Tracing Organic Contamination from Collection to Curation: Contamination Mitigation of Meteorites and Implications for Advanced Curation Methods of Astromaterials

by

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Abstract

Meteorites are the most primitive materials in the solar system and can provide important information about the early earth, planetary processes, and possibly yield insights to the building blocks of life. All meteoritic astromaterials are exposed to both organic compound and microbial terrestrial contamination when such materials enter the Earth's atmosphere and inevitably land on the surface. Documentation of the types and sources of terrestrial organic compounds is important for discerning extraterrestrial organic compounds from terrestrially sourced contaminants. In order to determine various sources of contamination it is critical to understand what influences the interactions astromaterials have with the Earth; these factors will hereafter be referred to as contamination controls. Contamination controls that are addressed in this thesis study include environmental aspects, transportation materials, laboratory processes, meteorite characteristics (composition, fractures, fusion crust, etc.), and a time factor. How and where the specimens are collected, transported, and stored has an influence on contamination as there can be a transfer of organics from the surroundings to the meteorite itself. Rate of build up or degradation of organic compounds is also of concern in contamination analysis and when interpreting intrinsic organic compounds from meteorites as it possible to gain and lose organic signatures through time. Gas chromatography – mass spectrometry will be the primary instrumental method used throughout this project to identify organic compounds in processing and storage materials as well as DCM and water extracts of meteorites with varying characteristics and collection circumstances to investigate how contamination is influenced by these controls. Each contamination control will play a role in how terrestrial organic compounds interact with the meteorite and governs what is detectable. In addition, next generation

sequencing will be used to characterize the 16S rRNA of microbial communities contaminating meteorites within the University of Alberta Meteorite Curation Facility.

The sources and controls of terrestrial contamination as well as their time and location dependencies are poorly constrained in the field of astromaterials thus far. Exploration of the advantages of cold curation and the development of clean rooms to process astromaterials are newly emerging techniques to mitigate contamination; however, a deeper understanding of contamination is needed to take preventative measures to against it. Here, we use a selection of different meteorites including, Aguas Zarcas and Tarda for organic compound extractions as well as Peace River, Redwater, and Bruderheim for microbial extractions. Suitable handling procedures and materials when working with astromaterials should be chosen under the criterion that they contain minimal concentrations and abundances of organic compounds available for transfer. This thesis will be aimed at documenting contamination and investigating their sources and controls, as described above, both of which are critical in protecting the scientific integrity of astromaterials. From this, procedures will be proposed to mitigate and reduce any potential organic contamination during their fall, collection, transportation, storage, and processing to preserve astromaterials in the most pristine states as possible. Being mindful of the terrestrial – extraterrestrial interaction complexities greatly influence the interpretations deduced from organic compound studies on astromaterials. In addressing contamination concerns, analyses on samples will provide increased accuracy and in turn a more comprehensive picture of processes in our solar system. Not only is this significant in planetary science, but assessing contamination is consequential in analytical studies in any scientific field.

Preface

Chapter 2 of this thesis has been published as L. D. Tunney, P. J. A. Hill, C. D. K. Herd, R. W. Hilts, and M. C. Holt "Distinguishing between terrestrial and extraterrestrial organic compounds in the CM2 Aguas Zarcas carbonaceous chondrite: Implications for intrinsic organic matter" in the journal *Meteoritics and Planetary Science*, Early View, pages 1-29. I was responsible for the experimental design, data collection and analysis, and was lead author in writing and submitting the publication. P. J. A. Hill assisted in the experimental procedure and provided edits to the manuscript. C. D. K. Herd was the supervisory author, was involved in concept formation and discussion, and contributed substantially to editing of the manuscript. R. W. Hilts assisted in the organic chemistry background and also provided edits on the manuscript. M. C. Holt aided with SEM data collection and analysis. The supplemental tables included in the publication have been included as Appendix A.

Chapter 3 of this thesis has been published as L. D. Tunney, P. J. A. Hill, C. D. K. Herd, and R. W. Hilts "Organic compounds in the Tarda C2 ungrouped carbonaceous chondrite: Evaluating the sources of contamination in a desert fall" in the journal Meteoritics and Planetary Science, Early View, pages 1-16. I was responsible for the experimental design, data collection and analysis, and was lead author in writing and submitting the publication. P. J. A. Hill assisted in the experimental procedure and provided edits to the manuscript. C. D. K. Herd was the supervisory author, was involved in concept formation and discussion, aided with SEM data collection and analysis, and contributed substantially to editing of the manuscript. R. W. Hilts assisted in the organic chemistry background and also provided edits on the manuscript. The supplemental tables included in the publication have been included as Appendix B.

The remainder of the thesis is original work by Libby Tunney and has not been previously published.

Dedication

I would like to dedicate this thesis to my parents, who have encouraged me and offered their unwavering support in every aspect and stage of my life. They have given me the tools necessary to successfully reach any goal I set my mind to and have allowed my passions to flourish. Thank you for being my safety net while simultaneously making me the independent and driven person I am today. Thank you for also staying engaged with my research projects, even though you have admitted on occasion that you have no idea what I am talking about.

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List of Abbreviations

AIB	α-aminoisobutyric acid
ASV's	Amplicon Sequencing Variants
DCM	Dichloromethane
FESEM	Field Emission Scanning Electron Microscope
GC-MS	Gas Chromatography – Mass Spectrometry
IOM	Insoluble organic matter
NIST	National Institute of Standards and Technology
MSD	Mass Selective Detector
MTBSTFA	N-tert-Butyldimethylsilyl-N-methyltrifluoroacetamide
OPA-NAC	o-phthalaldehyde-N-acetylcysteine
S_6	Hexathiane
S_8	Cyclic octaatomic sulfur
PAH	Polycyclic aromatic hydrocarbon
PCoA	Principal Coordinate Analysis
PFBHA	O-(2,3,4,5,6-pentafluorobenzyl)hydroxylamine hydrochloride
SEM	Scanning Electron Microscope
SOM	Soluble organic matter
RT	Retention time
t-BDMS	*tert*-butyldimethylsilyl
TFAA	Trifluoroacetic acid anhydride

Chapter 1: Introduction to Fundamental Concepts and Research of Extraterrestrial Organic Compounds

1.1 Introduction

Extraterrestrial material is received by the Earth daily, which can range from dust up to meters in size. Any such extraterrestrial material, as well as samples returned by robotic or human missions to solar system targets are generally referred to as astromaterials. This extraterrestrial material can contain organic matter that can provide information on the formation of the solar system and the processes that occur within it. Carbonaceous chondrites are commonly used in organic compound analyses due to their high carbon content relative to the other meteorite groups. In order to investigate organic matter in these astromaterials, their formation environment as well as the processes they experience thereafter need to be considered. This will play a role in how intrinsic organic compounds form and interact with its surroundings and governs what is detectable. The ultimate goal of this research is to address processes that astromaterials experience and the complications that it can cause when working with organic rich materials to keep them in pristine condition and improve the accuracy of analyses of their intrinsic properties.

1.2 Carbonaceous Chondrites

Carbonaceous chondrites are classified according to their bulk chemistry and mineralogy into 7 categories: CI, CM, CR, CO, CV, CK, and ungrouped (Botta and Bada, 2002). These classifications have associated petrographic types that are determined by the extent of the aqueous alteration and thermal metamorphism (Sephton, 2002). Aqueous alteration increases from petrographic types 2 to 1 and thermal metamorphism increases from 3 to 6. Their chemistry closely matches that of the solar photosphere (Lodders, 2003), making carbonaceous chondrites the most primitive material in the solar system (Pizzarello and Shock, 2010). The abundance of carbon within a carbonaceous chondrite specimen ranges and can be up to approximately 6 weight percent, which accounts for both organic and inorganic carbon contributions (Pearson et al., 2006). Conversely, other meteorite groups such as ordinary chondrites, typically contain less than 0.20 weight percent total carbon (Moore and Lewis, 1967; Grady et al., 1989). The organic carbon in carbonaceous chondrites can account for up to approximately 5 weight percent (Wetherill and Chapman, 1988) which can subsequently be divided into soluble organic matter

(SOM) and insoluble organic matter (IOM) and comprises 30% and 70% of the total organic carbon, respectively (Becker et al., 1999; Sephton, 2002). As their names suggest, the SOM is a solvent-soluble portion of organic matter whereas the IOM is a macromolecular fraction that is not soluble in organic solvents (Maillard et al., 2018). The IOM contains organic material that has high molecular weight and highly immobile, therefore its organic content is assumed to be stable and exclusively intrinsic (Sephton, 2002) likely controlled by its complex structure with more unsaturated carbons in relation to the SOM (Maillard et al., 2018). In contrast, the SOM has organic matter that has low molecular weights relative to the IOM and is very mobile. Due to the prebiotic nature of the soluble organic matter, despite its unstable properties, it will be the primary focus of this thesis.

1.3 Intrinsic Soluble Organic Compounds in Carbonaceous Chondrites

The intrinsic soluble organic matter found in carbonaceous chondrites span a diverse range of organic compound categories including carboxylic acids, amino acids, diamino acids, dipeptides, diketopiperazines, sulphonic and phosphonic acids, purines, pyrimidines, sugars and sugar-related compounds, hydrocarbons, alcohols, amines, amides, aldehydes, ketones (Martins, 2019), sulfur heterocycles (Sephton, 2002), and metalorganic compounds (Ruf et al., 2017). The organic molecules in carbonaceous chondrites are composed entirely of carbon (C), hydrogen (H), nitrogen (N), oxygen (O), phosphorus (P), and sulfur (S) (Lazcano, 2010), with the exception of the metalorganic group that contains CHOMg groups (Ruf et al., 2017). The distributions of these organic components are different depending on their source. For example, terrestrial polycyclic aromatic hydrocarbons (PAHs) are present in complex combinations whereas extraterrestrial PAHs consist of a unique, simple grouping of minimal compounds that are found across multiple meteorites previously analyzed (Becker et al., 1997). Moreover, the PAH distribution detected in meteorites require temperatures that are achieved from pre-solar processes which are then incorporated into their respective parent bodies, which again points toward an extraterrestrial origin (Botta and Bada, 2002). Another source of extraterrestrial organic material commonly found in meteorites is elemental sulfur (Kaplan and Hulston, 1966), typically in the form of octaatomic sulfur or hexathiane (Hilts et al., 2014).

Overall, the soluble organic matter within carbonaceous chondrites present several common features independent of the type of organic compound it belongs to: (1) branched chain isomers are more abundant over single chains; (2) as the carbon number of the molecule increases there is an exponential decline in the concentration; (3) the $\delta^{13}C$ values of organic matter decrease with increasing carbon number; (4) extraterrestrial organic matter show an enrichment in their $\delta^{13}C$, δD, and $\delta^{15}N$ isotopic signatures compared to their terrestrial equivalents; (5) saturated compounds are more abundant than unsaturated compounds (Sephton, 2002); and (6) the branched organic compounds are more enriched in $\delta^{13}C$, δD, and $\delta^{15}N$ isotopic signatures in relation to their straight-chain counterparts (Martins, 2019). There are also trends that emerge within and between individual organic compound categories. Sephton (2002) has shown that there is a structural preference of amino acids in which α configuration are most abundant, β configurations least abundant and γ configuration has an intermediate occurrence. Martins (2019) has noted that carboxylic acids are the most abundant type of soluble organic molecules found in carbonaceous chondrites and when compared to amino acids they have a lower δD and $\delta^{13}C$ signature that indicates origins from different precursors.

No matter the organic compound this enrichment of the $\delta^{13}C$, δD, and $\delta^{15}N$ isotopic signatures of meteorites suggests a formation of organic matter within the cold interstellar medium as the mass dependent fractionation becomes efficient (Pizzarello and Shock, 2010; Sandford et al., 2010). Pizzarello and Shock (2010) advocate that organic compound formation would thus be formed by icy asteroidal bodies accreting water and other volatiles that are later warmed and undergo aqueous alteration. Due to this, analysis of organic compounds intrinsic to meteorites can yield insights regarding carbon chemistry in the interstellar medium and solar nebula, the role of volatiles and organic matter in the formation of planetary bodies, and potentially the origin of life (Huss and Draine, 2006). By documenting extraterrestrial organic compounds, it can allow us to deduce the chemistry of the early Earth since geological and biologic activity have essentially erased all traces of our prebiotic Earth (Sephton, 2002). Therefore, studying organic matter in astromaterials can provide us with a significant amount of information about the chemistry of the solar system and in turn the processes that occur within it.

1.4 Methods of Distinguishing Between Terrestrial and Extraterrestrial Organic Matter

Since meteoritic organic compounds have an identical terrestrial counterpart, both of which have their own unique chemical signatures (Pizzarello and Shock, 2010), it is important be able to differentiate between the two in order to make accurate conclusions from organic analyses on these astromaterials. There are multiple methods to distinguish whether the organic matter detected in meteorites is sourced from terrestrial or extraterrestrial origins and are described below. These techniques are best combined with one another in order to improve the confidence of the conclusions we draw from organic compound analysis as mixing of terrestrial and extraterrestrial compounds can occur.

1.4.1 Sampling of Terrestrial Environment

The first method is the relative abundance and distribution which involves the comparison of the concentration and distribution of compounds detected in its surroundings, such as the collection site, storage location, processing location, and other areas of contact. A couple important questions to consider are: do any of the detected compounds show large spikes in concentration, and if so, how much? Or are any of the detected compounds rare in the terrestrial environment? Typically, meteoritic organics have a concentration up to a few hundred parts per million (ppm) (Sephton, 2002; Martins, 2019). If you were to detect organics well above this level it is highly likely sourced, at least in part, from a terrestrial source. On the other hand, if the compound is rare on Earth, or rare in the meteorite's location, this is a good indicator that the organics are intrinsic to the stone.

To display how this method works in practice a few examples follow below. Firstly, the organic compounds of interior and exterior samples of the same meteorite stone can be compared to determine whether a compound is extraterrestrial or is a result of contamination. Compounds, commonly PAHs, are attributed to being terrestrial contamination when they are found on exterior samples of meteorites and not distributed throughout the entirety of the stone which would be expected if the compound was indeed intrinsic (Han et al., 1969). This is because the exterior of the specimen is readily exposed to the Earth making it more prone to contamination build up than the interior. Next, this can be done by looking at the rare compounds in the terrestrial environment. Cronin et al. (1995) dealt with amino acids, and they outline that over seventy amino acids are found intrinsic to carbonaceous chondrites, of these 8 are found in terrestrial proteins, 11 are rare on Earth, and the remainder are unique to meteorites. If one of these unique amino acids are detected, we can be very confident that it is extraterrestrial in origin. In contrast, if it can be found on Earth an investigation should be done into whether it is found in the terrestrial environment where the meteorites had contact with. Lastly, trends in usual contamination from the terrestrial reservoir can be compared to what is found in the meteorite. For example, typical atmospheric contamination would show a relative enrichment of phenanthrene in comparison to anthracene, whereas intrinsic hydrocarbons would show a more even distribution of these PAHs (Monroe and Pizzarello, 2011).

1.4.2 Enantiomeric Ratios

The second method is looking at enantiomeric excesses of amino acids. All amino acids, with a few exceptions, contain one or more chiral centers around a carbon which describes the stereochemistry of organic molecules (Aubrey et al., 2008). Variations in chirality lead to the formation of L- and D-enantiomers which are chiral compounds that are mirror images of one another and describe different arrangements of the groups attached to that carbon (Aubrey et al., 2008). The amino acids found in carbonaceous chondrites are produced abiotically and have a racemic distribution with a slight L-enantiomeric excesses in some cases, whereas terrestrial amino acids display homochirality (almost exclusively L-enantiomers) (Aponte et al., 2016). It has been postulated that the homochirality, which is necessary for biological functions (Pizzarello et al., 2008), of amino acids on Earth could have been seeded by the L-enantiomeric excess observed in carbonaceous chondrites (Pizzarello et al., 2003; Glavin and Dworkin, 2009). The detection of both L- and D-enantiomers, either racemic distributions or L-excesses, is a sign that it is extraterrestrial in origin.

1.4.3 D, ^{13}C, and ^{15}N Isotopic Signatures

The third method is using isotopes as there is an enrichment in of the $\delta^{13}C$, δD, and $\delta^{15}N$ isotope signatures in bulk meteoritic organic matter compared to terrestrial organics (Sephton, 2002) (Table 1.1). This enrichment of δD and $\delta^{15}N$ suggests effective chemical fractionation which can be achieved in the interstellar medium (Martins, 2019) with controls by nucleosynthesis and nuclear processing (Penzias, 1980). In addition, aqueous processes on the parent body preferentially destroy $\delta^{12}C$ rich matter resulting in an enriched $\delta^{13}C$ isotope signature (Aponte et al., 2016). As shown in table 1.1, the differences between δD and $\delta^{15}N$ signatures for terrestrial and extraterrestrial reservoirs are quite dramatic which makes it the most useful tool for distinguishing the organic matters origin. The $\delta^{13}C$ isotope values can be useful but there is much overlap between extraterrestrial and terrestrial organic matter. The enrichment observed in these isotopes is seen at both the bulk organic matter and individual organic compound levels, although bulk values may differ due to the mixing of individual compounds isotopic signatures (Botta and Bada, 2002; Sephton, 2002; Martins, 2019).

Table 1.1 Average bulk δ13C, δD, and δ15N isotopic signatures from terrestrial and extraterrestrial organic matter. Data are compiled and reported by Sephton (2002).

Organic matter	$\delta^{13}C$ (‰)	δD (‰)	$\delta^{15}N$ (‰)
Terrestrial	-5 to -30	< -30	-5 to +20
Extraterrestrial	-13 to -21	+480 to +680	+25 to +150

1.5 Challenges in Soluble Organic Matter Analysis

Although there are ways to discriminate between terrestrial and extraterrestrial organic matter, there are a few variables that can complicate this process and are described in depth below.

1.5.1 Parent Body Processes

The first challenge that is encountered is parent body processes which include aqueous alteration and thermal metamorphism. Since carbonaceous chondrites are classified according to their bulk chemistry and mineralogy which is controlled by these parent body processes and expressed in their petrographic type, there is a multitude of impacts on organics observed based on the severity of each process (Botta and Bada, 2002). Both the aqueous and metamorphic activities inflicted upon astromaterials on their parent bodies prior to delivery to Earth can impact the types and abundances of organic matter detectable.

Alkylated PAHs become more abundant in meteorites that present intense aqueous alteration as these PAHs are less soluble and volatile than non-alkylated PAHs and therefore less prone to the effects of aqueous activity (Elsila et al., 2005). Elsila et al. (2005) also noted that the abundance of PAHs is reduced with increasing thermal metamorphism, which is attributed to the volatilization of these aromatic components in the soluble organic matter. Not only are aromatic components at risk of these processes, but the more water-soluble organic matter as well (Monroe and Pizzarello, 2011). Since both the aqueous and metamorphic activities observed by a meteorite determine its distribution of PAHs and other organic matter (Sephton et al., 2002), it is possible this can bias our conclusions of the original distribution of PAHs on the parent body. Smith et al. (2014) detected a negatively correlated trend in which aqueous alteration destroys pyridine carboxylic acids. Similarly, Burton et al. (2014) attributed an absence of amino acids in more aqueously and thermally metamorphosed, due to the destruction of organic molecules during these processes. A similar trend is seen with aliphatic amines, wherein their abundance decreases with increasing thermal alteration (Aponte et al., 2017). However, Aponte et al. (2017) note that a reduction of aliphatic amines are also observed in select unaltered carbonaceous chondrites which can be indicative of the parent body chemistry and environment and does not necessarily reflect aqueous or thermal processes. Typically, carbonaceous chondrites with lower petrographic types will contain a higher abundance of volatile compounds as thermal processes will result in their loss (Sephton et al., 2001). Conversely, an increased abundance of metalorganic compounds is associated with more heavily thermally altered specimens which is accompanied by an enrichment in $\delta^{26}Mg$ values (Ruf et al., 2017). This is the only organics group in carbonaceous chondrites that increases in abundance with thermal alteration as this process facilitates the mobilization and incorporation of magnesium into organic molecules.

Not only can aqueous alteration destroy organic material, but it has been shown to change the distribution of amino acids detected with varying levels of alteration (Glavin et al., 2006). A higher abundance of the amino acid β-alanine relative to α-aminoisobutyric acid (AIB) was detected in meteorites with greater aqueous alteration which was also linked to an increased L-isovaline enantiomeric excess (Glavin and Dworkin, 2009).

Although the IOM is not usually considered in SOM analyses, increasing thermal or aqueous alteration can liberate the ^{13}C and ^{15}N bearing components of the organic macromolecules (IOM) which causes an overall reduction in $\delta^{13}C$ and $\delta^{15}N$ as the petrologic types increase from 1 to 4 (Sephton et al., 1998; Sephton et al., 2003; Sephton et al., 2004). Sephton et al. (1998; 2003; 2004) emphasizes that increasing aqueous alteration would convert the IOM that is liberated into a soluble organic component therefore causing an enrichment in $\delta^{13}C$ and $\delta^{15}N$, whereas thermal alteration in types 3 and 4 would result in a loss of macromolecules and a reduction in $\delta^{13}C$ and $\delta^{15}N$. Since IOM has the potential to be converted to a soluble component this needs to be accounted for in soluble organic matter analyses. This further emphasizes the need to be conscious of the history of the meteorite specimens we analyze as their organic compound analyses can either represent the original material accreted on the parent body or the secondary processes following accretion (Pearson et al., 2006).

1.5.2 Delivery of Astromaterials to Earth

The terminology for meteorite material becomes important as it indicates what stage the material is in. This material begins as a meteoroid in space, after entering Earth's atmosphere it becomes a meteor where it ablates in its well-known bright fireball phase to create a fusion crust (Figure 1.1; Ceplecha et al. 1998). The fusion crust is formed as the meteor ablates due to frictional heating as it travels through the atmosphere during the fireball phase. The extreme temperature of this process causes the outer surface to melt which re-solidifies as it cools during the dark flight phase into a matte black crust that is typically no more than 1 to 2 mm thick, leaving the interior temperature relatively cool and stable through entry (Ceplecha et al. 1998; Thaisen and Taylor 2009). The crust can be separated into two categories: the primary and secondary fusion crusts. The primary fusion crust is the initial melting and solidification of the meteor. However, there are instances where the primary fusion crust is broken during flight, initiating additional phases of melt which yield thinner crusts as it has a shorter flight path left; known as the secondary fusion crust (Norton and Chitwood 2008). Once landing on the surface of the Earth the meteor is termed a meteorite, or in most cases meteorites, as the material fragments during entry. The meteorite fragments distribute over a wide, elliptical area to form what is known as a strewn field. The shape and area of the strewn field is dependent on atmospheric conditions where larger masses travel further than smaller meteorite stones (Limonta et al. 2021; Moilanen et al. 2021). The fusion crust is a unique feature to meteorites that allows for their distinction from terrestrial rocks.

The majority of amino acids, with some exceptions, are destroyed when heated at temperatures greater than 550 °C and would not make it to the Earth's surface once it is flash heated during atmospheric entry (Glavin and Bada, 2004). As organic matter is heated, chemical bonds begin to break and extreme temperatures above 10^4 Kelvin (~9727 °C) completely erase any trace of organic matter (Anders, 1989). Not only is the heating upon atmospheric entry and eventual impact on Earth's surface important in the detectability of intrinsic organic compounds in meteorites, but the interaction between the Earth's atmosphere and the astromaterials themselves must be considered. During the formation of fusion crust several changes to the meteorites composition and chemical signature occur: (1) Fe-rich sulphide, metal, and oxide liquids will separate and react; (2) mixing of extraterrestrial and atmospheric oxygen; (3) mixing of the crust with partially melted substrate; (4) evaporation and degassing of volatile elements

(Genge and Grady, 1999) and; (5) increased abundance of metalorganic compounds in the fusion crust due to heating (Ruf et al., 2017). This has implications for the biases that can appear in bulk analyses of meteorites that include a fusion crust component. Such biases can include a shift towards an oxygen isotope and organic matter signatures more characteristic of a terrestrial origin, enrichment in metalorganic compounds, or an incomplete picture of the intrinsic organic matter originally present due to the loss of volatile constituents. There can also be contamination of organics that are commonly found in Earths atmosphere, like chlorinated hydrocarbons as they are known atmospheric contaminants (Muir et al., 1988).

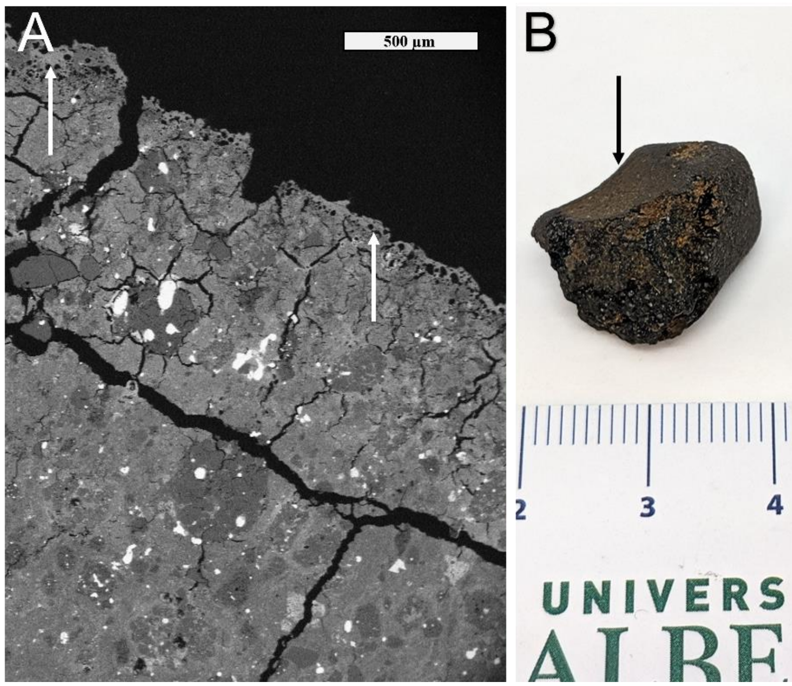

Figure 1.1 Example of fusion crust on the Aguas Zarcas meteorite in (a) SEM imaging and (b) hand specimen indicated with arrows.

1.5.3 Organic Matter Heterogeneity in Meteorites

It has been documented that the organic material within carbonaceous chondrites is heterogeneously distributed throughout a given stone, resulting from parent body processes, especially in brecciated meteorites (Pizzarello et al., 2003; Botta, 2008; Simkus et al., 2019). This can yield a biased report of the distribution and concentrations of organic compounds within carbonaceous chondrites which is also recorded by their isotopic signatures (Sephton, 2002). These inconstancies have been reported extensively in planetary science literature. Pizzarello et al. (2003) determined that the amino acid, L-isovaline, which is commonly found in carbonaceous chondrites, displayed an L-entantiomeric excess that varied from 0 to 15.2% within different Murchison meteorite stones. In comparison, another study by Glavin and Dworkin (2009) found an L-isovaline excess as much as 18.5%. Isovaline is often reported in individual amino acid measurements as it resistant to racemization therefore its L-excess proportion does not decrease significantly over time (Pollock et al., 1975).

This organic matter heterogeneity has also been observed within the fusion crust component of meteorites. Fusion crust properties are localized and vary significantly depending on the composition of the incorporated substrate below (Thaisen and Taylor, 2009) and the amount of the extraterrestrial and atmospheric oxygen mixing that occurs which produce concentrated areas of highly oxidized fusion crust amid reduced portions (Genge and Grady, 1999). These heterogeneities need to be considered to properly interpret data received from analyses as they can misrepresent the true mean values in data and therefore confound potential geochemical trends (Pearson et al., 2006).

1.5.4 Organic Contamination on Astromaterials

Due to the presence of life, astromaterials that enter the Earth's atmosphere and consequently fall onto its surface are exposed to a significant amount of contamination. The severity of contamination that these materials experience depends on the terrestrial environment in which they fall and how they are handled thereafter. Since the processes and conditions under which meteorites form are tremendously different than what they encounter on Earth (Allen et al., 2011), it is possible to distinguish between contaminant terrestrial organic compounds and intrinsic extraterrestrial organic compounds. Terrestrial organic contamination can be sourced naturally from the environment or from synthetic processes due to human activities. However, the term organic matter, whether it is terrestrial or extraterrestrial, does not necessarily indicate the presence of life as organic compounds can be formed by many processes that do not require life (Wright et al., 1989). For example, polycyclic aromatic hydrocarbons (PAHs) are common in both the interstellar medium (Elsila et al., 2005) and the terrestrial reservoir via anthropogenic or natural sources during the combustion of fossil fuels and during wildfires, respectively (Simoneit, 2002). Since the soluble organic content of meteorite specimens is extremely low it makes them susceptible to any concentration of terrestrial contamination, especially in non-carbonaceous meteorites that have negligible intrinsic organic material (Jull et al., 1998).

Therefore, any significant abundance of organic matter detected in ordinary chondrites are most likely sourced from terrestrial contamination.

It is critical to recognize that organic matter signatures, in any form, can be a mixture of terrestrial and extraterrestrial sources, requiring sampling of the specimen's surroundings to better characterize the terrestrial components (Becker et al., 1997; Bada et al., 1998). For example, the contribution of terrestrial organic compounds to extraterrestrial organic compounds results in a 13C-depleted stable carbon isotope signature (Kerridge et al., 1987). Even after acquiring specimens from the terrestrial surface, they are still subject to contamination from numerous sources; during transport, handling, storage, and curation processes (Toporski and Steele, 2007).

1.5.4.1 Terrestrial Surface

How long astromaterials sit on the terrestrial surface has a significant control on how much contamination they may experience, although this heavily depends on the surface it falls upon. Certain areas of the Earth aid in preservation and collection of meteorites, these localities being Antarctic ice or hot deserts where chemical processes and biologic activities are slowed and samples stand out in relation to their surroundings (Sephton, 2002). However, the best-case scenario to minimize contamination is a sample return mission as these samples are not exposed to the terrestrial surface.

An example of possible contamination from the terrestrial surface and how it is handled is described below. Due to the Earths homochirality behavior of amino acids, it is possible that terrestrial L-enantiomers could contribute to an enrichment in the L-excesses of certain compounds (Pizzarello et al., 2008). However, on Earth L-isovaline is scarce and is primarily found in fungus in its other configuration; D-isovaline (Keller et al., 1990). To confirm the absence of L-isovaline on the terrestrial surface, sampling of the collection area can be done to compare the concentration of an individual compound in the meteorite to its surroundings. Kvenvolden et al. (2000) took soil samples of the Murchison meteorite fall site to determine the L-isovaline concentration and found that there was no L-isovaline above their detection limit of 10 ppb and therefore could not be contributing to the L-excesses reported in the Murchison meteorite. Another instance of the distribution of enantiomers being a clue to its origins is D-/L-isoleucine and D-/L-alloisoleucine, which are diastereomers of one another. L-isoluecine is only found in terrestrial proteins, whereas all four forms can be found in carbonaceous chondrites (Pizzarello et al., 2008). In combination with L-excesses and terrestrial counterparts, if they are isotopically heavy, they are not considered to be caused by contamination from terrestrial sources (Pizzarello et al., 2003; Glavin and Dworkin, 2009).

In general, the time a meteorite spends on the surface is determined by whether the meteorite is a fall, in which its entry to Earth is seen and recorded, or a find, in which its fall date is unknown (Sephton et al., 2002). It is expected that a meteorite find would be more contaminated as they are typically found well after their fall and would sit on the Earth's surface for a period of time. But there can be problems that arise in analyses that contradict this. A study by Grady et al. (1982 and 1989) looking at ordinary chondrites found that meteorite falls have a carbon-13 signature similar to the average signature from terrestrial organics around -25‰, whereas finds had a more enriched signature around -15‰. This enriched signature of these finds was later attributed to inorganic material in the form of carbonates, which could be terrestrial and extraterrestrial in origin, contaminating the specimens. To avoid the contamination contributing to the isotopic signatures, carbonates can be removed from the bulk samples prior to analysis.

1.5.4.2 Handling Conditions

After astromaterials are removed from the terrestrial surface upon which they fell, they are still subject to sources of contamination governed by how they are handled. This can result from a range of scenarios from handling by people without gloves, which can include the transfer of the compound squalene from fatty oils of the skin, to storage in plastics which can transfer phthalates to the meteorite specimens (Hilts et al., 2014). How specimens are handled directly and indirectly is a significant concern when examining contamination. This can include airborne organics in the atmosphere, as well as anything that can come into contact with the specimens such as handling tools, storage materials, and analytical instruments (Herd et al., 2016).

1.5.4.3 Microbial Interactions

Contamination by microbiota on astromaterials is also a consideration in organic compound analyses. Heterotrophic microorganisms can metabolize a variety of hydrocarbons, and in doing so they acquire a similar δ13C signatures to the materials that they use during the process (Taipale et al., 2015). Mircoorganisms will either consume the intrinsic organic matter in carbonaceous chondrites or leave behind their own detritus which either destroy or mask the extraterrestrial organic compounds, respectively (Pizzarello and Yarnes, 2018). Since astromaterials may contain extraterrestrial hydrocarbons, it is plausible for microorganisms to inhabit these materials and carry out their metabolic activities using the extraterrestrial organic matter within them (Toporski and Steele, 2007). Such biological activity will impact organic analyses done on astromaterials and will hinder the conclusions that can be drawn from such analyses. For this reason, care needs to be taken when interpreting carbon isotope data of organic matter in meteorites if it presumed to be contaminated with terrestrial microbiota (Steele et al., 2000).

1.5.5 Organic Matter Extraction Method

There are two commonly used methods to extract the soluble organic matter from carbonaceous chondrites: solvent extraction and thermal extraction. Each method is efficient in extracting different groups of organic compounds determined by their chemical properties. Typically, high molecular weight organic compounds will be more abundant in solvent extracts due to the loss of more volatile low molecular weight compounds (Sephton, 2002). Another factor to consider is the type of solvent used, as the solvent will preferentially extract compounds with similar or lower polarity (Hilts et al., 2014). In contrast, the low molecular weight organics are better represented in the thermal extraction process as there are no evaporation steps needed in this method (Sephton, 2002). For thermal extraction there should be a step to remove IOM and inorganic carbon as temperature may mobilize this material and allow it to contribute to analyses (Grady et al., 1989).

An additional consideration needs to be made when choosing samples for either method. As discussed in the organic matter heterogeneity complication, it is important to determine whether the subsample used in analyses represents the entire meteorite as a whole. The method used can introduce bias into the type of organic matter detected, therefore, the extraction used needs to be kept in mind to place organic analyses results in context.

1.6 Summary and Implications for Advanced Curation

Owing to their high organic matter content, if we want to study organic compounds in astromaterials, carbonaceous chondrites are the best target to do so. However, challenges are posed by the processes and environments that astromaterials experience. Some of these challenges are under our control like the type of extraction method and contamination, whereas some are out of our control like parent body processes, delivery to Earth and heterogeneity. For contamination, we can develop methods to better handle specimens and reduce contamination but once the meteorite falls to Earth it is instantly subject to contamination. The delivery to Earth can be in our control during sample return missions, but if they enter Earth naturally these processes are no longer under our control. And lastly, heterogeneity, which can be mitigated for by choosing samples that best approximate the whole stone without introducing significant biases. Whether the variables are controllable or not, we need to be aware as to how these processes can impact extraterrestrial organic matter. The methods used to distinguish between terrestrial and extraterrestrial organic matter also each have their own challenges. This can include the masking of extraterrestrial isotopic signatures due to mixing of contamination (terrestrial organics) with extraterrestrial organics as well as amino acid racemization which would reduce the L-excesses of amino acids over time (Pollock et al., 1975). To overcome this, these are best used when combined as opposed to using individual methods alone.

The challenges posed to extraterrestrial organic matter analyses emphasize that measures need to be taken to preserve carbonaceous chondrites in the most pristine state possible to protect the scientific integrity of astromaterials including proper documentation of the collection and handling of each specimen. The types and abundances of organic molecules in carbonaceous chondrites can indicate whether they require unique handling conditions. From this information, protocols for advanced curation can be developed to maintain astromaterials in the most pristine state as possible as these materials are analogous to a sample return mission without the extensive cost and engineering needs, in turn, preserving its scientific integrity for future research (McCubbin et al., 2019). The development of advanced curation methods includes clean room facilities and subzero conditions for vulnerable samples that have a high volatility content (Herd et al., 2016). By addressing variables that can confound soluble organic matter analyses on astromaterials it will provide increased accuracy and in turn a more comprehensive picture of processes in our solar system.

Chapter 2: Distinguishing between terrestrial and extraterrestrial organic compounds in the CM2 Aguas Zarcas carbonaceous chondrite: Implications for intrinsic organic matter

Abstract

Soluble organic matter analyses of astromaterials can provide valuable information on the chemistry of our solar system and the processes that occur within it. The surface of the Earth, however, is a significant source of organic compounds due to the presence of life; this environment represents a major source of potential contamination for recently-fallen meteorites. Here, we analyze select stones of the CM2 Aguas Zarcas carbonaceous chondrite, which fell on April 23, 2019, in Aguas Zarcas, San Carlos county, Alajuela province, Costa Rica, with the goal of determining the complement of intrinsic and contaminant soluble organic matter. The specimens were collected pre- and post-rainfall, days to weeks after the stones fell to Earth. Through gas chromatography-mass spectrometry analysis of soluble organic matter in dichloromethane and hot water extracts of meteorite powders, we differentiate between extraterrestrial and contaminant sources for each organic compound detected. In this study, *N-tert*-butyldimethylsilyl- N-methyltrifluoroacetamide (MTBSTFA) was used to derivatize the hot water extracts to test out its "one-pot" extraction capabilities. The majority of the detectable organic compounds are contaminants and can be explained as being sourced from the terrestrial surface onto which the meteorite fell. Our results have implications for how environmental factors, such as land use and rainfall events in this case, can impact the intrinsic organics in carbonaceous chondrites.

2.1 Introduction

Analysis of organic compounds intrinsic to meteorites can provide information regarding the carbon chemistry of the interstellar medium and solar nebula, the roles of volatiles and organic matter in the formation of planetary bodies, indicators of planetary processes (both aqueous alteration and thermal metamorphism), and potentially the origin of life (e.g., Sephton 2004; Elsila et al. 2016). It is crucial when studying meteoritic organic matter to be able to distinguish between terrestrial and extraterrestrial organic matter as the majority of meteoritic organic compounds have a terrestrial counterpart (Pizzarello and Shock 2010). Due to geological and biological activity on Earth, all incoming extraterrestrial organic matter within meteorites is potentially subject to contamination, or alteration which may partially to completely replace or erase it (Sephton 2002). This activity can result in addition of organic matter, leaching and dissolution by water, hydrolysis, oxidation, terrestrial overprinting, and new mineral growth (Lee et al. 2021). Measures need to be taken to preserve meteorites in their most pristine state possible, including documenting their collection and curation histories in order to trace potential sources of terrestrial contamination (e.g., Tunney et al. 2020). A meteorite specimen's history can govern how it is handled and curated; for example, if it was readily exposed to water, steps during curation will need to be taken to decelerate rusting. Additionally, the types and abundances of intrinsic organic molecules in carbonaceous chondrites can indicate whether they require special handling conditions. For example, especially vulnerable samples that have a high volatile content may require advanced curation methods such as subzero conditions, in addition to clean room handling (Herd et al. 2016; McCubbin et al. 2019).

The recent fall of the Aguas Zarcas meteorite, (hereinafter referred to as "Aguas Zarcas") a CM2 carbonaceous chondrite, has provided a unique opportunity to study relatively pristine extraterrestrial organic matter due to its rapid collection. The Aguas Zarcas meteorite fell on April 23, 2019, in Aguas Zarcas, San Carlos county, Alajuela province, Costa Rica (centered on 10°23'29.03"N, 84°20'28.58"W) (Gattacceca et al. 2020). Between April 23rd and April 27th of 2019, 11 kgs of the meteorite were collected (hereby referred to as pre-rain material). In the afternoon of April 27, 2019, rain started to fall on the strewn field and continued for the following 3 days after which a total of 16 kg of post-rain material were recovered. The majority of the Aguas Zarcas stones (herein referred to as specimens) landed on agricultural land in the area (Figure 2.1).

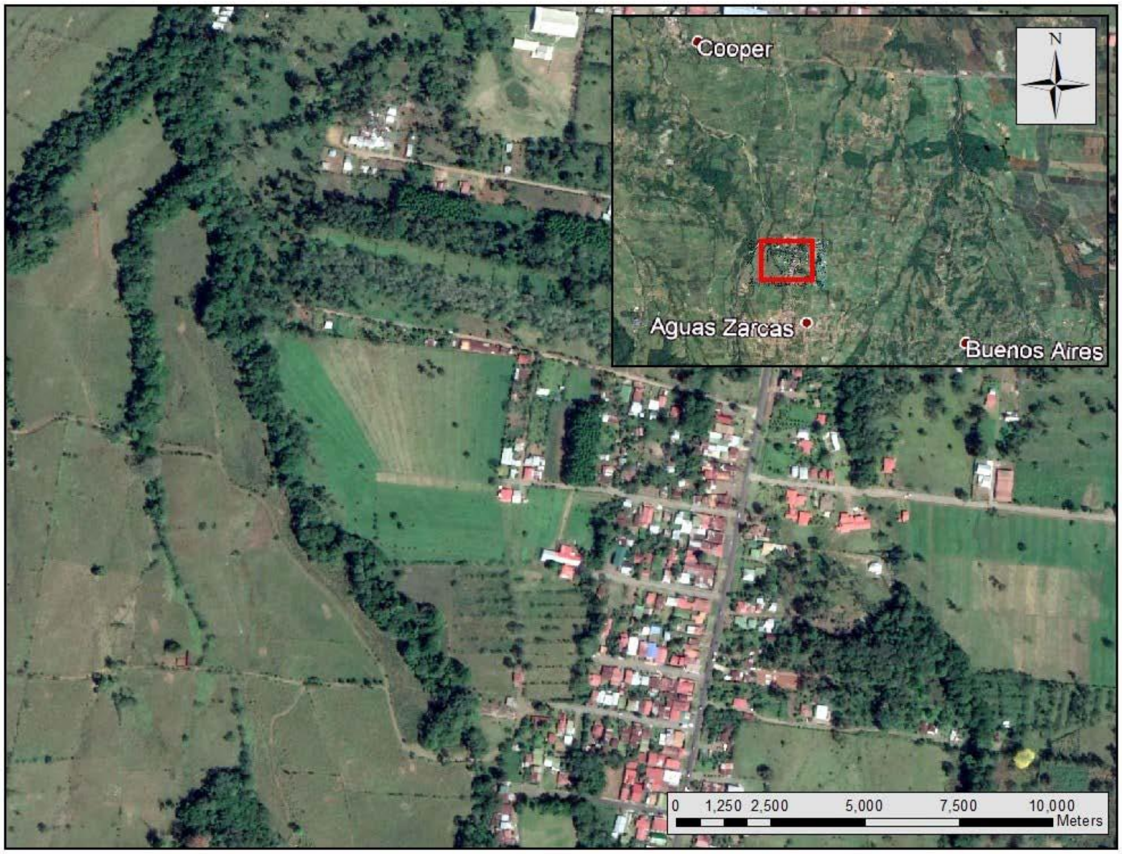

Figure 2.1. Approximate fall and collection location of Aguas Zarcas meteorite specimens in San Carlos county, Alajuela province, Costa Rica. Satellite image of the study area is from Google, CNES/Airbus, Maxar Technologies (2020).

Aguas Zarcas is a breccia with two main lithologies; a chondrule-rich lithology where chondrules constitute approximately 40% of the meteorite, and a chondrule-poor lithology with about a 10% chondrule content (Meteoritical Bulletin). In addition, a handful of specimens are reported to have a unique metal-rich lithology in which the distribution of organic matter has been suggested to indicate a more primitive nature compared to other CM chondrites (Kebukawa et al. 2020; Kerraouch et al. 2020). Due to its brecciated nature, and the presence of unusual metal-rich lithologies, documenting the distribution of intrinsic organic matter within Aguas Zarcas relative to its petrology has the potential to provide insights into the processes that occurred during its formation, provided that terrestrial contamination can be adequately discerned. The availability of pre- and post-rain Aguas Zarcas specimens enables the evaluation of terrestrial controls on organic matter distribution in meteorites.

In this study both dichloromethane (DCM) and hot water extractions were used to determine the soluble organic compounds in a selection of Aguas Zarcas specimens. *N-tert*-butyldimethylsilyl- N-methyltrifluoroacetamide (MTBSTFA) was the derivatization agent of choice in order to volatilize any highly polar organic compounds in the water extractions in order to utilize gas chromatography-mass spectrometry (GC-MS). MTBSTFA will silylate any compound with a labile hydrogen making it a "one-pot" derivatization as it does not discriminate based on type of compound (Orata 2012) and produces *tert*-Butyldimethylsilyl (*t*-BDMS)-compounds, a more stable derivative compared to tetramethylsilane (TMS)- compounds which is the typical derivative used in organic compound analyses (Chance et al. 1997). One disadvantage of MTBSTFA is its sensitivity to moisture. In the presence of moisture, MTBSTFA will react to produce 3 major hydrolysis products: 1,3-bis(1,1-dimethyethyl)-1,1,3,3-tetramethyldisiloxane, N-methyl-2,2,2-trifluoroacetamide, and *tert*-butyldimethylsilanol (Glavin et al. 2013). These hydrolysis products can create GC-MS peaks that may hinder the detection of trace intrinsic organic compounds due to co-elution and may indicate that the MTBSTFA was depleted through the reaction with moisture before reacting with the compounds of interest in the meteoritic extracts.

After identifying organic compounds in our Aguas Zarcas specimens, we elucidate their sources as either intrinsic to the specimen or contamination from the terrestrial surface. In addition, we explore environmental controls on organic contamination - specifically, land use and rainfall. From this information, proper techniques to recover, store, process, and curate extraterrestrial samples, like Aguas Zarcas, based on their organic compound content can be developed.

2.2 Materials and methods

2.2.1 Aguas Zarcas specimens

Five Aguas Zarcas specimens were obtained for the purposes of this study (Figure 2.2): a pre-rain sample (MET11791/1, 4.858 g) and a post-rain sample (MET11791/3, 3.12 g) from Mendy Ouzillou (Skyfall Meteorites), along with three additional pre-rain specimens (AZ-PT1, 1.92 g; AZ-PT2, 1.64 g; AZ-PT3, 6.63 g), from The Meteorite Market.

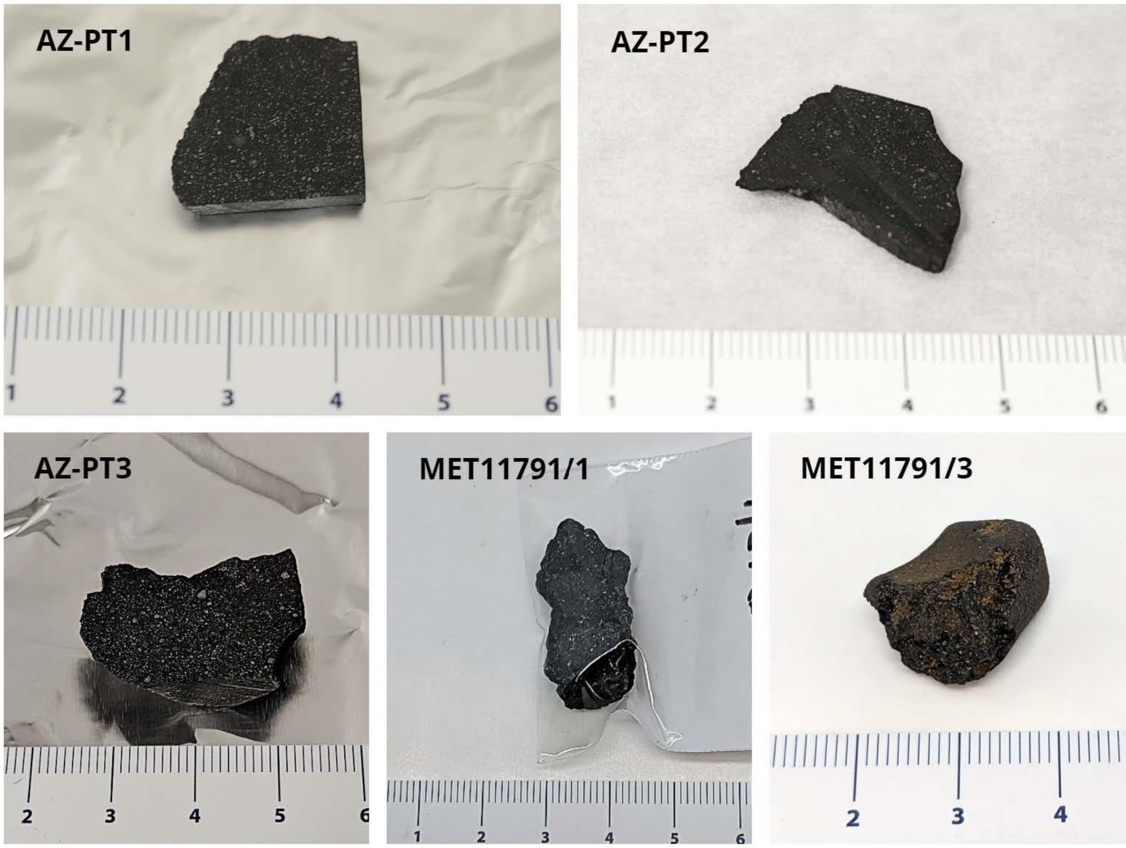

Figure 2.2. The 5 Aguas Zarcas specimens used in this study. AZ-PT1, AZ-PT2, AZ-PT3, and MET11791/1 are pre-rain material, and MET11791/3 is a post-rain sample. Scale bar in cm.

2.2.2 Storage and handling

All Aguas Zarcas specimens were stored, subsampled, and extracted with DCM in the University of Alberta Meteorite Curation Facility within a Class 1000 cleanroom, with the exception of MET11791/1, which was subsampled in an inert argon atmosphere glove box within a freezer in the facility (Herd et al. 2016). All water extractions were carried out within a glovebox at MacEwan University. Materials used for processing the Aguas Zarcas specimens were cleaned with ultrapure water (Millipore Direct Q3 UV, 18.2 MΩ, 3 ppb total organic carbon) and HPLC grade DCM, and if possible for the type of material (i.e., metal and glass), were combusted for at least 6 hours at 450 °C. Any direct handling was done with nitrile gloves or clean and combusted tweezers. Handling of the specimens prior to arrival at the University of Alberta is unknown and the specimens from the Meteorite Market were delivered in plastic bags.

All Aguas Zarcas specimens were subsampled using a sterile scalpel and subsequently powdered with a cleaned and combusted mortar and pestle in preparation for the two extractions with DCM and hot water (Table 2.1). The same mortar and pestle were used for each powder; the mortar and pestle was cleaned and combusted between each subsample. During the subsampling process of all Aguas Zarcas specimens, DCM swab extracts of various surfaces within the glovebox and cleanroom were taken and analyzed by GC-MS to track any laboratory contamination. To do so, cotton tipped applicators were soaked in a 2 mL GC vial filled with DCM for 5 minutes then used to swab each material in a grid pattern. Once the material was swabbed, the cotton tips were placed in a new 2 mL GC vial of DCM. After 45 minutes elapsed, the cotton tips were taken out of solution using sterilized tweezers and the DCM extracts were ready for GC-MS analysis. Materials that were swabbed for laboratory contamination included Alcan aluminum foil, analytical balance, mortar and pestle, sterile knives, tweezers, glass vials, and containers/packaging containing the Aguas Zarcas specimens. Subsequently, all samples and a procedural blank were extracted with 5 mL of dichloromethane (DCM) in a 4-dram glass vial by stirring for 5 minutes at room temperature. The above-mentioned extraction procedure was repeated for a total of four times with the supernatants separated from the meteorite powders using Pasteur pipettes. Following the DCM extraction, each meteorite residue was placed in separate round bottom flasks along with 75 mL of ultrapure water in preparation for a hot water extraction of organic compounds. Each sample was left to reflux at a gentle boil for approximately 24 hours. After refluxing, the water extracts were decanted from their respective meteorite residues and the extracts were subsequently taken to dryness using a Heidolph rotary evaporator at 60 rpm in an 80 °C water bath.

Table 2.1. Summary of the Aguas Zarcas specimens and their subsampled specimens used in this study.

Specimen ID	Pre-/Post-rain	Original mass [g]	Mass powdered [g]	Powder ID
AZ-PT1	Pre-rain	1.92	1.42	AZ-PT1/1
AZ-PT2	Pre-rain	1.64	1.06	AZ-PT2/1
AZ-PT3	Pre-rain	6.63	2.09	AZ-PT3/1
			2.09	AZ-PT3/2
			0.98	AZ-PT3/3
MET11791/1	Pre-rain	4.86	0.60	MET11791/1/2[1]
MET11791/3	Post-rain	3.12	0.72	MET11791/3/2[1]

[1]Specimens belonging to the University of Alberta Meteorite Collection

2.2.3 Desalting procedure

The presence of inorganic salts in meteoritic extracts may interfere with successive reactions and impact the success of derivatization or deteriorate the gas chromatography (GC) column (Simkus et al. 2019). To avoid this, the water extracts were purified using the desalting protocol outlined below.

Each hot water extract was desalted using Bio-Rad Poly-Prep Columns (AG 50W-X8). To prepare the columns before introducing the meteoritic extracts, the column resin was taken through the following regeneration procedure. 12 mL of water was added to each column and allowed to drain to the top of the packing material. Next, 4 mL portions of 2 M NaOH were added until the pH of the eluate was approximately 10. Ultrapure water, in 12 mL segments, were used to neutralize the packing material to bring the pH down to 7. Next, 4 mL portions of 1.5 N HCl was used to make the eluate acidic with a pH of about 2. Lastly, the column was again neutralized with 12 mL portions of ultrapure water and ready for use.

Before the addition of the meteorite samples, 7 mL of ultrapure water was added and drained to the top of the packing material. The meteoritic extracts were then rehydrated with 1 mL of ultrapure water and added to the column followed by two 1 mL and one 4 mL wash with ultrapure water. The 7 mL of meteorite extract was passed through the column with ultrapure water followed by 3.5 mL of 2 M NH_4OH and collected in a round bottom flask. Finally, each of the desalted extracts was evaporated down to dryness by the rotary evaporator as in the storage and handling section above. This desalting procedure was repeated for the procedural blank.

Although this procedure is very effective at desalting N-bearing compounds and other cationic compounds that can be made neutral by ammonium hydroxide, any compounds that cannot be protonated or cannot be deprotonated by ammonium hydroxide will either be washed through the column with water or not be eluted with ammonium hydroxide.

2.2.4 Derivatization procedure

Following the procedure outlined by Stenerson (2011), each water extract was derivatized by adding 2 mL acetonitrile and an excess of the derivatizing agent, *N-tert*-butyldimethylsilyl-N-methyltrifluoroacetamide (MTBSTFA with 1% t-BDMCS) to the dried extracts. 0.6 mL of MTBSTFA was used to ensure there was sufficient derivatizing agent to react with the compounds within the meteoritic material and any residual moisture. The samples were subsequently heated at 100 °C for 4 hours then neutralized with $NaHCO_3$. Lastly, the extracts were evaporated down to 0.5 mL and analyzed by GC-MS, then further evaporated down to 0.2 mL and reanalyzed by GC-MS.

2.2.5 Modified extraction technique for AZ-PT3/3

To determine if the order of extraction impacts the success of organic compound extraction and detection, AZ-PT3/3, one of the three subsamples of the pre-rain specimen AZ-PT3, was used to test a modified procedure. Using the steps described above for extractions, desalting, and the derivatization, the water extraction was performed first, followed by the DCM extraction using the steps described above.

2.2.6 GC-MS analyses and identification

Each extract was evaporated down to 0.2 mL and identification of soluble organic compounds in each sample and swab extraction were carried out by GC-MS. Two GC-MS instruments were utilized for the study, from the University of Alberta and MacEwan University, following similar methods. The University of Alberta's GC-MS instrument was utilized for the analyses of the extracts from MET11791/1/2 packaging and subsampling materials and AZ-PT3 subsampling materials. The remainder of the samples were analyzed at MacEwan University. The University of Alberta method was executed on an Agilent 5975C using a HP-5MS column (30 m length, 0.25 µm film thickness, 250 µm internal diameter), with detection being performed using an Agilent 5975C mass selective detector (MSD). Initially the oven temperature was held for 1 minute at 50 °C and increases to a final temperature of 320 °C by a rate of 20 °C min^{-1}. The final temperature was held for 5.5 minutes for a total run time of 20 minutes. Samples were injected using pulsed splitless mode at 250 °C using argon with a constant flow rate of 1.0 mL min^{-1} as the carrier gas. The MacEwan University method was executed on an Agilent 6890N using a HP-5MS column, with the same specs as mentioned above, and detection done by an Agilent 5975C MSD. To begin with the oven temperature was held for 1 minute at 50 °C and increased to a final temperature of 250 °C by a rate of 10 °C min^{-1}. The final temperature was held for 20 minutes for a total run time of 41 minutes. Samples were injected using pulsed splitless mode at 275 °C using helium with a constant flow rate of 1.0 mL min^{-1} as the carrier gas. Regardless of the method, peaks of individual compounds were then identified by the 2011 NIST Mass Spectral Library (Version 2.0g). Using the NIST database, the general compound type can be identified but can become uncertain at the compound level. Despite this aspect, the GC-MS patterns of compounds belonging to the same compound category will be comparable. From the identifications, compounds were categorized as either terrestrial or extraterrestrial based on previous literature and the probability that a given compound was likely to be sourced from the terrestrial surface. This aligns with the three criteria that are commonly used help identify contamination versus intrinsic compounds which can be used together or individually; (1) chemical and/or isotopic composition or mineralogy are related to post-fall characteristics, (2) chemical and/or isotopic composition or mineralogy from a collection of meteorites changes with respect to its terrestrial age, and (3) chemical and/or isotopic composition or mineralogy of the meteorite is inconsistent compared to other CM chondrites (Lee et al. 2021). Here we employ the third criterion outlined by Lee et al. (2021) whereby if the compound is rare on Earth, or unlikely to have been present in the collection site where the meteorite was found, we concluded that it was intrinsic to the specimen. In addition, any compounds that are concluded to be intrinsic to the meteorite or determined to have come from the terrestrial surface must also be either absent from the procedural blanks, or present in higher abundance than the blanks.

2.2.7 Scanning electron microscope (SEM) analyses

Assessment of the overall petrology and mineralogy of Aguas Zarcas was conducted by analyzing a carbon coated epoxy mount of each specimen using a Zeiss Sigma 300 VP-FESEM in the Department of Earth and Atmospheric Sciences at the University of Alberta, operating at 15 kV and 6 mm working distance.

2.3 Results

2.3.1 GC-MS results

2.3.1.1 DCM swabs of laboratory and storage materials

No organic compounds detected in the laboratory and storage material swabs were found in the meteorite extracts (see Appendix A Tables A8-A20). Nearly all detected compounds were related to organics shedding from the swabs themselves, including N-propyl-benzamide, diethylene glycol dibenzoate, and 4-phenyl-morpholine.

2.3.1.2 DCM extracts of Aguas Zarcas samples

A total of 5, 6, 11, 8, 9, 18, and 8 peaks were detected in the DCM extracts of AZ-PT1/1, AZ-PT2/1, AZ-PT3/1, AZ-PT3/2, AZ-PT3/3, MET11791/1/2, and MET11791/3/2, respectively

(Table 2.2, Figures 2.3-2.5). The species detected in the meteorite extracts included two elemental sulfur allotropes, hexathiane (S_6) and cyclic octaatomic sulfur (S_8), five different polycyclic aromatic hydrocarbons, and a large abundance of long chain hydrocarbons. The majority of the compounds in the DCM extractions are commonly used in fuels, pharmaceuticals, and pesticides, with a handful relating to agricultural products and plasticizers.

Table 2.2. Organic and inorganic compounds detected in DCM rinses, post-blank subtraction, of the Aguas Zarcas specimens, their retention times (RT), and their possible terrestrial sources determined from the PubChem database. All compound identifications are best matches from the NIST database.

RT (min)	Quality (%)	Compound	Possible Terrestrial Source
AZ-PT1/1			
15.836	91	Hexathiane	[Pharmaceuticals]
18.931	90	Cyclic octaatomic sulfur	[Pharmaceuticals]
20.315	83	Fluoranthene	[Pesticides]
20.772	14	Tetradecane, 2,6,10-trimethyl-	Fuels, pesticides, and polymers
23.998	27	Heptadecane	Fuels
AZ-PT2/1			
17.002	54	Diphentamethylene thiuram hexasulfide	Adhesives and plastics
18.595	92	Hexathiane	[Pharmaceuticals]
19.595	98	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.770	32	Fluoranthene	[Pesticides]
20.271	48	Pyrene	[Pesticides]
20.434	83	1-Propene-1,2,3-tricarboxylic tributyl ester	Plasticizers
AZ-PT3/1			
4.624	4	Ethylbenzene	Agricultural products, fragrances, pesticides, pharmaceuticals, and plastics
12.284	93	Benzaldehyde, 3-hydroxy-4-methoxy-	Pharmaceuticals
13.450	81	Pentadecane	Fuels
13.777	95	Hexathiane	[Pharmaceuticals]
14.649	72	Pentadecane	Fuels
15.215	47	Octadecane, 2,6-dimethyl-	Fuels
15.793	93	Heptadecane	Fuels
19.617	94	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.759	81	Pyrene	[Pesticides]

20.271	81	Fluoranthene	[Pesticides]
21.328	91	Tributyl acetylcitrate	Plasticizers

AZ-PT3/2

4.635	3	Hydrogen sulfide	Fuels
13.450	90	Pentadecane	Fuels
13.788	94	Hexathiane	[Pharmaceuticals]
14.648	72	Tetratetracontane	Fuels
15.215	50	Nonahexacontanoic acid	Fuels and grease
19.617	94	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.759	93	Fluoranthene	[Pesticides]
20.271	93	Pyrene	[Pesticides]

AZ-PT3/3

6.508	5	Ethane, 1-chloro-1-isocyanato-	Pharmaceuticals and polymers
7.293	53	Nonane, 2,2,4,4,6,8,8-heptamethyl-	Fragrances and personal care products
9.309	91	Azulene	[Pharmaceuticals]
10.562	50	Dodecane, 2,7,10-trimethyl-	Fuels
13.417	50	Pentadecane	Fuels
13.700	94	Hexathiane	[Pharmaceuticals]
14.615	64	Heptadecane	Fuels
19.573	94	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.715	96	Fluoranthene	[Pesticides]

MET11791/1/2

6.300	84	Azulene	[Pharmaceuticals]
7.020	83	Undecane, 4,7-dimethyl-	Adhesives and fuels
7.740	94	Phenol, 4-(1,1-dimethylpropyl)-	Pesticides
7.790	90	Dodecanal	Pesticides
8.190	98	1-Dodecanol	Agricultural products
8.440	85	Acenaphthene	[Pharmaceuticals]
8.510	94	Butylated hydroxytoluene	Agricultural products, fuels, and plasticizers
8.940	93	Diethyltoluamide	Pesticides (DEET)
9.010	58	Nonyl pentafluoropropionate	Pharmaceuticals
9.320	63	3-Trifluoromethylbenzoic acid, 4-tetradecyl ester	Fuels, pesticides, pharmaceuticals, and polymers
9.540	62	Tetradecane, 2-methyl-	Fuels, pesticides, and polymers
10.230	73	9H-Fluorene, 9-methylene-	[Pharmaceuticals]
11.240	72	Carbonic acid, dodecyl phenyl ester	Salts
11.600	63	Eicosane, 2-methyl-	Fuels and plasticizers
11.670	63	Cyclic octaatomic sulfur	[Pharmaceuticals]
11.700	92	Fluoranthene	[Pesticides]
11.970	82	Pyrene	[Pesticides]

12.060	88	Heptadecane	Fuels
MET11791/3/2			
15.204	72	Pyridine, 4,4’-(1,2-ethenediyl)bis-, (E)-	Agricultural products, pharmaceuticals, and polymers
19.628	74	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.802	16	Fluoranthene	[Pesticides]
20.304	53	1-Naphthalenecarboxylic acid	Pharmaceuticals
20.772	25	Hentriacontane	Fuels and pharmaceuticals
27.539	43	Chloromethyl propanoate	Pharmaceuticals
28.727	76	1,4-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	Adhesives and plasticizers
33.336	11	Sulfurous acid, 2-propyl tridecyl ester	Food additives, pesticides, and pharmaceuticals

Note: Square brackets indicate the compound’s possible terrestrial source; however, these compounds were determined to likely be intrinsic to the Aguas Zarcas specimens. See text for details. See figures 3-5 for corresponding GC traces.

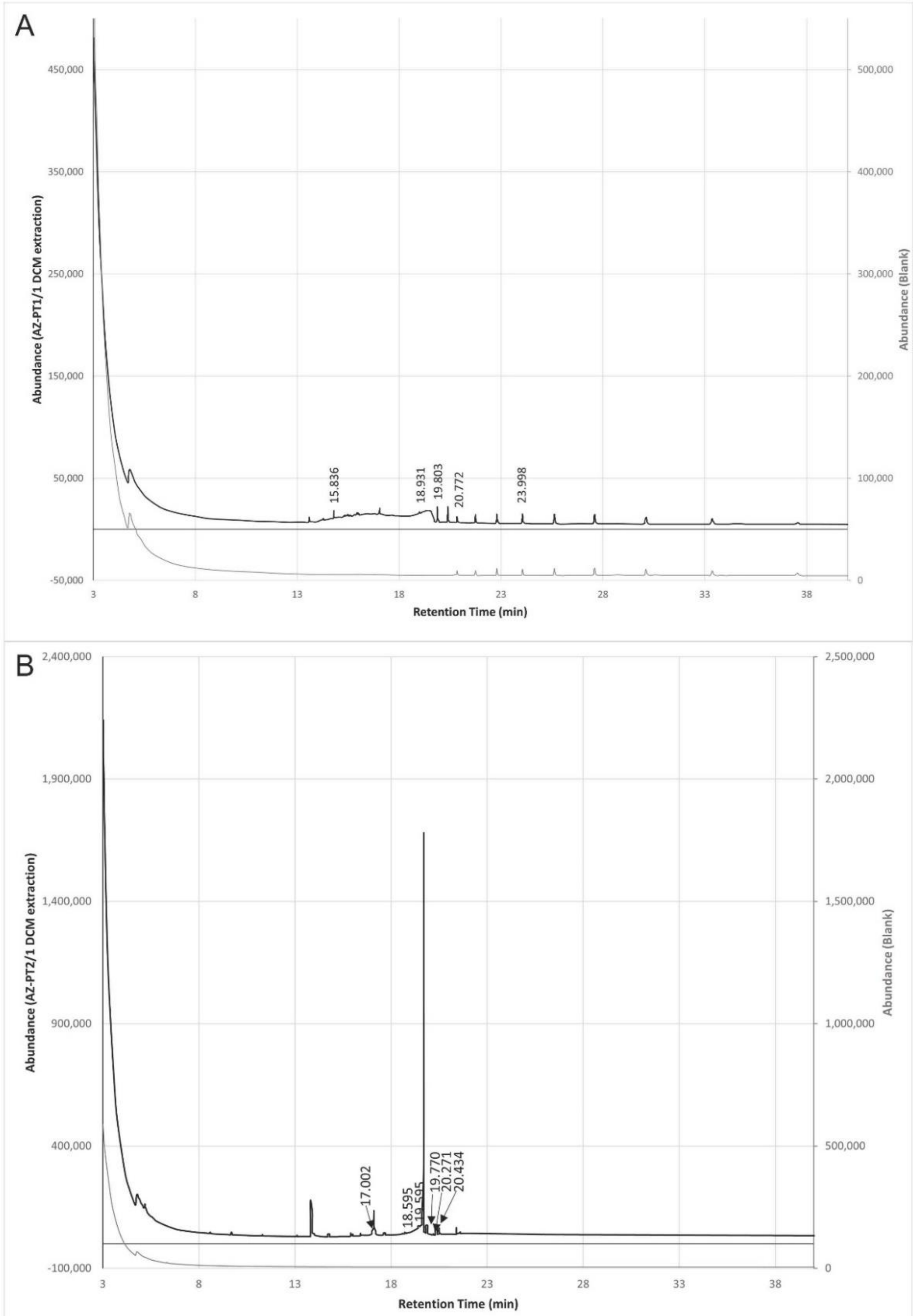

Figure 2.3. GC-MS traces of compounds detected in the DCM extracts of a) AZ-PT1/1 and b) AZ-PT2/1 with their corresponding procedural blanks in grey, offset for clarity. These samples are grouped together for comparison of two pre-rain specimens. Retention times labeled correspond to peaks reported in Table 2. Note that the y-axes in A and B are different.

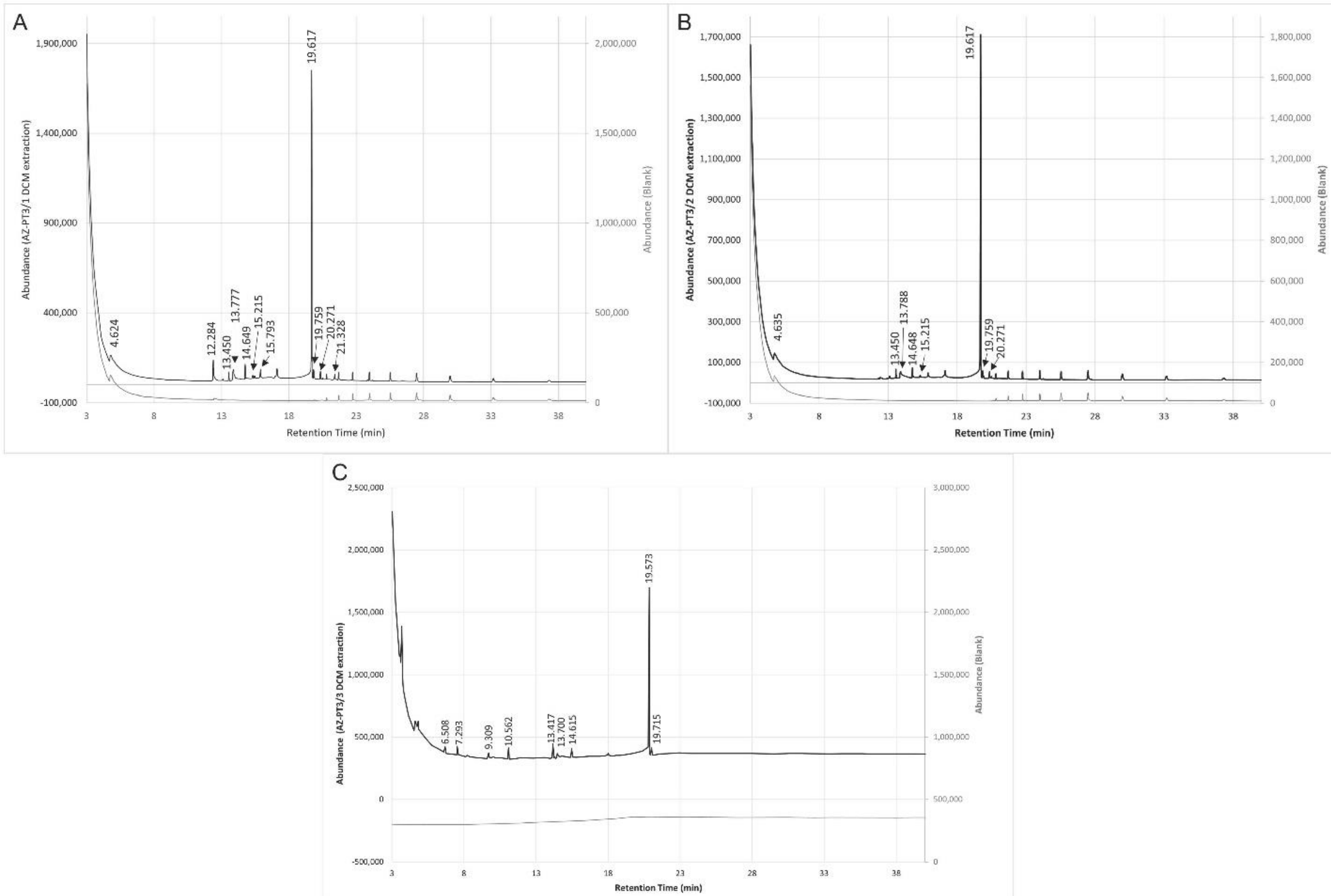

Figure 2.4. GC-MS traces of compounds detected in the DCM extracts of a) AZ-PT3/1, b) AZ-PT3/2, and c) AZ-PT3/3 with their corresponding procedural blanks in grey, offset for clarity. These samples are grouped together as they are from the same specimen. Retention times labeled correspond to peaks reported in Table 2. Note that the y-axes of A, B, and C are different.

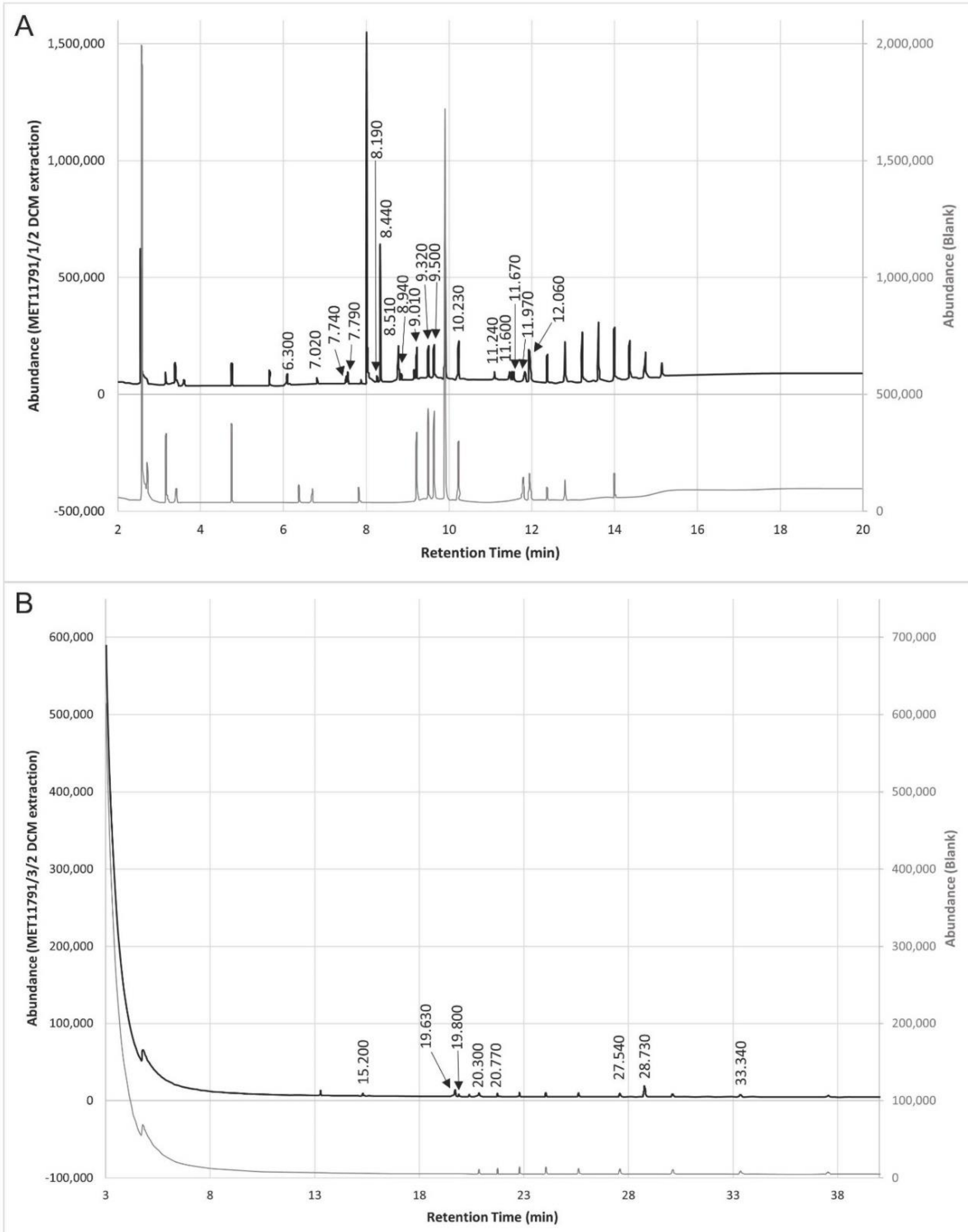

Figure 2.5. GC-MS traces of compounds detected in the DCM extracts of a) MET11791/1/2 and b) MET11791/3/2 with their corresponding procedural blanks in grey, offset for clarity. These samples are grouped together for comparison of a pre-rain specimen to a post-rain specimen.

Retention times labeled correspond to peaks reported in Table 2. Note that the y-axes of A and B are different.

2.3.1.3 Hot water derivatized extracts of Aguas Zarcas samples

A total of 79, 3, 0, 6, 8, 12, and 15 peaks were detected in the hot water extracts of AZ-PT1/1, AZ-PT2/1, AZ-PT3/1, AZ-PT3/2, AZ-PT3/3, MET11791/1/2, and MET11791/3/2, respectively (Table 2.3, Figures 2.6-2.8). Identifications included derivatized compounds belonging to multiple organic compound categories including amino acids, carboxylic acids, dicarboxylic acids, amines, alcohols, and hydrocarbons. Nearly all the compounds detected in the hot water extracts of the Aguas Zarcas specimens are commonly used in agricultural products and pharmaceuticals. During the setup for the reflux of MET11791/1/2 there was a hairline fracture in the condenser which caused contamination of the sample by tap water; the contamination was confirmed by the presence of glass in the meteorite residue after the extraction was complete. Regardless, the tap water did not appear to contribute significantly to the suite of contaminants in this extract as it shares compounds in common with other extracts not compromised with tap water, including: lactic acid, tert-butyldimethylsilyl ester, 4-pentamethyldisilanyloxyoctane, 1-ethyl-2-pentamethyldisilanyloxycyclohexane, 7-acetamido-2,2-dimethyl-2,3-dihydrobenzofuran, tris(tert-butyldimethylsilyl) borate, heneicosanoic acid, tert-butyldimethyl ester, and 3-chloro-4-fluoroiodobenzene. The GC-MS traces of the hot water extractions included the three hydrolysis products of MTBSTFA: 1,3-bis(1,1-dimethyethyl)-1,1,3,3-tetramethyldisiloxane, N-methyl-2,2,2-trifluoroacetamide, and *tert*-butyldimethylsilanol (see Appendix A data).

Table 2.3. Organic and inorganic compounds detected in hot water extractions, post-blank subtraction, of the Aguas Zarcas specimens, their retention times (RT), and their possible terrestrial sources determined from the PubChem database. The possible terrestrial sources are determined from the precursors of the derivatized compounds reported. All compound identifications are best matches from the NIST database.

RT (min)	Quality (%)	Compound	Possible Terrestrial Source
AZ-PT1/1			
3.371	9	Furan, 2,3-dihydro-3-(1-methylpropyl)-	Pharmaceuticals
3.447	9	Ditrifluoromethyl(chlorocarbonyloxy)amine	Pharmaceuticals

3.491	32	2H-Pyran-2-one, 4-hydroxy-6-methyl-	Fungicides and pharmaceuticals
3.948	28	Methyl trifluoroacetate	Pesticides and pharmaceuticals
4.003	47	3-Pentenoic acid, 4-methyl-, methyl ester	Insecticides
4.046	10	1-Pentyn-3-ol, 3-methyl-	Food additives and pharmaceuticals
4.352	7	tert-Butyldimethylsilylamine	[Agricultural chemicals, fuels, pharmaceuticals, and urea]
4.362	5	Methyl isovalerate	Food additives and fragrances
5.103	17	Thiazole, 5-methoxy-	Pharmaceuticals and polyolefins
5.212	59	9,12-Octadecadiynoic acid, trimethylsilyl ester	Pharmaceuticals
5.234	25	2,2-Dimethyl-1-dimethyl(dichloromethyl)silyloxypropane	Pesticides and pharmaceuticals
5.343	52	tert-Butyldimethylsilyl nitrile	[Agricultural products and pharmaceuticals]
5.561	83	tert-Butyldimethylsilyl acetate	[Agricultural products, fragrances, fuels, pharmaceuticals, and plastics]
6.084	58	tert-Butyldimethylsilyl trifluoromethanesulfonate	Fuels
6.672	14	2-Pyridinepropanamide, N-phenyl-	Pharmaceuticals
6.781	35	N-(2-Chloroethyl)-N-ethylaniline	Pharmaceuticals
6.803	35	Propanoic acid, t-butyldimethylsilyl ester	Food additives, pesticides, and pharmaceuticals
7.010	14	Propanoic acid, 3-amino-3-(4-ethylphenyl)-	Pesticides and pharmaceuticals
7.174	25	4-Methyl-benzofurazan	Pesticides, pharmaceuticals, and polymers
7.337	38	Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	Pesticides and pharmaceuticals
7.446	37	1H-Indol-3-ol-, acetate	Pharmaceuticals
7.609	43	Thiophene, 2-(cyclopentylthio)-	Pharmaceuticals
7.653	38	2-Thiophenethiol	Food additives
7.751	27	4-(4-Methoxyphenyl)butyric acid, TMS	Pharmaceuticals
7.893	22	Pyrazon	Agricultural products
7.904	16	2-Thiazolamine, 5-chloro-	Pharmaceuticals
8.165	23	S(-)-Cathinone, N-trimethylsilyl-	Pharmaceuticals
8.176	25	(.+/-.)-p-Methoxyamphetamine, N-trimethylsilyl-	Pharmaceuticals

8.198	23	2,3-Dihydro-2-acetoxy-2,5-dimethyl-3,6-diphenyl-1,4-dioxin	Pharmaceuticals
8.928	23	N-Phenyl-N'-(2-piperazin-1-yl-ethyl)-oxalamide	Flavoring agent and pharmaceuticals
9.113	9	Hexanoic acid, 3-chloroprop-2-enyl ester	Food additives, fragrances, pesticides, and human metabolite
9.124	9	2H-Pyran-2-one, 6-hexyltetrahydro-	Food additives and fragrances
10.715	43	4-Pyrimidinecarboxaldehyde, 2,6-bis[(trimethylsilyl)oxy]-	Pharmaceuticals
10.726	50	Propanedioic acid, bis(trimethylsilyl) ester	[Food additives, human metabolite, and pharmaceuticals]
10.791	43	Glyoxylic acid, di-TMS	[Adhesives, human metabolite, pesticides, and pharmaceuticals]
10.911	27	5-Phenoxymethyl-N-phenyl-2-thiazolin-2-amine	Pharmaceuticals
11.423	40	2,2-Dimethyl-1-pentamethyldisilanyloxypropane	Pharmaceuticals
11.663	64	Levulinic acid, tert-butyldimethylsilyl ester	[Food additives, fragrances, pharmaceuticals, plant metabolism and plastics]
11.783	59	2-Butenoic acid, 2-[(trimethylsilyl)oxy]-, trimethylsilyl ester	Adhesives, plant metabolism, and polymers
11.946	53	3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	Pharmaceuticals and plastics
12.306	64	4-Acetamido-2-methallylphenol	Pharmaceuticals and polymers
13.134	87	Ethanimidic acid, N-(trimethylsilyl)-, trimethylsilyl ester	Agricultural products, pharmaceuticals, and plasticizers
13.559	80	Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	[Agricultural products, fuels, and pharmaceuticals]
13.657	59	4-Pentamethyldisilyloxyhexadecane	Pesticides, pharmaceuticals, and polymers
13.733	32	Thiophene, 2,2'-(1,2-ethenediyl)bis-, (E)-	Pharmaceuticals
13.973	50	2-Ethyl-1-Pentamethyldisilyloxyhexane	Agricultural products, fragrances, fuels, pharmaceuticals, plastics,

			propellants, and surfactants
13.984	50	Lactic acid, tert-butyldimethylsilyl ester	[Agricultural products, human metabolite, and pharmaceuticals]
14.082	91	Bis(dimethyl-t-butylsilyl) oxalate	[Human metabolite, pesticides, pharmaceuticals, and plant metabolite]
14.540	91	Sulfuric acid, bis(tert-butyldimethylsilyl) ester	Agricultural products, food additives, fragrances, fuels, pharmaceuticals, plastics, and surfactants
14.921	59	2-Pentamethyldisilanyloxybutane	[Fragrances, fuels, pesticides, pharmaceuticals, and plastics]
15.716	58	Tris(tert-butyldimethylsilyl) borate	Insecticides, pharmaceuticals, and volcanic rocks
15.880	50	3,4-Dimethyl-1-pentamethyldisilyloxycyclohexane	Pharmaceuticals and resins
16.109	53	1,3-Dimethyl-5-pentamethyldisilyloxycyclohexane	Cosmetics, fuels, pharmaceuticals, and resins
16.152	83	Dimethylglyoxime, di(tert-butyldimethylsilyl) ether	Pharmaceuticals
16.218	59	6-Ethyl-3-pentamethyldisilyloxydecane	Food additives
16.381	50	tert-butyl(dimethyl)silyl-2-{[tert-butyl(dimethyl)silyl]oxy}pent-2-enoate	Food additives and pharmaceuticals
16.468	87	Bis(dimethyl-t-butylsilyl) succinate	[Food additives, fragrances, human metabolite, pesticides, and pharmaceuticals]
16.566	53	3-Dimethyl(trimethylsilyl)silyloxytetradecane	Cosmetics, fuels, pharmaceuticals, and polymers
17.264	49	Bis-N,N-(trimethylsilyl)formamide	[Agricultural products, food additives, human metabolite, and pharmaceuticals]
17.493	83	Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	[Human metabolite and pharmaceuticals]
17.928	70	Phosphoric acid, tris(tert-butyldimethylsilyl) ester	[Agricultural products, fragrances, fuels, human

			metabolite, and pharmaceuticals]
18.015	64	Heneicosanoic acid, tert-butyldimethylsilyl ester	[Human metabolite]
18.506	62	Isoborneol, pentamethyldisilanyl ether	Food additives, fragrances, and human metabolite
18.517	50	1-Pentamethyldisilyloxycyclopentane	Fragrances and pharmaceuticals
18.593	87	Bis(dimethyl-t-butylsilyl) adipate	[Adhesives, human metabolite, pesticides, pharmaceuticals, and plastics]
18.833	59	2-Pentamethyldisilanyloxypentane	Food additives
18.844	64	4-Pentamethyldisilanyloxyoctane	Fragrances and pharmaceuticals
18.920	43	Benzenepropanoic acid,.beta.,.beta.,3,4-tetramethyl-	Pharmaceuticals
19.073	43	3-Ethyl-6-pentamethyldisilyloxyoctane	Pharmaceuticals
19.628	43	1-Methyl-2-pentamethyldisilanyloxycyclohexane	Agricultural products and pharmaceuticals
20.238	93	1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	Fragrances, phthalates, and pharmaceuticals
20.489	87	Octanedioic acid, bis(tert-butyldimethylsilyl) ester	[Adhesives, human metabolite, paint, and plastics]
21.404	87	Nonanedioic acid, bis(tert-butyldimethylsilyl) ester	[Food additives, human metabolite, pharmaceuticals, and plastics]
21.415	59	3-((1-Amino-2-naphthyl)methylene)-2-benzofuran-1(3H)-one tms	Pharmaceuticals
21.611	64	9,12-Octadecadienoic acid, tert-butyldimethylsilyl ester, (Z,Z)-	Food additives and pharmaceuticals
22.428	46	Decanedioic acid, bis(tert-butyldimethylsilyl) ester	[Human metabolite, pesticides, plant metabolite]
23.376	64	Diethylene glycol dibenzoate	Adhesives, pesticides, pharmaceuticals, and plasticizers
23.485	43	trans-Vaccenic acid, tert-butyldimethylsilyl ester	Pharmaceuticals
32.889	58	Docosanoic acid, tert-butyldimethylsilyl ester	[Human metabolite and pesticides]

AZ-PT2/1

4.537	91	Acetamide	Agricultural products, pesticides, and pharmaceuticals
5.474	91	tert-Butyldimethylsilyl acetate	[Agricultural products, fragrances, fuels, pharmaceuticals, and plastics]
AZ-PT3/1			
ND	-	-	-
AZ-PT3/2			
3.142	91	Phosphorocyanidothioic difluoride	Pharmaceuticals
3.621	35	3-Pentenoic, 4-methyl-, methyl ester	Food additive
3.665	16	3,4-Dimethyl cyclohexanone	Perfume and pharmaceuticals
5.539	17	1-Dimethyl(isopropyl)silyloxypropane	[Agricultural products, fragrances, fuels, pesticides, and pharmaceuticals]
7.239	15	2,4-Dinitro-6-isopropylphenol	Pharmaceuticals and plasticizers
7.915	25	Silanamine, N-(2,2-dimethylpropyldiene)-1,1,1-trimethyl-	Pharmaceuticals
AZ-PT3/3			
5.255	17	Proline, trimethylsilyl ester	[Human metabolite and pharmaceuticals]
5.451	27	1-Dimethyl(isopropyl)silyloxypropane	[Agricultural products, fragrances, fuels, pesticides, and pharmaceuticals]
12.283	19	3-Fluoro-4-piperazin-1-yl-benzonitrile	Pharmaceuticals
13.373	91	Bis(tert-butyldimethylsilyl) sulfite	Agricultural products, cleaning products, and wastewater processing
13.852	30	Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	[Agricultural products, food additives, human metabolite, pharmaceutical, personal care products, and pesticides]
15.356	20	Bis(dimethyl-t-butylsilyl) fumarate	[Agricultural products, pharmaceuticals, food additives, human

			metabolite, pesticides, and plastics]
15.509	17	2’,6’-Dihydroxyacetophenone, bis(trimethylsilyl) ester	Pharmaceuticals and polymers
21.502	20	Hexadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food additives, fragrances, personal care products, pesticides, and plastics
MET11791/1/2			
7.304	9	7-Amino-2-trifluoromethylphenothiazine	Pharmaceuticals
7.620	50	2H-Thiopyran-3-(4H)-one, dihydro-	Pharmaceuticals
7.838	38	Lactic acid, tert-butyldimethylsilyl ester	[Agricultural products, human metabolite, and pharmaceuticals]
7.860	9	4-Pentamethyldisilanyloxyoctane	Fragrances and pharmaceuticals
9.037	50	1-Ethyl-2-pentamethyldisilanyloxycyclohexane	Pharmaceuticals and polymers
12.306	50	7-Acetamido-2,2-dimethyl-2,3-dihydrobenzofuran	Pharmaceuticals
15.390	40	Dodecandioic acid, tert-butyldimethylsilyl ester	Adhesives, pharmaceuticals, plastics, and surfactants
15.738	87	Tris(tert-butyldimethylsilyl) borate	Insecticides, pharmaceuticals, and volcanic rocks
16.087	50	1-Ethyl-2-pentamethyldisilanyloxycyclohexane	Pharmaceuticals and polymers
17.547	38	Geranylgeraniol, tert-butyldimethylsilyl ether	Plants and pharmaceuticals
18.201	40	Heneicosanoic acid, tert-butyldimethylsilyl ester	[Human metabolite]
19.072	72	trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	[Plants and pharmaceuticals]
19.639	35	3-Chloro-4-fluoroiodobenzene	Pharmaceuticals
MET11791/3/2			
3.120	4	3-Buten-1-ol, 3-methyl-	Food additives, fragrances, and pesticides
6.378	9	Benzene, 1,4-dibromo-2-nitro-	Pharmaceuticals
8.361	40	1-Ethyl-2-pentamethyldisilanyloxycyclohexane	Pharmaceuticals and polymers
8.557	35	2-Methyl-2-hexanol, benzyldimethylsilyl ether	Pharmaceuticals

9.189	38	Propane, 1,1,1-triethoxy-	Fuels, pesticides, pharmaceuticals, and polymers
9.364	9	1-Butanol, 3-t-butyldimethylsilyloxy-	Fragrances, pesticides, pharmaceuticals, and plasticizers
10.399	7	1-Phenylethanol, benzyldimethylsilyl ether	Pharmaceuticals
12.306	43	7-Acetamido-2,2-dimethyl-2,3-dihydrobenzofuran	Pharmaceuticals
13.363	89	Lactic acid ditbdms	[Agricultural products, human metabolite, and pharmaceuticals]
14.180	42	Acetate, 2-[(acetyloxy)methyl]-4,4-dimethoxybutyl ester	Fragrances, insecticides, and pharmaceuticals
15.466	9	2-Methyl-1-isopropyl(dimethyl)silyloxypropane	[Fragrances, pesticides, and pharmaceuticals]
15.727	76	Tris(tert-butyldimethylsilyl) borate	Insecticides, pharmaceuticals, and volcanic rocks
17.547	10	2-Pentamethyldisilanyloxypentane	Food additives
18.201	83	Phosphoric acid, tris(tert-butyldimethylsilyl) ester	[Agricultural products, fragrances, fuels, human metabolite, and pharmaceuticals]
19.639	25	3-Chloro-4-fluoroiodobenzene	Pharmaceuticals

Notes: Triplicate runs of the extraction of AZ-PT1/1, AZ-PT3/3, MET11791/1/2, and MET11791/3/2 were conducted and are combined to account for results from all runs. The compound identifications are reported as MTBSTFA derivatives; however, the possible terrestrial source was determined from their true identifications, pre-derivatization. **S**quare brackets indicate the compounds possible terrestrial source; however, these compounds were determined to likely be intrinsic to the Aguas Zarcas specimens. See figures 6-8 for corresponding GC traces.

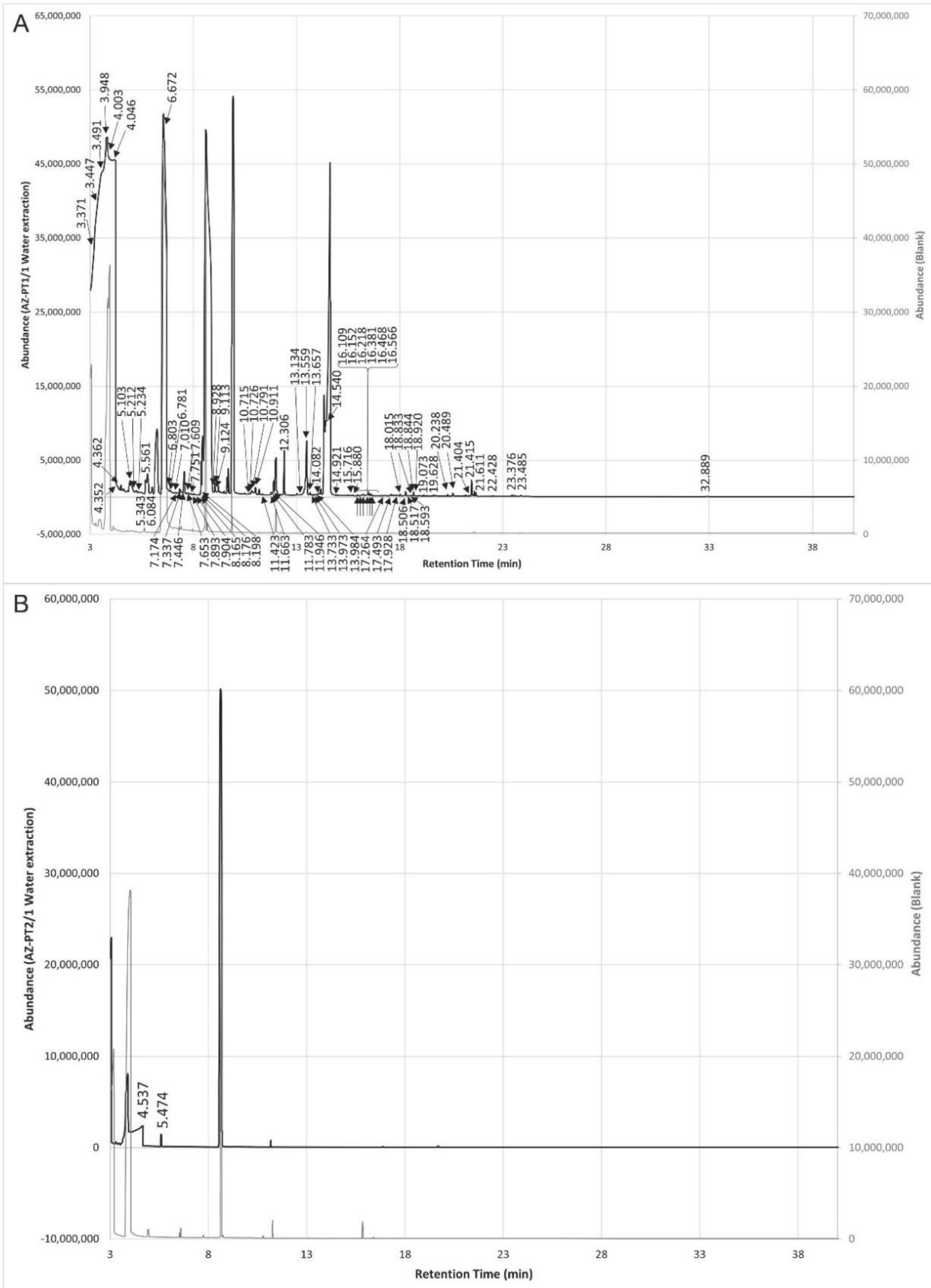

Figure 2.6. GC-MS traces of compounds detected in the hot water extracts of a) AZ-PT1/1 and b) AZ-PT2/1 with their corresponding procedural blanks in grey, offset for clarity. These samples are grouped together for comparison of two pre-rain specimens. Retention times labeled correspond to peaks reported in Table 3. Note that the y-axes of A and B are different.

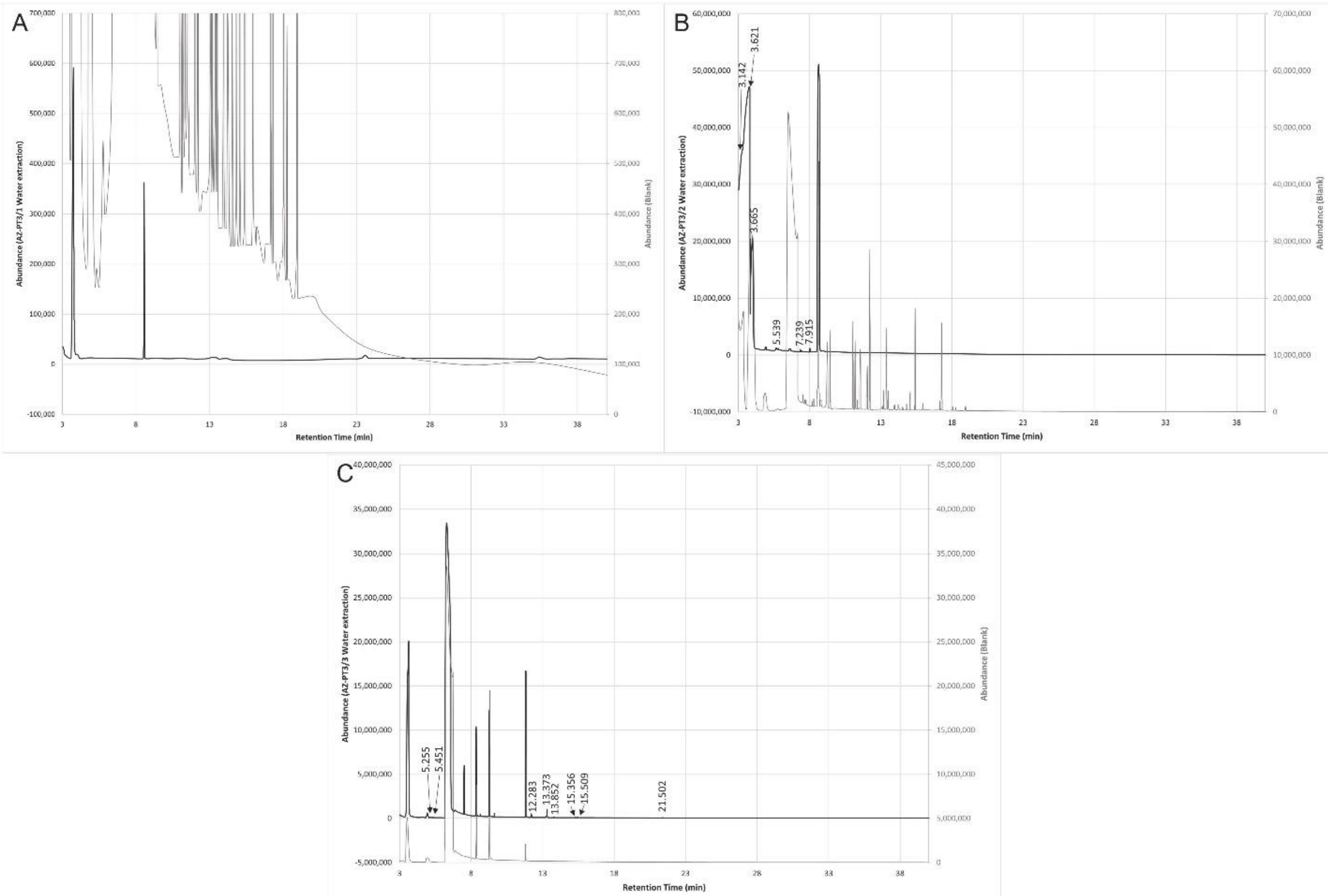

Figure 2.7. GC-MS traces of compounds detected in the hot water extracts of a) AZ-PT3/1, b) AZ-PT3/2, and c) AZ-PT3/3 with their corresponding procedural blanks in grey, offset for clarity. These samples are grouped together as they are from the same specimen. Retention times labeled correspond to peaks reported in Table 3. Note that the y-axes of A, B, and C are different.

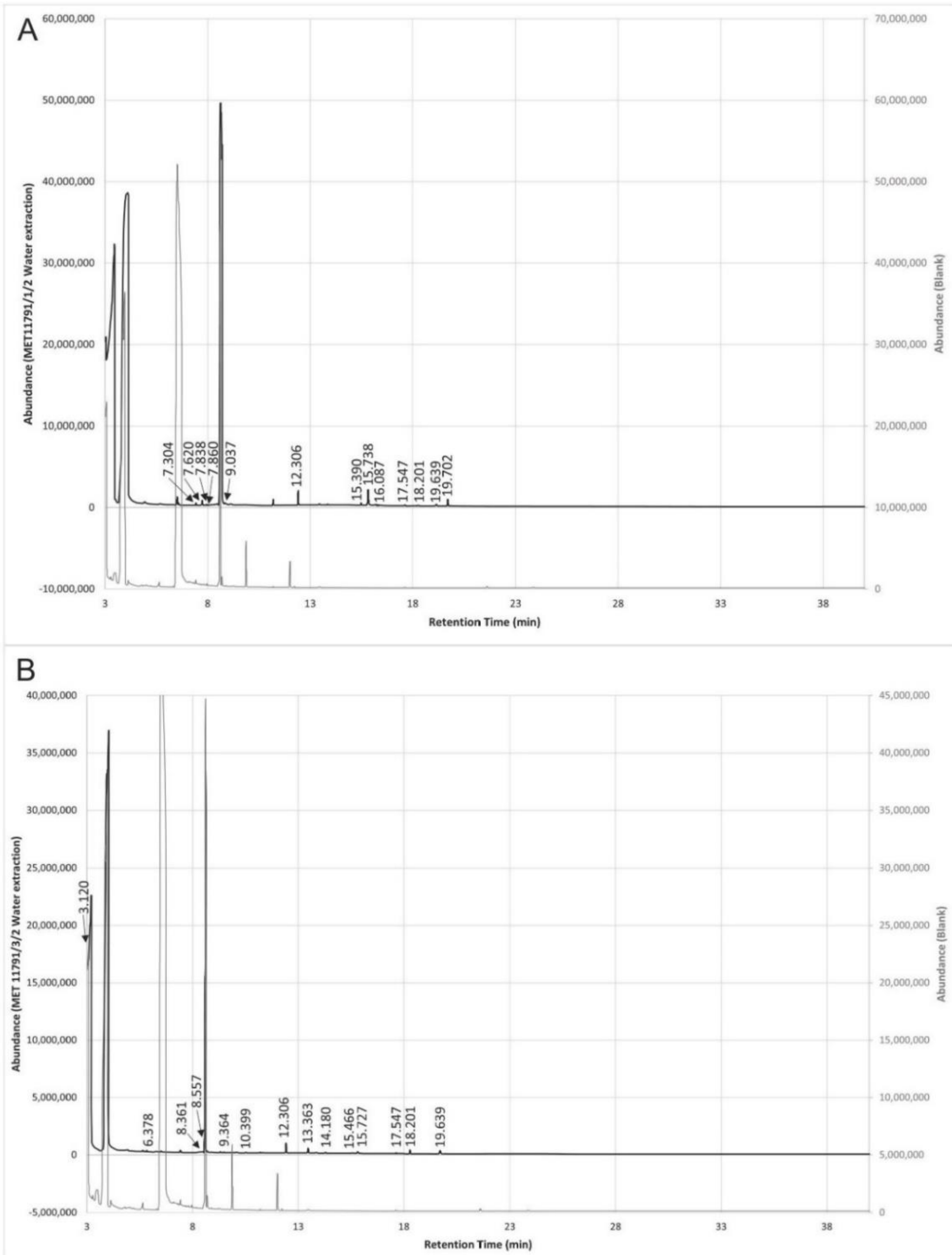

Figure 2.8. GC-MS traces of compounds detected in the hot water extracts of a) MET11791/1/2 and b) MET11791/3/2 with their corresponding procedural blanks in grey, offset for clarity. These samples are grouped together for comparison of a pre-rain specimen to a post-rain specimen. Retention times labeled correspond to peaks reported in Table 3. Note that the y-axes of A and B are different.

2.3.2 SEM analyses

SEM images of AZ-PT1/1 (Figure 2.9), AZ-PT2/1 (Figure 2.10), AZ-PT3 (Figure 2.11), and MET11791/3/2 (Figure 2.12) all contain both of the two lithologies previously reported in Aguas Zarcas - chondrule-rich and chondrule-poor. The chondrules have well-defined, fine-grained rims, and contain sulfides throughout the mesostasis. Rare iron-rich metal is observed within select chondrules' mesostases. MET11791/3/2 shows the most typical two-lithology pattern just as in AZ-PT1 and 2; however, the boundary between these lithologies in this case appears comparatively less defined.

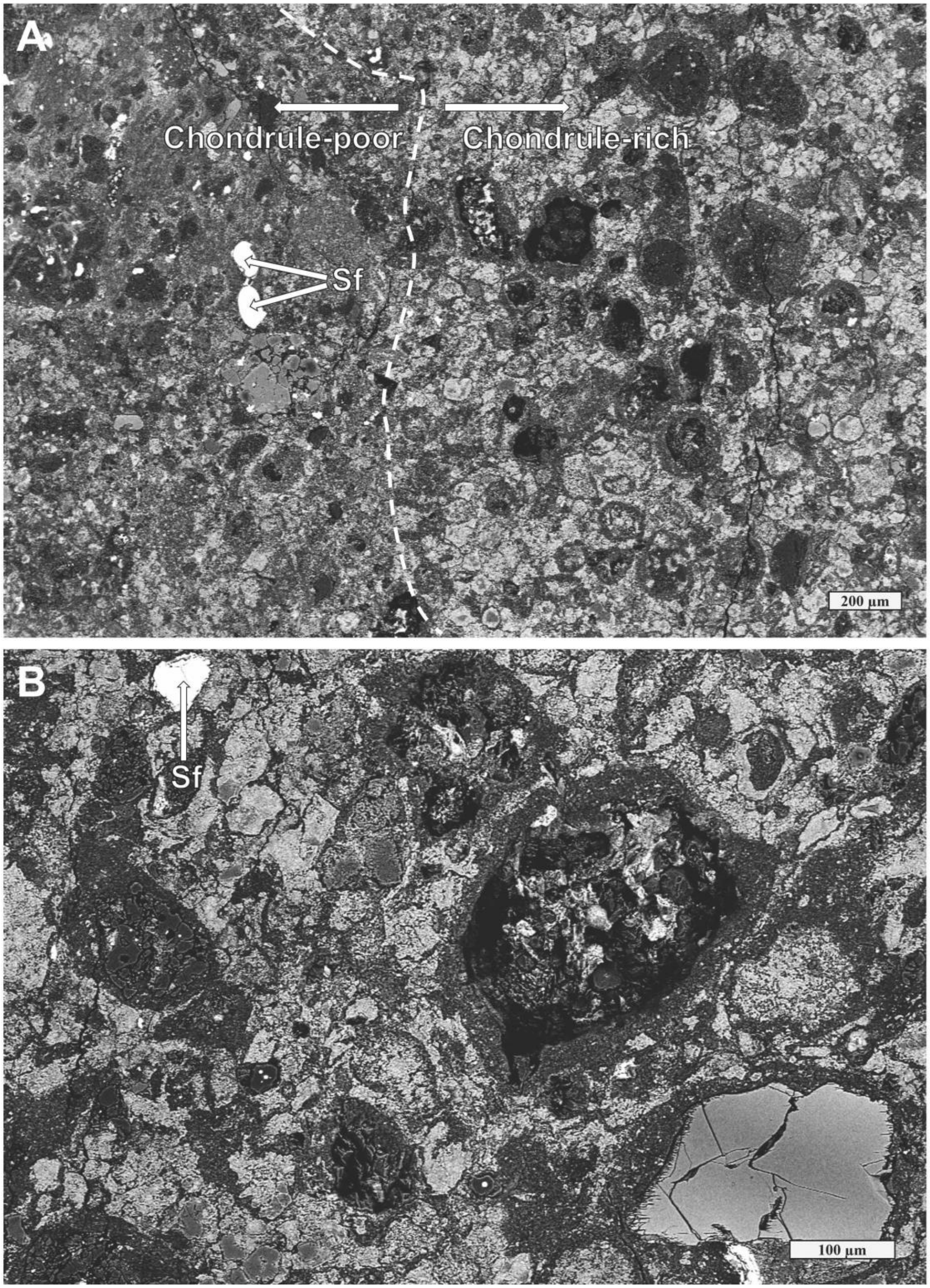

Figure 2.9. SEM images of AZ-PT1/1 with identified sulfides (Sf). The chondrule-rich and chondrule-poor boundary is shown in (A) and a close up of the chondrule-rich portion is shown in (B).

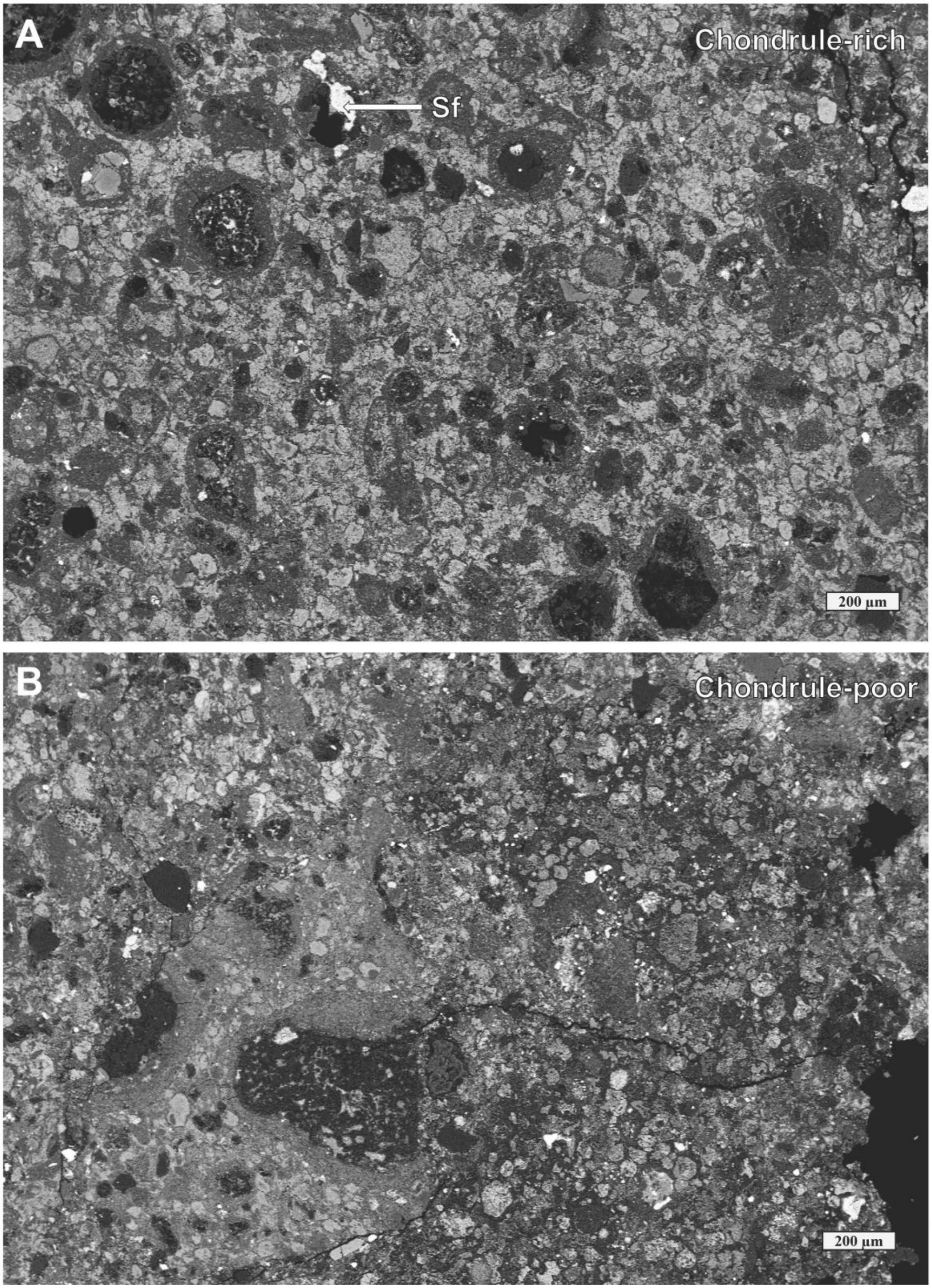

Figure 2.10. SEM images of AZ-PT2/1 with identified sulfides (Sf). There are chondrule-rich (A) and chondrule-poor (B) lithologies present.

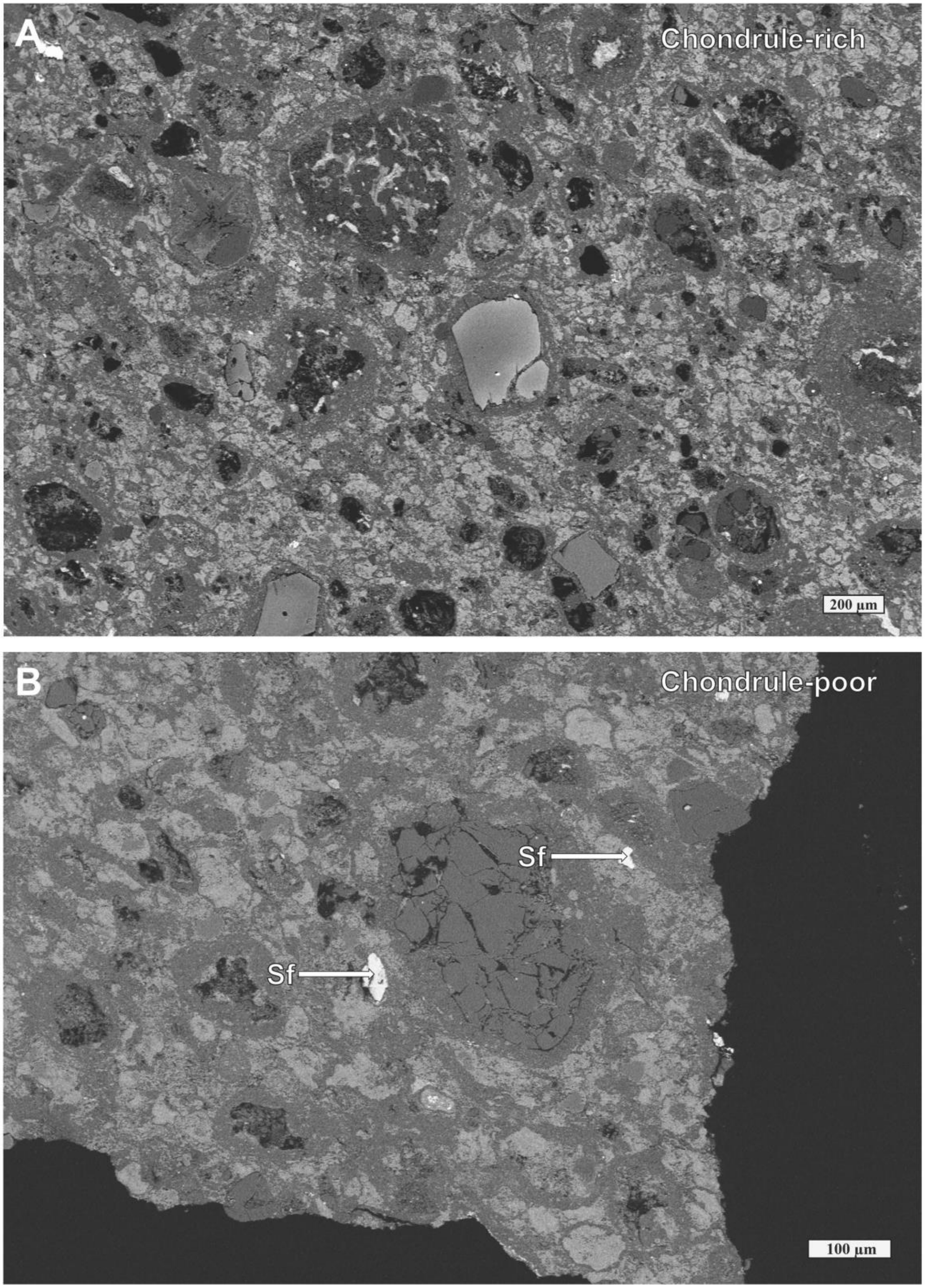

Figure 2.11. SEM images of AZ-PT3 with identified sulfides (Sf). There are chondrule-rich (A) and chondrule-poor (B) lithologies observed.

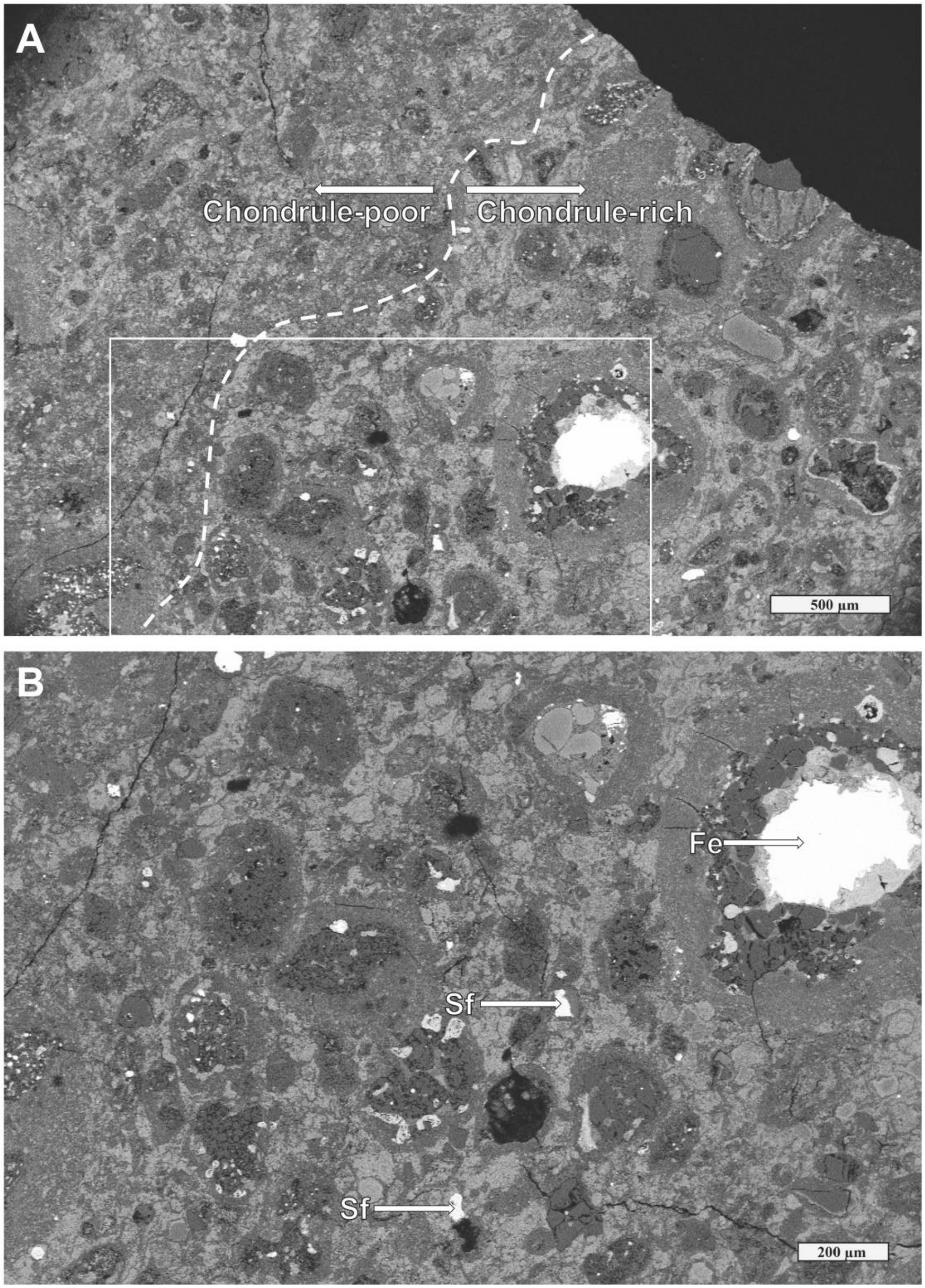

Figure 2.12. SEM images of MET11791/3/2 with identified sulfides (Sf) and iron metal (Fe). The chondrule-rich and chondrule-poor boundary is shown in (A) and a close up of the chondrule-rich portion is shown in (B).

SEM imaging of MET11791/1/2 reveals a metal-rich lithology (Figure 2.13). Unlike the other specimens, the metal can be found both within the chondrule as well as scattered throughout the matrix. Furthermore, this lithology lacks chondrule-rich and chondrule-poor portions.

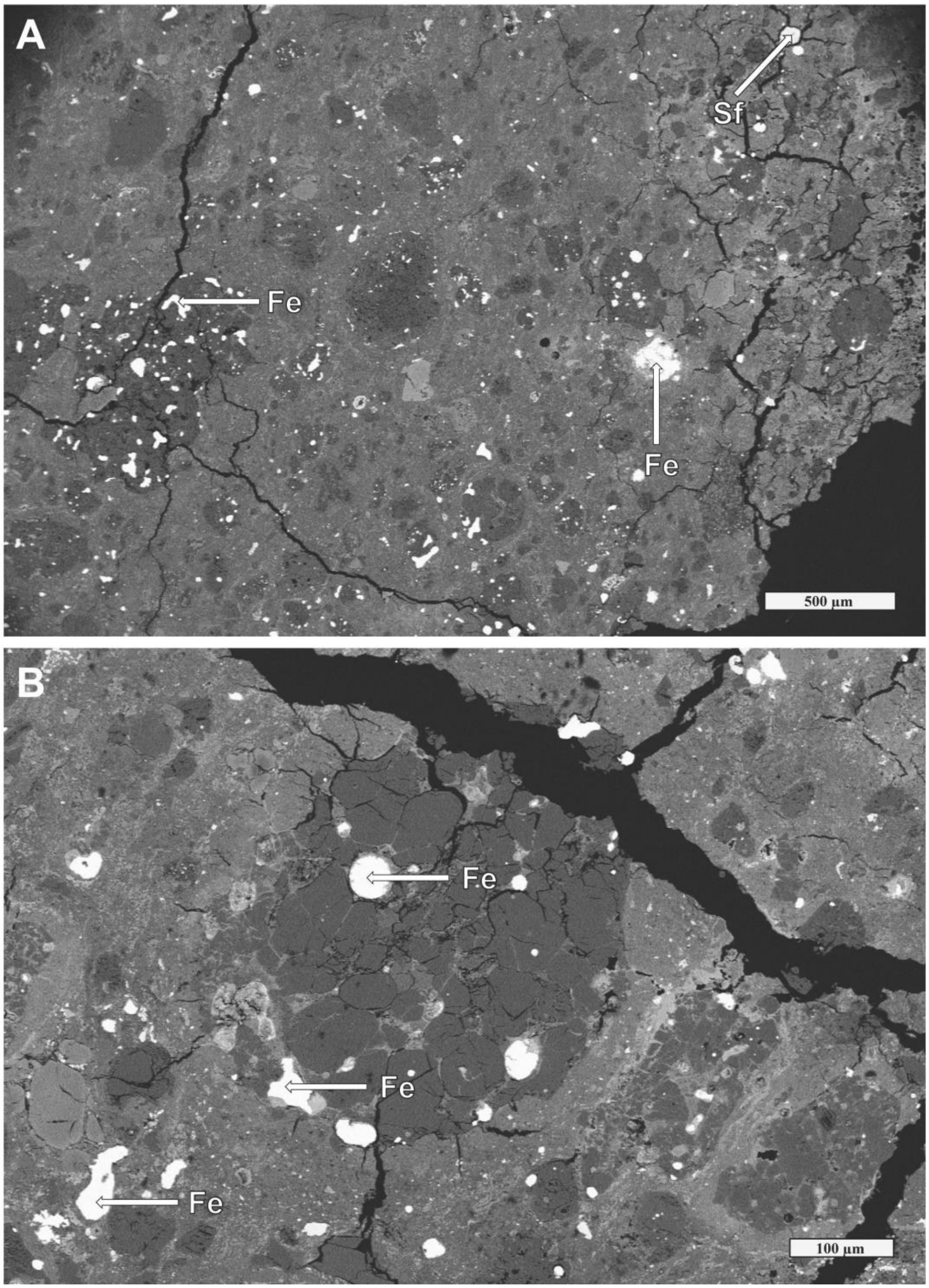

Figure 2.13. SEM images of MET11791/1/2 with identified sulfides (Sf) and iron metal (Fe). The overall petrography is shown in (A) and a close up of a chondrule that has undergone significant alteration is shown in (B).

2.4 Discussion

2.4.1 GC-MS results

The GC-MS results for DCM and hot water extracts for each Aguas Zarcas specimen are summarized in Table 2.4. The organic compounds reported for both the DCM and hot water extracts may not reflect the full suite of the volatile compounds in the Aguas Zarcas specimens due to the period of time between its collection and extraction, or the extractions being carried out in an open system which would allow these compounds to escape. Although all the organic compounds detected in Aguas Zarcas can be found on Earth, they can be divided into those that are likely intrinsic to the meteorite and those ascribed to terrestrial contaminants based on previous literature of common extraterrestrial organics, coupled with an assessment of the probability of finding the organic compound on the Earth's surface. If compounds are rare on Earth, collection site, or unique to meteorites, it can be concluded with confidence that these compounds are extraterrestrial in origin (e.g., Cronin et al. 1995). In addition, trends in usual contamination from a terrestrial source can be compared to what is detected in the meteorite. For example, Monroe and Pizzarello (2011) outline that typical atmospheric contamination would show a relative enrichment of phenanthrene in comparison to anthracene, whereas intrinsic hydrocarbons would show a more even distribution of these PAHs. Sample mass is a potential factor in our results; since the subsampled masses of the Aguas Zarcas specimens varies, the GC-MS extracts were concentrated down to 0.5 mL to simplify the comparison between specimens by eliminating variable sample volumes. The differences in sample masses across specimens could explain the difference in total number of different types of compounds found in each specimen; however, AZ-PT1/1 contains the greatest diversity of intrinsic and contaminant compounds despite its lower mass relative to AZ-PT3/1 and AZ-PT3/2. No obvious patterns emerge when comparing pre-rain and post-rain specimens with regards to either intrinsic or terrestrial organic compounds which suggests that rainfall, in the case of Aguas Zarcas, did not influence the intrinsic compounds within the meteorite. It is possible that a difference may be discerned when comparing concentrations or isotopic data of intrinsic compounds of pre- versus post-rain specimens. This idea is demonstrated in studies of the Sutter's Mill meteorite fall, in which the first three specimens were collected pre-rain and the majority post-rain. The rainfall event was found to reduce the concentrations of water-soluble compounds such as formate, acetate, sulfate, and chloride, minimizing them to trace levels in the post-rain specimens (Jenniskens et al. 2012). Jenniskens et al. (2012) also reported that DCM extracts of the pre-rain specimens were dominated by naphthalene, anthracene/phenanthrene, linear C, alkanes, with little sulfur, in contrast with the cyclic octaatomic sulfur that dominated post-rain specimens. A similar trend is suggested in our data from Aguas Zarcas, in which the post-rain samples are dominated by cyclic octaatomic sulfur. In addition to removing compounds from meteorites during rainfall events, there is also evidence from the Sutter's Mill meteorite that rainwater can introduce L-amino acid terrestrial contamination (Burton et al. 2014). Further studies will need to be done on Aguas Zarcas to determine if the rainfall event had similar influences on its intrinsic compounds as those seen in Sutter's Mill. Additionally, subsampling MET11791/1/2 in an inert-gas glovebox within a freezer does not have a notable effect on the outcome of the extractions, as the intrinsic compounds detected in MET11791/1/2 do not vary significantly in comparison to those extracted within the Class 1000 clean room in air, at room temperature.

Table 2.4. Summary of the GC-MS results for both the DCM and hot water extractions for each Aguas Zarcas specimen. All compound identifications are best matches from the NIST database.

Powder ID	**Pre-/Post-rain**	**Mass of powder [g]**	**Volume of extract [mL]**	**Number of intrinsic compounds**			**Number of terrestrial compounds**			**Total**
				DCM	*Water*	*Total*	*DCM*	*Water*	*Total*	
AZ-PT1/1	Pre-rain	1.42	0.5	3	20	**23**	2	60	**62**	**85**
AZ-PT2/1	Pre-rain	1.06	0.5	4	1	**5**	2	2	**4**	**9**
AZ-PT3/1	Pre-rain	2.09	0.5	4	0	**4**	7	0	**7**	**11**
AZ-PT3/2	Pre-rain	2.09	0.5	4	1	**5**	4	5	**9**	**14**
AZ-PT3/3	Pre-rain	0.98	0.5	4	4	**8**	5	4	**9**	**17**
MET11791/1/2	Pre-rain	0.596	0.5	6	3*	**9**	12	9*	**21**	**30**
MET11791/3/2	Post-rain	0.72	0.5	2	3	**5**	6	12	**18**	**23**

*Contaminated with tap water during hot water extraction.

2.4.1.1 DCM extraction

In the DCM extracts a total of 5 polycyclic aromatic hydrocarbons (PAHs) and 2 allotropes of sulfur - hexathiane (S_6) and cyclic octaatomic sulfur (S_8) - were detected and determined to be intrinsic to the Aguas Zarcas specimens (Table 2.5). All but S_6 were detected in the pre-rain specimen MET11791/1, and every specimen contained at least S_8 and fluoranthene. There is no clear relationship between the total number of compounds and allotropes and whether the specimen was collected pre- or post-rain.

Table 2.5. Detectable intrinsic organic and inorganic compounds in the Aguas Zarcas DCM extractions. All compound identifications are best matches from the NIST database.

	AZ-PT1/1 (pre-)	**AZ-PT2/1 (pre-)**	**AZ-PT3/1 (pre-)**	**AZ-PT3/2 (pre-)**	**AZ-PT3/3 (pre-)**	**MET11791/1/2 (pre-)**	**MET11791/3/2 (post-)**
9H-Fluorene, 9-methylene-						✓	
Acenaphthene						✓	
Azulene					✓	✓	
Cyclic octaatomic sulfur, S_8	✓	✓	✓	✓	✓	✓	✓
Fluoranthene	✓	✓	✓	✓	✓	✓	✓
Hexathiane, S_6	✓	✓	✓	✓	✓		
Pyrene		✓	✓	✓		✓	
Total	**3**	**4**	**4**	**4**	**4**	**6**	**2**

2.4.1.2 DCM swabs

No compounds identified in the laboratory material swabs were detected in the processed meteorite samples, implying there was no detectable contamination from processing within the laboratory. This suggests that all of the terrestrial organic compounds in this study are likely sourced from the terrestrial environment where the meteorite fell or from handling prior to arrival at the University of Alberta Meteorite Facility.

2.4.1.3 Hot water extraction

There are a combined total of 26 intrinsic organic compounds detected across the hot water extracts of the Aguas Zarcas specimens (Table 2.6). Based on the compound identifications reported by the NIST software, the compounds that we conclude are likely intrinsic to the meteorite samples include compound classes such as monocarboxylic acids, dicarboxylic acids, amino acids, alcohols, amides, keto acids, cyanides, and two inorganic compounds: ammonia and phosphoric acid. Hydrogen cyanide is a particularly important find as it is vital in the interstellar medium and in the discussion of the origin of life (Pizzarello 2012); this compound is rarely reported in organic compound analyses of astromaterials. The vast majority of the compounds were detected in AZ-PT1/1, totaling 20; in contrast, AZ-PT3/1 has no detectable intrinsic compounds. The remaining Aguas Zarcas specimens contained only a handful of intrinsic compounds, ranging from 1 to 4. The intrinsic compounds acetic acid, adipic acid, butanedioic acid, propanedioic acid, glycine, fumaric acid, and hydrogen cyanide have been reported in other studies of Aguas Zarcas (Aponte et al. 2020; Pizzarello et al. 2020; Glavin et al. 2020). The remainder of the intrinsic compounds in the water extracts in Aguas Zarcas are found in other carbonaceous chondrites like Murchison and Tagish Lake (Jungclaus et al. 1976; Pizzarello et al. 2001; Kminek et al. 2002; Koga and Naraoka 2017). The total number of carboxylic acids is greater than total number of amino acids detected in Aguas Zarcas, a common pattern in CM2 meteorites (Pizzarello et al. 2006). AZ-PT1/1, MET11791/1/2, and MET11791/3/2 were all extracted and derivatized concurrently, and therefore used the same stock solutions and volumes of solvent and derivatizing agent. Although a large number of compounds was detected in AZ-PT1/1 in comparison to MET11791/1/2 and MET11791/3/2, since they were processed in the same batch it is unlikely that the difference in total abundance is due to the experimental method. The substantial difference in the abundance of the intrinsic organics in the hot water extracts of AZ-PT1/1 compared to the other specimens can therefore be attributed to heterogeneity between specimens (Sephton 2002; Pizzarello et al. 2003; Botta 2008), an observation consistent with the brecciated nature of Aguas Zarcas. In addition, the presence of all three hydrolysis products in the hot water extracts show that the MTBSTFA reagent readily reacted with water during the derivatizations of the Aguas Zarcas samples. The peaks corresponding to the hydrolysis products have peak areas similar in size or larger than the compounds deemed to be intrinsic to Aguas Zarcas.

Table 2.6. Detectable intrinsic compounds in the Aguas Zarcas hot water extractions. All compound identifications presented in this table are their compound precursor names prior to becoming a t-BDMS derivative after reacting with MTBSFTA. All compound identifications are best matches from the NIST database.

t-BDMS derivatives	Precursors of t-BDMS derivatives	AZ-PT1/1 (pre-)	AZ-PT2/1 (pre-)	AZ-PT3/1 (pre-)	AZ-PT3/2 (pre-)	AZ-PT3/3 (pre-)	MET11791/1/2 (pre-)	MET11791/3/2 (post-)
Monocarboxylic acids								
tert-Butyldimethylsilyl acetate	Acetic acid[a]	✓	✓					
Docosanoic acid, tert-butyldimethylsilyl ester	Docosanoic acid	✓						
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	Glycolic acid	✓						
Glyoxylic acid, di-TMS	Glyoxylic acid	✓						
Heneicosanoic acid, tert-butyldimethylsilyl ester	Heneicosanoic acid	✓					✓	
Nonanedioic acid, bis(tert-butyldimethylsilyl) ester	Nonanedioic acid	✓						
Dicarboxylic acids								
Bis(dimethyl-t-butylsilyl) adipate	Adipic acid[a]	✓						
Bis(dimethyl-t-butylsilyl) succinate	Butanedioic acid[a,b]	✓						
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	Butanedioic acid, methyl-	✓						
Decanedioic acid, diethyl ester	Decanedioic acid	✓						
Bis(dimethyl-t-butylsilyl) fumarate	Fumaric acid[a]					✓		
Octanedioic acid, bis(tert-butyldimethylsilyl) ester	Octanedioic acid	✓						
Bis(dimethyl-t-butylsilyl) oxalate	Oxalic acid	✓						
Propanedioic acid, bis(trimethylsilyl) ester	Propanedioic acid[a]	✓						

trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	trans-Traumatic acid						✓	
Amino acids								
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	Glycine[c]					✓		
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	Proline					✓		
Alcohols								
2-Pentamethyldisilanyloxybutane	2-Butanol	✓						
2-Methyl-1-pentamethyldisilyloxypropane	Isobutanol							✓
1-Dimethyl(isopropyl)silyloxypropane	n-Propanol				✓	✓		
Amides								
Bis-N,N-(trimethylsilyl)formamide	Formamide	✓						
Keto acids								
Levulinic acid, tert-butyldimethylsilyl ester	Levulinic acid	✓						
Organic acids								
Lactic acid, tert-butyldimethylsilyl ether	Lactic acid	✓					✓	✓
Cyanides								
tert-Butyldimethylsilyl nitrile	Hydrogen cyanide[a]	✓						
Inorganic								
Bis(tert-butyldimethylsilyl)amine	Ammonia	✓						
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	Phosphoric acid	✓						✓
	Total	**20**	**1**	**0**	**1**	**4**	**3**	**3**

[a] Reported in Aguas Zarcas by Aponte et al. 2020

[b] Reported in Aguas Zarcas by Pizzarello et al. 2020

[c] Reported in Aguas Zarcas by Glavin et al. 2020

To date, there have been three other organic compound studies on the Aguas Zarcas meteorite to which our results may be compared. Using trifluoroacetic acid anhydride (TFAA) as the derivatization agent on hot water extracts of Aguas Zarcas, Pizzarello et al. (2020) found their specimens to be depleted in ammonia, amino acids, and amines, and enriched in hydrocarbons, carboxylic acids, dicarboxylic acids, sugar alcohols, and sugar acids. Only one dicarboxylic acid, butanedioic acid, was found in common between this study and our findings. Aponte et al. (2020) derivatized water extracts of Aguas Zarcas with pentafluorobenzylhydroxylamine (PFBHA) and reported them to be rich in carboxylic acids. Five compounds, acetic acid, adipic acid, butanedioic acid, fumaric acid, and hydrogen cyanide were found in both our study and the Aponte et al. (2020) study. Lastly, Glavin et al. (2020) determined their *o*-Phthalaldelhyde-*N*-acetylcysteine polyamine (OPA-NAC) derivatized Aguas Zarcas water extracts to be rich in α-amino acids, with only glycine in common with our study.

The GC-MS results of the hot water extracts in this study are notably different compared to other studies conducted on the Aguas Zarcas meteorite. The most pronounced difference between the methodology of all studies is the derivatization agent used: TFAA is primarily used to isolate alcohols and phenols and not amines or amides, PFBHA is used to esterify phenols, thiols, and carboxylic acids (Orata 2012), and OPA-NAC is almost exclusively utilized for amino acids or polyamines (Campíns-Falcó et al. 2001). The types of compounds detected in a given study are directly correlated to the derivatization agent that was chosen. As our study demonstrates, MTBSTFA is used to derivatize compounds over a wide range of compound types as this reagent's only selection criterion are compounds with an active hydrogen. The impact the derivatization reagent has on the outcome of the compounds detected illustrates the need for cross comparison of organic analyses results from various methodologies, as one derivatization agent alone cannot capture the entirety of compounds in a meteorite sample. In addition, heterogeneity between specimens can also explain a portion of the variability of compounds detected between studies.

2.4.2 Terrestrial contaminants

The terrestrial organic contamination makes up ~75% of the total number of organic compounds detected in the Aguas Zarcas specimens. We attribute the majority of these contaminants into one of five categories: agricultural products, fuels, pesticides, pharmaceuticals, and plastics. None of the terrestrially sourced compounds, especially agricultural products, fuels, and pesticides, are surprising as they are commonly used on agricultural land, like the area where Aguas Zarcas specimens were collected.

2.4.3 Order of extraction

To investigate whether the order of extraction impacts what organic matter is detected by GC-MS, AZ-PT3/3 was extracted with water followed with DCM, whereas AZ-PT3/1 and AZ-PT3/2 were extracted with DCM first. Since all three specimens came from the same specimen, the results should reflect any differences between the sequence of steps. The DCM extraction revealed 4 intrinsic compounds in each sample, with only one differing compound, azulene, detected in AZ-PT3/3. The hot water extractions showed that AZ-PT3/3 had the greatest number of intrinsic compounds, with 4 in total, whereas AZ-PT3/1 and AZ-PT3/2 has 0 and 2, respectively. The difference in the hot water extractions results suggests that the quantities of the compounds detected in a water extraction may be diminished if the meteorite sample has previously been leached with DCM. However, the difference in abundances of compounds in the DCM and hot water extracts in relation to the order of extraction is not significant enough to firmly conclude that the order of extraction impacts the organic compound results. Alternatively, the difference may be attributable to the lower mass extracted, and inter-sample organic matter heterogeneity.

2.4.4 SEM results

Combining both the GC-MS and SEM results reveals a few key insights into organics in the Aguas Zarcas meteorite. The unique metal-rich lithology in MET11791/1/2 does not appear to be enriched or depleted in either DCM or water-soluble organics. Even though the metal-rich lithology has no apparent control on the organic compounds detected, the iron metal identified in both chondrules and the matrix suggests that Aguas Zarcas may be more primitive than other CM2 carbonaceous chondrites (Kebukawa et al. 2020; Kerraouch et al. 2020). The SEM imaging of the Aguas Zarcas specimens displays varying petrography with chondrule-rich and chondrule-poor portions, and a rare metal rich lithology identified in MET11791/1/2. Nevertheless, the lack of correlation between organic matter and petrography suggests that the organics in the meteorite are randomly distributed.

2.5 Conclusion

Terrestrial contamination and surface processes have the potential to alter or erase extraterrestrial organic matter signatures. The results of our study of Aguas Zarcas indicate that the rainfall event did not significantly impact the total number of organic compounds found in the Aguas Zarcas specimens. The only compound not found in other extractions is the intrinsic compound, isobutanol, which could be explained by intrinsic sample heterogeneity. To fully assess the effects of rainfall events on intrinsic organic material, similar analyses should be carried out on additional post-rain samples as the singular post-rain sample used in our study may not fully capture how rainfall may have influenced the soluble organics in Aguas Zarcas. Our results suggest instead that organic matter heterogeneity has a larger control on detectable organics. Despite this, the terrestrial surface still greatly influences the complement of soluble organic matter of even freshly fallen meteorites. The contaminants detected in this study were primarily agricultural products, fuels, and pesticides, consistent with the fact that the Aguas Zarcas specimens fell on agricultural land. These contaminants have not been reported in other carbonaceous chondrites (as intrinsic or otherwise), and yet are common on the terrestrial surface (Tunney et al. 2020), which indicates that the meteorite specimens' complete contamination histories have not been recorded. This theme is echoed in the absence of studies that aim to discriminate between intrinsic compounds and terrestrial contaminants of other carbonaceous chondrites.

Obtaining terrestrial surface samples where the meteorite falls is advantageous as it can aid in pinpointing the origin(s) of contamination with higher certainty. Although terrestrial sampling was not possible for this study, previous studies have recommended that it become standard practice for future organic matter analyses of freshly fallen carbonaceous chondrites and other meteorites (Tunney et al. 2020). Understanding the meteorite specimen's history, including collection information and handling conditions, can greatly affect our ability to discriminate between intrinsic and contaminant organic compounds. The rarity of a given compound in the fall site or within meteorites themselves can also be used as an indication of the source of a compound. If a compound is rare on the Earth's surface or commonly reported as being intrinsic to meteorites, it is likely an extraterrestrial sourced compound. Conversely, if a compound is common in the fall site and rare or absent from meteorite soluble compound analyses it is likely terrestrially sourced.

The methodology used in processing meteorites can also impact results. Here, we demonstrated that the order of the DCM and hot water extractions has little or no effect on the number and concentrations of the compounds detected. It is possible that specimens previously leached with DCM may result in fewer compounds detected in the hot water extraction, but other factors such as heterogeneity or mass extracted, may be a larger factor. Due to the complex interaction of components, the order of extractions should be investigated further in the future. Additionally, using MTBSTFA as a derivatizing agent comes with its own advantages and disadvantages. MTBSTFA is successful at producing stable derivatives from a wide range of organic compounds at once. However, MTBSTFA proved to be more water sensitive than previously reported. Great care needs to be taken to ensure that the derivatization reaction occurs in a moisture free environment. Regardless of its moisture sensitivity, MTBSTFA is still a desirable derivatizing agent due to its ability to silylate any compound with a free hydrogen without discrimination and retains its "one-pot" capability.

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Chapter 3: Organic compounds in the Tarda C2 ungrouped carbonaceous chondrite: Evaluating the sources of contamination in a desert fall

Abstract

Studying organic compounds in meteorites provides important insight into the chemical processes that occurred in the early solar system. Once meteorites reach the Earths' surface, they are subject to terrestrial organic contamination that may confound the conclusions that we draw from meteorite organic analyses. Within this study, specimens of the Tarda C2 ungrouped carbonaceous chondrite, collected within a few days of its fall on August 25, 2020, from a barren desert in Morocco, were analyzed for their organic compound contents. In addition, a sand sample from the strewn field was analyzed to confirm the sources of a handful of contaminating compounds detected in the Tarda stones. Using dichloromethane rinses of the Tarda stone exteriors and dichloromethane and hot water extractions of meteorite specimen powders and sand sample, and analysis of the soluble organics by gas chromatography-mass spectrometry, we distinguish between extraterrestrial and contaminant sources for each organic compound. In this study, N-tert-butyldimethylsilyl- N-methyltrifluoroacetamide (MTBSTFA) was used to derivatize the hot water extractions to utilize its single-step derivatization reaction ability. The compounds determined to be intrinsic to Tarda include: propanoic acid, propanedioic acid, butanedioic acid, fumaric acid, methylmaleic acid, threonine, proline, glycine, urea, and cyclic octaatomic sulfur. We detected numerous terrestrial organic compounds, all of which were traced back to the meteorites' collection area, with several being confirmed in the sand sample. Our results have implications for best practices for collection of freshly fallen meteorites, especially carbonaceous chondrites, as well as how specimens should be handled and curated after collection.

3.1 Introduction

Organic compound analysis of carbonaceous chondrites can provide a glimpse into processes that were occurring at the time of solar system formation and alteration events thereafter on asteroid parent bodies (Sephton 2002). Upon reaching the Earth's surface meteoritic material may become contaminated, primarily due to the abundant life Earth hosts (Pizzarello and Shock 2010). This terrestrial contamination and alteration have been found to occur rapidly on carbonaceous meteorite falls as soon as they enter Earth's atmosphere (Burton et al. 2014; Glavin et al. 2021; Lee et al. 2021). The susceptibility of meteoritic materials to become contaminated makes the differentiation between extraterrestrial and terrestrial compounds crucial in order to make informed inferences about organic and/or pre-biotic processes that occurred on the early Earth and in our solar system. Since contamination can obscure or confound extraterrestrial organic analyses, it is important to develop advanced curation methods to mitigate organic contamination on meteoritic material (McCubbin et al. 2019). The recent fall of the Tarda C2 ungrouped carbonaceous chondrite on August 25, 2020 in Morocco with a strewn field centered around 31°49’35”N, 4°40’46”W (Figure 3.1), offers a unique opportunity to analyze and determine the intrinsic properties of a relatively fresh carbonaceous chondrite collected within only a few days of its fall. In addition, the Tarda meteorite provides a chance to study the transfer of terrestrial organics to the fallen stones, including in a hot desert as well as laboratory environments.

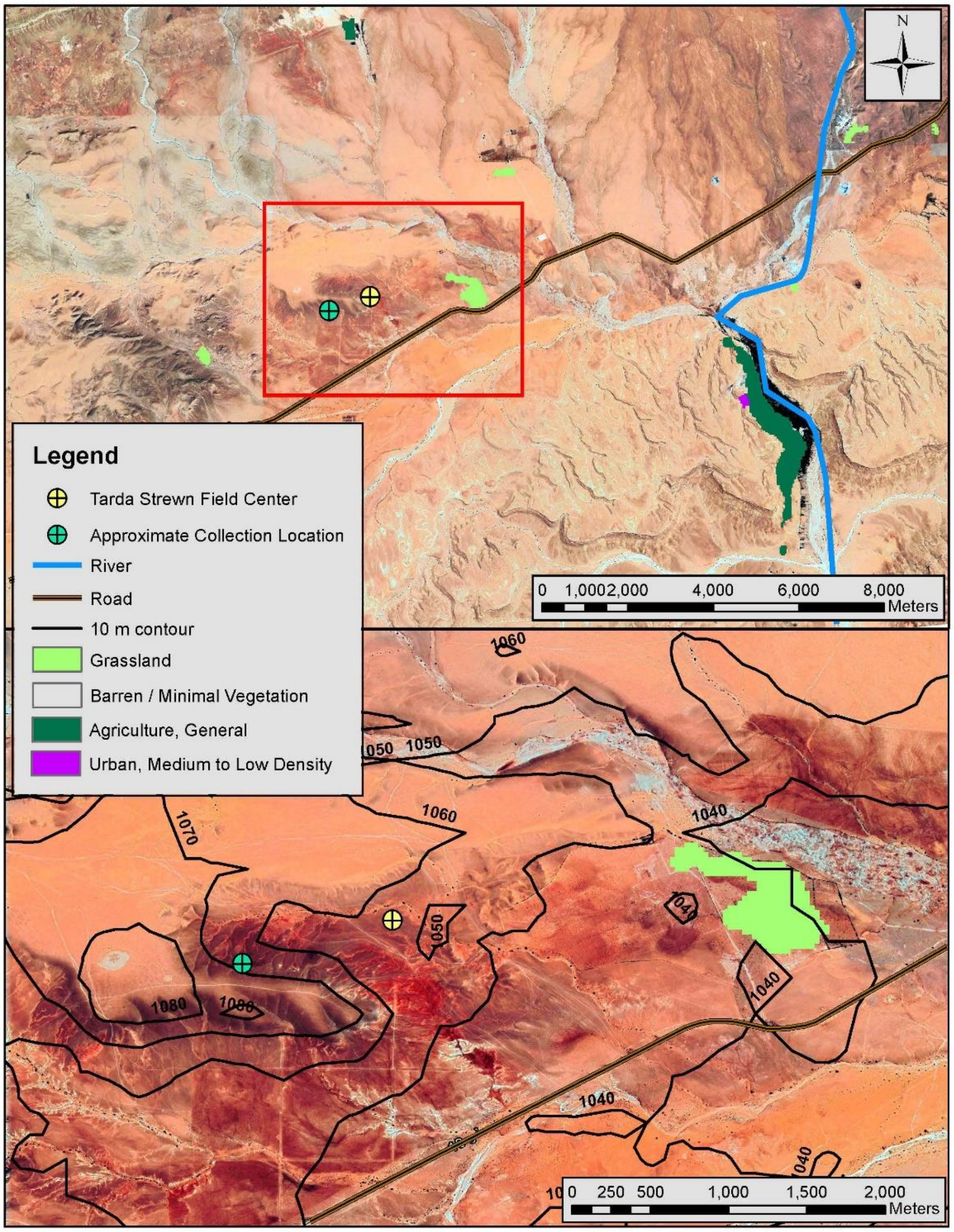

Figure 3.1. The location of the Tarda fall strewn field center and surrounding land features including topography, land use, and location of roads and water bodies. The approximate collection location corresponds to the specimens used in this study. Satellite image of the study area is from Google, CNES/Airbus, Maxar Technologies (2021). Africa DEM and land use shapefiles are from USGS/NASA-STRM and MDAUS, respectively.

To determine the soluble organic content of Tarda, dichloromethane (DCM) and hot water extractions were carried out on two specimens, and the extracted organic compounds were then analyzed by gas chromatography-mass spectrometry (GC-MS). In order to detect certain compounds of interest by GC-MS, several phases needed to be volatilized. Important species in meteoritic organic analyses, such as amino acids and polycyclic aromatic hydrocarbons (PAHs), are not volatile under GC analytical conditions and therefore require an additional derivatization step prior to GC analysis (Belmahdi et al. 2014). N-tert-butyldimethylsily-N-methyltrifluoroacetamide (MTBSTFA) is our derivatization agent of choice in this study since tBDMS derivatives can be purified from silylation reagents and solvents which makes it advantageous for small samples (Chance et al. 1997).

MTBSTFA is a silylation reagent that reacts easily with a wide range of organic compounds (Buch et al. 2006; Glavin et al. 2013) providing a highly stable and pure derivative that yields optimal GC and mass spectral peaks (Kim et al. 1992). Silylation reagents work by replacing active hydrogens (in -OH, -COOH, -NH, -NH_2, and -SH groups) with a trimethylsilyl group consequentially volatize the compound (Orata 2012). Due to the readily available active hydrogens in most compound species, MTBSTFA has been used as a single-step derivatization technique to analyze for numerous types of organic compounds simultaneously (Mawhinney et al. 1986). Despite its multiple advantages, MTBSTFA has been shown to be more water sensitive than what was previously reported and reacts readily with water to create 3 major hydrolysis products: 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyldisiloxane, N-methyl-2,2,2-trifluoroacetamide, and tert-butyldimethylsilanol (Buch et al. 2006; Glavin et al. 2013). In this investigation, we took this behavior into account when working with MTBSTFA and other silylation reagents, ultimately minimizing the inference of the hydrolysis products' peak areas with the compounds of interest in our study. Using methods to counteract its moisture sensitivity, we employed MTBSTFA to identify organic compounds in the Tarda specimens and characterize the performance of this derivatization technique relative to other common analytical methods.

3.2 Materials and methods

3.2.1 Tarda specimens

Two Tarda specimens, weighing 3.64 g (UAlberta Collection #MET11800/1; "Tarda A") and 3.69 g (MET11800/2; "Tarda B"), along with a 7.61 g sand sample (Figure 3.2) from the collection area were obtained from Juan Poblador, who procured the sample in the field. The sand specimen was collected from the center of the strewn field (31°49’35”N, 4°40’46”W) and Tarda A and Tarda B were collected at approximately 31°49’25”N, 4°41’17”W. The Tarda stones are low density, friable, moisture sensitive, and primarily fusion encrusted (Meteoritical Bulletin Database 2020); however, Tarda A and Tarda B both have an exposed interior face. Neither of the Tarda specimens had visible grains of sand on its exterior.

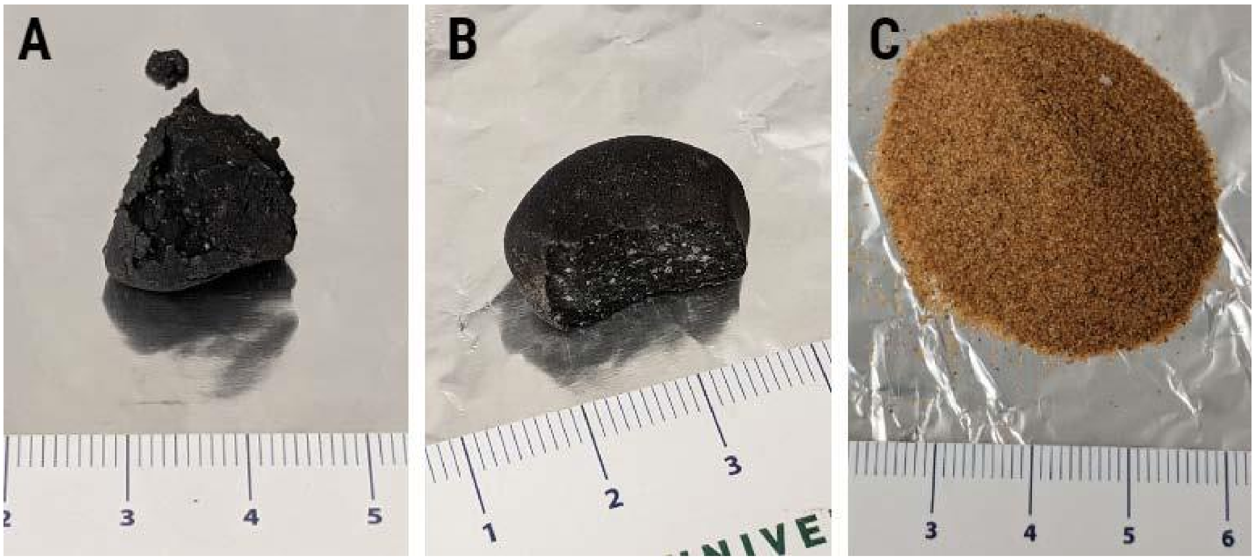

Figure 3.2. Images of Tarda A (A), Tarda B (B), and sand from the collection are (C) prior to subsampling. Scale bar in cm.

3.2.2 Storage and handling

Prior to arriving at the University of Alberta the samples were handled with direct hand contact without gloves and were kept in tissue paper lined pockets (Juan Poblador, pers. comm.) until being packaged in plastic (type unknown) containers cushioned with cotton inserts within cardboard boxes (Figure 3.3). After arrival, the Tarda specimens were stored and processed within a Class 1000 cleanroom in the University of Alberta Meteorite Curation Facility (Herd et al. 2016). All materials used in handling and processing the specimens were cleaned with ultrapure water (Millipore Direct Q3 UV, 18.2 MΩ, 3 ppb total organic carbon) and Sigma-Aldrich HPLC grade dichloromethane (DCM), and if possible, were combusted at 450 °C for at least 6 hours. Direct handling of the specimens in the clean laboratory were done with nitrile gloves or cleaned and combusted tweezers.

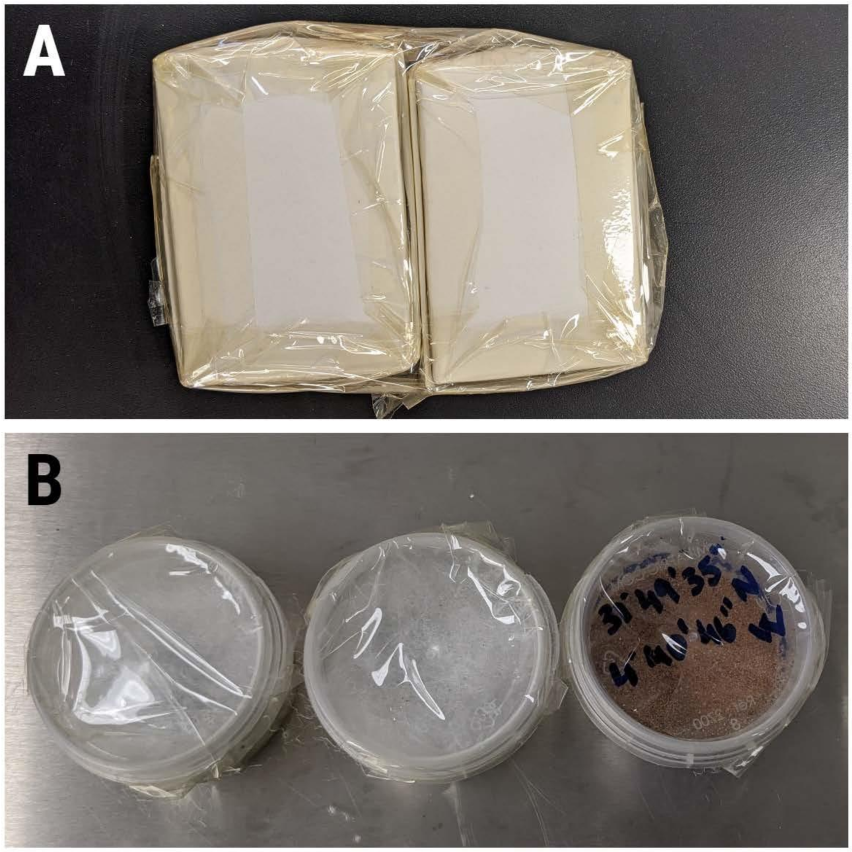

Figure 3.3. Packaging of the Tarda specimens upon arrival at the University of Alberta Meteorite Curation Facility. Packing included cardboard boxes (A) which held plastic containers with the Tarda stones cushioned with cotton inserts (B).

3.2.3 Sample preparation

Preceding subsampling of the Tarda specimens the fusion crusted exteriors of Tarda A and Tarda B were rinsed at room temperature with 5 mL of DCM. Next, approximately 0.60 g of each Tarda specimen were subsampled and powdered for analysis using a combusted mortar and pestle (Table 3.1). The Tarda A and Tarda B powders, along with a 1.5 g subsample of the sand sample and procedural blank, were extracted at room temperature with 5 mL of DCM, four times, for a total of 20 mL. Each rinse and extract were evaporated down to 0.5 mL and analyzed by GC-MS. Following the DCM extractions, each meteorite residue, sand sample, and the procedural blank were left to reflux at a gentle boil in 75 mL of ultrapure water. After 24 hours had elapsed, the hot water extracts were taken to dryness using a Heidolph rotary evaporator at 60 rpm in an 80°C-water bath.

Table 3.1. Summary of Tarda specimens used in organic compound analyses.

Specimen ID	Original Mass [g]	Mass Powdered [g]	Powder ID
MET11800/1	3.64	0.60	Tarda A
MET11800/2	3.69	0.58	Tarda B
-	7.61	1.50	Tarda Sand

To determine if any baseline laboratory contamination exists, DCM swabs of surfaces within the cleanroom of the University Meteorite Curation Facility and any subsampling materials were taken then analyzed by GC-MS. In addition, the packaging materials that the Tarda specimens arrived (Figure 3.3B) in were also swabbed for any contaminants that may have been transferred from the temporary storage materials to the meteorite specimens.

3.2.4 Derivatization procedure of the hot water extracts

To reduce exposure of the derivatizing agent to moisture, prior to derivatization, acetonitrile was distilled using calcium hydride under nitrogen gas ($N_{2(g)}$) (Figure 3.4A). Remaining under a stream of $N_{2(g)}$, 2 mL of freshly distilled acetonitrile was added to each flask containing the Tarda water extracts and procedural blank. Each flask and its contents were placed in a 60°C ultrasonic bath for 20 minutes. The resulting acetonitrile solution was transferred to a 2 mL ampule that was being flushed continuously with $N_{2(g)}$ and then evaporated down to 1 mL. A volume of 0.1 mL of MTBSFTA was added to each ampule, the ampule was then flame sealed, and heated at 100°C for 4 hours. After cooling to room temperature each extract and the procedural blank were evaporated down to 0.2 mL under $N_{2(g)}$ (Figure 3.4B) and analyzed by GC-MS.

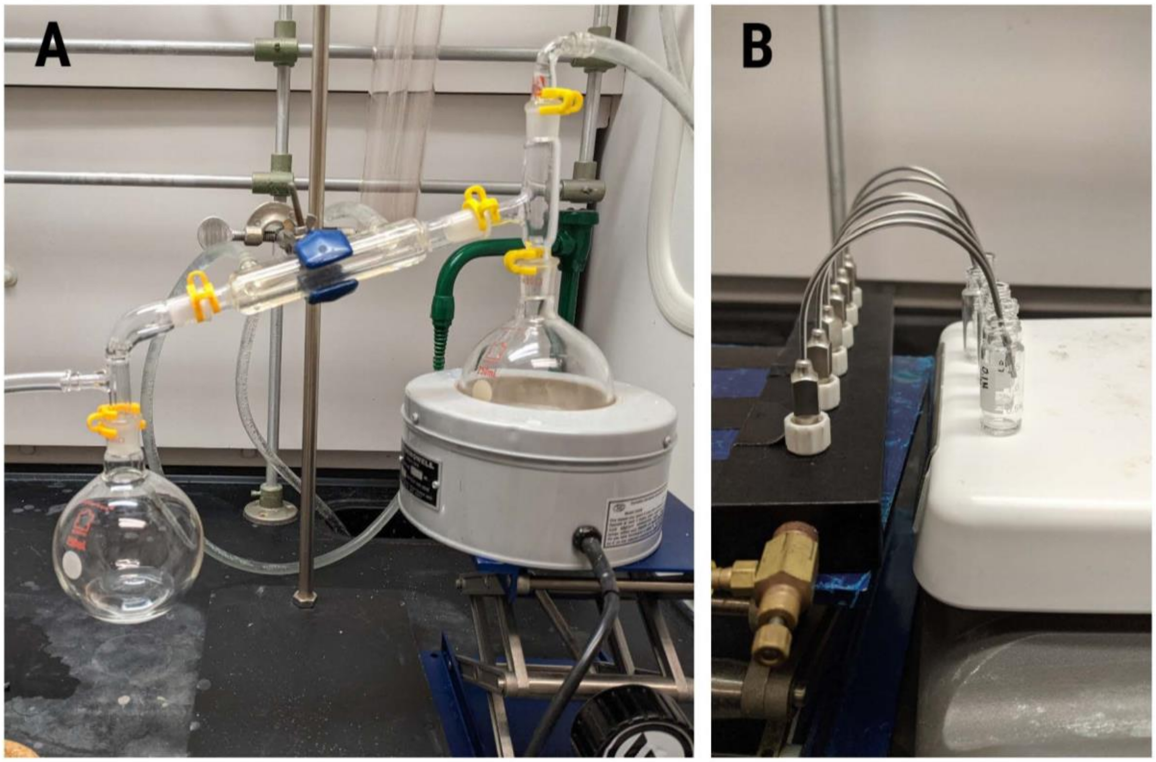

Figure 3.4. Setup of distilling calcium hydride (A) and evaporating down the derivatized hot water extracts (B) under a constant steam of $N_{2(g)}$ to minimize moisture in the experiment.

3.2.5 GC-MS analyses and compound identification

Soluble organic compounds in the rinses, extractions, and swabs in this study were detected and identified by gas chromatography - mass spectrometry (GC-MS) at Grant MacEwan University. The GC-MS analyses were performed on an Aglient 6890N equipped with a HP-5MS column (30 m length, 0.25 µm film thickness, 250 µm internal diameter), and detection was done using an Agilent 5975C MSD. In this study, the oven temperature was initially held at 50℃ for 1 minute and increased by 10℃ min^{-1} to a final temperature of 250℃. The final temperature remained fixed for 20 minutes for a total run time of 41 minutes. Samples were injected using pulsed splitless mode at 275 ℃ using helium as a carrier gas which has a constant flow rate of 1.0 mL min^{-1}. Peaks of individual compounds were then identified by the 2011 NIST Mass Spectral Library (Version 2.0g). Using the NIST database, the general compound type can be identified but its precise structure often remains uncertain if the concentration for the species is low. Regardless of this limitation, compounds within the same compound category will have similar, if not, identical terrestrial sources. From this, compounds were categorized as either extraterrestrial or terrestrial compounds based on their likelihood to be found in the fall area and comparing this to other compounds that are typically found intrinsic to other carbonaceous chondrites.

3.2.6 Scanning electron microscope (SEM) analyses

A carbon-coated polished epoxy mount of Tarda specimen MET11800/1/EP was analyzed using a Zeiss Sigma 300 VP-FESEM at the University of Alberta's Earth and Atmospheric Sciences department to characterize the petrology and mineralogy of the specimen. Operating conditions included a15 kV beam and 7.1 mm working distance.

3.3 Results

Identified compounds for the DCM and water rinses, swabs, and extractions are listed in Tables 3.2–3.4. The data presented have been blank subtracted to account for any contamination that may have occurred during the processing procedures or due to impurities in chemical stock solutions. Detailed peak identifications can be found in Appendix B (Tables B1–B5).

3.3.1 DCM rinses

A total of 10 and 5 peaks were detected in the Tarda A and Tarda B rinses, respectively (Table 3.2, Figure 3.5). Most of these compounds are commonly used in pharmaceuticals, however there are a few related to the production of agricultural products, pesticides, and plasticizers.

Table 3.2. Organic and inorganic compounds detected in DCM rinses, post-blank subtraction, of Tarda A and Tarda B and their retention times (RT) and possible terrestrial sources determined from the PubChem database. All compound identifications are best matches from the NIST database.

RT (min)	Quality (%)	Compound	Possible Terrestrial Source
Tarda A			
3.697	7	2-Ethylacridine	Pharmaceuticals
4.470	1	N,N-Dibenzyl-1-(benzylthio)-3,4,4-trichloro-2-nitro-1,3-butadienylamine	Pharmaceuticals
6.791	2	Ammonia	Agricultural products and biological activity
10.267	2	Hydrazine, 1,2-dimethyl-	Pesticides

11.183	9	Acetic acid, [bis[(trimethylsilyl)oxy]phosphinyl]-, trimethylsilyl ester	Pharmaceuticals
16.402	4	2,3,4,5-Tetrahydropyridazine	Agricultural products and pharmaceuticals
16.990	2	Nitrous oxide	Pesticides and pharmaceuticals
17.394	3	2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	Pharmaceuticals
17.557	2	Indolizine, 2-(4-methylphenyl)-	Antifungal agents
37.323	27	N-Benzyl-N-ethyl-p-isopropylbenzamide	Pharmaceuticals
Tarda B			
20.728	28	Nonahexacontanoic acid	Pharmaceuticals
24.727	86	Phthalic acid, di(2-propylpentyl) ester	Plasticizers
37.171	7	.gamma.-Cyano-3-methyl-5,10-dihydrobenzo[f]indolizine	Pharmaceuticals
37.236	32	Di-n-decylsulfone	Antifungal agents and pharmaceuticals
37.258	12	2-Ethylbutyric acid, 2,7-dimethyloct-5-yn-7-en-4-yl ester	Fragrances and pesticides

Note: Duplicates of each rinse were conducted and are combined below to account for results from both runs. See Figure 3.5 for corresponding GC traces.

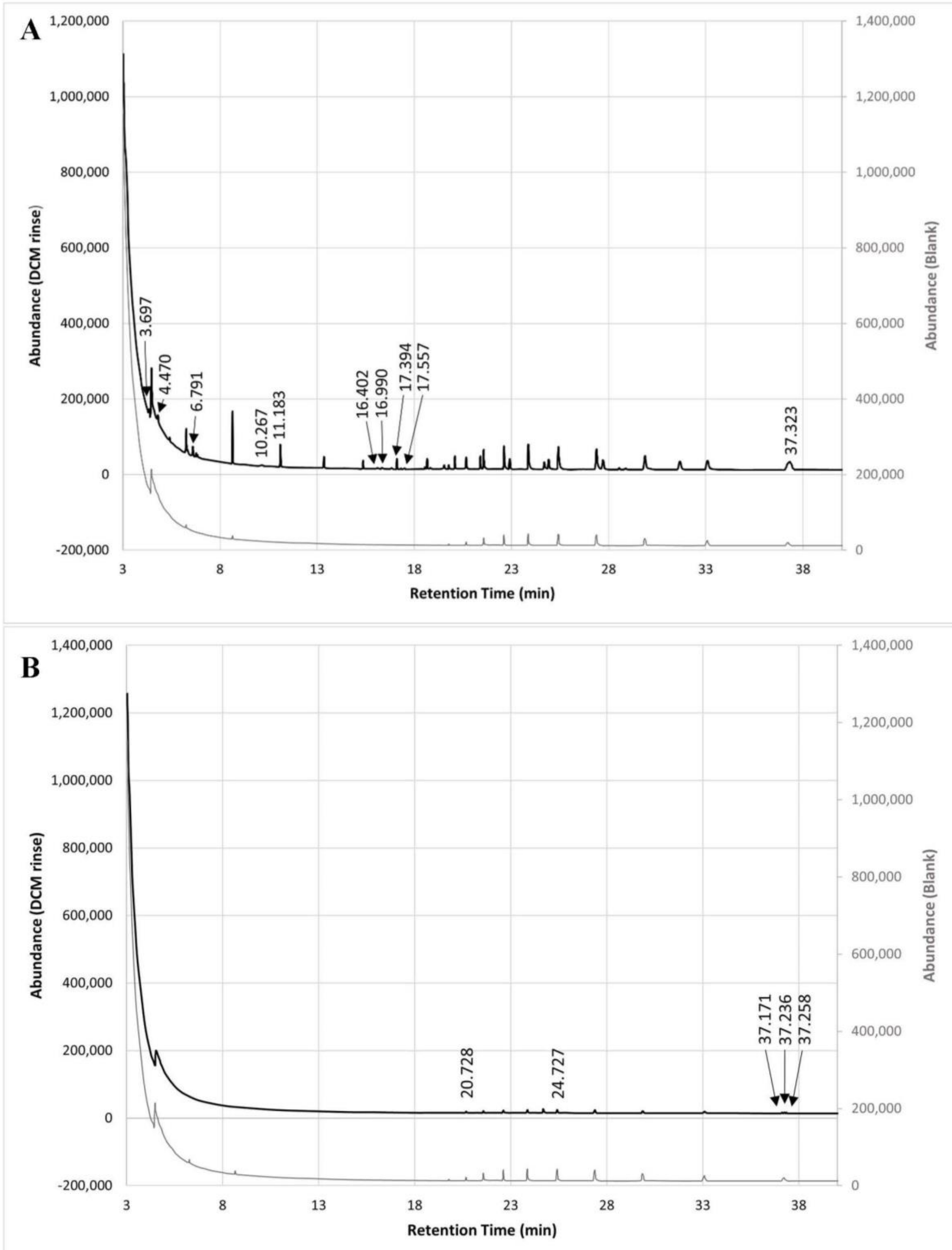

Figure 3.5. GC-MS traces of compounds detected in the DCM rinses of a) Tarda A and b) Tarda B with their corresponding procedural blank shown in grey, shown offset for clarity.

3.3.2 DCM extractions

A total of 2, 21, and 30 peaks were detected in the DCM extractions of Tarda A, Tarda B, and the Tarda sand, respectively (Table 3.3, Figure 3.6). The compounds in the meteorite specimens included two elemental sulfur allotropes, hexathiane (S_6) and cyclic octaatomic sulfur (S_8), long chain saturated hydrocarbons, phthalic acid/phthalate derivatives, and alcohols, whereas long chain saturated hydrocarbons are predominant in the Tarda sand. Five compounds detected in Tarda B were also identified in the sand sample including: Dibutyl phthalate, heneicosane, nonadecane, 9-methyl, phthalic acid, di(2-propylpentyl) ester, and tetratetracontane. A long-chain hydrocarbon with a retention time of 20.717 minutes was also found in both Tarda A and the sand sample extracts. Compounds attributed to pharmaceuticals are predominant in the DCM extractions, however, there are also a handful of organics related to agricultural products, fuels, pesticides, and plasticizers.

Table 3.3. Organic and inorganic compounds detected in DCM extractions, post-blank subtraction, of Tarda A, Tarda B, and Tarda sand and their retention times (RT) and possible terrestrial sources determined from the PubChem database. All compound identifications are best matches from the NIST database.

RT (min)	Quality (%)	Compound	Possible Terrestrial Source
Tarda A			
15.584	98	Cyclic octaatomic sulfur	[Pharmaceuticals]
20.717	86	Heptadecane	Fuels
Tarda B			
9.113	90	Cyclohexanol, 5-methyl-2-(1-methylethyl)-	Agricultural products, pesticides, pharmaceuticals, and propellant
9.320	72	o-Cymene	Fragrances and pesticides
10.126	98	Propanol, 2-methyl-3-phenyl-	Pharmaceuticals
10.791	46	Bicyclo[4.1.0.]heptane, 7-(1-methylethyldiene)-	Pharmaceuticals
14.681	98	Diethyl Phthalate	Plasticizers
15.422	83	Hexathiane	[Pharmaceuticals]
15.629	81	Hexathiane	[Pharmaceuticals]

16.010	87	Hexathiane	[Pharmaceuticals]
17.666	78	Phthalic acid, isobutyl non-5-yn-3-yl ester	Plasticizers
18.603	76	Dibutyl phthalate	Plasticizers
18.712	53	Dihydropyrimidine-2-methyl thiosulfuric acid	Agricultural products and pharmaceuticals
18.876	81	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.584	85	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.813	72	Heneiocosane	Fuels
20.717	93	Nonadecane, 9-methyl-	Fuels
24.727	91	Phthalic acid, di(2-propylpentyl) ester	Plasticizers
24.738	72	Di-n-octyl phthalate	Plasticizers
31.690	38	Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-	Pharmaceuticals
32.888	64	Cholesta-3,5-diene	Pharmaceuticals
37.236	59	Tetratetracontane	Fuels
37.247	49	Tetratetracontane	Fuels
Tarda Sand			
15.509	8	Octatriene, 1,3-trans-5-trans-	Polymers
17.895	4	2-Propenamide	Adhesives, flocculent in waste treatment, and soil conditioning agents
18.167	25	Heptane, 3,3-dimethyl-	Fuels
18.483	95	n-Hexadecanoic acid	Agricultural products, personal care products, plastics, and surfactants
18.603	78	1,2-Benzenedicarboxylic acid, butyl 2-ethylhexyl ester	Plasticizers
18.876	86	Heptadecane	Fuels
19.824	86	Heptadecane	Fuels
20.194	43	Sulfurous acid, butyl heptadecyl ester	Food additive, pesticides, and pharmaceuticals
20.205	72	Heneicosane	Fuels
20.369	93	Octadecanoic acid	Agricultural products, fuels, pharmaceuticals, personal care

			products, pesticides, and plastics
20.717	93	Docosane	Fuels
22.254	22	Octadecane, 1,1'-[1,3-propanediylbis(oxy)]bis-	Fuels
23.332	25	Decan-1-one, 1-(2,6-dimethyl-1-piperidyl)-	Pharmaceuticals
23.343	27	2-(Acetoxymethyl)-3-(methoxycarbonyl)biphenylene	Flavouring agents and polymers
23.409	11	Morphinan, 7,8-didehydro-3-methoxy-17-methyl-6-methylene-, (-)-	Pharmaceuticals
23.659	22	Indolizine, 3-methyl-	Pharmaceuticals
24.520	22	Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-	Pharmaceuticals
24.727	38	Phthalic acid, di(6-methylhept-2-yl) ester	Plasticizers
24.836	50	11-Methylnonacosane	Fuels
26.623	46	2-Methylhexacosane	Fuels
26.852	25	1,2-Bis(trimethylsilyl)benzene	Pharmaceuticals and polymers
27.037	16	7-Chloro-4-methoxy-3-methylquinoline	Pharmaceuticals and resins
27.048	32	1H-Indole, 4-methyl-	Pharmaceuticals
28.911	47	11-Methylnonacosane	Fuels
30.437	35	Benz[b]-1,4-oxazepine-4(5H)-thione, 2,3-dihydro-2,8-dimethyl-	Agricultural products, pharmaceuticals, polymers, and pesticides
31.810	35	Octadecane, 1,1'-[1,3-propanediylbis(oxy)]bis-	Fuels
32.725	17	Gibb-3-ene-1,10-dicarboxylic acid, 2,4a-dihydroxy-1-methyl-8-methylene-, 1,4a-lactone, 10-methyl ester, (1.alpha.,2.beta.,4a.alpha.,4b.beta.,10.beta.)-	Pharmaceuticals
35.558	32	Fumaric acid, 2-decyl tridecyl ester	Agricultural products, flavoring agents, pesticides, pharmaceuticals, and plastics
36.408	52	Eicosane	Cosmetics, fuels, and plasticizers
37.247	72	Methoxyacetic acid, 4-hexadecyl ester	Pharmaceuticals

Note: Duplicates of each extraction were conducted and are combined below to account for results from both runs. Square brackets indicate the compounds possible terrestrial source;

however, these compounds were determined to likely be intrinsic to the Tarda stones. See Figure 3.6 for corresponding GC traces.

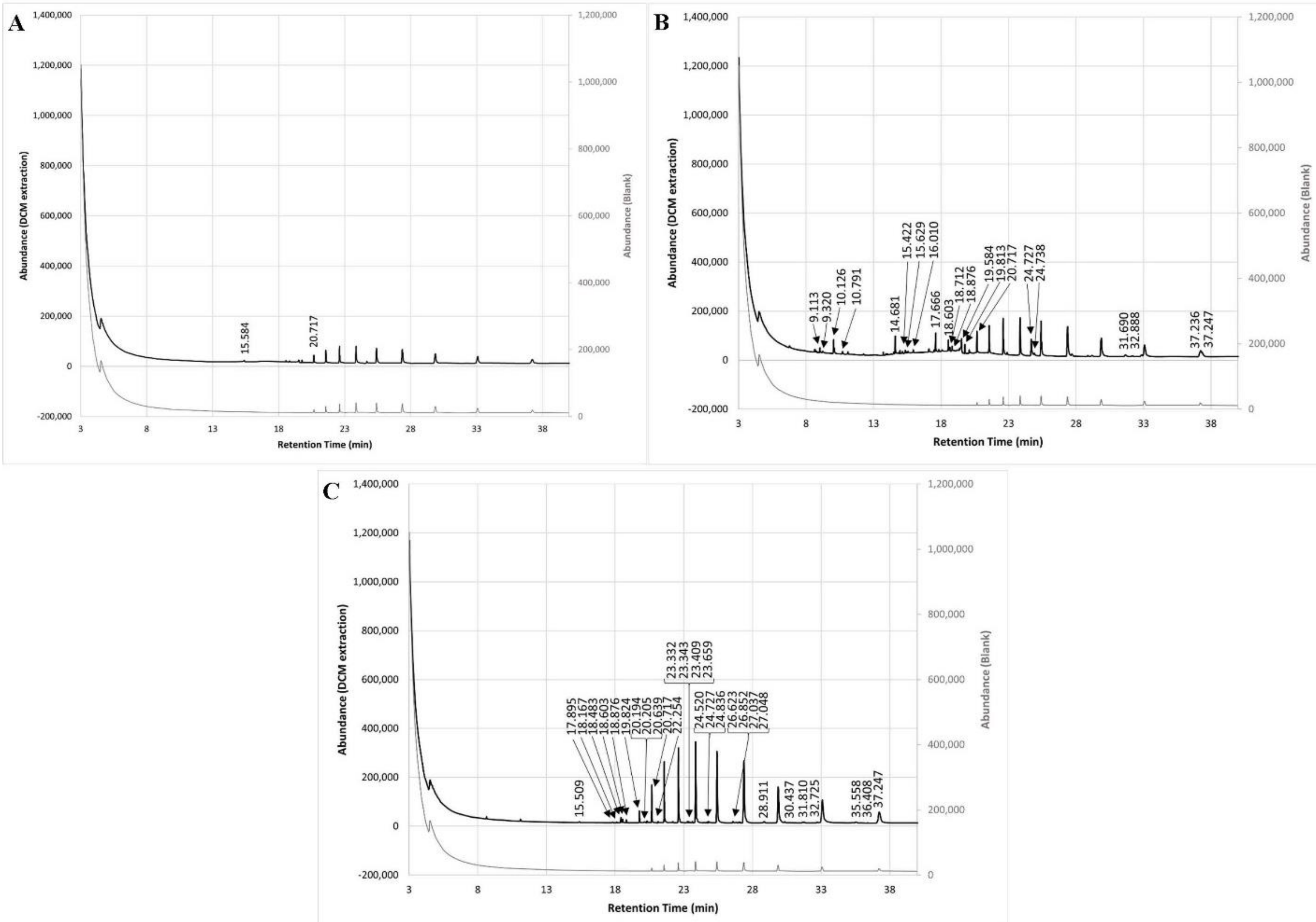

Figure 3.6. GC-MS traces of compounds detected in the DCM extracts of a) Tarda A, b) Tarda B, and the c) Tarda sand with the procedural blank shown in grey, shown offset for clarity.

3.3.3 DCM swabs

No compounds identified in the swabs of the laboratory materials used during handling and processing of the Tarda specimens were detected in the rinses or extractions of Tarda (Appendix B Tables B4 and B5).

3.3.4 Hot water extractions

A total of 41, 31, and 10 peaks were detected in the hot water extractions of Tarda A, Tarda B, and the Tarda sand, respectively (Table 3.4, Figure 3.7). Identifications included a wide range of derivatized organic compounds such as amino acids, carboxylic acids, dicarboxylic acids, amines, amides, alcohols, and hydrocarbons. Two compounds detected in the sand sample were also found in both Tarda A and Tarda B, namely, hexadecanoic acid, tert-butyldimethylsilyl ester, and octadecanoic acid, tert-butyldimethylsilyl ester. An additional two compounds, carbonic acid, dimethyl ester and 1-monolinoleoglycerol trimethylsilyl ester, were common between Tarda A and the sand sample. The majority of the compounds in the hot water extracts are commonly used in agricultural products and pharmaceuticals; however, other common terrestrial origins are fuels, pesticides, and plasticizers.

Table 3.4. Organic and inorganic compounds detected in hot water extractions, post-blank subtraction, of Tarda A, Tarda B, and Tarda sand and their retention times (RT) and possible terrestrial sources determined from the PubChem database. All compound identifications are best matches from the NIST database.

RT (min)	Quality (%)	Compound	Possible Terrestrial Source
Tarda A			
3.207	4	Carbonic acid, dimethyl ester	Batteries, fuels, pharmaceuticals, and solvents
3.217	1	1,3,5-Triazine, 2,4,6-trimethoxy-	Fuels, pharmaceuticals, and resins
4.983	9	Threonine	[Foods and used in the biosynthesis of proteins]
4.994	12	Propanoic acid, nonyl ester	[Polymers, resins, and rubbers]
5.417	4	Methanamine, N,N-dimethyl-, N-oxide	Food additives, fuels, and human metabolite
6.803	27	tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	Pharmaceuticals

6.933	16	Benzene, (1-methoxyethenyl)-	Pharmaceuticals and polymers
7.107	12	2-Thiazolamine, 5-chloro-	Pharmaceuticals
7.391	25	Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	Pharmaceuticals
7.642	59	Trimethylsilyl isothiocyanate	Pharmaceuticals
8.372	38	N-(Trimethylsilyl)acetamide	Polymers and resins
8.546	47	Benzaldehyde, 2,4-dimethyl-	Food additives
9.015	43	Phenol, 4-(2-propenyl)-	Flavoring agents and fragrances
9.058	35	2-Cyano-3,3-bis(trifluoromethyl)aziridine	Pharmaceuticals
9.374	53	Pentanoic acid, tert-butyldimethylsilyl ester	Food additives, fragrances, human metabolite, pesticides, and pharmaceuticals
10.714	56	Levulinic acid, tert-butyldimethylsilyl ester	Food additives, fragrances, human metabolite, pharmaceuticals, and plastics
11.869	56	1H-Benzo[b]1,4-diazepin-2(3H)-one, 4,5-dihydro-5-acetyl-7-amino-4-methyl-	Pharmaceuticals
12.011	59	2-Octanol, tert-butyldimethylsilyl ether	Food additives, fragrances, fuels, and plastics
12.065	62	3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	Pharmaceuticals and plasticizers
12.076	53	2-Butenoic acid, 2-[(trimethylsilyl)oxy]-, trimethylsilyl ester	Agricultural products, food additives, pesticides, and plastics
12.305	39	Propanedioic acid, bis(trimethylsilyl) ester	[Pharmaceuticals]
12.458	13	Butanedioic acid, bis(trimethylsilyl) ester	[Food additives, pesticides, and pharmaceuticals]
12.643	14	Benzenesulfonamide, p-(3,3-dimethyl-1-triazeno)-	Pharmaceuticals
12.861	11	1-Pentamethyldisilyloxybutane	Agricultural products, disinfectant, food additives, fuels, fungicides, pesticides, pharmaceuticals, and surfactants
13.264	64	2-Ethylhexanoic acid, trimethylsilyl ester	Agricultural products, food additives, fuels, pesticides, plastics, and surfactants

13.722	31	Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	[Human metabolite and pharmaceuticals]
13.831	31	Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	[Agricultural products, food additives, human metabolite, pharmaceutical, personal care products, and pesticides]
13.852	33	Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	[Agricultural products, food additives, human metabolite, pharmaceutical, personal care products, and pesticides]
14.234	47	Dibutylamine, N-(2-(trimethylsiloxy)ethyl)-	Machinery and paints
14.452	56	1-Triethylsilyloxyoctane	Agricultural products, food additives, fragrances, fuels, pesticides, and plastics
15.215	94	Urea, N,N'-bis(tert-butyldimethylsilyl)-	[Agricultural products, animal urine, pharmaceuticals, fertilizers, fuels, fungicides, pesticides, and plastics]
15.334	38	Bis(dimethyl-t-butylsilyl) fumarate	[Agricultural products, pharmaceuticals, food additives, human metabolite, pesticides, and plastics]
15.552	33	Phosphoric acid, tris(tert-butyldimethylsilyl) ester	Agricultural products, disinfectants, pharmaceuticals, fertilizers, food additives, fragrances, fuels, human metabolite, personal care products, pesticides, and plastics
16.152	58	Methylmaleic acid, bis(trimethylsilyl) ester	[Human metabolite and plastics]
17.764	14	2-Fluoro-4-iodoaniline	Pharmaceuticals
19.562	91	Cyclic octaatomic sulfur	[Pharmaceuticals]
19.573	87	Cyclic octaatomic sulfur	[Pharmaceuticals]
20.565	24	1-Monolinoleoglycerol trimethylsilyl ester	Pharmaceuticals
21.469	84	Hexadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food additives, fragrances, personal

			care products, pesticides, and plastics
21.480	50	3-Tripropylsilyloxytridecane	Personal care products and surfactants
23.714	75	Octadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food additives, fragrances, fuels, personal care products, pesticides, and plastics
Tarda B			
6.323	27	tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	Pharmaceuticals
6.857	37	tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	Pharmaceuticals
6.933	25	Benzo[b]thiophene	Pharmaceuticals
6.966	47	2-Allylphenol	Antifungal agrochemicals and pharmaceuticals
7.336	38	Isophthalaldehyde	Disinfectants, pharmaceuticals, and polymers
7.652	59	Trimethylsilyl isothiocyanate	Pharmaceuticals
8.372	22	Phenylpropanolamine, bis(trimethylsilyl)	Pharmaceuticals
8.547	18	1-(3-Methylbutyl)-2,3,4-trimethylbenzene	Fuels and pharmaceuticals
8.557	50	Isophthalaldahyde	Disinfectants, pharmaceuticals, and polymers
9.058	35	Isophthalaldahyde	Disinfectants, pharmaceuticals, and polymers
10.703	32	Pentanoic acid, 3-methyl-, tert-butyldimethylsilyl ester	Food additives
10.714	38	4-Methylvaleric acid, tert-butyldimethylsilyl ester	Food additives and human metabolite
11.869	91	Bis(tert-butyldimethylsilyl) carbonate	Food additives and human metabolite
11.978	23	2-Ethylhexanoic acid, trimethylsilyl ester	Agricultural products, food additives, fuels, pesticides, plastics, and surfactants
12.065	62	3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	Pharmaceuticals and plasticizers

12.262	45	N-(7-Methylbenzo(b)thien-3-yl)acetamide	Pharmaceuticals
12.305	39	Propanedioic acid, bis(trimethylsilyl) ester	[Pharmaceuticals]
13.264	83	Octanoic acid, tert-butyldimethylsilyl ester	Agricultural products, food additives, fragrances, pesticides, and pharmaceuticals
13.722	7	Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	[Human metabolite and pharmaceuticals]
13.831	16	Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	[Agricultural products, food additives, human metabolite, pharmaceutical, personal care products, and pesticides]
14.234	37	Dibutylamine, N-(2-(trimethylsiloxy)ethyl)-	Machinery and paints
14.419	62	Sulfuric acid, bis(tert-butyldimethylsilyl) ester	Agricultural products, batteries, fertilizers, food additives, fragrances, fuels, pesticides, pharmaceuticals, and plastics
15.214	93	Urea, N,N'-bis(tert-butyldimethylsilyl)-	[Agricultural products, animal urine, pharmaceuticals, fertilizers, fuels, fungicides, pesticides, and plastics]
15.323	49	Bis(dimethyl-t-butylsilyl) fumarate	[Agricultural products, pharmaceuticals, food additives, human metabolite, pesticides, and plastics]
15.334	50	Bis(dimethyl-t-butylsilyl) fumarate	[Agricultural products, pharmaceuticals, food additives, human metabolite, pesticides, and plastics]
16.152	36	Methylmaleic acid, bis(trimethylsilyl) ester	[Human metabolite and plastics]
17.764	22	2,4-Diphenylthiazole	Pharmaceuticals
19.431	57	Camphoric acid, bis(tert-butyldimethylsilyl) ester	Pharmaceuticals
20.554	24	Anisuric acid, bis(O_trimethylsilyl)-	Pharmaceuticals
21.469	86	Hexadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food

			additives, fragrances, personal care products, pesticides, and plastics
23.714	82	Octadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food additives, fragrances, fuels, personal care products, pesticides, and plastics
Tarda Sand			
3.457	1	Carbonic acid, dimethyl ester	Batteries, fuels, pharmaceuticals, and solvents
6.541	23	4-(Methylthio)benzonitrile	Pharmaceuticals
7.195	54	Ethanol, 2-(trimethylsilyl)-	Food additives, fragrances, fungicides, personal care products, and pharmaceuticals
8.524	43	1,3,4-Thiadizaol-2-amine, 5-(butylthio)-	Herbicides and pharmaceuticals
8.982	38	1-Ethyl-2-pentamethyldisilanyloxycyclohexane	Fuels, insecticides, and placticizers
9.908	43	4-Cyanothiophenol	Pharmaceuticals
19.235	52	Dimethylgloxime, di(tert-butyldimethylsilyl) ether	Pharmaceuticals
20.564	52	1-Monolinoleoglycerol trimethylsilyl ester	Pharmaceuticals
21.469	73	Hexadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food additives, fragrances, personal care products, pesticides, and plastics
23.714	86	Octadecanoic acid, tert-butyldimethylsilyl ester	Agricultural products, pharmaceuticals, food additives, fragrances, fuels, personal care products, pesticides, and plastics

Note: Duplicates of each extraction were conducted and are combined below to account for results from both runs. The compound identifications are reported as MTBSTFA derivatives; however, the possible terrestrial source was determined from their true identifications, pre-derivatization. **S**quare brackets indicate the compounds possible terrestrial source; however, these compounds were determined to likely be intrinsic to the Tarda stones. See Figure 3.7 for corresponding GC traces.

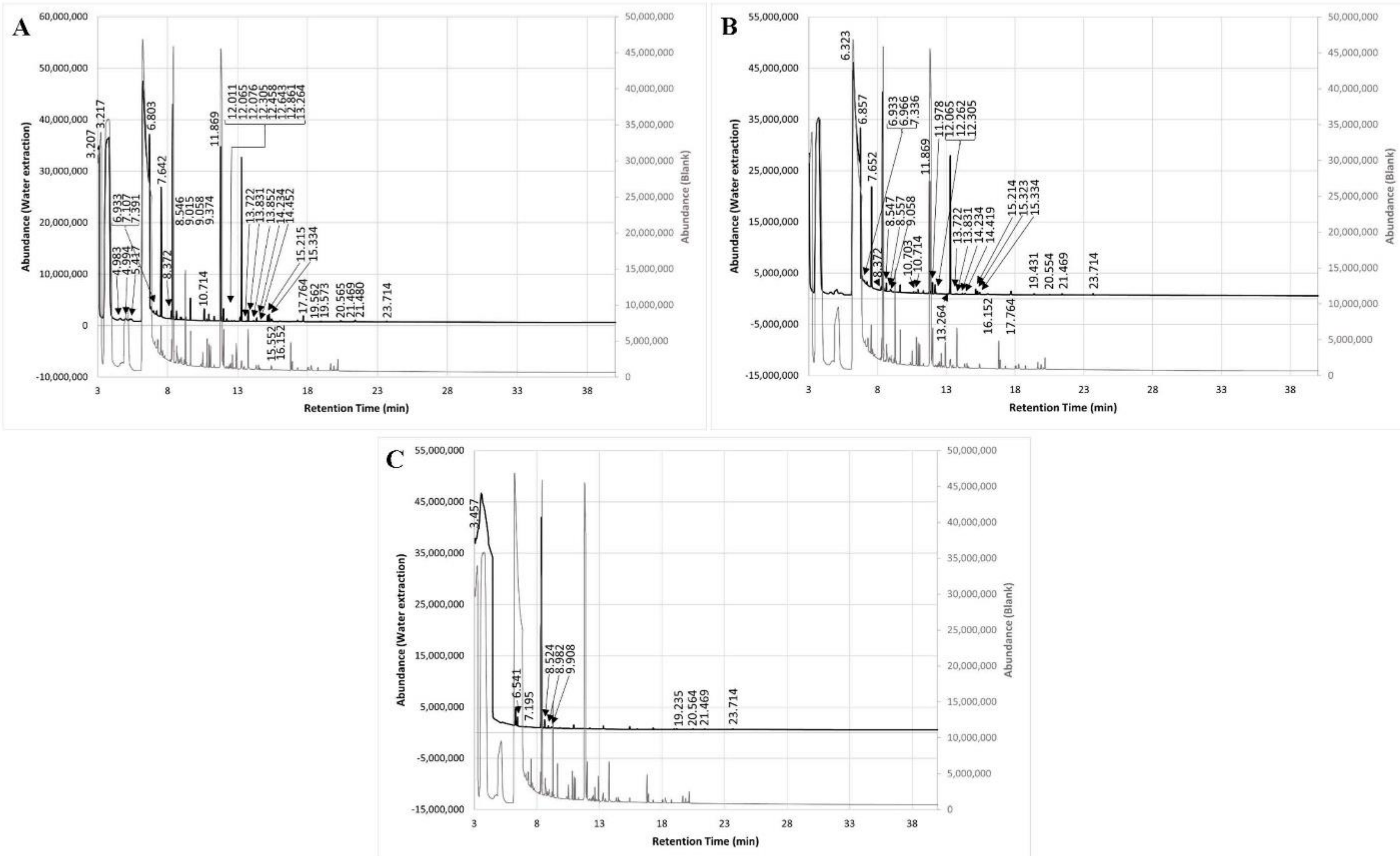

Figure 3.7. GC-MS traces of compounds detected in the hot water extracts of a) Tarda A, b) Tarda B, and the c) Tarda sand with the procedural blank shown in grey, shown offset for clarity.

3.3.5 SEM analyses

SEM images of the Tarda A stone (Figure 3.8) contains sparse chondrule and chondrule-like objects up to 350 µm across set in a very fine-grained matrix. The stone contains a few clasts of olivine 20-50 µm across, blocky occurrences of sulfides (pentlandite and pyrrhotite), as well as dodecahedral framboidal magnetite in 10-40 µm rounded clusters and as 5-10 µm discrete magnetite grains. The remainder of the matrix comprises phyllosilicates as reported by other authors (e.g., Hoffmann et al. 2021).

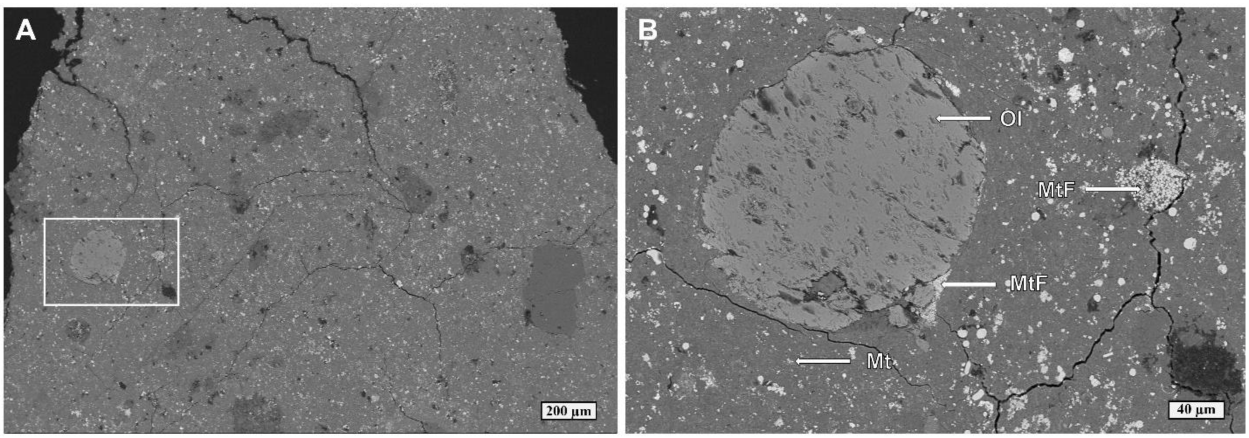

Figure 3.8. SEM images of Tarda A with olivine (Ol) predominant chondrule-like objects with fine-grained rims, clasts, magnetite grains (Mt), and magnetite framboids (MtF). The matrix (A) is fine-grained containing olivine-dominant chondrule-like objects (B).

3.4 Discussion

3.4.1 DCM rinses

No compounds detected in the rinses of either Tarda specimens were deemed intrinsic to the Tarda stones. All compounds in both Tarda specimen rinses can be attributed to agricultural products, pesticides, pharmaceuticals, or plasticizers. The likely terrestrial sources combined with the absence of these compounds on the laboratory materials and surfaces suggests that these contaminants originated from the terrestrial surface in which the meteorites fell or resulted from handling prior to arrival at the University of Alberta Meteorite Curation Facility.

3.4.2 DCM extractions

The elemental sulfur allotropes, hexathiane (S_6) and cyclic octaatomic sulfur (S_8), were the only two species in the DCM extracts determined to be intrinsic to the Tarda stones from the DCM extractions. Tarda A contained S_8 and Tarda B had both S_6 and S_8. Although S_8 is used in pharmaceuticals, these are absent from the Tarda sand. Furthermore, they are unlikely to be found with the suite of contaminating compounds from the environment, while they are commonly found intrinsic to other carbonaceous chondrites like Tagish Lake and Aguas Zarcas (Hilts et al. 2014; Tunney et al. 2020). The compounds found in common between the sand sample and the Tarda specimens are typically used in fuels and plasticizers. This confirms that these contaminants are indeed from the terrestrial surface on which the stones fell, and furthermore, that these contaminants were not introduced after collection. The remaining compounds potentially originate from agricultural products, fuels, pesticides, pharmaceuticals, and plasticizers. These compound types are commonly found as terrestrial surface contaminants on meteorites (Tunney et al. 2020b) and therefore do not have an extraterrestrial source and are not laboratory contaminants. The low total number of compounds detected in Tarda A compared to Tarda B and the sand sample is likely due to a lack of contamination of that particular stone at its fall location and during subsequent handling.

3.4.3 DCM swabs

The absence of detectable contaminant transfer from the laboratory environment to the Tarda specimens suggests that laboratory procedures and materials are suitable for mitigating organic contamination in this context.

3.4.4 Hot water extractions

There are 10 and 6 intrinsic compounds detected in that hot water extracts of Tarda A and Tarda B, respectively, which include, monocarboxylic acids, dicarboxylic acids, amino acids, carbamides, and elemental sulfur compounds (Table 3.5). This suite of organic compounds has also been found in other carbonaceous chondrites such as Murchison, Tagish Lake and Aguas Zarcas (Hayatsu et al. 1975; Kminek et al. 2002; Koga and Naraoka 2017; Glavin et al. 2021; Aponte et al. 2020). Glycine was also detected in the procedural blank but part of the peak area is still identified as an intrinsic compound in Table 3.5. Since glycine is common in the environment and in meteorites its GC signature is likely a mixture of terrestrial and extraterrestrial glycine. This inference is further reinforced by its large peak area that is 2-3 times that of the other identified intrinsic compounds. The difference in intrinsic compounds detected in the hot water extracts of Tarda A and Tarda B could be explained by heterogeneity of organic matter in the meteorite, whereby the organic compounds are heterogeneously distributed throughout a given specimen (Sephton 2002; Pizzarello et al. 2003; Botta 2008; Simkus et al.

2019). Similar to the DCM extracts, the remaining compounds in the hot water extracts are terrestrial contaminants sourced from agricultural compounds, fuels, pesticides, pharmaceuticals, and plasticizers. Their terrestrial origin is further confirmed by the presence of a select few compounds in the Tarda extracts that are also identified in the Tarda sand. The compounds in common between Tarda A, Tarda B, and the Tarda sand are hexadecanoic acid and octadecanoic acid, as well as carbonic acid and 1-monolinoleglycerol in Tarda A and the Tarda sand. All the compounds in common with the Tarda sand are commonly used in agricultural products, fuels, and pharmaceuticals which supports a terrestrial surface origin. The absence of what has been assigned as intrinsic compounds in the Tarda sand combined with these compounds frequently found in meteorites supports the conclusion that the compounds listed in Table 3.5 are extraterrestrial.

Table 3.5. Organic compounds intrinsic to each of the Tarda stones. All compound identifications are best matches from the NIST database.

Compound ID	Tarda A	Tarda B
Monocarboxylic acids		
Propanoic acid	✓	-
Dicarboxylic acids		
Propanedioic acid	✓	✓
Butanedioic acid	✓	-
Fumaric acid	✓	✓
Methylmaleic acid	✓	✓
Amino acids		
Threonine	✓	-
Proline	✓	✓
Glycine	✓	✓
Carbamides		
Urea	✓	✓
Elemental sulfur		
Cyclic octaatomic sulfur	✓	-

Note: Compounds are listed as their true identifications by removing the silyl group resulting the derivatizing agent, MTBSTFA.

3.5 Conclusion

A total of 11 and 8 compounds were detected in the DCM and water extracts of Tarda A and Tarda B, respectively, and determined to likely be intrinsic. The intrinsic compounds reported in this study have also been found in other studies of carbonaceous chondrites and inferred to be extraterrestrial. Despite this, more analyses, such as stable isotopic measurements and enantiomeric measurements for chiral compounds, would be needed to unambiguously establish an extraterrestrial origin. Compared to other C2-ungrouped carbonaceous chondrites, such as Tagish Lake, Tarda has an absence of polycyclic aromatic hydrocarbons (PAHs). However, Tarda contains urea which is seldom reported in meteorite compound analyses across all carbonaceous chondrite categories. The predominant compounds detected are various terrestrial surface contaminants which make up 50% and 90% of the total number of compounds in the DCM extraction results of Tarda A and Tarda B, respectively, and 76% and 80% of the total number of compounds in the hot water extracts results of Tarda A and Tarda B, respectively. The terrestrial surface contaminants belong to one of five common use categories: agricultural products, fuels, pesticides, pharmaceuticals, and polymers. The Tarda meteorite fell in the desert in Morocco close to a road which could explain the presence of fuel related compounds. There are farms approximately 8 km both north and east from the center of the strewn field (Figure 3.1) which suggests that terrestrial contamination can travel significant distances in this environment as agricultural products and pesticides sourced from farmland. Long-range air transport of pollutants has been shown to be highly efficient in arid environments (Kallos et al. 1998) and could explain how terrestrial organic compounds from kilometers away could contaminate the Tarda specimens. Additionally, the strewn field is centered in a topographic low on the terrestrial surface which could be contributing to the Tarda stones high rate of contaminant accumulation via channeling to this area. The susceptibility of astromaterials to contamination highlights the importance of proper techniques when recovering and handling astromaterials to manage terrestrial contamination and preserve intrinsic properties for future research. The Tarda stones were collected shortly after the fall; however, our organic analyses show that it was heavily contaminated in the short time frame of a few days. This observation highlights the importance of quickly recovering astromaterials to stop further accumulation of contaminants, destruction of the sample through processes such as weathering, or becoming a host to microbial communities. Not only is documenting terrestrial surface contamination crucial but exploring how meteorite components interact with the surface provides important insights into contamination pathways and factors. Factors can include the percentage of the stone covered by fusion crust that may act as a barrier against contamination. In the case of Tarda, terrestrial organic compounds may have entered the meteorite through the exposed interior (where the fusion crust was removed during the fall). This conclusion is supported by the lack of significant contaminants found in the washes of the exteriors. In addition, documenting potential contamination from the laboratory environment and handling protocols can inform the sources of contamination on meteorites as well as aid in advanced curation method development. This study has highlighted that there is minimal organic contamination within the University of Alberta Meteorite Curation Facility and the cleaning, handling, and curation techniques utilized are successful in eliminating detectable contamination transfer to the meteorites kept and processed within the facility. The absence of detectable organics transferred from the laboratory surfaces to the Tarda stones is evidence that our procedures are suitable for mitigating contamination, and we highly recommend similar protocols be adopted when handling meteorites for research purposes, particularly organic analyses.

MTBSTFA is an effective single-step derivatization technique that does not require purification. Organic compounds, both terrestrial and extraterrestrial, spanning a wide range of categories were successfully extracted and detected by GC-MS using MTBSTFA, including, monocarboxylic acids, dicarboxylic acids, alcohols, amino acids, carbamides, hydrocarbons, and amines. One disadvantage of MTBSTFA is its sensitivity to moisture, but if controlled correctly, such as conducting the derivatization under nitrogen gas and distilling the reagents used, the hydrolysis products can be minimized as to not obscure the organic compound analyses. It also should be noted that MTBSTFA impedes carbon isotope and chiral separation measurements, making this agent not ideal if these measurements are desired after derivatization. Nevertheless, not only does MTBSTFA allow for the simplification of the derivatization experimental procedure, it also yields a wider scope of organic compounds which yields a better picture of both the extraterrestrial and contamination compounds present. In order to accurately determine which organic compounds are intrinsic to a meteorite, it is critical to understand the level of contamination in the sample. Sampling of the terrestrial environment, such as gathering soil or sand samples, should become standard practice in the recovery of meteorites and astromaterials to aid in the confirmation of the origins of the organic compounds. If done correctly in an environment that reduces moisture, MTBSTFA provides a relatively simple way of identifying organic compounds using GC-MS while simultaneously producing derivatives with increased stability over other techniques.

3.6 Acknowledgements

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Chapter 4: Methods for mitigating contamination during the handling and curation of astromaterials

4.1 Introduction

Processes that occurred during the formation of the solar system and the chemistry of the interstellar medium are recorded by the soluble organic compounds within meteoritic material (e.g., Aponte et al. 2016; Botta and Bada 2002). Since carbonaceous chondrites are the most primitive relative to other meteorite groups, their elemental compositions closely reflect that of the Sun with only minor deviations (Botta and Bada 2002; Cody et al. 2011; Martins 2019). In this way organic matter in carbonaceous chondrites can act as a chemical inventory of the early solar system and thus can put constraints on the processes that occurred within it and how these processes evolved (Sephton 2002; Pizzarello 2016). Organic compound analyses on meteoritic material, however, can be complicated once it is delivered to Earth. The presence of life and other processes at the Earth's surface threaten to destroy, alter, or contaminate a meteorite's intrinsic properties and replace them with terrestrial signatures. Terrestrial organic compounds have been shown to rapidly, and potentially in most cases, extensively, contaminate meteorites with a range of compounds from primarily agricultural products, fuels, pharmaceuticals, and plastics (Tunney et al. 2020; Tunney et al. 2022a, Tunney et al. 2022b). Although the terrestrial contamination has become increasingly documented, few studies examining contamination resulting from recovery and curation have been carried out thus far.

All extraterrestrial organic compounds have a terrestrial counterpart, making terrestrial contamination a genuine concern when studying intrinsic organics in meteorites. However, extraterrestrial organic matter has chemical signatures that are unique and distinguishable from terrestrial sources using clues from a given compound's molecular structure, chirality, isotope composition, as well as its setting in a geologic and spatial context (Pizzarello and Shock 2010; Summons et al. 2014). Documentation of all aspects of handling of astromaterials is fundamental to discriminating between terrestrial and extraterrestrial organic compounds (Stansbery and Draper 2014). If organic compounds are determined to be terrestrial in origin, their terrestrial source should be investigated further in order to understand the processes that control contamination. These subcategories of terrestrial contamination can be sourced from the Earth's surface or from handling conditions, i.e., collection protocols or laboratory environments.

Previous studies have been devoted to investigating optimal cleaning procedures used in curation facilities, as well as collection and curation procedures for meteorites (and returned samples from missions) that minimize contamination and from this, determining possible sources of contamination within terrestrial and laboratory settings (Calaway et al. 2013; McCubbin et al. 2019). Documenting potential sources of contamination within a given environment acts as a baseline of the level of contamination to expect in analyses of extraterrestrial organics (Calaway et al. 2014). Organic contamination is unavoidable thus eliminating all chance of organic contamination is an unattainable goal (Chan et al. 2020); however, improving the types of materials and methods used during collection, handling, and curation of astromaterials can help to mitigate such contamination. This is applicable also to best practices for handling specimens from sample return missions as they are the most pristine materials available and have not fallen to the Earth's surface uncontrollably. Due to restricted in-situ instrument capabilities of space missions, upholding the pristine nature of sample return missions allows us to do full investigation of nearly uncompromised extraterrestrial organic compounds (Chan et al. 2020).

In this study we document organic contamination within the laboratory setting and test a range of potential materials that could be used for handling, transport, and storage of astromaterials. This type of investigation has been predominantly missing from extraterrestrial organic compound analyses, but which can round out our knowledge on the best practices for the curation of astromaterials and mitigating contamination in the laboratory setting. Since suppliers typically withhold information about the materials and processes used when manufacturing products, we have an incomplete, or in many cases entirely missing, material description. This becomes problematic when considering the best suited materials to use when handling and curating astromaterials as we cannot anticipate the probable contaminants. Here, potential materials used to wrap meteorites for transport and storage are tested to determine contaminants that shed from such materials as well as how effective these materials might protect samples from further contamination. Determining the optimal materials to handle and curate meteorites based on their likelihood to transfer organic contaminants can inform how we can minimize contamination on meteorites following their collection. This becomes of particular importance for transporting specimens between research institutions to preserve them in their most pristine state and uphold their scientific integrity. The main factors to consider are the stability of the compounds found in these materials and the nature of the material being curated. For example, materials could potentially outgas, contamination could be influenced by time exposed at the ambient temperature, or compounds within the meteorites could interact with the supplies based on its properties (such as the reaction of aluminum foil with the Tagish Lake meteorite reported by Herd et al. 2016). In addition, these data are put in context using a case study of the Bruderheim meteorite by comparing three stones with varying physical properties and curation conditions. From this information we derive a set of materials appropriate for use in collection and curation of astromaterials, whether meteoritic or from sample return missions.

4.2 Materials and methods

4.2.1 Materials

A variety of materials that could aid in the collection, transportation, and curation of meteorites were sourced and then analyzed for potential organic contaminants. Included are handling materials (i.e., gloves), adhesive tape, films, bags, cushioning materials, and containers (Table 4.1, Figure 4.1). Each category contains multiple product options, with different properties and from different manufacturers.

Table 4.1. Overview of potential products for meteorite collection and curation that were analyzed for organic compounds and assessed for their contamination potential.

Product name	Product No.	Material description	Manufacturer
Handling			
Nitrile gloves	191301597	Latex-free nitrile gloves (non-sterile)	Fisherbrand
Nitrile gloves	113921C	Latex-free nitrile gloves	MAPA Professional
Co-polymer vinyl gloves	61003	Vinyl co-polymer (non-sterile)	Kimberly-Clark
Tape			
Green PET tape	S-19435	Polyester film with silicone adhesive (max 204°C)	Uline
Cleanroom tape	1153	Polyethylene backing with rubber adhesive (-28°C to 80°C)	UltraTape
Cleanroom tape	1154	Polyethylene backing with rubber adhesive (0°C to 70°C)	UltraTape
Cleanroom tape	1160	Vinyl backing with rubber adhesive (-28°C to 80°C)	UltraTape
Film			
Aluminum foil	N/A	Aluminum alloy	Alcan
PVC shrink film	S-7755	PVC	Uline
Bags			
Plastic reclosable bags	1405001	Polyethylene	Shippers Supply

Reclosable bags	S-1291	Polyethylene film	Uline
Precision Clean II	10423	Unknown ("ultra-pure and pristine resins")	Benchmark Products
Precision ZipClean Pouches	91086P	Unknown ("ultra-pure and pristine resins")	Benchmark Products
Freezer bags	N/A	N/A	Glad
Cushioning			
Air pillows	N/A	Low density polyethylene	Sealed Air
Volara foam	N/A	Crosslinked polyolefin foam	Sekisui Voltek Inc
Containers			
Glass vials	03-338E	Borosilicate glass	Fisher Scientific
Plastic boxes	28060	Polystyrene	Cargille Inc
PFA jar	100-0060-1	PFA (-200℃ to 260℃)	Savillex

Note: Material descriptions reported contain what was publicly available information from the manufacturer.

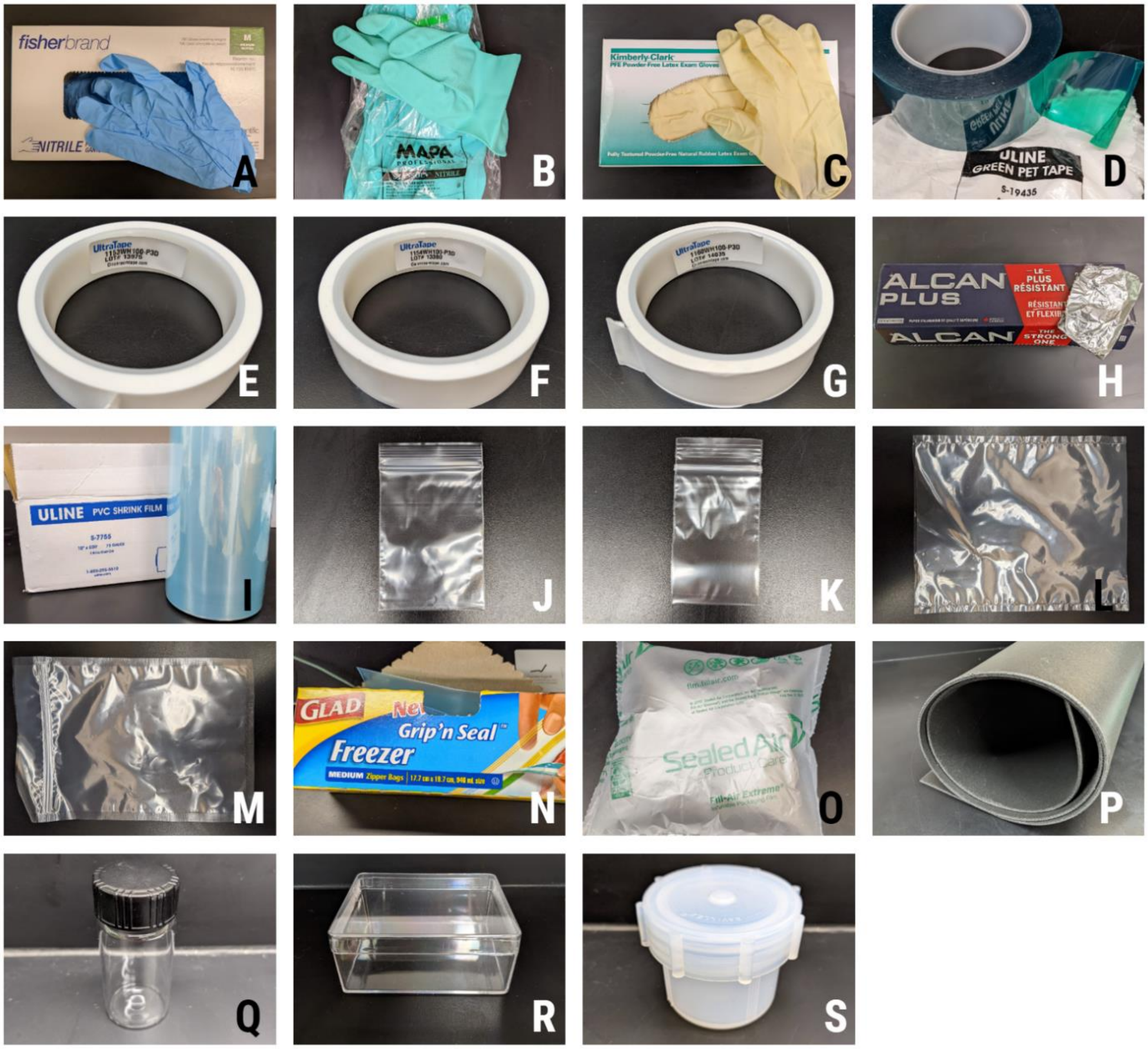

Figure 4.1. Curation materials that were swabbed with DCM. Materials included (a) Fisher nitrile gloves, (b) MAPA nitrile gloves, (c) Kimberly Clark co-polymer gloves, (d) Uline green PET tape, (e) UltraTape cleanroom tape #1153, (f) UltraTape cleanroom tape #1154, (g) UltraTape cleanroom tape #1160, (h) Alcan aluminum foil, (i) Uline PVC shrink film, (j) Shippers Supply reclosable bags, (k) Uline reclosable bags, (l) Benchmark Products Precision Clean II, (m) Benchmark Products Precision ZipClean Pouches, (n) Glad freezer bags, (o) Sealed Air air pillows, (p) Sekisui Voltek Inc Volara film, (q) Fisher Scientific glass vials, (r) Cargille Inc. plastic boxes, and (s) Savillex PFA jar.

4.2.2 Treatment of materials

The majority of the materials were tested as they came from the manufacturer, with two exceptions. The aluminum foil and glass vials were tested both before and after being combusted at 450°C for at least 6 hours to determine the degree to which combustion removes any organics present. The Precision Clean II bags were tested with and without using a heat-sealer to observe if any organics outgas from the heating of this material. Cleanroom tape was tested for cases where heat-sealing is not possible nor preferred for fastening the bags.

4.2.3 Rinses of meteorite analogue

Sample-intimate materials – that is, any materials that would come in direct contact with the meteorites during storage, such as films, bags, and containers (Table 4.1) - were tested for their potential to transfer organic compounds using quartz beads (Figure 4.2a) as a meteorite analogue. The quartz beads were first sterilized by heating at 450°C for at least 6 hours. The quartz beads were divided into 2 g subsamples then wrapped with each sample-intimate material and set aside for two weeks. The beads were rinsed in 20 mL of HPLC grade dichloromethane (DCM) both before and after wrapping. Duplicate experiments for each material were also done, one stored at room temperature within a Class 1000 cleanroom and one in a freezer at -15 °C, to examine the effect of temperature on contamination.

Although quartz beads provide a good baseline, they are an inert medium and do not capture the more complex interaction of sample-intimate materials with actual meteorite characteristics. For this reason, interior chips of the Allende meteorite (Figure 4.2b), sample MET7100/A-207 from the University of Alberta Meteorite Collection, were used. Two grams of powdered, sieved (106 µm), and combusted Allende meteorite samples (Figure 4.2c) were stored in Al foil, combusted Al foil, and Cargille plastic boxes in both the cleanroom and freezer for two weeks. The Allende powder was sterilized prior to the experiments, following the same method as for the quartz beads. After the two-week time period elapsed, each meteorite powder was extracted with 20 mL of DCM.

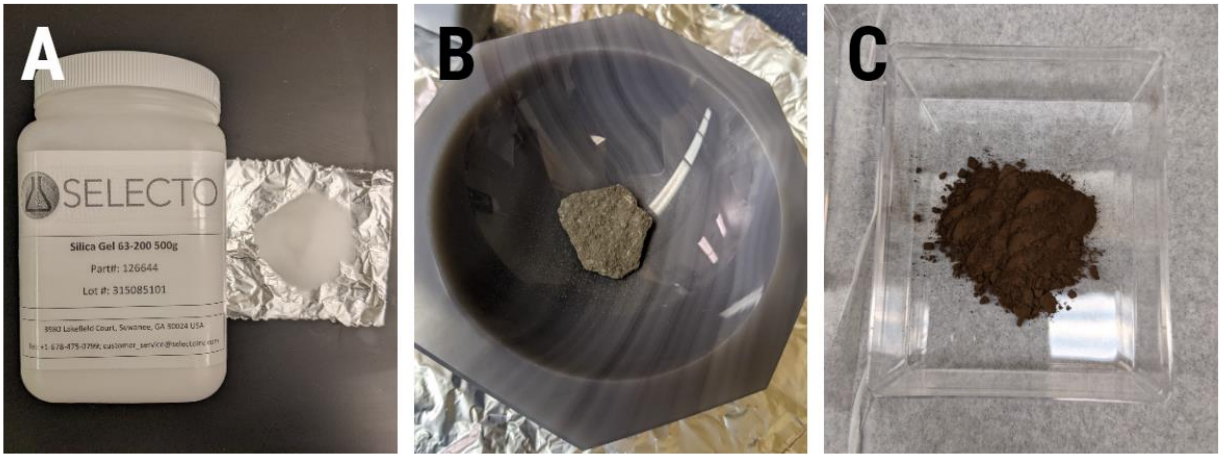

Figure 4.2. Photographs of (a) quartz beads and (b) Allende meteorite pre- and (c) post-powdering used for testing curation materials over a two-week time period.

4.2.4 Dichloromethane (DCM) swabs

All materials in Table 4.1 were swabbed and extracted with ultrapure HPLC grade dichloromethane (DCM), placed in 2 mL of DCM for 45 minutes, evaporated down to 0.5 mL, and analyzed by gas chromatography-mass spectrometry (GC-MS) to determine if there are detectable organic compounds on the surfaces of these materials. Alongside swabs of the materials, DCM swabs of various laboratory surfaces were conducted to observe if there is any cross contamination from these surfaces to the potential curation materials. Such surfaces included the laboratory doorknob, a keyboard, cleanroom counter, cleanroom cabinets, freezer counter, laboratory counter, and a light switch (Figure 4.3).

Figure 4.3. Laboratory surfaces within the University of Alberta Meteorite Curation Facility that were swabbed with DCM. Surfaces included (a) laboratory keyboard, (b) light switch, (c) door handle, (d) laboratory counter, (e) cleanroom cabinets, (f) cleanroom counter, and (g) freezer counter.

4.2.5 Bruderheim meteorite case study

The Bruderheim L6 ordinary chondrite fell on March 4, 1960, near the town of Bruderheim, Alberta. After its rapid collection, a couple of the stones were vacuum sealed in glass capsules cushioned with quartz wool in the spring of 1960. The encapsuled Bruderheim meteorite specimens were stored in the University of Alberta Meteorite Curation Facility until one capsule (MET4270/B-195; Figure 4.4) was cracked open on November 10, 2021, in order to investigate the degree to which the encapsulation had preserved the specimen from contamination. This Bruderheim specimen presented a unique opportunity to document organic contamination on a specimen kept in an enclosed atmosphere compared to those exposed to surrounding atmosphere conditions throughout its time on Earth – a period of over 60 years. Specimen MET4270/B-195, along with two other specimens, MET4270/B-163 (Figure 4.5a) and MET4270/B-196 (Figure 4.5b) were rinsed with 20 mL of ultrapure HPLC grade DCM to extract any organic contaminants on their surfaces. MET4270/B-163 and MET4270/B-196 are both stored in the University of Alberta Meteorite Curation Facility’s’ class 1000 cleanroom, double bagged in a cushioned plastic box. MET4270/B-163 is partially fusion crusted and MET4270/B-196 is completely enclosed in fusion crust.

Figure 4.4. Photograph of MET4270/B-195 in the glass capsule with quartz wool cushioning.

Figure 4.5. Photographs of (a) MET4270/B-163 and (b) MET4270/B-196. MET4270/B-163 is partially enclosed in fusion crust and shows oxidation on the surfaces where the interior is exposed whereas MET4270/B-196 is completely enclosed in fusion crust.

4.2.6 Gas chromatography-mass spectrometry (GC-MS)

All soluble organic compounds in each swab and extraction were analyzed by gas chromatography-mass spectrometry (GC-MS) at MacEwan University after concentrating each sample down to 0.5 mL. The GC-MS method is executed on an Agilent 6890N using a HP-5MS column (30 m length, 0.25 µm film thickness, 250 µm internal diameter), and detection done by an Agilent 5975C MSD. To start, the oven temperature is held at 50 °C for 1 minute and increased by 10 °C min^{-1} to a final temperature of 250 °C. The final temperature is held for 20 minutes for a total run time of 41 minutes. Samples are injected using pulsed splitless mode at 275 °C using helium with a constant flow rate of 1.0 mL min^{-1} as the carrier gas. Peaks of individual compounds are then identified by the 2011 NIST Mass Spectral Library (Version 2.0g).

4.3 Results

Compounds identified within the DCM swabs and DCM extracts are listed in Tables 4.2-4.4. The data presented have been blank subtracted to correct for contaminants present in the DCM stock solution or contamination introduced during the experimental procedure. Detailed peak identifications and representative GC traces can be found in the Appendix C tables (Tables C1-C8) and figures (Figures C1-C3), respectively.

4.3.1 DCM swab extractions of laboratory surfaces and materials

A single compound was detected on the keyboard, with no other laboratory surfaces having detectable organic contamination. This peak has a retention time of 23.768 minutes and is identified as 3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate. Of the 19 potential laboratory materials swabbed, only 3 had detectable organic compounds: MAPA nitrile gloves, Uline green PET tape, and Uline reclosable bags (Table 4.2). The MAPA nitrile gloves had 4 compounds including ethanol, 2-chloromethoxy-, benzoate, octadecanoic acid, benzoic acid, 2-propenyl ester, and hexatriacontane. The Uline green PET tape and Uline reclosable bags contained only benzoic acid, 2-propenyl ester and 13-docosenamide, (Z)-, respectively.

Table 4.2. Organic compounds detected in DCM swabs, post-blank subtraction, of the curation materials. Compounds reported are best matches from the NIST 2011 database.

RT (min)	Compound
MAPA nitrile gloves	
15.738	Ethanol, 2-chloromethoxy-, benzoate
20.270	Octadecanoic acid
20.379	Benzoic acid, 2-propenyl ester
25.272	Hexatriacontane
Uline green PET tape	
20.445	Benzoic acid, 2-propenyl ester
Uline reclosable bags	
29.315	13-Docosenamide, (Z)-

4.3.2 DCM extractions of quartz beads

Six of the materials used in the quartz bead experiments contained detectable organic compounds in their extractions (Table 4.3). The combusted aluminum foil and PVC shrink film have two contaminants each, the Shippers Supply reclosable bag, Uline reclosable bag, and the precision ZipClean pouches each have one compound, and the Cargille plastic box imparted the most contamination with a total of 24 compounds detected. No quartz beads stored in materials within freezer conditions had detectable organics.

Table 4.3. Organic compounds detected in DCM rinses of quartz beads stored in potential curation materials in a room temperature Class 1000 cleanroom for two weeks.

Retention Time (min)	Compound
Aluminum foil, combusted	
22.537	Sulfurous acid, 2-ethylhexyl tetradecyl ester
23.746	Hexatriacontane
PVC shrink film	
23.757	Heptacosane
28.312	Terephthalic acid, 4-octyl octyl ester
Shippers Supply reclosable bag	
17.459	Cyclopentane, heneicosyl-
Uline reclosable bag	
19.475	Cyclopentane, heneicosyl-
Precision ZipClean Pouches	
13.547	Phenol, 2,4-bis(1,1-dimethylethyl)
Cargille plastic box	
11.924	Butanoic acid, 2-methyl-, 2-methyl butyl ester
12.795	Cyclododecane
13.264	Propanoic acid, 3-mercapto-, 2-ethylhexyl ester
14.005	Dodecanoic acid
14.223	2-Amino-2-oxo-acetic acid, N-[3,4-dimethylphenyl]-, ethyl ester
14.484	Diethyl Phthalate
15.258	Octane, 1,1'-oxybis-
15.596	Dodecyl acrylate
15.672	Oxalic acid, cyclobutyl octadecyl ester
16.326	Tetradecanoic acid
16.762	Eicosane
17.045	Isopropyl myristate
17.394	Tetracontane, 3,5,24-trimethyl-
20.303	Octadecanoic acid
20.968	Butyl 2-(2-(2-methoxyethoxy)ethoxy)acetate
21.687	Tri(propylene glycol) propyl ether
23.888	2-Propanol, 1-[1-methyl-2-(2-propenyloxy)ethoxy]-
23.964	Propanol, [(butoxymethylethoxy)methylethoxy]-

24.879	Propanol, [(butoxymethylethoxy)methylethoxy]-
24.923	Hexaethylene glycol dimethyl ether
24.988	Methyl 2,5,8,11,14,17,20-heptaoxadocosan-22-oate
29.042	Methyl 2,5,8,11,14,17,20-heptaoxadocosan-22-oate
30.992	Methyl 2,5,8,11-tetraoxatridecan-13-oate
38.914	Methyl 2,5,8,11,14,17,20,23,26,29-decaoxahentriacontan-31-oate

Note: The results presented have been blank subtracted and include peaks that with a quality of 50% or greater. Compounds reported are best matches from the NIST 2011 database.

4.3.3 DCM extractions of the Allende meteorite

The DCM extracts of the powdered Allende meteorite samples stored in aluminum foil, combusted aluminum foil, and Cargille plastic boxes in both room temperature and freezer conditions had only one powder sample with detectable organics. The extraction of the Allende powder stored in a Cargille plastic box in the class 1000 clean room identified 4 compounds (Table 4.4): ibuprofen, oxalic acid, isobutyl tetradecyl ester, benzoic acid, 2,4-bis[(trimethylsilyl)oxy]-, trimethylsilyl ester, and phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-.

Table 4.4. Organic compounds detected in DCM rinses of Allende powders stored in potential curation materials in a room temperature Class 1000 cleanroom for two weeks.

RT (min)	Compound
Cargille plastic box	
14.822	Ibuprofen
19.421	Oxalic acid, isobutyl tetradecyl ester
20.052	Benzoic acid, 2,4-bis[(trimethylsilyl)oxy]-, trimethylsilyl ester
36.844	Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-

Note: The results presented have been blank subtracted and include peaks that with a quality of 50% or greater. Compounds reported are best matches from the NIST 2011 database.

4.3.4 Bruderheim case study

The DCM rinses of the Bruderheim specimens detected one compound in the glass encapsulated specimen MET4270/B-195 (n-hexadecanoic acid), six compounds in MET4270/B-163 (ibuprofen, n-hexadecanoic acid, 9-octadecenamide, 4,5-dimethyl-2-(4-methylphenylsulfonylamino) thiazole, nonanamide, and dodecanamide), and no compounds in the rinse of MET4270/B-196.

4.4 Discussion

4.4.1 DCM swab extractions of laboratory surfaces and materials

The only laboratory surface with a singular detectable organic compound was the laboratory keyboard with 3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate. This compound is associated with polymer production and is likely a result of the keyboard materials itself, and not contamination introduced through its use. The remaining laboratory surfaces (laboratory doorknob, cleanroom counter, cleanroom cabinets, freezer counter, laboratory counter, and a light switch) had no detectable organic contamination which can be attributed to success of the cleaning protocols used in the University of Alberta Meteorite Curation Facility. Primarily in response to the COVID-19 pandemic, all surfaces within the facility were cleaned with Spray Nine Heavy-Duty Cleaner throughout the timeframe of this study. This practice appears to have largely eliminated any organic contamination from these surfaces. The organic compounds detected in the swab extracts of the MAPA nitrile gloves, Uline green PET tape and Uline reclosable bags are all likely related to the products themselves as they are commonly used in laboratory products or in plasticizers. In particular, 13-docosenamide, (Z)- found on the Uline reclosable bags is a compound commonly used as a slip additive in plastic manufacturing.

4.4.2 DCM extractions of quartz beads and the Allende meteorite

The high total number of contaminants found on the quartz beads in comparison with the low number of compounds detected on the powdered Allende meteorite samples reflects the absorbent properties of the quartz beads (Table 4.5). In particular, the quartz beads stored in the Cargille plastic box adsorbed six times more compounds compared to the Allende powder in the same material stored at room temperature. However, our results clearly demonstrate that freezer storage hinders the activity and adsorption of contaminants onto the quartz beads. In the case of the Cargille plastic boxes, the 24 contaminants adsorbed on the quartz beads stored in the cleanroom suggest that the boxes are not airtight and perhaps are not suitable for standalone use in the storage of astromaterials. This result supports current practice for the meteorite collection – specifically double-bagging of specimens. The presence of two compounds in the DCM extraction of quartz beads stored in combusted aluminum foil within the cleanroom suggests that the combustion of aluminum foil appears to release organic contamination or adsorb compounds from the environment immediately after combustion. This is further supported by the absence of contamination on the non-combusted aluminum foil of the quartz beads also stored in the cleanroom. As with the quartz beads, the Allende meteorite powder stored in the freezer had no detectable organic contamination regardless of the type of storage material tested.

Table 4.5. Summary of compounds detected in DCM rinses of quartz beads and Allende stored in potential curation materials room temperature and freezer conditions in University of Alberta Meteorite Curation Facility.

Material	**Clean room quartz beads**	**Clean room Allende**	**Freezer quartz beads**	**Freezer Allende**
	Number of compounds			
Al foil	0	0	0	0
Al foil, combusted	**2**	0	0	0
PVC shrink film	**2**	-	0	-
Shippers Supply bag	**1**	-	0	-
Uline bag	**1**	-	0	-
PCII bag	0	-	0	-
PCII bag, heat sealed	0	-	0	-
ZipClean bag	**1**	-	0	-
Glad freezer bag	0	-	0	-
Glass vial	0	-	0	-
Glass vial, combusted	0	-	0	-
Cargille plastic boxes	**24**	4	0	0
PFA jar	0	-	0	-

4.4.3 Bruderheim meteorite case study

The results of the DCM rinses of the Bruderheim specimens show that both the storage conditions and meteorite characteristics are factors in the transfer of contaminants to meteorites. The presence of n-hexadecanoic acid (also known as palmitic acid) indicates contact with humans without gloves, which could have been transferred to MET4270/B-195 prior to being sealed in the glass capsule. The appearance of palmitic acid on MET4270/B-163 and not on MET4270/B-196 could indicate that the former specimen is handled on a more frequent basis. Since MET4270/B-163 and MET4270/B-196 are stored in the same materials and conditions but

MET4270/B-163 contains the only six detectable compounds, the higher contamination of ME4270/B-163 is attributable to its fusion crust. The partial fusion crust on this specimen, exposing its interior, causes a rough texture on its surface and thus contributes to abrading any materials around it. This inference is supported by the presence of 9-octadecenamide on MET4170/B-163, which is sourced from the plastic bag in which it is stored. Likewise we infer that 9-octadecenamide was not transferred to the surface of specimen MET4270/B-196.

4.5 Conclusions and implications for curation best practices

Overall, the best method for minimizing organic contamination and its impact on extraterrestrial organic analyses is having the ability to distinguish terrestrial organics from those of an extraterrestrial origin. This can be accomplished through an as-thorough-as-possible understanding of astromaterials' curation history and baseline organics for its surroundings – both at the site of collection and in the lab. Our results signify the importance of accounting for a meteorite's composition and physical characteristics when investigating contamination as this may impact the accumulation rate and type of organics that contaminate the specimens. Even if organic contaminants are detected on potential materials for handling, processing, and curation of meteorites, this does not mean they cannot be used. The baseline contamination can inform the way that material is utilized and for documentation when investigating the sources for contamination in organic analyses on meteorites. For example, our results suggest that our combustion process used on aluminum foil may release or adsorb contaminants from its environment immediately following heating, which can then be transferred to potential meteorite specimens. This demonstrates that it may be more appropriate to utilize fresh aluminum foil handled with gloves instead of combusting this material. We advocate for examination of materials used in the handling, processing, and curation of meteorites in order to accurately document the baseline contamination that has the potential to transfer to the meteorite specimens themselves in any investigation of organics in meteorites. Since the list of materials tested in this study is not exhaustive, it is critical to test materials that are specific to what materials are available for individual studies. In addition, the relationship between contamination accumulation with temperature and meteorite composition should be factors that are investigated; our data show that there is a temperature dependency of organic contamination wherein colder temperatures inhibit accumulation of organics. In the case study of the Bruderheim meteorite, being closed off from Earth's atmosphere inhibits organic contamination from transferring to the meteorite until it is reintroduced to the atmosphere. Although the appropriate materials can recreate the effects of being sealed off from the atmosphere, the texture and composition of the meteorite should be considered as this can accelerate contamination of the meteorite itself.

Combining results from this study with previous studies of soluble organic analyses on meteorites (Calaway et al. 2014; Tunney et al. 2020; Lee et al. 2021; Tunney et al. 2022a; Tunney et al. 2022b) we have developed fifteen key recommendations for recovering, handling, and curating freshly fallen meteorites:

1. Meteorite specimens should be collected as rapidly as possible in order to avoid the potential or further damage (e.g., weathering) and accumulation of contaminants (either chemical or biological). Although terrestrial contamination is essentially instantaneous once within the Earth's atmosphere, accumulation of organics can be prevented, particularly with microbial communities that colonize samples at a lower rate (Lee et al. 2021).
2. Extensive site notes should be kept to document strewn field characteristics (land type, distances to features of interest such as roads and water, weather, season, topography, etc.) and meteorite characteristics (fusion crust, interior exposure, etc.). This includes photos of the area and meteorite specimens prior to their collection (Tunney et al. 2020).
3. Samples from the strewn field and surrounding area should be taken (including water, soil, sand, etc.) to enable later characterization of the contaminants present in the surrounding environment and help inform sources of contaminants on the meteorite. For example, the collection of sand from the Tarda fall area was key to discriminating terrestrial contamination (Tunney et al. 2022b/Chapter 4). If the strewn field falls within an agricultural area, it will be useful to know what agricultural products are used on surrounding plots of land due to the long-range transport of contaminants (Tunney et al. 2020).
4. Using gloves and appropriate materials, samples should be collected while photographing, weighing, and documenting any notable characteristics of the sample or its surroundings.

5. Baseline contamination that can be shed from materials and surfaces used when collecting, handling, and storing samples should be documented prior to the use of the materials. Although it is not possible to eliminate contamination entirely, it is possible to minimize and mitigate contaminants by understanding the sources of possible contaminants from materials and surfaces. Materials used in meteorite handling should be chosen based on minimal contamination potential and must have a known composition or compound content.
6. A thorough curation history of all meteorite specimens should be documented. This includes the material(s) and temperature in which it is stored, any analyses or handling conducted, or any activities that have the potential to introduce contamination. Although cold storage is recommended, it is just as important to understand how materials interact with the sample at the temperature of choice for storage. It should be noted that this interaction can change based on the meteorite composition, which is also a factor that should be explored.
7. Avoid the use of nylon and polyethylene as they are a major source of contamination (Calaway et al. 2014).
8. Understand the sources of contamination sourced from personal hygiene products of individuals in the laboratory and create protocols to best minimize them (Calaway et al. 2014).
9. Keep a well-documented cleaning log of all materials in the laboratory. This can include gloveboxes, cabinets, materials, etc. (Calaway et al. 2014).
10. Determine a shelf-life for sample handling tools, i.e., outline the frequency that such materials should be recleaned (Calaway et al. 2014).
11. Materials and samples that are bagged should be cleaned and/or rebagged at a pre-determined regular frequency due to degradation of the bag over time which can transfer contaminants to the material within it (Calaway et al. 2014).
12. Equipment and materials should have a replacement schedule to avoid use of deteriorating products (Calaway et al. 2014).
13. All personnel working in the laboratory should be provided training on contamination sources and protocols to minimize them in specific environments (e.g., gloveboxes, cleanrooms, etc.) (Calaway et al. 2014).

14. Create a system to track curation decisions and changed to procedures that all personnel have access to (Calaway et al. 2014).
15. Conduct regular lab inspections specifically for tracking contamination (Calaway et al. 2014).

Another factor to consider is how the same type of material from one manufacturer may be well suited for a given purpose, whereas the same material from another manufacturer may introduce contamination. For example, different types of gloves have been shown to have significant amounts of contamination for trace element and Zn isotopic analyses (Garçon et al. 2016). This emphasizes the need to investigate contamination sources targeted towards the types of analyses that will be conducted as well as considering the short and long term affects of the materials introduced to meteoritic specimens at any stage. A thorough contamination analysis of the given laboratory to be used should be done as it provides critical information on mitigating contamination in the future.

Despite the rapid contamination that meteorites experience once they reach the Earth's atmosphere and surface, the contamination it experiences once collected is within our control, which is where these recommendations should become best practices for meteorite recovery and handling thereafter. This becomes particularly important when preparing for sample return missions such as OSIRIS-Rex, Hayabusa2, and Mars Sample Return, which do not experience uncontrollable contamination upon entry to Earth. If our recommendations are put into practice in addition to other methods of best practices previously reported, we will be capable of maintaining meteorites or returned samples in a pristine state for planetary research.

4.6 Acknowledgements

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Chapter 5: Documenting microbial populations within the University of Alberta Meteorite Curation Facility using 16S rRNA gene sequencing: Implications for the curation of astromaterials

5.1 Introduction

Carbonaceous chondrites have similar bulk chemical composition as the sun, making them the most primitive materials we can study, which makes them the ideal candidates for understanding the chemical inventory of the interstellar medium and the solar system (Martin et al. 2020; Sephton 2004). Conducting organic matter analyses on astromaterials with a high carbon content can provide a glimpse into the processes occurring or that have occurred in the solar nebula but with one major challenge: terrestrial contamination. Once meteorites enter Earth's atmosphere and subsequently land on the surface they are faced with numerous sources of terrestrial organic contaminants, from both the terrestrial surface and from handing thereafter (Tunney et al. 2020). In addition to organic matter contaminants, contamination by microbiota on astromaterials is an important consideration in organic compound analyses of meteorites, especially when searching for the origin of life.

Some microorganisms use organic material as a food source, meaning when they contaminate meteorites, the ^{13}C and deuterium isotopic signatures of the extraterrestrial organic material are adopted by the microorganisms (Steele et al. 2000; Taipale et al. 2015). Microorganisms will either consume the intrinsic organic matter in carbonaceous chondrites or leave behind their own detritus which either destroy or mask the extraterrestrial organic compounds, respectively (Pizzarello and Yarnes, 2018). It remains to be confirmed if microorganisms contaminating meteorites contribute to the organic compounds that are identified and documented in meteorites (Oró and Tornabene 1965), however, this factor should be considered when reporting organic compound analyses of meteorites as it has the potential to change our view on what is considered extraterrestrial organics. For example, a number of fungal species produce amino acids that are considered intrinsic to meteorites when detected in this context, such as α-aminoisobutyric acid and isovaline (Brückner et al. 2009; Elsila et al. 2011), which are also used in biogenic processes in cells that produce ATP (Steele et al. 2000). Due to the natural production of organic compounds by microorganisms that are of importance in planetary science, it is crucial to document microbial contamination both in the laboratory (Regberg et al. 2018) and terrestrial surface environments. Microorganisms can also significantly accelerate meteorite alteration (Bennett et al. 2010) by microbial weathering (Lian et al. 2008) and dissolve primary silicate and secondary carbonate minerals (Banfield et al. 1999; Tait et al. 2017b), which can result in a loss of meteoritic material. Microbial contamination occurs primarily from the fall and eventual landing on Earth (Benzerara et al. 2006; Horneck et al. 2010). Assessing contaminating microorganisms on meteorites do not necessarily reflect the entire suite of microorganisms in the surrounding environment, either the laboratory or terrestrial surface (Tait et al. 2017a). Therefore, making assumptions about the environment in which the contaminants came from should be done with caution as this may not be the full picture of the microbial populations present, and significantly depends on the meteorites' properties. The meteorite characteristics like degree of thermal or aqueous alteration, organic content and mineralogy determine what microorganism colonizers it hosts, and therefore an equilibrium of microorganisms between the surroundings and the meteorite should not be assumed.

Microbial DNA can be extracted using an individually created experimental procedure or, more commonly, using one of many widely available commercial kits which allow for method standardization and cross-comparison of microbial datasets between facilities (Lever et al. 2015). Although commercial extraction kits can be advantageous, the sensitivity and success of any given DNA extraction kit has been shown to be tied to two primary factors: type of bacterial species present and its concentration (e.g., Becker et al. 2016; Knüpfer et al. 2020). Often adaptations are required on existing commercial kit protocols (Tremblay et al. 2015), particularly when working with samples where low population densities are expected (Lever et al. 2015), such as meteorites. Here, we employ two different DNA extraction kits, the PowerSoil DNA Extraction Kit and the QIAamp UCP Pathogen Mini Kit, to determine which is more sensitive in the application of meteorite studies and identifying microbial contamination on astromaterials. The PowerSoil DNA extraction kit is intended for use with environmental samples containing a high humic acid content, whereas the QIAamp UCP Pathogen kit is optimized for minimizing kit contamination when extracting bacterial DNA from whole blood, swabs, cultures, and body fluids. Contaminated reagents and DNA extraction kits can introduce microbial contamination (Glassing et al. 2016; Salter et al. 2014) in the form of nonviable DNA which when amplified can overwhelm the live organisms of interest. The UCP Pathogen kit has also been validated in low biomass environments like aerospace cleanrooms (Minich et al. 2018). The PowerSoil Kit was used on meteorite powders, whereas the QIAamp UCP Pathogen kit was used on swabs of meteorite exteriors and laboratory surfaces to gain a sense of microbial populations contaminating the laboratory and curation environments. Two different kits were utilized in this study to determine if one is more favorable at detecting DNA in low biomass samples such as meteorites. Next Generation Sequencing was used to conduct 16S rRNA gene sequencing as it is advantageous over other methods commonly used in planetary studies, such as gas chromatography-mass spectrometry (GC-MS), as sequencing is capable of discriminating between abiotic and biotic nucleic acid polymers, as well as detecting false positives using an Illumina MiSeq. From this, sources of any contaminating microbial populations will be deduced to determine appropriate curation methods for mitigating microbial contamination.

5.2 Materials and Methods

5.2.1 Meteorite specimens

Seven meteorite specimens from the University of Alberta Meteorite Collection were used for the purposes of this study (Figure 5.1): three Peace River samples (MET6568, 2.197 kg; MET11547/PR1, 1.464 kg; MET11547/PR1a/p8, 114 g), one Redwater specimen (MET11621B, 5.77 g) and three Bruderheim specimens (MET4270/B-163, 224.52 g; MET4270/B-195, 782.95 g; MET4270/B-196, 41.86 g). The Peace River L6 Chondrite fell on March 31, 1963, on farmland near the Peace River town, Alberta, Canada, and the Redwater H4 Chondrite was found on August 30, 2009, on off-road trails near Redwater, Alberta, Canada (Meteoritical Bulletin Database). The Bruderheim L6 chondrite fell on March 4, 1960, near Bruderheim, Alberta. Each specimen was chosen for their different collection and curation histories to determine possible controls of microbial contamination on astromaterials. MET6568 (also known as Peace River #9) (Figure 5.1A) was found more than 4 years later than the original specimens of this fall. MET11547/PR1 (Peace River #1) (Figure 5.1B) was found soon after its fall. MET11547/PR1a/p8 (Peace River #1) (Figure 5.1C) is a mineral separate from a specimen that had previously been stored in a wet environment. Redwater (MET11621B; Figure 5.1D) was a meteorite find that had been sitting on the terrestrial surface for a long period of time (terrestrial age unknown), as shown by its heavily weathered appearance and color. MET4270/B-163 (Figure 5.1E) and MET4270/B-196 (Figure 1F) were collected shortly after their fall and have been stored in a Class 1000 cleanroom in the University of Alberta Meteorite Curation Facility within curation bags for at least the past decade. MET4270/B-195 (Figure 1G) was also collected less than a month after its fall, however, it was sealed within a glass capsule shortly after its collection and remained in its sealed capsule until November 2021 (Chapter 4).

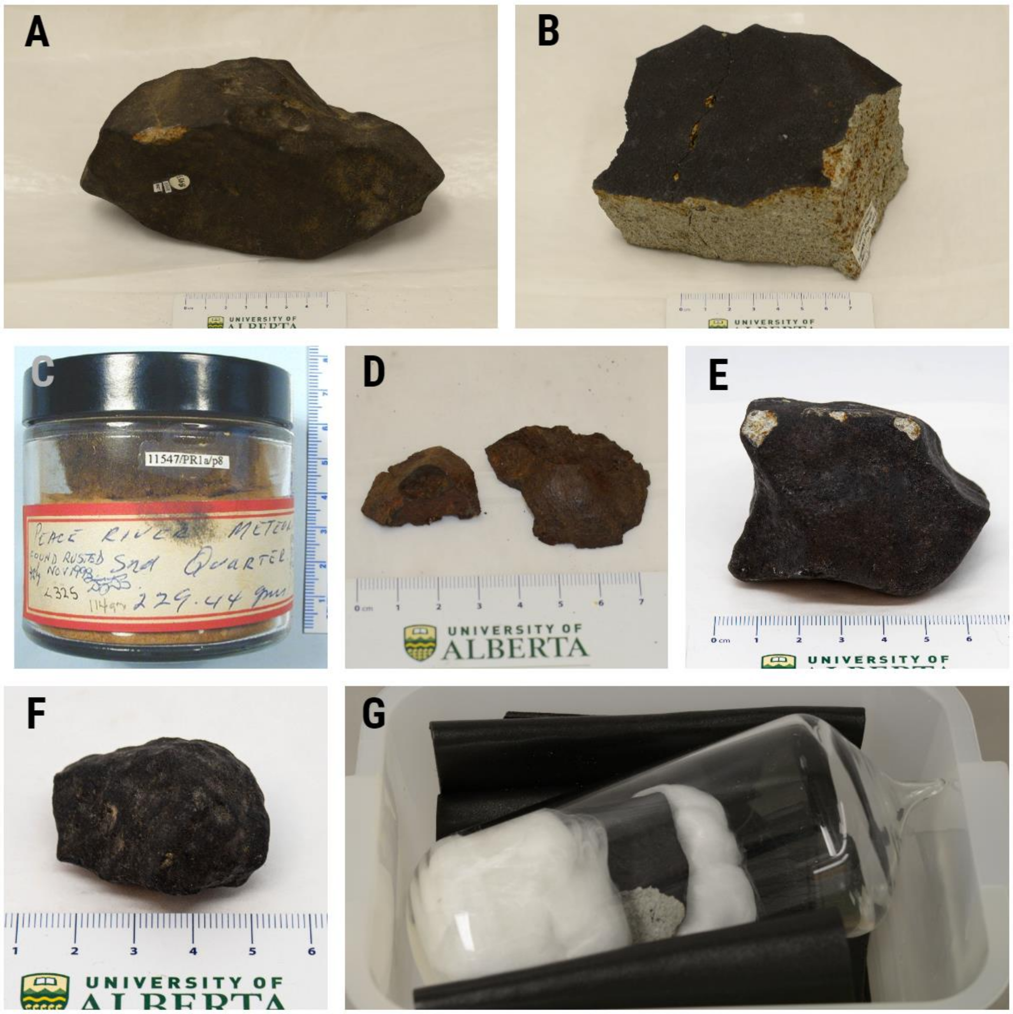

Figure 5.1. The meteorite specimens used in this study: MET6568 (A), MET11547/PR1 (B), MET11547/PR1a/p8 (C), MET11621B (D), MET4270/B-163 (E), MET4270/B-196 (F), and MET4270/B-195 in glass capsule (G). Scale bar in cm in each case.

5.2.2 Sample preparation

Prior to subsampling meteorite specimens all sampling materials were cleaned with ultrapure water (Millipore Direct Q3 UV, 18.2 MΩ, 3 ppb total organic carbon) and HPLC grade dichloromethane (DCM), and if possible, were combusted at 450°C for >6 hours to remove any contaminants. The Peace River and Redwater meteorite specimens were subsampled using a chisel and hammer to obtain 0.25 g of each, which were subsequently powdered using a mortar and pestle. The exteriors of each meteorite specimen and the glass capsule of MET4270/B-195 were also swabbed using a sterile cotton-tipped swab. Alongside the meteorite specimens, surfaces within the University of Alberta Meteorite Curation Facility were swabbed using sterile cotton-tipped swabs. Surfaces sampled included: meteorite curation cabinet and drawer handles within the Class 1000 cleanroom, handle to the freezer of the subzero curation facility, Volara foam used to cushion meteorite specimens within cleanroom cabinets and the interiors and exteriors of gloves in an argon atmosphere glovebox within the freezer (Figure 5.2). The interior and exterior of the glovebox gloves refers to where hands fit inside the gloves and the surfaces on the inside of the glovebox, respectively. Details of the University of Alberta Subzero Curation Facility are described by Herd et al. 2016.

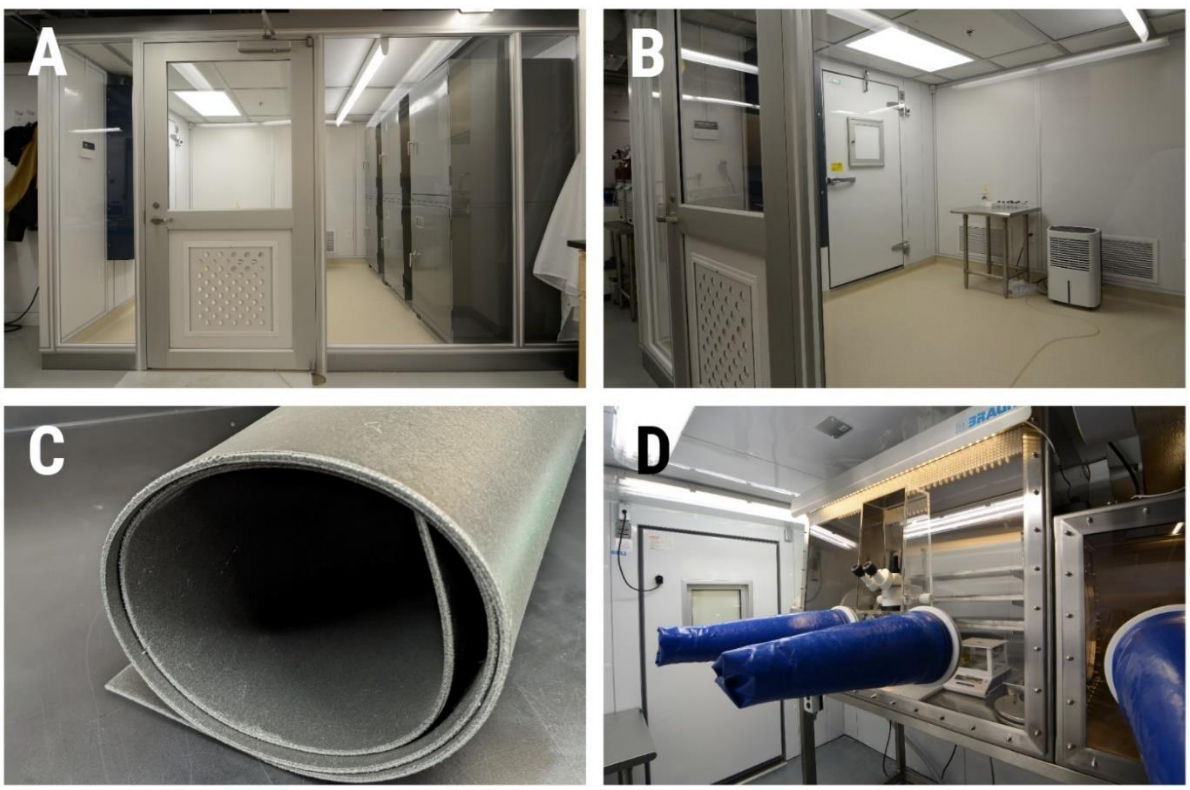

Figure 5.2. Laboratory surfaces swabbed for 16S rRNA extraction: cleanroom cabinet and drawer handles (A), freezer door handle (B), Volara foam (C), interior and exterior of glovebox gloves (D).

5.2.3 DNA Extraction and Next Generation Sequencing

DNA was extracted from the meteorite powders using a PowerSoil DNA Extraction Kit (#12888-100, MoBio) and the swabs were extracted using a QIAamp UCP Pathogen Mini Kit

(50214, QIAGEN) according to the manufacturer's instructions. Next Generation Sequencing (NGS) was carried at NASA Johnson Space Center to determine the detectable DNA present in the meteorite and laboratory specimens and swabs. The DNA amplification and gene sequencing is outlined by Regberg et al. 2020 and is summarized below.

Polymerase Chain Reaction (PCR) was used to amplify the V3-V4 (Bacteria and Archaea) of the 16S rRNA gene which was quantified using a Qubit Fluorometer. The 16S rRNA gene was amplified with Earth Microbiome primers 515FB-806RG (Caporaso et al. 2012; Walters et al. 2015). The amplifications took place in Platinum Hot Start PCR Master Mix using 35 PCR cycles. Triplicates of the ZymoBIOMICS Microbial Community Standard II was also sequenced to evaluate any sequencer errors. PCR was run in triplicate, pooled, and cleaned using AmPure magnetic beads. Libraries for an Illumina MiSeq sequencer were prepared for sequencing as stated by the Earth Microbiome protocols (Caporaso et al. 2012). Once the 16S sequences were trimmed and cleaned, they were analyzed using the QIIME2 pipeline. The QIIME 2 pipeline (Bolyen et al. 2018) was as implemented by EDGE bioinformatics (Li et al. 2017) and used to truncate the forward and reverse reads at 230 and 200 base pairs respectively, when the median quality score fell below 30. The DADA2 (Callahan et al. 2016) plugin was used to remove amplicon sequencing errors and identify ASV's (amplicon sequencing variants). Taxonomic identifications were made with the SILVA v132 database (Quast et al. 2013).

5.3 Results

All meteorite and laboratory extraction samples are low biomass samples indicated by their low pooled concentration post PCR, ranging from too low to detect to 2.21 ng/µL, despite detecting upwards of 1706 different ASV's (Table 5.1). Prior to analysis, ASV's that were detected in the blanks and control samples were attributed to kit contamination and removed. Including both the meteoritic and laboratory samples the taxa detected spanned a total of 2 domains, 25 kingdoms, 52 phyla, 125 classes, 213 families, 414 genera, and 965 species (Appendix D). In samples MET6568 (QIAamp), MET11547/PR1a/p8 (QIAamp) and MET11621B (PowerSoil), there were no amplifiable DNA.

Table 5.1. Number of ASV's detected in each 16S DNA extract down to the lowest detectable taxonomic level after removal of identified contaminants.

Sample	**Kit**	**ASV's**	**Pooled and cleaned (ng/µL)**	**Size**
MET6568	PowerSoil	202	1.62	403
MET6568	QIAamp UCP Pathogen Mini	0	Too low	0
MET11547/PR1	PowerSoil	117	0.286	418
MET11547/PR1	QIAamp UCP Pathogen Mini	85	0.278	430
MET11547/PR1a/p8	PowerSoil	121	0.142	420
MET11547/PR1a/p8	QIAamp UCP Pathogen Mini	0	Too low	129
MET11621B	PowerSoil	0	0.155	130
MET11621B	QIAamp UCP Pathogen Mini	107	0.515	401
Bruderheim capsule contents	QIAamp UCP Pathogen Mini	16	0.641	407
MET4270/B-195	QIAamp UCP Pathogen Mini	55	0.596	411
MET4270/B-163	QIAamp UCP Pathogen Mini	147	1.53	401
MET4270/B-196	QIAamp UCP Pathogen Mini	61	0.538	396
Cleanroom drawer handles	QIAamp UCP Pathogen Mini	74	0.39	405
Cleanroom cabinet handles	QIAamp UCP Pathogen Mini	85	0.232	410
Freezer door handle	QIAamp UCP Pathogen Mini	69	0.922	401
Volara foam	QIAamp UCP Pathogen Mini	34	0.626	407
Glovebox gloves (interior)	QIAamp UCP Pathogen Mini	105	2.21	402
Glovebox gloves (exterior)	QIAamp UCP Pathogen Mini	39	0.132	418
Microbial community standard II (75 uL)	PowerSoil	7	25.3	391
Microbial community standard II (75 uL)	PowerSoil	7	17.5	395
Microbial community standard II (75 uL)	PowerSoil	6	59.6	391
Kit blank	PowerSoil	29	0.239	418

Microbial community standard II (75 uL)	QIAamp UCP Pathogen Mini	9	12.1	392
Microbial community standard II (75 uL)	QIAamp UCP Pathogen Mini	9	40.1	433
Microbial community standard II (75 uL)	QIAamp UCP Pathogen Mini	6	44.8	386
Kit blank	QIAamp UCP Pathogen Mini	26	0.293	411

Out of the 52 phyla, the dominant phyla detected in both meteoritic and laboratory specimens are Alphaproteobacteria, Bacilli, Bacteroidia, Gammaproteobacteria, and Thermolephilia independent of the type of extraction kit used (Figure 5.3). All three of the microbial community standards, using the PowerSoil and QIAamp kits matched closely to the reported relative abundance from the manufacturer (Figure 5.4), and were consistent among the trials of both kits in our study. It should be noted that the extraction kits are imparting small biases into the samples as the relative abundances of the mock community standard determined by both the PowerSoil and QIAamp extraction kits are not an exact match to the reported theoretical values of the standard. As shown in Figure 5.4, Bacillus is overrepresented by the QIAamp kit, whereas the PowerSoil kit overrepresents Pseudomonas and underrepresents Listeria.

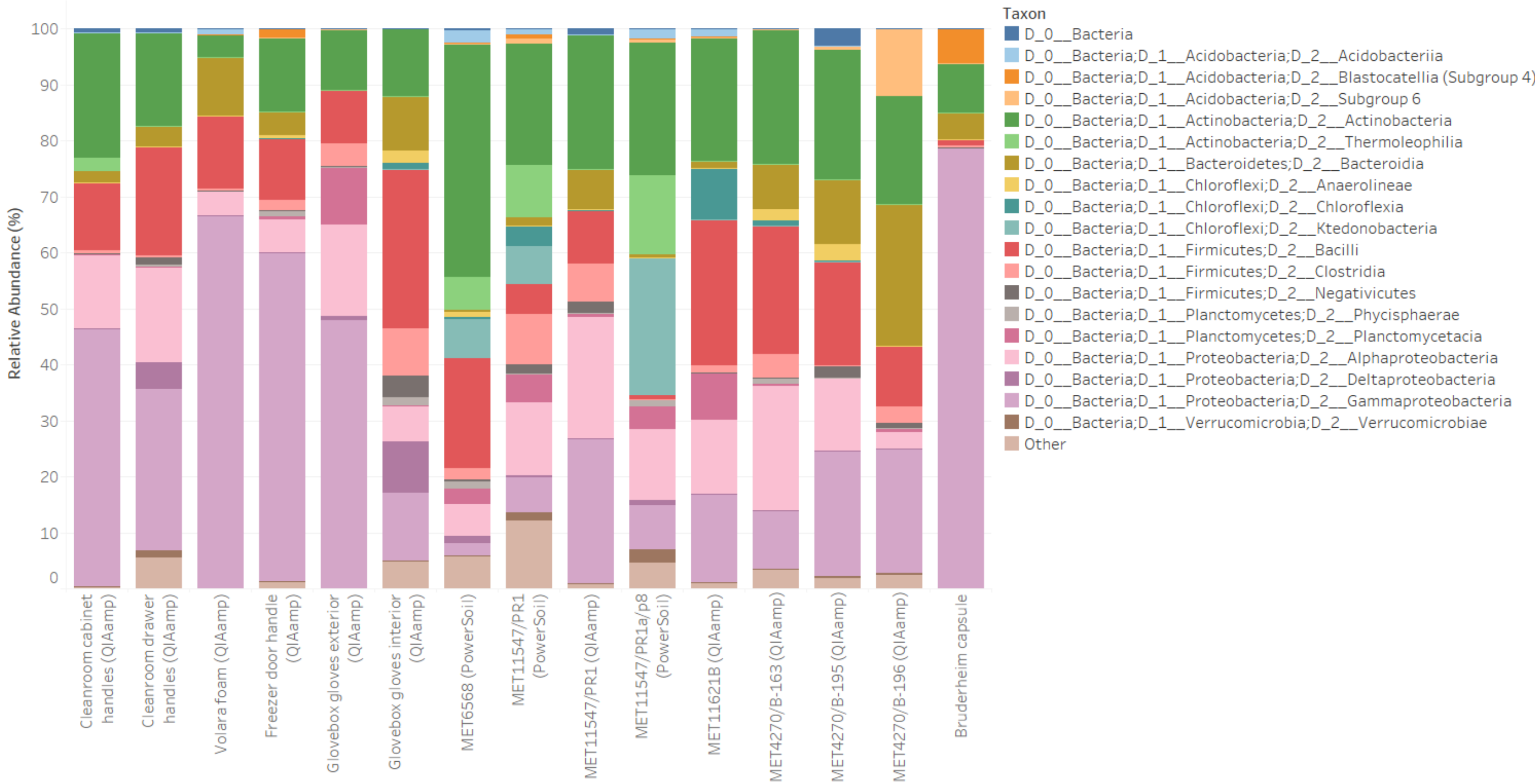

Figure 5.3. Stacked bar chart of the taxon and their corresponding relative abundance detected in each extraction down to their phylum after removal of identified contaminants.

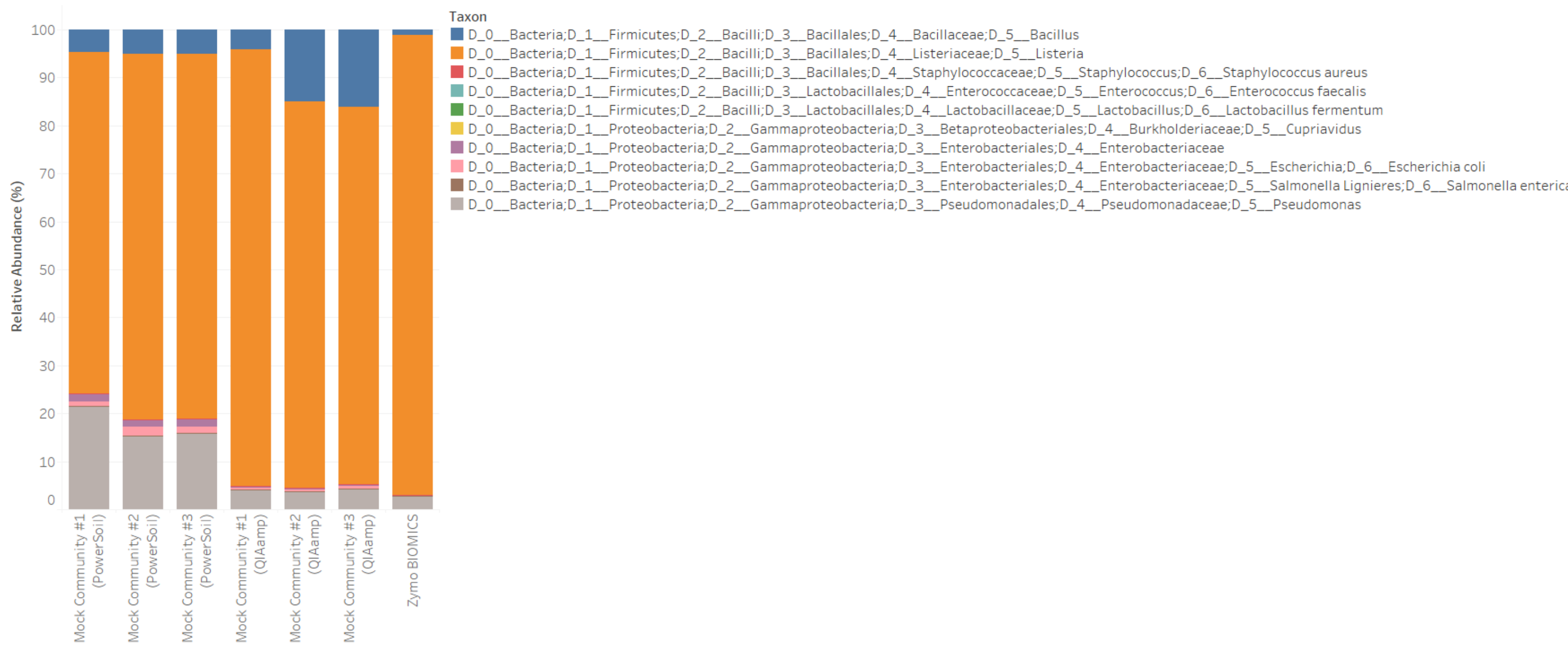

Figure 5.4. Stacked bar chart of the taxon and their corresponding relative abundance detected in the extractions of the microbial standard community compared to the theoretical relative abundances reported by ZymoBIOMICS specifications.

5.4 Discussion

Although the phyla detected in the DNA extracts were similar across the meteorite and laboratory samples, Actinobacteria display a higher relative abundance within the meteorite samples whereas Gammaproteobacteria were detected at a higher relative abundance within the laboratory samples. Both Actinobacteria and Gammaproteobacteria are most commonly isolated from soils, indicating they are likely sourced from the terrestrial environment. Despite their likelihood of originating from the terrestrial environment in which the meteorites fell, it is not possible to rule out the transfer of microbes during their storage with the rest of the meteorite collection or interactions with people that can track microbe bearing terrestrial materials into the Meteorite Curation Facility. The number of ASV's detected in each meteorite extraction do not indicate a relationship to their corresponding terrestrial ages; however, the Bruderheim specimen, MET4270/B-195, had the lowest number of detectable ASV's suggesting storage within a sealed glass ampule is advantageous in minimizing microbial contamination. The small biases introduced by the extraction kits, shown in the relative abundances of the mock community, should be considered in all microbial extraction studies. The three most abundant taxa in each meteorite and laboratory sample are taxa that are most commonly isolated from soil, water, plants, and/or the human microbiota (Table 5.2 and 5.3). The microbes connected with the human flora are attributed to either collection of meteorites by people, or during the processing and curation of meteorites within the facility. As stated above, the exact source of the terrestrial associated microbes cannot be determined with absolute certainty. Although the DNA extraction kits exhibit similar relative abundances of taxon; however, the PowerSoil kit requires the destruction of a portion of the meteorite to create a powder, which makes the QIAamp kit the favorable option in low biomass samples where availability of the meteorite can become a significant complication. In addition, the QIAamp kit best captures the true relative abundances of the ZymoBIOMICS over the PowerSoil kit.

Table 5.2. The three most abundant taxon detected in each DNA extraction of the meteorite specimens after removal of identified contaminants. Each taxon displayed are to their lowest possible taxonomic level. The sources that each taxon is commonly isolated from are provided.

Taxon	Relative Abundance (%)	Confidence	Isolated From
MET6568 (PowerSoil)			
Family: Micrococcaceae	14.12714	0.99991	Air and skin
Family: Micromonosporaceae	7.16448	0.99999	Soil
Species: Thermoactinomyces sp. JAM-FM1001	2.82543	0.82835	Plant debris
MET6568 (QIAamp)			
No taxon amplified	-	-	-
MET11547/PR1 (PowerSoil)			
Genus: Anaerococcus	5.83501	0.90509	Human microbiota
Genus: Bradyrhizobium	5.53320	0.81766	Soil
Phylum: AD3	4.02415	0.83901	Soil
MET11547/PR1 (QIAamp)			
Genus: Sphingomonas	20.21116	0.78761	Soil
Genus: Haemophilus	5.73152	0.90589	Salivary microbiome
Genus: Enhydrobacter	5.12821	0.99999	Soil and water
MET11547/PR1a/p8 (PowerSoil)			
Family: Ktedonobacteraceae	7.09220	0.90970	Soil
Genus: Pseudomonas	5.26849	0.99964	Soil, water, and plants
Family: Ktedonobacteraceae	3.95137	0.99995	Soil
MET11547/PR1a/p8 (QIAamp)			
No taxon amplified	-	-	-
MET11621B (PowerSoil)			
No taxon amplified	-	-	-
MET11621B (QIAamp)			
Genus: Staphylococcus	12.12766	0.99999	Skin and mucous
Family: Acetobacteraceae	4.453074	0.71583	Soil and plants
Genus: Singulisphaera	4.20712	0.78679	Soil
MET4270/B-163 (QIAamp)			
Genus: Sphingomonas	6.50954	0.98465	Soil

Genus: Staphylococcus	5.94837	0.99999	Skin and mucous
Genus: Nakamurella	3.25477	0.99985	Soil, rocks, and plant bark
MET4270/B-195 (QIAamp)			
Class: Corynebacteriales	14.16894	0.99787	Soil, water, plants, and skin
Genus: Neisseria	11.17166	0.79990	Mucosal surfaces
Genus: Flavobacterium	9.53678	0.99996	Soil and fresh water
MET4270/B-196 (QIAamp)			
Class: Chitinophagales	21.50901	0.83993	Soil
Genus: Stenotrophomonas	19.25676	0.99997	Soil and plants
Kingdom: Acidobacteria	12.16216	0.99999	Soil

Table 5.3. The three most abundant taxon detected in each DNA extraction of the laboratory specimens after removal of identified contaminants. Each taxon displayed are to their lowest possible taxonomic level. The sources that each taxon is commonly isolated from are provided.

Taxon	Relative Abundance (%)	Confidence	Isolated From
Cleanroom drawer handle (QIAamp)			
Genus: Brevundimonas	11.95652	0.99996	Soil and water
Genus: Lawsonella	8.69565	0.99999	Plants
Genus: Lactococcus	6.95652	0.99999	Food
Cleanroom cabinet handle (QIAamp)			
Genus: Neisseria	14.46863	0.99951	Mucosal surfaces
Family: Burkholderiaceae	12.80410	0.99831	Soil and freshwater
Genus: Pseudonocardia	4.35339	0.99654	Soil
Freezer door handle (QIAamp)			
Genus: Acinetobacter	39.15663	0.99999	Soil and water
Genus: Acinetobacter	7.83133	0.99959	Soil and water
Genus: Acinetobacter	4.66867	0.99999	Soil and water
Volara foam (QIAamp)			
Species: Pseudomonas caeni	30.30303	0.99288	Soil, water, and plants
Genus: Pseudomonas	25.58923	0.99999	Soil, water, and plants
Genus: Prevotella	10.10101	0.99719	Human microbiota
Interior of glovebox gloves (QIAamp)			
Genus: Nannocystis	8.82353	0.78040	Soil and decaying plant matter

Genus: Streptococcus	7.54476	0.99907	Salivary microbiome
Species: Geobacillus stearothermophilus	4.60358	0.77371	Soil
Exterior of glovebox gloves (QIAamp)			
Genus: Acinetobacter	19.58384	0.99999	Soil and water
Genus: Acinetobacter	16.76867	0.99961	Soil and water
Genus: SH-PL14	9.91432	0.87292	Soil and water
Bruderheim capsule contents (QIAamp)			
Genus: Pseudomonas	70.62147	0.99923	Soil, water, and plants
Genus: Flavobacterium	9.53678	0.99996	Soil and fresh water
Genus: Acinetobacter	7.34463	0.99978	Soil and water

5.5 Conclusion

Regardless of the challenges posed by low biomass samples, it is important to understand the microbial communities that colonize meteorites and their curation surroundings in order to put other meteorite analyses into an appropriate context. When studying soluble organic matter in meteorites, determining if they are of intrinsic nature may become difficult when microbial communities can add or take away from this reservoir. For example, the genus Mitsuokella, detected in select meteorites in this study, produce acetate and succinate as end products of glucose fermentation (Willems and Collins 2015), both of which compounds have been identified as extraterrestrial in many carbonaceous chondrites. In this study ordinary chondrites were exclusively used; however, when studying carbonaceous chondrites, the impact that microbial communities can have become more of a concern. This preliminary study should be followed by additional steps to determine if there is any statistical variation within the data that could be explained by other variables such as storage type, meteorite type, weathering indices, etc. The first step would be to use the decontam package in R to remove any noise and contamination from extraction samples compared to blanks and standards (more accurate than removing these taxa by hand). Then, analyze principal coordinate analysis (PCoA) plots to determine if other variables are controlling the taxa detected in each sample.

5.6 Acknowledgements

We thank Aaron Regberg from NASA JSC for conducting the Next Generation Sequencing on our samples and aiding in the processing of the DNA data using the QIIME2 software. We thank Maija Raudsepp from University of Alberta, for assistance with the PowerSoil kit extractions.

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Chapter 6: Thesis Conclusions and Future Research

The soluble organic compound and microbial extraction analyses conducted over these studies suggest that specimens were readily contaminated, independent of the type of meteorite. Several inferences can be made from these organic compound and microbial study results, including:

a) There is a temperature dependency of organic contamination transfer to meteorites during curation, wherein colder storage temperatures hinder the accumulation of organic contaminants (Chapter 4).
b) There is a time dependency of organic contamination wherein contaminants may either degrade or penetrate into the meteorite over time. The longer the time period between collection and analyses conducted, the fewer the contaminants detected (Tunney et al. 2020). This trend has yet to be shown for intrinsic organics but there could be a loss of intrinsic compounds over time, in particular with volatile species.
c) The properties of the meteorite itself may impact the degree of contamination. There was evidence that the fusion crust may act as a barrier, whereas the exposed interiors of the meteorites are more abrasive and facilitated the accumulation of organics from materials in direct contact with the specimen (Chapter 4).
d) The derivatization agent of choice can greatly impact the types of organics, both intrinsic and terrestrial, detected (Orata 2012). This is particularly important when using a derivatizing agent that is not specialized in derivatizing one particular compound group, such as MTBSTFA, which was utilized in the studies of Aguas Zarcas and Tarda (Chapters 2 and 3).
e) Inter-specimen heterogeneity plays a large role in what organics are detected. This aspect is amplified in breccias, such as Aguas Zarcas and Tarda (Chapters 2 and 3). Inter-specimen heterogeneity can cause a selection bias wherein some subsamples of a given stone may be rich in organics, in contrast another subsample from the same specimen may display an organic poor signature.
f) Organic contaminants that are found in meteorite soluble compound analyses typically belong to one of four categories, independent of geography: agricultural products, fuels, pharmaceuticals, polymers. For example, the Aguas Zarcas meteorite fell on agricultural

land in Costa Rica, whereas the Tarda meteorite fell in the desert in Morocco; however, both have extensive terrestrial contamination within all four categories.

g) Microbial communities that contaminate meteorites and laboratory surfaces are typically either terrestrially sourced or common in the human flora which indicates that there is significant contamination from handling and curating specimens by humans (Chapter 5). This is of great concern as meteorites are low biomass samples and microbial contamination can overwhelm potential microbiota of interest.

h) Microbial communities detected on meteorites may produce or destroy organic compounds of interest, in particular, those that are commonly detected as intrinsic to meteorites (Chapter 5).

Based on the inferences made from this thesis, several recommendations for best practices during collection and curation were created:

1. Rapid collection during meteorite falls to avoid damage (e.g., weathering) to the meteorite and further accumulation of contaminants (either chemical or biological).
2. Extensive site notes including documenting the strewn field characteristics, topography, weather/season, what type of surface the meteorite landed on, meteorite characteristics (fusion crust, interior exposure, etc.). This included photos of the area and the meteorite prior to collecting any stones.
3. Terrestrial samples from the strewn field area should be taken (including water, soil, sand, etc.) to later determine what contaminants are in the area surrounding the meteorite and will later help confirm the sources of contaminants on the meteorite.
4. Using gloves and appropriate materials, collect samples while photographing, weighing, and documenting any notable characteristics of the sample.
5. Document the baseline contamination that can shed from materials and surfaces used when collecting, handling, and storing samples. Although it is not possible to eliminate contamination entirely, it is possible to mitigate contamination by understanding the sources of possible contaminants within your control.
6. How the specimen is handled after collection, including material(s) and temperature in which it is stores, any analyses or handling conducted, or any activities that have the potential to introduce contamination should be documented. Although storage in colder conditions is

recommended, to minimize microbial activity and loss of organic compounds, it is just as important to understand how materials interact with the sample at the temperature of storage.

This thesis just scratches the surface of studies that could be done on meteoritics to improve advanced curation methods. Building on the topics presented in this research future work can be concentrated on investigating the connection between organic and microbial contamination of meteorites. This could include the impacts that temperature and type of meteorite have on contaminant organic and microbial populations. In relation to this, studies into whether terrestrial and microbial contaminants penetrate the meteorite or if they degrade over a certain time frame should be conducted, including impacts the fusion crust have on contamination. In addition, microbial DNA extractions should be done on the terrestrial samples collected alongside meteorite falls to determine how the population of the terrestrial surface varies from the microbial communities that colonize the meteorite.

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Appendix A

Table A1. GC-MS results of the 0.5 mL DCM extraction of AZ-PT1/1 and its procedural blank. Analysis was executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT1/1				
Methylene chloride	1	94	4.668	1521896
Methylene chloride	2	87	13.494	112948
Methylene chloride	3	86	14.180	74795
Hexathiane	4	58	14.692	205142
Hexathiane	5	72	15.204	51571
Hexathiane	6	86	15.259	89033
Hexathiane	7	86	15.411	93323
Hexathiane	8	91	15.836	145106
Hexathiane	9	78	15.902	93394
Hexathiane	10	64	16.959	166979
Cyclic octaatomic sulfur	11	90	18.931	143276
Fluoranthene	12	90	19.803	300929
Methylene chloride	13	59	19.868	85773
Fluoranthene	14	83	20.315	400624
Tetradecane, 2,6,10-trimethyl-	15	14	20.772	161509
Hentriacontane	16	58	21.677	210971
Tetracosane	17	84	22.723	204398
Heptadecane	18	27	23.998	300505
Sulfurous acid, butyl tetradecyl ester	19	43	25.567	312129
Heptacosane	20	89	27.550	424856
Hentriacontane	21	64	30.078	368726
Methylene chloride	22	38	33.336	312382
Procedural Blank				
Methylene chloride	1	96	4.624	429248

Methylene chloride	2	96	4.668	1247631
Methylene chloride	3	43	20.772	100351
Hexyl octyl ether	4	22	21.677	115217
1,8-Nonadien-3-ol	5	43	22.723	170162
1,8-Nonadien-3-ol	6	47	23.987	204353
Hentriacontane	7	64	25.567	196338
Nonadecane	8	43	27.550	302985
Octacosane	9	42	30.078	305663
Hentriacontane	10	47	33.325	370977

Table A2. GC-MS results of the 0.5 mL DCM extraction of AZ-PT2/1 and its procedural blank. Analysis was executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT2/1				
Dipentamethylene thiuran hexasulfide	1	54	17.002	72855
Hexathiane	2	92	18.595	39434
Cyclic octaatomic sulfur	3	98	19.595	2816593
Fluoranthane	4	32	19.770	39783
Pyrene	5	48	20.271	22662
1-Propene-1,2,3-tricarboxylic tributyl ester	6	83	20.434	17902
Procedural Blank				
Methylene chloride	1	95	4.631	429336
Cylcotetrasiloxane, octamethyl-	2	78	6.367	348962

Table A3. GC-MS results of the 0.5 mL DCM extraction of AZ-PT3/1 and its procedural blank. Analysis was executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT3/1				
Ethylbenzene	1	4	4.624	781218

Benzaldehyde, 3-hydroxy-4-methoxy-	2	93	12.284	570514
Pentadecane	3	81	13.450	99262
Hexathiane	4	95	13.777	478694
Pentadecane	5	72	14.649	147705
Octadecane, 2,6-dimethyl-	6	47	15.215	74612
Heptadecane	7	93	15.793	72351
Cyclic octaatomic sulfur	8	40	17.035	241239
Cyclic octaatomic sulfur	9	94	19.617	3638956
Pyrene	10	81	19.759	122949
Fluoranthene	11	81	20.271	114819
Tributyl acetylcitrate	12	91	21.328	60323
Eicosane	13	68	21.622	113865
Tetracosane	14	87	22.668	99167
Heptadecane, 2-methyl-	15	90	23.921	145646
Eicosane	16	97	25.480	178546
Eicosane	17	97	27.430	249651
Eicosane	18	87	29.936	186869
Nonacosane	19	70	33.151	144256
Di-n-decylsulfone	20	37	37.302	86310
Procedural Blank				
Cyclohexane-1,3-dione, 2-allylaminomethylene-5,5-dimethyl-	1	2	4.635	1735891
Vanillin	2	91	12.360	80238
Eicosane	3	86	20.729	35608
Eicosane	4	89	21.633	56906
Tetracosane	5	80	22.668	87732
Eicosane	6	94	23.921	123390
Tetracosane	7	87	25.479	148342
Eicosane	8	93	27.441	218817
Eicosane	9	91	29.936	165180
1-Bromoeicosane	10	47	33.140	143079
Di-n-decylsulfone	11	47	37.269	39270

Table A4. GC-MS results of the 0.5 mL DCM extraction of AZ-PT3/2 and its procedural blank. Analysis was executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT3/2				
Hydrogen sulfide	1	3	4.635	1522283
Pentadecane	2	90	13.450	109544
Hexathiane	3	94	13.788	275745
Tetratetracontane	4	72	14.648	88358
Nonahexacontanoic acid	5	50	15.215	58009
Cyclic octaatomic sulfur	6	50	17.035	155142
Cyclic octaatomic sulfur	7	94	19.617	3712552
Fluoranthene	8	93	19.759	81943
Pyrene	9	93	20.271	88415
Eicosane	10	93	20.729	43068
Eicosane	11	98	21.622	100117
Tetracosane	12	89	22.668	101128
Eicosane	13	93	23.921	122746
Tetracosane	14	87	25.479	158260
Tetracosane	15	62	27.441	222214
Tetracosane	16	72	29.936	161439
Eicosane	17	95	33.161	152335
2-Methylhexacosane	18	27	37.302	89457
Procedural Blank				
Nitrous oxide	1	2	4.624	763925
Eicosane	2	70	20.729	27794
Eicosane	3	91	21.633	54003
Tetracosane	4	93	22.668	78790
Eicosane	5	96	23.921	99304
Tetracosane	6	74	25.480	144621
Eicosane	7	96	27.441	214758

Eicosane	8	93	29.947	133384
Eicosane	9	42	33.151	123159
Hentriacontane	10	27	37.291	65165

Table A5. GC-MS results of the 0.5 mL DCM extraction of AZ-PT3/3 and its procedural blank. Analysis was executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT3/3				
Ethane, 1-chloro-2-isocyanato-	1	5	6.508	142537
Nonane, 2,2,4,4,6,8,8-heptamethyl-	2	53	7.293	153768
Azulene	3	91	9.309	145235
Dodecane, 2,7,10-trimethyl-	4	50	10.562	172039
Pentadecane	5	50	13.417	256017
Hexathiane	6	94	13.700	187193
Heptadecane	7	64	14.615	169638
Cyclic octaatomic sulfur	8	94	19.573	2723055
Fluoranthene	9	96	19.715	152345
Fluoranthene	10	87	20.227	162403
Procedural Blank				
Cyclotetrasiloxane, octamethyl-	1	78	6.323	45812
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	2	3	6.432	42585
Acetic acid, (aminooxy)-	3	1	9.636	42448
1,2-Butadiene	4	3	10.137	62158
Hydrogen sulfide	5	3	11.641	50146
Benzaldehyde, 2-nitro-, diaminomethylidenhydrazone	6	3	12.403	42041
1,6-Heptadiyne	7	3	14.430	42608
Benzene, 4-methyl-1,2-dinitro-	8	4	15.149	53006
Benzyl 2-chloroethyl sulfone	9	1	17.023	97994
1,6-Heptadiyne	10	3	18.178	46132

Table A6. GC-MS results of the 0.5 mL DCM extraction of MET11791/1/2 and its procedural blank. Analysis was executed at the University of Alberta and all organic and inorganic compounds reported are best matches from the NIST 2008 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
MET11791/1/2				
Toluene	1	98	2.810	793154
Toluene	2	81	2.940	35427
2-Pentanone, 4-hydroxy-4-methyl-	3	89	3.400	90089
Ethylbenzene	4	90	3.580	19032
p-Xylene	5	97	3.640	199712
p-Xylene	6	88	3.850	22593
Propane, 1-(1,1-dimethylethoxy)-2-methyl-	7	84	4.980	112669
Cyclopentasiloxane, decamethyl-	8	92	5.890	62165
Azulene	9	84	6.300	42936
Pentanedioic acid, 2-methyl-, dimethyl ester	10	71	6.580	24253
1,2-Cyclopentanedicarboxylic acid, dimethyl ester, trans-(.+/-.)-	11	65	6.900	21684
Undecane, 4,7-dimethyl-	12	83	7.020	28892
Nonane, 2,2,4,4,6,8,8-heptamethyl-	13	79	7.250	57595
Undecane, 5-ethyl-	14	78	7.710	28417
Phenol, 4-(1,1-dimethylpropyl)-	15	94	7.740	38961
Dodecanal	16	90	7.790	23468
2-Pentenoic acid, 5-phenyl-, ethyl ester, (E)-	17	67	8.000	40404
1-Dodecanol	18	98	8.190	1680414
Acenaphthene	19	85	8.440	29823
Butylated Hydroxytoluene	20	94	8.510	560193
Diehtyltoluamide	21	93	8.940	189528
Nonyl pentafluoropropionate	22	58	9.010	24550
3-Trifluoromethylbenzoic acid, 4-tetradecyl ester	23	63	9.320	46930
2,4-Hexadienedioic acid, 3-methyl-4-propyl-, dimethyl ester, (E,E)-	24	67	9.370	111374
Tetradecane, 2-methyl-	25	62	9.540	14074
4-Cyclohexene-1,2-dicarboxylic acid, 4-methyl-, dimethyl ester, trans-	26	59	9.660	133189

6,8-Diacetoxy-2-methyl-non-2-enoic acid, methyl ester	27	64	9.790	169438
ND	28	-	9.860	38821
6,8-Diacetoxy-2-methyl-non-2-enoic acid, methyl ester	29	64	10.060	657437
Hexadecane, 1-bromo-	30	56	10.150	26649
9H-Fluorene, 9-methylene-	31	73	10.230	38817
2-Thiabicyclo[2.2.2]octan-5-one, 8-hydroxy-1,3,8-trimethyl-	32	57	10.380	200602
Carbonic acid, dodecyl phenyl ester	33	72	11.240	28893
Eicosane, 2-methyl-	34	63	11.600	55291
Cyclic octaatomic sulfur	35	63	11.670	39336
Fluoranthene	36	92	11.700	36058
ND	37	-	11.930	25787
Pyrene	38	82	11.970	67926
Heptadecane	39	88	12.060	53001
Trimethyl tridecane-1,5,13-tricarboxylate	40	60	12.090	151722
Heneicosane	41	91	12.500	142454
Tetracosane	42	96	12.920	184528
Tetracosane	43	92	13.330	274271
Hexacosane	44	96	13.720	278064
ND	45	-	13.810	42134
Heptacosane	46	93	14.100	305300
Eicosane	47	92	14.460	215447
Octadecane	48	90	14.820	150007
10-Methylnonadecane	49	79	15.210	88103
Sulfurous acid, 2-ethylhexyl isohexyl ester	50	53	15.640	38442
Procedural Blank				
Toluene	1	99	2.840	2825778
2-Propenoic acid, 2-methyl-, ethyl ester	2	96	2.960	169068
2-Pentene, 3,4-dimethyl-, (E)-	3	82	3.080	19791
2-Pentanone, 4-hydroxy-4-methyl-	4	94	3.410	341211
Ethylbenzene	5	84	3.590	20636
p-Xylene	6	98	3.660	154371

p-Xylene	7	83	3.860	26930
1,1-Ethanediol, diacetate	8	84	4.800	27838
Propane, 1-(1,1-dimethylethoxy)-2-methyl-	9	83	4.980	395548
Butane, 2,2'-[methylenebis(oxy)]bis[2-methyl-	10	78	5.820	32542
1-Heptene, 6-methyl-	11	78	6.270	62630
Pentanedioic acid, 2-methylene-, dimethyl ester	12	94	6.580	76158
Pentanedioic acid, 2-methyl-, dimethyl ester	13	80	6.900	62550
3-Pentanol, 2,2,4,4-tetramethyl-	14	61	7.060	42003
1,2-Cyclopentanedicarboxylic acid, dimethyl ester, trans-(.+/-.)-	15	78	7.250	14919
5-n-Propylhydantoin	16	66	7.660	30367
Hexanedioic acid, 2-methyl-, diethyl ester	17	59	7.710	14332
Benzenebutanoic acid, methyl ester	18	67	8.000	80867
Benzene, octyl-	19	62	9.180	21591
2-Pentenoic acid, 5-phenyl-, ethyl ester, (E)-	20	79	9.370	339990
ND	21	-	9.660	386394
4-Acetoxyheptanedioic acid, dimethyl ester	22	53	9.790	447799
3-Cyclobutene-1,2-dicarboxylic acid, 3-methyl-4-propyl-, dimethyl ester, trans-	23	72	9.860	112916
1,2-Cyclopropanedicarboxylic acid, 3-(2-methyl-1-propenyl)-, dimethyl ester	24	69	9.940	21622
1,2-Cyclopropanedicarboxylic acid, 3-(2-methyl-1-propenyl)-, dimethyl ester	25	69	10.060	1793805
Cyclohexanone, 5-methyl-2-(1-methylethyl)-, O-methyloxime, (2S-trans)-	26	63	10.150	37715
ND	27	-	10.190	23389
6,8-Diacetoxy-2-methyl-non-2-enoic acid, methyl ester	28	64	10.380	548430
Endothal dimethyl ester	29	54	10.750	21758
ND	30	-	10.810	34756
2-Thiabicyclo[2.2.2]octan-5-one, 8-hydroxy-1,3,8-trimethyl-	31	58	11.280	16165
ND	32	-	11.470	17959
ND	33	-	11.610	65129
ND	34	-	11.660	57673
ND	35	-	11.930	79051
ND	36	-	11.990	34646
ND	37	-	12.090	395224

ND	38	-	12.150	13688
ND	39	-	12.320	64499
ND	40	-	12.500	67098
ND	41	-	12.920	93374
ND	42	-	13.330	117639
Trimethyl tridecane-1,5,13-tricarboxylate	43	60	13.580	54457
Heptacosane	44	88	13.720	123552
ND	45	-	13.810	129434
Hexadecane, 2,6,10,14-tetramethyl-	46	86	14.100	133961
ND	47	-	14.270	30685
Nonadecane	48	84	14.460	85663
Eicosane, 2-methyl-	49	76	14.820	61797
Sulfurous acid, 2-ethylhexyl tetradecyl ester	50	65	15.220	37724

Table A7. GC-MS results of the 0.5 mL DCM extraction of MET11791/3/2 and its procedural blank. Analysis was executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
MET11791/3/2				
Methylene chloride	1	96	4.646	1547001
Methylene chloride	2	97	4.809	909293
Methylene chloride	3	90	13.177	136724
Pyridine, 4,4'-(1,2-ethenediyl)bis-, (E)-	4	72	15.204	106474
Cyclic octaatomic sulfur	5	74	19.628	463403
Fluoranthene	6	16	19.802	78505
1-Naphthalenecarboxylic acid	7	53	20.304	88968
Hentriacontane	8	25	20.772	144361
Hentriacontane	9	50	21.677	102938
Octadecane, 2-methyl-	10	14	22.723	149051
Hentriacontane	11	72	23.987	148010
Heptadecane, 2-methyl-	12	38	25.567	158387
Chloromethyl propanoate	13	43	27.539	197459

1,4-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	14	76	28.727	806284
Hentriacontane	15	38	30.078	203810
Sulfurous acid, 2-propyl tridecyl ester	16	11	33.336	214233
Blank				
Methylene chloride	1	96	4.635	1017073
Methylene chloride	2	96	4.744	1617134
Methylene chloride	3	38	20.772	125463
Hentriacontane	4	53	21.677	163102
Tetracosane	5	50	22.723	237471
Hentriacontane	6	76	23.987	250775
Hentriacontane	7	83	25.567	257548
Tetratetracontane	8	43	27.550	336251
Sulfurous acid, hexyl octyl ester	9	46	30.078	293269
Hentriacontane	10	43	33.347	267462
Heptadecane, 9-octyl-	11	38	37.531	210952

Table A8. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT1/1 packaging materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality	Retention Time (min)	Peak Area
Outer teflon container				
Methylene chloride	1	96	4.657	4800415
4-Cyanobenzophenone	2	10	20.522	79525
4-Spirohexanone, 5,5-dichloro-	3	1	21.502	89819
Morpholine, 4-phenyl-	4	59	23.693	1470834
Diethylene glycol dibenzoate	5	72	23.845	7640375
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	6	72	24.205	217022
Blank for outer teflon container				
Methylene chloride	1	97	4.646	3867535

Benzamide, N-propyl-	2	53	23.703	263700
Diethylene glycol dibenzoate	3	72	23.834	1377879
Inner teflon container				
Methylene chloride	1	95	4.657	1726261
Methylene chloride	2	95	4.776	1661768
Benzamide, N-propyl-	3	80	23.703	1081904
Diethylene glycol dibenzoate	4	72	23.834	5822814
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	5	56	24.205	191006
Blank for inner teflon container				
Methylene chloride	1	95	4.635	1877615
Methylene chloride	2	97	4.787	1064281
Propanol, 2,2-dimethyl-, oxime	3	2	21.361	32636
4-Spirohexanone, 5,5-dichloro-	4	2	21.393	33323
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	5	40	23.682	487653
Diethylene glycol dibenzoate	6	72	23.834	2618617

Table A9. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT2/1 packaging materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Outer bag				
N-propylbenzamide	1	69	23.649	3873374
Diethylene glycol dibenzoate	2	65	23.846	18448557
Blank for outer bag				
N-propylbenzamide	1	69	23.649	82565
Diethylene glycol dibenzoate	2	65	23.846	349131
Clam shell case				

N-propylbenzamide	1	69	23.649	1816176
Diethylene glycol dibenzoate	2	65	23.846	10975665
Blank for clam shell case				
N-propylbenzamide	1	69	23.649	212187
Diethylene glycol dibenzoate	2	65	23.846	810300

Table A10. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT3/1, AZ-PT3/2, and AZ-PT3/3 packaging materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Clam shell case				
No peaks detected	-	-	-	-
Blank for clam shell case				
Methane	1	2	4.635	168005
Benzamide, N-propyl-	2	72	23.616	142822
Diethylene glycol dibenzoate	3	64	23.780	722790
Morpholine, 4-phenyl-	4	58	24.139	27205

Table A11. GC-MS results of the 1.8 mL DCM swab extraction of MET11791/1/2 packaging materials and their blanks. Analyses were executed at the University of Alberta and all organic and inorganic compounds reported are best matches from the NIST 2008 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Outer bag				
Hexanoic acid	1	85	4.460	80360
Benzamide, N-propyl-	2	83	13.300	433957
Diethylene glycol dibenzoate	3	80	13.350	1813069
Benzamide, N-propyl-	4	74	13.450	107082

1-Decanol, 5,9-dimethyl-	5	68	14.460	87807
Blank for outer bag				
Benzene, 1,3-dimethyl-	1	88	3.680	24829
Benzamide, N-propyl-	2	76	13.320	47131
Diethylene glycol dibenzoate	3	72	13.360	181435
Inner bag				
Bicyclo[3.2.0]hepta-2,6-diene	1	73	2.900	22904
Benzene, 1,3-dimethyl-	2	90	3.680	31575
ND	3	-	3.910	9395
Butanoic acid	4	66	4.450	22167
Sulfurous acid, 2-ethylhexyl hexyl ester	5	79	12.500	10896
Hexane, 3,3-dimethyl-	6	74	12.920	20539
Benzamide, N-propyl-	7	83	13.310	177729
Diethylene glycol dibenzoate	8	79	13.360	766333
Benzamide, N-propyl-	9	74	13.460	46485
Sulfurous acid, 2-ethylhexyl isohexyl ester	10	74	13.720	22492
Octane, 2,7-dimethyl-	11	53	14.090	16670
Blank for inner bag				
Bicyclo[3.2.0]hepta-2,6-diene	1	77	2.900	13265
p-Xylene	2	88	3.680	24679
ND	3	-	5.190	12174
Nonane, 1-iodo-	4	74	12.930	8678
Benzamide, N-propyl-	5	78	13.320	65367
Benzamide, N-propyl-	6	73	13.360	207790
Sulfurous acid, 2-ethylhexyl isohexyl ester	7	74	13.720	10363
ND	8	-	14.100	8070

Table A12. GC-MS results of the 1.8 mL DCM swab extractions of MET11791/3/2 packaging materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Outer bag				
Methylene chloride	1	97	4.624	2251783
1-Propanol, 2-[2-benzoyloxy)propoxy]-, benzoate	2	64	23.682	479584
Benzamide, N-propyl-	3	58	23.834	2555818
13-Docosenamide, (Z)-	4	30	29.500	243865
Blank for outer bag				
Methylene chloride	1	97	4.635	2441353
Benzamide, N-propyl-	2	72	23.671	286534
Diethylene glycol dibenzoate	3	72	23.834	1571934
Inner bag				
Methylene chloride	1	96	4.635	1109088
Methylene chloride	2	95	4.820	148174
1-Propanol, 2-[2-benzoyloxy)propoxy]-, benzoate	3	40	23.682	489827
Benzoic acid, 2-(4-nitrophenoxy)-	4	59	23.834	2629925
3,5-Dimethylphenyl isothiocyanate	5	14	24.205	144579
8-Methyl-6-nonenamide	6	12	29.479	184451
Blank for inner bag				
Methylene chloride	1	97	4.635	1262267
Methylene chloride	2	95	4.798	531854
Benzamide, N-propyl-	3	72	23.682	418673
Diethylene glycol dibenzoate	4	72	23.834	2212333

Table A13. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT1/1 subsampling materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminium foil				
Methylene chloride	1	97	4.635	1670824
Hexanoic acid, 2-cyano-2-hydroxy-, ethyl ester, benzoate (ester)	2	12	20.522	84955
Benzamide, N-propyl-	3	72	23.693	1333880
1,3-Dioxolane, 2-benzyl-2-phenyl-	4	64	23.834	6924518
Benzamide, N-propyl-	5	72	24.205	313385
Blank for aluminium foil				
Methylene chloride	1	98	4.624	2670515
Isonitroacetophenone	2	72	23.834	613769
Scale				
Methylene chloride	1	97	4.635	1257900
Methylene chloride	2	96	4.744	836564
Benzamide, N-propyl-	3	64	23.692	735744
Diethylene glycol dibenzoate	4	72	23.834	3905218
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	5	25	24.205	137100
Blank for scale				

Methylene chloride	1	97	4.635	2117892
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	2	28	23.682	140680
Isonitroacetophenone	3	83	23.834	690193
Mortar and pestle				
Methylene chloride	1	94	4.624	1891687
Morpholine, 4-phenyl-	2	64	23.682	477120
Diethylene glycol dibenzoate	3	72	23.834	2579279
Blank for mortar and pestle				
Methylene chloride	1	95	4.635	1659169
Oxadixyl	2	45	23.693	157649
2-(2-(2-Ethoxyethyoxy)ethoxy)ethyl acetate	3	59	23.834	757952
Sterile knife				
Methylene chloride	1	94	4.635	459482
Methylene chloride	2	96	4.656	696672
Methylene chloride	3	95	4.733	1275015
Benzamide, N-propyl-	4	72	23.681	640238
Diethylene glycol dibenzoate	5	72	23.834	3369835
Blank for sterile knife				
Methylene chloride	1	94	4.635	466694
Methylene chloride	2	96	4.668	1224787
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	3	64	23.671	323475

1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	4	50	23.834	1698536
Tweezers				
Methylene chloride	1	96	4.635	1443330
Methylene chloride	2	97	4.787	561638
Benzenepropanamide, .alpha.-(benzoylamino)-4-(2-(diethylamino)ethoxy)-N,N-dipropyl-, hydrochloride, (+/-)-	3	39	23.682	550266
Diethylene glycol dibenzoate	4	72	23.834	3140804
Chloroemethyl chloroacetate	5	28	24.205	132803
Blank for tweezers				
Methylene chloride	1	97	4.646	2478384
Benzamide, N-propyl-	2	64	23.682	392597
Diethylene glycol dibenzoate	3	64	23.834	2022413
Glass vial				
Methylene chloride	1	96	4.635	1166087
Benzamide, N-acetyl-	2	64	23.682	438328
1,2-Propanedione, 1-phenyl-, 2-oxime	3	50	23.823	2342819
Blank for glass vial				
Methylene chloride	1	94	4.635	2065730
Morpholine, 4-phenyl-	2	59	23.682	411386
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	3	64	23.834	2155751

Table A14. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT2/1 subsampling materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminum foil				
N-propylbenzamide	1	69	23.649	1866370
Diethylene glycol dibenzoate	2	65	23.846	11665799
Blank for aluminum foil				
N-propylbenzamide	1	69	23.649	595518
Diethylene glycol dibenzoate	2	65	23.846	3324574
Scale				
N-propylbenzamide	1	69	23.649	3019258
Diethylene glycol dibenzoate	2	65	23.846	16863011
Blank for scale				
N-propylbenzamide	1	69	23.649	823033
Diethylene glycol dibenzoate	2	65	23.846	5026927
Mortar and pestle				
N-propylbenzamide	1	69	23.649	1515958
Diethylene glycol dibenzoate	2	65	23.846	9117940
Blank for mortar and pestle				
N-propylbenzamide	1	69	23.649	647317
Diethylene glycol dibenzoate	2	65	23.846	4000013
Sterile knife				
N-propylbenzamide	1	69	23.649	2390368

Diethylene glycol dibenzoate	2	65	23.846	13587768
Blank for sterile knife				
N-propylbenzamide	1	69	23.649	630074
Diethylene glycol dibenzoate	2	65	23.846	3613840
Tweezers				
N-propylbenzamide	1	69	23.649	1057886
Diethylene glycol dibenzoate	2	65	23.846	6457447
Blank for tweezers				
N-propylbenzamide	1*	69	23.649	1132160
Diethylene glycol dibenzoate	2*	65	23.846	7601005
Glass vial				
N-propylbenzamide	1	69	23.649	1744751
Diethylene glycol dibenzoate	2	65	23.846	10672532
Blank for glass vial				
N-propylbenzamide	1	69	23.649	704031
Diethylene glycol dibenzoate	2	65	23.846	4589593

Table A15. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT3/1 and AZ-PT3/2 subsampling materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminum foil				
Formamide	1	2	4.646	1245702
Morpholine, 4-phenyl-	2	80	23.638	130610
Diethylene glycol dibenzoate	3	59	23.780	564295
Morpholine, 4-phenyl-	4	42	24.139	22168

Di-n-decylsulfone	5	43	27.452	22207
Blank for aluminum foil				
Cyclopropane, 1-chloro-2,2-dimethyl-3-(3,3-dimethyl-1-butynyl)-	1	4	4.613	857049
Benzamide, N-propyl-	2	64	23.638	117627
Diethylene glycol dibenzoate	3	64	23.780	498811
Morpholine, 4-phenyl-	4	47	24.139	17148
Scale				
Ammonia	1	2	4.635	1223886
Morpholine, 4-phenyl-	2	59	23.649	210886
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	3	59	23.780	1029503
Benzamide, N-propyl-	4	59	24.139	50501
Phthalic acid, di(oct-3-yl) ester	5	47	24.749	14770
Blank for scale				
1,2-Propadiene-1,3-dione	1	1	4.624	1017784
Morpholine, 4-phenyl-	2	80	23.649	122645
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	3	53	23.780	600808
4-Cyanobenzophenone	4	38	24.139	33533
Mortar and pestle				
Hydrogen azide	1	1	4.657	358915
Morpholine, 4-phenyl-	2	64	23.616	145118
3-Benzoylamino-2-benzyl-butyric acid, methyl ester	3	64	23.780	724410
Morpholine, 4-phenyl-	4	52	24.139	28047
Blank for mortar and pestle				
2-(2-(2-Butoxyethoxy)ethoxy)ethyl benzoate	1	38	23.823	17533
Sterile knife				
Carbamic acid, N,N-dimethyl-, 4-isopropylphenyl ester	1	5	4.646	655109

1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	2	78	23.616	91877
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	3	53	23.780	423484
Glyoxyamide, N-propyl	4	9	24.139	12243
Blank for sterile knife				
Indolizine, 2-(4-methylphenyl)-	1	2	4.624	746230
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	2	64	23.638	99830
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	3	59	23.780	510793
3,4-Xylyl isothiocyanate	4	40	24.128	35882
Tweezers				
Allene	1	2	4.624	42497
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	2	56	23.638	77056
Benzoic acid, 2-(3-nitrophenyl)ethyl ester	3	53	23.780	318312
Methyl 3-(1-pyrrolo)thiophene-2-carboxylate	4	9	24.128	13180
Blank for tweezers				
No peaks detected.	-		-	-
Glass vial				
Indolizine, 2-(4-methylphenyl)-	1	2	4.635	366771
Morpholine, 4-phenyl-	2	47	23.627	79108
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	3	53	23.780	383516
1,2-Benzenedicarboxylic acid, ethyl methyl ester	4	58	24.117	18187
Blank for glass vial				
Methane	1	2	4.624	178379
Benzonitrile, 3,4-dimethoxy-	2	72	23.616	98314
2,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	3	64	23.780	488271
3,4-Xylyl isothiocyanate	4	58	24.139	18574

Table A16. GC-MS results of the 1.8 mL DCM swab extractions of AZ-PT3/3 subsampling materials and their blanks. Analyses were executed at the University of Alberta and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminum foil				
Cyclooctasiloxane, hexadecamethyl-	1	88	9.200	176624
Benzeneacetic acid, .alpha.-oxo-, methyl ester	2	35	11.900	230634
Benzamide, N-propyl	3	70	13.200	8537244
Diethylene glycol dibenzoate	4	74	13.300	32533143
Eicosane	5	64	14.300	209806
Blank for aluminum foil				
p-Xylene	1	69	3.600	80097
Nonadecane	2	71	12.800	269702
Heptacosane	3	89	13.600	754116
Eicosane	4	72	14.000	653024
Eicosane	5	72	14.300	505296
Eicosane	6	73	14.700	357525
Eicosane	7	65	15.100	207575
Scale				
Benzamide, N-propyl-	1	74	13.200	1759648
Diethylene glycol dibenzoate	2	72	13.300	8593317
1,2-Benzenedicarboxylic acid, diisooctyl ester	3	64	13.500	157229
Blank for scale				
Benzamide, N-propyl-	1	74	13.200	918088
Diethylene glycol dibenzoate	2	72	13.300	4377428
Nonadecane	3	45	14.000	116196
Mortar and pestle				

Benzamide, N-propyl-	1	49	13.200	720828
Diethylene glycol dibenzoate	2	72	13.300	2704330
Blank for mortar and pestle				
Benzamide, N-propyl-	1	74	13.200	661940
Diethylene glycol dibenzoate	2	72	13.300	2908001
Sterile knife				
Ethanone, 2-(formyloxy)-1-phenyl-	1	68	11.900	83893
Benzamide, N-propyl-	2	74	13.200	757704
Diethylene glycol dibenzoate	3	72	13.300	3190438
Blank for sterile knife				
Benzamide, N-propyl-	1	74	13.200	847777
Diethylene glycol dibenzoate	2	72	13.300	3807190
Tweezers				
Benzamide, N-propyl-	1	49	13.200	605134
Diethylene glycol dibenzoate	2	72	13.300	2497488
Blank for tweezers				
Benzamide, N-propyl-	1	49	13.200	773832
Diethylene glycol dibenzoate	2	72	13.300	3064626

Table A17. GC-MS results of the 1.8 mL DCM swab extraction of MET11791/1/2 subsampling materials and their blanks. Analyses were executed at the University of Alberta and all organic and inorganic compounds reported are best matches from the NIST 2008 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminium foil				
2-Heptanone, 3-methyl-	1	69	3.910	84054
Benzamide, N-propyl-	2	83	13.310	787494

Diethylene glycol dibenzoate	3	81	13.350	3112571
Benzamide, N-propyl-	4	77	13.450	165753
Nonadecane	5	89	13.720	42924
Nonadecane	6	84	14.100	63074
Hexane, 3,3-dimethyl-	7	57	14.460	227204
Blank for aluminium foil				
Benzamide, N-propyl-	1	80	13.320	88145
Diethylene glycol dibenzoate	2	73	13.360	309785
Scale				
ND	1	-	4.470	133964
Benzaldehyde, 2,4-dihydroxy-6-methyl-	2	72	7.820	57893
Nonane, 2-methyl-5-propyl-	3	85	12.500	20270
Oxalic acid, 2-ethylhexyl hexyl ester	4	75	12.920	39852
Benzamide, N-propyl-	5	80	13.300	256444
Diethylene glycol dibenzoate	6	81	13.360	1006357
Benzamide, N-propyl-	7	75	13.460	47777
Undecane, 3,7-dimethyl-	8	66	13.720	29082
Sulfurous acid, decyl 2-propyl ester	9	56	14.100	30592
Blank for scale				
Benzamide, N-propyl-	1	77	13.320	44654
Benzamide, N-propyl-	2	71	13.360	128413
Tweezers				
p-Xylene	1	83	3.670	89573
Hexanoic acid	2	88	4.470	108133
2,4,7,9-Tetramethyl-5-decyn-4,7-diol	3	79	7.830	91938
Benzamide, N-propyl-	4	83	13.30	754210
Diethylene glycol dibenzoate	5	82	13.360	3281853
Benzamide, N-propyl-	6	75	13.450	158254

Blank for tweezers				
Hexane, 3,3-dimethyl-	1	57	12.500	4624
Hexane, 3,3-dimethyl-	2	81	12.930	5078
Benzamide, N-propyl-	3	78	13.310	68345
Benzamide, N-propyl-	4	72	13.360	226190
Benzamide, N-propyl-	5	66	13.470	12270
Hexane, 3,3-dimethyl-	6	60	13.720	20776
Di-n-decylsulfone	7	51	14.100	16103
ND	8	-	14.470	8581
Teflon sheet				
2-Butanone	1	89	3.550	47352
Cyclopentanol, 2-methyl-, acetate, trans-	2	76	3.910	74969
Hexanoic acid	3	80	4.470	213642
ND	4	-	4.630	188754
n-Hexadecanoic acid	5	84	10.920	73754
Benzamide, N-propyl-	6	83	13.310	768721
Diethylene glycol dibenzoate	7	83	13.360	3526028
Benzamide, N-propyl-	8	79	13.450	162012
Decane, 2,4,6-trimethyl-	9	66	13.720	119090
ND	10	-	13.980	62783
ND	11	-	15.760	58988
Blank for teflon sheet				
Benzamide, N-propyl-	1	80	13.310	138488
Diethylene glycol dibenzoate	2	76	13.360	474668
Gloves				
Benzenesulfonamide, N-ethyl-2-methyl-	1	87	9.440	90436
Benzamide, N-propyl-	2	82	13.300	239731
Diethylene glycol dibenzoate	3	82	13.360	1051764

Benzamide, N-propyl-	4	72	13.460	56864
Blank for gloves				
Benzamide, N-propyl-	1	73	13.320	55202
Benzamide, N-propyl-	2	71	13.360	129186
Vacuum before use[a]				
3,5-Dithiahexanol 5,5-dioxide	1	69	2.510	366711
2,2-Dimethoxybutane	2	84	2.900	276049
1,2-Ethanediol, monoacetate	3	84	3.490	186711
Benzoic acid, ethyl ester	4	76	9.610	114988
n-Propyl benzoate	5	76	9.770	135895
n-Hexadecanoic acid	6	90	10.920	142345
Phenacylidene diacetate	7	84	11.980	97099
Benzamide, N-propyl-	8	82	13.310	2747401
Diethylene glycol dibenzoate	9	85	13.360	10389364
Benzamide, N-propyl-	10	76	13.450	372125
Blank for vacuum before use[a]				
3,5-Dithiahexanol 5,5-dioxide	1	70	2.490	271257
2,2-Dimethoxybutane	2	86	2.910	284854
1,3-Dioxolane-4-methanol, 2-ethyl-	3	61	3.530	35616
Benzamide, N-propyl-	4	83	13.310	1154929
Diethylene glycol dibenzoate	5	85	13.360	4837756
Benzamide, N-propyl-	6	75	13.450	144845
Vacuum after use[a]				
3,5-Dithiahexanol 5,5-dioxide	1	70	2.500	236634
2,2-Dimethoxybutane	2	85	2.890	266119
3,3-Dimethyoxy-2-butanone	3	78	3.490	127096
Benzoic acid, ethyl ester	4	78	9.610	174728
n-Propyl benzoate	5	80	9.770	177404

Benzoic acid, 1-methylethyl ester	6	79	9.840	138821
n-Hexadecanoic acid	7	89	10.920	129595
1,2-Ethanediol, dibenzoate	8	83	11.980	156119
Benzamide, N-propyl-	9	82	13.310	4264553
Diethylene glycol dibenzoate	10	85	13.370	15732188
Benzamide, N-propyl-	11	76	13.450	585605
Blank for vacuum after use[a]				
3,5-Dithiahexanol 5,5-dioxide	1	69	2.450	91283
2,2-Dimethoxybutane	2	85	2.890	176567
3,3-Dimethyoxy-2-butanone	3	80	3.480	39640
1,3-Dioxolane-4-methanol, 2-ethyl-	4	72	3.530	26193
Benzeneacetic acid, .alpha.-oxo-, ethyl ester	5	75	9.630	60445
n-Propyl benzoate	6	80	9.770	101157
Benzoic acid, 1-methylethyl ester	7	81	9.850	75789
Ethanone, 2-(formyloxy)-1-phenyl-	8	83	11.990	50302
Benzamide, N-propyl-	9	83	13.300	1412843
Diethylene glycol dibenzoate	10	86	13.360	5803534
Benzamide, N-propyl-	11	75	13.450	181864
Guillotine cutter				
Benzamide, N-propyl-	1	74	13.330	21401
Benzamide, N-propyl-	2	72	13.390	83705
Blank for guillotine cutter				
Benzamide, N-propyl-	1	74	13.330	10884
Diethylene glycol dibenzoate	2	65	13.400	58728
Teflon container				
Butanal, 2-ethyl-	1	65	3.910	42737
Hexanoic acid	2	87	4.470	105834
n-Propyl benzoate	3	77	9.780	64344

Benzamide, N-propyl-	4	83	13.310	550139
Diethylene glycol dibenzoate	5	81	13.360	2367347
Benzamide, N-propyl-	6	77	13.450	138400
Blank for teflon container				
Benzamide, N-propyl-	1	73	13.330	22081
Benzamide, N-propyl-	2	69	13.350	62862

[a]Indicates that methanol was used as the solvent instead of DCM.

Table A18. GC-MS results of the 1.8 mL DCM swab extractions of MET11791/3/2 subsampling materials and their blanks. Analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminum foil				
Methylene chloride	1	94	4.635	419403
Methylene chloride	2	94	4.667	862688
1-Propanol, 2-[2-benzoyloxy)propoxy]-, benzoate	3	78	23.682	896367
Diethylene glycol dibenzoate	4	47	23.834	4868447
Ethanone, 2-(2-methylpropoxy)-1,2-diphenyl-	5	27	24.205	176411
Blank for aluminium foil				
Methylene chloride	1	86	4.624	1248586
2-(2-(2-Ethoxyethyoxy)ethoxy)ethyl acetate	2	38	23.823	316155
Scale				
Methylene chloride	1	95	4.624	990327
Methylene chloride	2	94	4.765	342383
(3-Phenyloxiran-2-yl)methyl benzoate	3	53	23.692	701191
Diethylene glycol dibenzoate	4	64	23.834	3837251
1-Propanol, 2-[2-benzoyloxy)propoxy]-, benzoate	5	43	24.194	125744

Blank for scale				
Methylene chloride	1	96	4.624	1195019
Methylene chloride	2	98	4.798	414328
Morpholine, 4-phenyl-	3	37	23.682	188107
2-Bromomethyl-2-phenyl[1,3]dioxolane	4	64	23.823	837640
Mortar and pestle				
Methylene chloride	1	95	4.667	2420488
Morpholine, 4-phenyl-	2	53	23.671	452278
Diethylene glycol dibenzoate	3	64	23.834	2344874
Blank for mortar and pestle				
Methylene chloride	1	96	4.646	1410772
Morpholine, 4-phenyl-	2	27	23.682	152986
Diethylene glycol dibenzoate	3	53	23.834	796010
Sterile knife				
Methylene chloride	1	96	4.635	1253531
Methylene chloride	2	96	4.831	458592
Morpholine, 4-phenyl-	3	59	23.682	400716
Diethylene glycol dibenzoate	4	50	23.834	2138454
Blank sterile knife				
Methylene chloride	1	95	4.635	1123514
1-Propanol, 2-[2-benzoyloxy)propoxy]-, benzoate	2	72	23.682	158428
Benzamide, N-propyl-	3	72	23.714	153760
Benzoic acid, 2-(4-nitrophenoxy)-	4	59	23.834	1570971
Tweezers				
Methylene chloride	1	97	4.624	338027
Methylene chloride	2	95	4.667	560842
Benzamide, N-propyl-	3	64	23.692	560724

Diethylene glycol dibenzoate	4	72	23.834	2832129
1-Propanol, 2-[2-benzoyloxy)propoxy]-, benzoate	5	47	24.205	157350
Blank for tweezers				
Methylene chloride	1	94	4.624	788994
Methylene chloride	2	95	4.776	54372
Morpholine, 4-phenyl-	3	47	23.682	219446
2,2'-(Ethane-1,2-diylbis(oxy))bis(tetrahydro-2h-pyran)	4	50	23.834	1131158
Glass vial				
Methylene chloride	1	95	4.646	2126545
Benzamide, N-propyl-	2	64	23.682	436419
Diethylene glycol dibenzoate	3	64	23.834	2303404
Blank for glass vial				
Methylene chloride	1	95	4.646	1776917
Morpholine, 4-phenyl-	2	50	23.682	152442
Diethylene glycol dibenzoate	3	64	23.834	797139

Table A19. GC-MS results of the 0.5 mL DCM swab extraction of aluminium foil used in the subsampling process of AZ-PT1/1 and its blank. Triplet analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminium foil				
Run 1				
p-Xylene	1	72	4.624	4887420
Benzamide, N-(iminothioureidomethyl)-	2	9	4.668	21714594
n-Hexadecanoic acid	3	97	18.506	1831203
Benzamide, N-propyl-	4	50	20.511	978730
Benzo[b]thiophen-2-amine, 3-phenyl-N-(phenylmethylene)-	5	72	21.535	1082474
Ethanone, 1-[2-(dimethylamino)phenyl]-	6	56	23.682	30502536

Diethylene glycol dibenzoate	7	59	23.823	194872871
Morpholine, 4-phenyl-	8	47	24.183	8839186
Run 2				
1,3-Cyclopentadiene, 5-(1-methylethyldiene)-	1	64	4.635	16180655
n-Hexadecanoic acid	2	97	18.506	2034519
1-Butanone, 2-methyl-1-phenyl-	3	64	20.500	835554
Ethanone, 1-[2-(dimethylamino)phenyl]-	4	56	23.682	30060229
Diethylene glycol dibenzoate	5	64	23.823	187101520
Morpholine, 4-phenyl-	6	58	24.172	10611497
Run 3				
Ethylbenzene	1	42	4.624	6780366
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	53	4.776	5105401
n-Hexadecanoic acid	3	99	18.506	1861428
Benzoic acid, 2-propenyl ester	4	50	20.500	836769
Ethanone, 1-[2-(dimethylamino)phenyl]-	5	56	23.682	24568820
Diethylene glycol dibenzoate	6	64	23.812	149449400
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	7	56	24.172	6943362
Blank				
Run 1				
o-Xylene	1	42	4.646	11570180
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	42	4.787	3047322
Morpholine, 4-phenyl-	3	50	23.660	3384750
Diethylene glycol dibenzoate	4	72	23.812	24799324
Run 2				
1,3-Cyclopentadiene, 5-(1-methylethyldiene)-	1	53	4.646	4603425
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	42	4.733	659452
Morpholine, 4-phenyl-	3	64	23.660	3031141
Diethylene glycol dibenzoate	4	80	23.801	24057090

Run 3				
o-Xylene	1	86	4.624	2544757
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	33	4.744	102306
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	3	50	23.660	2839410
Diethylene glycol dibenzoate	4	80	23.801	21425906

Table A20. GC-MS results of the 0.5 mL DCM swab extraction of tweezers used in the subsampling process of MET11791/3/2 and its blank. Triplet analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Tweezers				
Run 1				
Benzeneethanol, .alpha.,.beta.-dimethyl-	1	64	4.635	29073933
Benzoic acid, 2-propenyl ester	2	59	20.511	1040438
Hexadecanoic acid, tert-butyldimethylsilyl ester	3	86	21.535	2101291
Ethanone, 1-[2-(dimethylamino)phenyl]-	4	56	23.693	39218199
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	5	59	23.823	206945156
Morpholine, 4-phenyl-	6	64	24.172	11478651
Run 2				
Benzene, 1,3-dimethyl-	1	58	4.635	9174958
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	53	4.755	3137261
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	3	59	4.798	6370125
n-Hexadecanoic acid	4	97	18.506	2326937
Benzoic acid, {6-[(benzoyloxy)methyl]-2,8-dioxabicyclo[3.2.1]oct-7-yl} ester	5	53	20.511	780865
Hexadecanoic acid, tert-butyldimethylsilyl ester	6	72	21.535	1171349
Ethanone, 1-[2-(dimethylamino)phenyl]-	7	56	23.682	34660509

2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	8	64	23.823	197444577
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	9	50	24.172	10178927
Run 3				
Cyclopentene, 1-ethenyl-3-methylene-	1	46	4.635	7010064
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	25	4.766	6678607
n-Hexadecanoic acid	3	99	18.506	2138923
Benzoic acid, 2-propenyl ester	4	50	20.500	1018318
Ethanone, 1-[2-(dimethylamino)phenyl]-	5	45	23.660	30799729
Diethylene glycol dibenzoate	6	64	23.823	170020820
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	7	56	24.172	7693834
Blank				
Run 1				
1,3-Cyclopentadiene, 5-(1-methylethylidene)-	1	35	4.635	10365368
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	40	4.755	12283613
Cyclotetrasiloxane, octamethyl-	3	91	6.378	4380664
Cyclopentasiloxane, decamethyl-	4	93	8.754	5611138
Cyclohexasiloxane, dodecamethyl-	5	90	11.216	4459039
Hexasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11-dodecamethyl-	6	50	13.450	1897903
18-Methyl-nonadecane-1,2-dio, trimethylsilyl ether	7	43	15.455	1383410
Cyclononasiloxane, octadecamethyl-	8	90	17.198	739912
n-Hexadecanoic acid	9	95	18.506	1181413
Benzoic acid, 2-propenyl ester	10	59	20.500	1133398
Hexadecanoic acid, tert-butyldimethylsilyl ester	11	72	21.535	799922
Morpholine, 4-phenyl-	12	45	23.682	26335274
Diethylene glycol dibenzoate	13	59	23.823	168827965
Morpholine, 4-phenyl-	14	58	24.172	7160697

Run 2

1,3-Cyclopentadiene, 5-(1-methylethylidene)-	1	16	4.635	15465162
Cyclotetrasiloxane, octamethyl-	2	90	6.378	3943316
Cyclopentasiloxane, decamethyl-	3	91	8.754	5430752
Cyclohexasiloxane, dodecamethyl-	4	90	11.216	5020746
Hexasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11-dodecamethyl-	5	50	13.450	2288435
Silane, [[4-[1,2-bis[(trimethylsilyl)oxy]ethyl]-1,2-phenylene]bis(oxy)]bis[trimethyl-	6	38	15.455	1212403
Cyclononasiloxane, octadecamethyl-	7	94	17.198	899126
n-Hexadecanoic acid	8	98	18.495	1655514
Benzoic acid, 2-propenyl ester	9	64	20.500	1118540
Ethanone, 1-[2-(dimethylamino)phenyl]-	10	56	23.682	25867057
Diethylene glycol dibenzoate	11	64	23.823	165385850
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	12	50	24.172	7109542

Run 3

Ammonia	1	2	4.646	6211230
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	2	40	4.765	2691323
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	3	53	4.809	2011181
Cyclotetrasiloxane, octamethyl-	4	86	6.378	3331057
Cyclopentasiloxane, decamethyl-	5	94	8.753	4202608
Cyclohexasiloxane, dodecamethyl-	6	90	11.216	3846752
N-Benzyl-N-ethyl-p-isopropylbenzamide	7	37	13.450	1736000
Silane, [[4-[1,2-bis[(trimethylsilyl)oxy]ethyl]-1,2-phenylene]bis(oxy)]bis[trimethyl-	8	43	15.455	991714
Cyclononasiloxane, octadecamethyl-	9	86	17.198	883235
n-Hexadecanoic acid	10	99	18.506	1754776
1,2-Ethanediol, dibenzoate	11	59	20.500	918180
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	12	40	23.681	23741888
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	13	59	23.823	145945010

Morpholine, 4-phenyl-	14	53	24.172	6245443

Table A21. GC-MS results of the 1.8 mL MTBSTFA derivatized hot water extraction of the remaining AZ-PT1/1, MET11791/1/2, and MET11791/3/2 residues following their DCM extraction, along with a procedural blank of the reaction of L-Cysteine with MTBSTFA and TBDMCS. Triplet analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT1/1				
Run 1				
2-Butenamide, N,2,3-trimethyl-	1	38	2.902	262036308
2-Penten-1-amine, N,N,2-trimethyl-, (E)-	2	43	3.077	364178846
Benzene	3	4	3.131	371753151
Toluene	4	90	3.349	85934005
Silane, chloro(1,1-dimethylethyl)dimethyl-	5	91	3.654	2844904504
Silane, chloro(1,1-dimethylethyl)dimethyl-	6	58	4.036	213849579
cis-4-Hepten-1-al diethyl acetal	7	42	4.678	218675583
Ethane, 2-bromo-1,1-dimethoxy-	8	32	4.951	9165652
Allyloxy-t-butyldimethylsilane	9	37	5.103	70034329
tert-Butyldimethylsilyl acetate	10	83	5.528	179676233
tert-Butyldimethylsilyl trifluoromethanesulfonate	11	42	6.204	20060880
Benzenesulfonamide, N-(3-chloropropyl)-	12	37	6.389	1104593041 5
2-Allylphenol	13	50	6.989	109249339
N-(2-Chloroethyl)-N-ethylaniline	14	17	7.065	122693114
1,4-Dimethoxy-2-(methylthio)-benzene	15	11	7.272	48228431
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-N'-phenyl-	16	35	7.359	63582657
Pyrazine, 2-methyl-5-(1-propenyl)-	17	35	7.588	107813314
2-Allylphenol	18	38	7.686	18999798
Benzenesulfonamide, N-(3-chloropropyl)-	1	32	7.729	19948244

3-Thiazolin-4(3H)-one, 5-benzylideno-3-(2-chlorophenylaminomethyl)-2-thioxo-	20	35	7.882	24191125
Benzenesulfonamide, N-(3-chloropropyl)-	21	32	8.089	8979050
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	22	93	8.536	2865894230
2-(4-Dimethylaminobenzyl)indan-1-ol	23	27	8.786	7395157
N-(2-Chloroethyl)-N-ethylaniline	24	25	9.059	5352689
7-Methoxy-2-tetralone	25	22	9.113	1630838
Benzene, 2,4-dimethyl-1-nitro-	26	43	9.146	2057223
N-(2-Chloroethyl)-N-ethylaniline	27	27	9.211	2827574
1-(2,3-Dimethyl-phenyl)-3-methyl-butylamine	28	14	9.342	3518690
Benzenesulfonamide, N-(3-chloropropyl)-	29	25	9.386	8231730
Bis(tert-butyldimethylsilyl)amine	30	70	9.822	3773043873
Bis(tert-butyldimethylsilyl)amine	31	30	9.996	8281395
Bis(tert-butyldimethylsilyl)amine	32	60	10.050	7160911
3-(1-Cyclopentenyl)furan	33	27	10.410	4164923
4-Pyrimidinecarboxaldehyde, 2,6-dichloro-	34	32	10.944	54846720
Trisiloxane, octamethyl-	35	30	11.096	7800069
3-(1-Cyclopentenyl)furan	36	27	11.151	1659576
3-(1-Cyclopentenyl)furan	37	35	11.293	1244937
3-(1-Cyclopentenyl)furan	38	27	11.467	272972
Pentanoic acid, 3-methyl-, tert-butyldimethylsilyl ester	39	50	11.663	15793905
3-(1-Cyclopentenyl)furan	40	22	11.750	2141083
Bis(tert-butyldimethylsilyl) carbonate	41	86	11.914	60428257
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	42	62	12.121	124636459
N-(7-Methylbenzo(b)thien-3-yl)acetamide	43	45	12.317	229845035
Tricyclo[4.2.1.1(2,5)]decan-9-one	44	23	12.938	9224439
Bis(tert-butyldimethylsilyl) sulfite	45	74	13.406	242326391
1-Methyl-2-pentamethyldisilanyloxycyclohexane	46	47	13.570	9703014
1-Butanol, 3-t-butyldimethylsilyloxy-	47	37	13.668	4097334
2-Butene-1,4-diol, tert-butyldimethylsilyl ester	48	23	13.755	4786966
Silane, (1,1-dimethylethyl)dimethyl-	49	37	13.897	6163598
6-Nitrobenzothiazole	50	35	13.962	14247638

Bis(dimethyl-t-butylsilyl) oxalate	51	58	14.071	31335161
1-Butanol, 3-t-butyldimethylsilyloxy-	52	28	14.202	11857762
tert-Butyldimethylsilanol	53	9	14.333	3636622
Sulfuric acid, bis(tert-butyldimethylsilyl ester	54	91	14.518	1270272740
1-Phenyl-3,5-dimethyl-7-thioxo-6,7(8H)-dihydropyrazolo(3,4-b)(1,4)diazepine	55	38	14.627	10954813
tert-Butyldimethylsilanol	56	9	14.921	14679277
2-Dimethylisopropylsilyloxyoct-3-ene	57	28	15.226	14350579
Silane, (1,1-dimethylethyl)dimethyl-	58	33	15.499	9016010
tert-Butyldimethylsilanol	59	49	15.575	8061750
tert-Butyldimethylsilanol	60	49	15.618	9531979
Tris(tert-butyldimethylsilyl) borate	61	90	15.749	579194273
2-Pentamethyldisilanyloxypentane	62	25	16.131	5242016
4-Pentamethyldisilanyloxyoctane	63	25	16.392	2307808
Bis(dimethyl-t-butylsilyl) succinate	64	50	16.468	7478513
4-(Dimethyl(prop-2-enyl)silyloxy)octane	65	12	16.577	3969849
Phosphine oxide, diisopropyl-t-butyl-	66	33	16.839	991479
t-Butyl(1,5-dimethyl-1-vinylhex-4-enyloxy)dimethylsilane	67	38	17.329	899733
4-Hexenoic acid, 4-methyl-6-(fluorodimethylsilyl)-6-trimethylsilyl-	68	23	17.493	2387092
2-Methyl-1-pentamethyldisilyloxypropane	69	50	17.547	6446166
Silanol, trimethyl-, propanoate	70	17	17.612	1933798
Phosphoric acid, tris(tert-butylphenyl)-	71	99	18.212	7047940
Tris(tert-butyldimethylsilyl)sulfamate	72	87	18.343	4386655
trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	73	25	19.073	3110839
Tricyclo[5.2.1.0(4,10)]dec-2-ene	74	23	19.628	3407714
9,12-Octadecadienoic acid (Z,Z)-	75	32	20.238	3779263
Benzene, 1-[(dimethoxymethyl)-1-ethyl]-4-methoxycarbonyl-1-ethyl-	76	16	21.535	1298505
9,12-Octadecadienoic acid, tert-butyldimethylsilyl ester, (Z,Z)-	77	64	21.622	29412649
Run 2				
Phosphorocyanidothioic difluoride	1	37	2.902	55425823
Phosphorocyanidothioic difluoride	2	50	2.968	108474489

Dimethyl trisulfide	3	10	3.055	273792501
N-(2,2,3,3-Tetrafluoroaziridino)difluoromethyleneimine	4	38	3.109	428395880
Toluene	5	91	3.338	48955516
Silane, chloro(1,1-dimethylethyl)dimethyl-	6	91	3.665	2789107208
Silane, chloro(1,1-dimethylethyl)dimethyl-	7	60	4.046	186708363
tert-Butyldimethylsilyl formate	8	45	4.678	87116069
tert-Butyldimethylsilyl formate	9	78	4.733	97553931
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	10	25	4.918	61376009
2-Propen-1-ol, 3-(trimethylsilyl)-	11	39	5.081	57742135
tert-Butyldimethylsilyl acetate	12	83	5.528	166245058
tert-Butyldimethylsilyl trifluoromethanesulfonate	13	50	6.215	16079527
Benzenesulfonamide, N-(3-chloropropyl)-	14	37	6.389	10893796658
2-Allylphenol	15	47	6.988	44449803
N-(2-Chloroethyl)-N-ethylaniline	16	17	7.075	20761964
N,N-Dibutylbenzenesulphonamide	17	17	7.152	19826917
2-Thiazolamine, 5-chloro-	18	12	7.282	13260266
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-N'-phenyl-	19	35	7.359	29613851
Benzenesulfonamide, N-(3-chloropropyl)-	20	32	7.435	1273678
1H-Inden-1-ol, 2,3-dihydro-	21	38	7.588	80756287
2-Allylphenol	22	27	7.686	10521826
Benzenesulfonamide, N-(3-chloropropyl)-	23	25	7.729	5032421
N-t-Butyldioxymethyl-N-ethylaniline	24	22	7.882	14867451
Benzenesulfonamide, N-(3-chloropropyl)-	25	25	8.089	3992687
Benzenesulfonamide, N-(3-chloropropyl)-	26	32	8.241	1311471
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	27	83	8.546	3003029176
7-[2'-Hydroxyethoxymethyl]-4-aminopyrolo[2,3-d]pyrimidine 2'-phosphate	28	25	8.786	6891590
4-Pentenoic acid, trimethylsilyl ester	29	22	9.059	5333204
Benzene, 2,4-dimethyl-1-nitro-	30	43	9.146	3299164
7-Methoxy-2-tetralone	31	14	9.211	2739313
N-(2-Chloroethyl)-N-ethylaniline	32	17	9.342	3344625
Dibenzothiophene	33	14	9.385	7693587

Bis(tert-butyldimethylsilyl)amine	34	62	9.821	3853513564
Bis(tert-butyldimethylsilyl)amine	35	45	9.996	14413230
3-(1-Cyclopentenyl)furan	36	38	10.410	4018362
2-Methoxythiobenzamide	37	35	10.889	2843469
4-Pyrimidinecarboxaldehyde, 2,6-bis[(trimethylsilyl)oxy]-	38	32	10.944	52156851
Tris(trimethylsilyl)borate	39	47	11.096	8294160
1-(2,3-Dimethyl-phenyl)-3-methyl-butylamine	40	14	11.434	2926738
3-Ethyl-6-pentamethyldisilyloxyoctane	41	27	11.467	3326156
Levulinic acid, tert-butyldimethylsilyl ester	42	64	11.663	16307170
3-(1-Cyclopentenyl)furan	43	22	11.750	2433208
Bis(tert-butyldimethylsilyl) carbonate	44	87	11.913	62325785
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	45	62	12.120	132071098
N-(7-Methylbenzo(b)thien-3-yl)acetamide	46	45	12.317	228577903
3-(1-Cyclopentenyl)furan	47	27	12.611	1096467
1-Propanone, 2,2-dimethyl-1-(2'-methylaminophenyl)-	48	22	12.938	9561177
Silanol, trimethyl-, propanoate	49	27	13.134	3066374
Bis(tert-butyldimethylsilyl) sulfite	50	74	13.406	241402313
Sebacic acid, (2-(cyclohexenyl-3)-1-phenyl)ethyl pentyl ester	51	22	13.504	1109319
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	52	47	13.570	9518801
2-Benzoxazolamine, N-propyl-	53	16	13.668	2498828
2-Dimethylamino-3-phenylpropionitrile	54	14	13.755	3962103
N,N'-Bis(tert-butyldimethylsilyl)acetamidine	55	95	13.907	6816769
7-Methoxy-2-tetralone	56	14	13.962	6676085
Bis(dimethyl-t-butylsilyl) oxalate	57	87	14.071	34271091
5-Dimethyl(trimethylsilyl)silyloxytridecane	58	38	14.202	9163734
Benzenemethanamine, N,N,.alpha.-trimethyl-, (S)-	59	22	14.332	3727465
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	60	80	14.518	1247373091
Phosphine oxide, diisopropyl-t-butyl-	61	38	14.627	7307902
t-Butyl(1,5-dimethyl-1-vinylhex-4-enyloxy)dimethylsilane	62	27	14.921	9162743
5-Dimethyl(isopropyl)silyloxytetradecane	63	27	15.237	15543126
Silanol, trimethyl-, propanoate	64	32	15.357	7359892
Silanol, trimethyl-, propanoate	65	32	15.400	7029364

t-Butyl(1,5-dimethyl-1-vinylhex-enyloxy)dimethylsilane	66	23	15.498	8532107
Tetrazolo[1,5-a]1,2,5-oxadiazolo[3,4-E]pyrazine, 5-(chlorophenylamino)-	67	27	15.575	7879889
Benzene, 1-[(dimethoxymethyl)-1-ethyl]-4-methoxycarbonyl-1-ethyl-	68	16	15.618	5974178
Tris(tert-butyldimethylsilyl) borate	69	90	15.749	1002324655
4-(4-Methoxyphenyl)butyric acid, TMS	70	32	16.119	5880831
4-Dimethyl(trimethylsilyl)silyloxytridecane	71	35	16.392	2496365
Bis(dimethyl-t-butylsilyl) succinate	72	80	16.468	12345284
Pentanedioic acid, bis(tert-butyldimethylsilyl) ester	73	47	16.566	4629556
2-Isopropyl-6-methylaniline	74	14	17.057	1125817
Pentanedioic acid, 3-methyl-, bis(tert-butyldimethylsilyl) ester	75	32	17.264	1091558
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	76	22	17.329	1148192
Propionic acid, 3-amino-3-(4-ethylphenyl)-, methyl ester	77	22	17.405	1395640
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	78	60	17.492	5134507
Propanedioic acid, dimethyl-, bis(trimethylsilyl) ester	79	43	17.547	6738887
Bromazepam	80	59	17.612	4065267
Benzoic acid, 4-(indan-5-yloxycarbonylamino)-, ethyl ester	81	18	17.754	1078684
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	82	27	17.928	1734792
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	83	86	18.212	16218357
Propanehydrazide, N2-(2-methylcyclohexylidene)-2-(3-methylphenylamino)-	84	14	18.266	1405007
Tris(tert-butyldimethylsilyl)sulfamate	85	60	18.342	4831371
Bis(dimethyl-t-butylsilyl) adipate	86	47	18.593	4979622
(4-Methylsulfanylphenyl)carbamic acid, 2-(ethylphenylamino)ethyl ester	87	16	18.854	1546306
3-Dimethylamino-3-phenylpropionitrile	88	10	18.931	1259353
2-Dodecenedioic acid, bis(tert-butyldimethylsilyl) ester, (Z)-	89	42	19.072	3110071
4-(Dimethylamino)phenethyl alcohol	90	18	19.563	1034444
Quinoline-5-sulfonic acid, 8-methoxy-, (2,4,6-trimethylphenyl)amide	91	11	19.628	4350447
Benzenemethanamine, N,N,.alpha.-trimethyl-	92	14	19.999	2219826
1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	93	93	20.249	21809447
Phosphine oxide, diisopropyl-t-butyl-	94	23	20.500	1319545
Nonanedioic acid, bis(tert-butyldimethylsilyl) ester	95	47	21.415	2350674
Hexadecanoic acid, tert-butyldimethylsilyl ester	96	42	21.535	1340448
9,12-Octadecadienoic acid, tert-butyldimethylsilyl ester, (Z,Z)-	97	64	21.622	9661614

Run 3

Phosphorocyanidothioic difluoride	1	37	2.902	397409500
2-Methylcyclohexyl isopropylphosphonofluoridate	2	36	3.088	678334546
Toluene	3	91	3.338	95457537
Silane, chloro(1,1-dimethylethyl)dimethyl-	4	91	3.654	2672369092
Silane, chloro(1,1-dimethylethyl)dimethyl-	5	60	4.036	182668076
tert-Butyldimethylsilyl formate	6	45	4.678	167076765
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	7	43	4.907	73973763
2-Propen-1-ol, 3-(trimethylsilyl)-	8	28	5.082	49821970
tert-Butyldimethylsilyl acetate	9	74	5.528	151656907
tert-Butyldimethylsilyl trifluroromethanesulfonate	10	50	6.193	4903521
Benzenesulfonamide, N-(3-chloropropyl)-	11	37	6.389	1065995798 4
2-Allylphenol	12	50	6.978	72124160
N-(2-Chloroethyl)-N-ethylaniline	13	42	7.065	88992499
2-Thiazolamine, 5-chloro-	14	12	7.272	25385880
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-N'-phenyl-	15	35	7.359	47758735
1H-Inden-1-ol, 2,3-dihydro-	16	50	7.588	80989963
4-Methyl-benzofurazan	17	23	7.686	12484792
Benzenesulfonamide, N-(3-chloropropyl)-	18	32	7.729	5569776
Benzenesulfonamide, N-(3-chloropropyl)-	19	32	7.882	14832091
Benzenesulfonamide, N-(3-chloropropyl)-	20	32	8.078	4121393
Benzenesulfonamide, N-(3-chloropropyl)-	21	32	8.329	511697
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	22	93	8.536	2872016257
2-(4-Dimethylaminobenzyl)indan-1-ol	23	27	8.775	11565956
N-(2-Chloroethyl)-N-ethylaniline	24	32	9.059	5290092
Benzene, 2,4-dimethyl-1-nitro-	25	43	9.146	2692739
N-(2-Chloroethyl)-N-ethylaniline	26	25	9.211	3106788
N,N-Dibutylbenzenesulphonamide	27	14	9.342	3062771
Benzenesulfonamide, N-(3-chloropropyl)-	28	25	9.386	7049287
Bis(tert-butyldimethylsilyl)amine	29	62	9.822	3874909882

Bis(tert-butyldimethylsilyl)amine	30	35	9.985	15553374
3-(1-Cyclopentenyl)furan	31	38	10.410	3304451
2-Methoxythiobenzamide	32	27	10.889	4287155
5-Phenoxymethyl-N-phenyl-2-thiazolin-2-amine	33	38	10.944	47456169
3-(1-Cyclopentenyl)furan	34	22	11.096	7929805
Benzene, (1-methoxyethenyl)-	35	27	11.434	3613686
3-(1-Cyclopentenyl)furan	36	38	11.467	2389666
Levulinic acid, tert-butyldimethylsilyl ester	37	50	11.663	15937144
Benzene, (1-methoxyethenyl)-	38	38	11.750	2884298
Propanoic acid, 2-methyl-3-[(trimethylsilyl)oxy]-, trimethylsilyl ester	39	78	11.914	46053118
Decanedioic acid, diethyl ester	40	47	11.946	13851091
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	41	62	12.121	124801031
N-(Chroman-7-yl)-N-methylacetamide	42	45	12.317	208917175
3-(1-Cyclopentenyl)furan	43	22	12.600	1690320
1,3-Benzenediamine, 4-(1-piperidinyl)-	44	22	12.938	7786406
Benzo[b]thiophene	45	22	13.134	2366433
Bis(tert-butyldimethylsilyl) sulfite	46	74	13.406	220006755
(R)-(+)-N,N-Dimethyl-1-phenethylamine	47	22	13.505	732626
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	48	70	13.559	8474469
7-Methoxy-2-tetralone	49	22	13.668	2417544
4-(4-Methoxyphenyl)butyric acid, TMS	50	38	13.755	3730639
N,N'-Bis(tert-butyldimethylsilyl)acetamidine	51	92	13.908	5868049
Naphtho[1,2-b]thiophene	52	25	13.984	5082325
Bis(dimethyl-t-butylsilyl) oxalate	53	83	14.071	30285342
L-.beta.-Homoproline, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	54	35	14.202	8350841
4-(4-Methoxyphenyl)butyric acid, TMS	55	32	14.344	3095420
Sulfuric acid, bis(tert-butyldimethylsilyl ester	56	91	14.518	1149182506
1H-1,2,3,4-Tetrazole-1,5-diamine, N(1)-[[4-(dimethylamino)phenyl]methyl]-	57	22	14.627	5354786
4-Tosyl-(4-fluorphenyl)-methylisonitrile	58	22	14.921	5741649
1-Phenyl-2-acetoxy-prop-1-en	59	18	15.237	10119337
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	60	27	15.411	6885027

Thiazole, 2-methyl-4-phenyl-	61	18	15.499	6615686
Arachidonic acid, trimethylsilyl ester	62	22	15.564	5374361
4-t-Butylbenzeneamine	63	25	15.618	4304809
Tris(tert-butyldimethylsilyl) borate	64	90	15.749	1003426200
4-(4-Methoxyphenyl)butyric acid, TMS	65	27	16.120	5856427
L-.beta.-Homoproline, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	66	27	16.392	2490019
Bis(dimethyl-t-butylsilyl) succinate	67	60	16.468	11370404
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	68	45	16.566	4825106
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	69	22	17.057	1326058
Propane, 1,3-bis(p-nitrophenoxy)-	70	27	17.264	839936
Cyclohexanol, 2-[2-pyridyl]-	71	30	17.329	975610
Propionic acid, 3-amino-3-(4-ethylphenyl)-, methyl ester	72	27	17.405	1395360
Octanedioic acid, bis(trimethylsilyl) ester	73	43	17.493	4549207
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	74	38	17.547	6088288
Bromazepam	75	53	17.612	3533085
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	76	97	18.201	15882174
5,6,7,8-Tetrahydroquinoxaline	77	22	18.266	1097417
Tris(tert-butyldimethylsilyl)sulfamate	78	55	18.343	4542177
Bromazepam	79	90	18.593	4315358
N-[2-[N-Aziridyl]ethyl]-p-dimethylaminobenzylamine	80	14	18.920	1815507
,2-Dimethyl-5-(4-oxo-5,6,7,8-tetrahydro-4H-thiazolo[5,4-c]azepin-2-yloxy)-1H-indole-3-carboxylic acid, ethyl ester	81	30	19.073	2997379
4-(4-Chlorophenylamino)pyrido[3,2-c]pyridazine	82	12	19.628	4813292
2-Isopropyl-6-methylaniline	83	18	19.977	3679202
1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	84	91	20.238	20056743
Benzoic acid, 4-(indan-5-yloxycarbonylamino)-, ethyl ester	85	25	20.500	1168763
Nonanedioic acid, bis(tert-butyldimethylsilyl) ester	86	38	21.404	2405562
Hexadecanoic acid, tert-butyldimethylsilyl ester	87	22	21.535	1247159
Silane, diphenyldecyloxy(2-methoxyethoxy)-	88	47	21.611	5918175

MET11791/1/2

Run 1

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Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	2.924	1295907438
Toluene	2	91	3.349	78611056
Silane, chloro(1,1-dimethylethyl)dimethyl-	3	64	3.480	3212693
tert-Butyldimethylsilanol	4	74	3.687	1546018425
tert-Butyldimethylsilanol	5	72	3.796	1428853936
tert-Butyldimethylsilanol	6	72	4.003	5442240
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	7	25	4.668	20224459
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	8	35	4.820	312691067
2-Dimethylisopropylsilyloxyoct-3-ene	9	25	5.071	8718931
Silanol, trimethyl-, acetate	10	56	5.496	6056360
3-Methyl-1-dimethyl(isopropyl)silyloxybutane	11	37	5.692	2541974
Octanoic acid, 6,6-dimethoxy-, methyl ester	12	28	5.768	5202927
Butanoic acid, 2-oxo-, trimethylsilyl ester	13	40	6.182	3302793
Benzenesulfonamide, N-(3-chloropropyl)-	14	43	6.389	6867759410
1-Aminocyclopentanecarboxylic acid	15	10	6.988	65758884
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-N'-phenyl-	16	25	7.108	16078037
1,4-Benzenedicarboxaldehyde	17	22	7.174	36149095
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-N'-phenyl-	18	32	7.304	28912381
3-Ethylthiolane	19	38	7.631	48718547
(.+/-.)-2-Phenylbutyric acid, tert-butyldimethylsilyl ester	20	27	7.838	21420050
Silanol, trimethyl-, acetate	21	35	8.405	24997152
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	22	96	8.492	1319865022
Disiloxane, pentamethyl-	23	58	8.579	24090816
Isophthalaldehyde	24	25	8.765	11591223
Neopentyl alcohol, tert-butyldimethylsilyl ether	25	17	9.102	11163886
Bis(tert-butyldimethylsilyl)amine	26	38	9.691	20676180
Bis(tert-butyldimethylsilyl)amine	27	97	9.767	500277892
Silanol, trimethyl-, propanoate	28	38	10.933	1927915
Trisiloxane, octamethyl-	29	22	11.086	2491118
Propanedioic acid, bis(trimethylsilyl) ester	30	83	11.914	55463932

Propanedioic acid, bis(trimethylsilyl) ester	31	50	12.121	23123866
N-(Chroman-7-yl)-N-methylacetamide	32	45	12.306	38645224
Bis(tert-butyldimethylsilyl) sulfite	33	74	13.406	56313270
1-Methyl-2-pentamethyldisilanyloxycyclohexane	34	45	13.570	5628805
tert-Butyldimethylsilanol	35	37	13.755	6472691
tert-Butyldimethylsilanol	36	53	13.951	3232277
1-Butanol, 3-t-butyldimethylsilyloxy-	37	50	14.071	5509558
Silane, (1,1-dimethylethyl)dimethyl-	38	50	14.202	7244703
tert-Butyldimethylsilanol	39	64	14.921	10435298
tert-Butyldimethylsilanol	40	64	15.270	33403513
Neopentyl alcohol, tert-butyldimethylsilyl ether	41	53	15.390	18011030
Tris(tert-butyldimethylsilyl) borate	42	87	15.749	694370784
Silane, trimethyl(2-methylpropoxy)-	43	27	16.468	904681
Silane, trimethyl(2-methylpropoxy)-	44	10	17.547	951960
Phosphoric acid, tris(tert-butylphenyl)-	45	93	18.201	2972434
trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	46	55	19.073	3684190
Cyclic octaatomic sulfur	47	93	19.639	6188397

Run 2

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Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.913	1474039209
Toluene	2	91	3.316	69161809
Silane, chloro(1,1-dimethylethyl)dimethyl-	3	64	3.480	3048088
tert-Butyldimethylsilanol	4	72	3.687	1477156564
tert-Butyldimethylsilanol	5	72	3.785	1416567562
tert-Butyldimethylsilanol	6	72	4.003	16371597
tert-Butyldimethylsilanol	7	38	4.667	13192707
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	8	35	4.820	253343024
tert-Butyldimethylsilanol	9	32	5.071	6292430
Silanol, trimethyl-, acetate	10	78	5.495	3641885
Butanoic acid, 3-methyl-2-oxo-, trimethylsilyl ester	11	12	6.182	2680725
Benzenesulfonamide, N-(3-chloropropyl)-	12	43	6.400	6885886591

1,4-Benzenedicarboxaldehyde	13	16	6.999	35142523
Trimethylsilyl 2,2,3,3,3-pentafluoropropanoate	14	10	7.043	40591590
Cis-1-(2-furyl)-2-phenylcyclopropane	15	27	7.184	24561207
Acetohydrazide, 2-(3,5-dimethylphenoxy)-N2-benzylideno-	16	25	7.293	32502290
Thiophene, 2-(cyclopentylthio)-	17	47	7.631	26084700
Tris(trimethylsilyl)borate	18	14	7.838	5408121
Silane, (1,1-dimethylethyl)dimethyl-	19	35	8.394	14135580
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	20	96	8.492	1283318476
Disiloxane, pentamethyl-	21	53	8.568	16077174
4-Pentamethyldisilyloxyhexadecane	22	27	8.764	1826665
Isophthalaldehyde	23	25	9.113	2617361
Isophthalaldehyde	24	14	9.407	2863260
Bis(tert-butyldimethylsilyl)amine	25	38	9.701	12518833
Bis(tert-butyldimethylsilyl)amine	26	97	9.767	465193118
4-Hexenoic acid, 4-methyl-6-(fluorodimethylsilyl)-6-trimethylsilyl-	27	25	10.933	1429364
(.+/-.)-2-Phenylbutyric acid, tert-butyldimethylsilyl ester	28	50	11.085	2112224
Butanoic acid, 4-[(trimethylsilyl)oxy]-, trimethylsilyl ester	29	83	11.913	53559218
2-Hydroxycyclohexane-1-carboxylic acid, bis(trimethylsilyl) deriv.	30	59	12.120	23053912
N-(Chroman-7-yl)-N-methylacetamide	31	45	12.306	34402661
Bis(tert-butyldimethylsilyl) sulfite	32	90	13.406	54147531
1-Ethyl-2-pentamethyldisilanyoxycyclohexane	33	38	13.570	4670422
Hexathiane	34	64	13.755	8054183
2-Pentamethyldisilanyloxypentane	35	36	14.071	3685232
1-Methyl-2-pentamethyldisilanyloxycyclohexane	36	45	14.202	7192496
Geranylgeraniol, tert-butyldimethylsilyl ether	37	38	14.921	6149787
tert-Butyldimethylsilanol	38	43	15.073	9768764
Geranylgeraniol, tert-butyldimethylsilyl ether	39	50	15.270	19294677
(1,1-Dioxido-2,3-dihydro-3-thienyl)acetic acid tms	40	43	15.389	24874375
Tris(tert-butyldimethylsilyl) borate	41	90	15.749	838832724
1-Ethyl-2-pentamethyldisilanyoxycyclohexane	42	45	16.468	1013725
2-Pentamethyldisilanyloxybutane	43	42	17.547	836727
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	44	81	18.201	2618672

trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	45	87	19.072	3327311
Cyclic octaatomic sulfur	46	95	19.639	6704002
Run 3				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	2.924	-428561851
Acetamide, 2,2,2-trifluoro-N-methyl-	2	43	3.120	2841509
Toluene	3	91	3.349	69160786
Silane, chloro(1,1-dimethylethyl)dimethyl-	4	58	3.480	2834467
tert-Butyldimethylsilanol	5	87	3.687	1443030819
tert-Butyldimethylsilanol	6	64	3.785	1443545767
tert-Butyldimethylsilanol	7	72	4.003	22363635
4-Dimethyl(isopropyl)silyloxytetradecane	8	47	4.668	9822704
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	9	53	4.820	150760068
tert-Butyldimethylsilanol	10	32	5.071	5835212
Silanol, trimethyl-, acetate	11	72	5.496	5478178
Silanol, dimethyl(1,1,2-trimethylpropyl)-	12	43	5.692	2478598
Benzenesulfonamide, N-(3-chloropropyl)-	13	43	6.400	6959356432
Propionic acid, 3-amino-3-(4-ethylphenyl)-, methyl ester	14	10	6.989	26940831
3-Methoxyphenylpropionic acid, TMS	15	10	7.032	19440105
N,N-Diethylaniline	16	16	7.087	24463272
Cis-1-(2-furyl)-2-phenylcyclopropane	17	27	7.185	20443024
Acetohydrazide, 2-(3,5-dimethylphenoxy)-N2-benzylideno-	18	25	7.294	45487038
Thiophene, 2-(cyclopentylthio)-	19	47	7.631	40914989
Tris(trimethylsilyl)borate	20	14	7.838	21312677
(.+/-.)-3,4-Methylenedioxyamphetamine	21	35	8.394	20219969
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	22	96	8.492	1323405649
Disiloxane, pentamethyl-	23	59	8.569	19268470
2,2-Dimethyl-1-pentamethyldisilanyloxypropane	24	27	8.765	3302674
Benzene, (1-methoxyethenyl)-	25	14	9.113	1979952
Propionic acid, 3-amino-3-(4-ethylphenyl)-, methyl ester	26	14	9.408	2108251
Bis(tert-butyldimethylsilyl)amine	27	42	9.691	15255956
Bis(tert-butyldimethylsilyl)amine	28	97	9.767	465595283

Arachidonic acid, trimethylsilyl ester	29	35	10.933	1321273
(.+/-.)-2-Phenylbutyric acid, tert-butyldimethylsilyl ester	30	53	11.086	2151580
Bis(tert-butyldimethylsilyl) carbonate	31	91	11.903	52940550
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	32	59	12.121	23027116
N-(Chroman-7-yl)-N-methylacetamide	33	45	12.306	34201397
Bis(tert-butyldimethylsilyl) sulfite	34	91	13.406	50148419
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	35	60	13.559	3156117
Hexathiane	36	64	13.755	2827272
2-Pentamethyldisilanyloxypentane	37	40	14.071	823100
1-Pentamethyldisilyloxycyclohexane	38	50	14.202	2408973
Acetate, 2-[(acetyloxy)methyl]-4,4-dimethoxybutyl ester	39	43	15.270	7940638
Bis(dimethyl-t-butylsilyl) maleate	40	47	15.390	15226692
Tris(tert-butyldimethylsilyl) borate	41	90	15.749	879875288
1-Ethyl-2-pentamethyldisilanyoxycyclohexane	42	40	16.468	957037
3-Dimethyl(trimethylsilyl)silyloxytridecane	43	50	17.547	811235
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	44	87	18.201	2897370
Morphin, 6-acetyl-3-O-trimethylsilyl-	45	38	19.073	3740249
Cyclic octaatomic sulfur	46	95	19.639	7428449

MET11791/3/2

Run 1

Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.957	-54087944
Acetamide, 2,2,2-trifluoro-N-methyl-	2	78	3.109	-25531691
tert-Butyldimethylsilanol	3	83	3.556	15922410
tert-Butyldimethylsilanol	4	50	3.611	18968376
tert-Butyldimethylsilanol	5	78	3.720	972206872
tert-Butyldimethylsilanol	6	72	3.828	1947330489
tert-Butyldimethylsilanol	7	86	3.970	16830986
tert-Butyldimethylsilanol	8	46	4.580	2628268
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	9	35	4.798	221389934
tert-Butyldimethylsilyl acetate	10	83	5.496	5494518
Acetamide, 2,2,2-trifluoro-N-methyl-	11	52	5.692	4865351

Cyclotetrasiloxane, octamethyl-	12	47	6.378	2554366
1-Propene, 1,3-dichloro-	13	25	7.283	2786482
tert-Butyldimethylsilanol	14	23	7.610	1084409
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	15	90	8.481	934530508
Butyl 2-(tert-butyldimethylsilyloxy)acetate	16	53	8.568	4195298
1-Dichloromethyl(dimethyl)silyloxypentane	17	64	9.190	2036867
Benzene, 1-[(dimethoxymethyl)-1-methyl-	18	43	9.364	3228691
tert-Butyldimethylsilanol	19	49	9.963	1999113
tert-Butyldimethylsilanol	20	47	11.085	666725
N-(7-Methylbenzo(b)thien-3-yl)acetamide	21	45	12.306	42562948
Lactic acid ditbdms	22	68	13.363	27908325
(1-Ethylvinyloxy)trimethylsilane	23	40	13.570	337354
2-Pentamethyldisilanyloxybutane	24	59	14.191	3798829
Tris(tert-butyldimethylsilyl) borate	25	81	15.738	451479528
Heneicosanoic acid, tert-butyldimethylsilyl ester	26	83	18.201	3199497
Ethanethioamide	27	9	19.639	2023284
Run 2				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.957	-95339200
Acetamide, 2,2,2-trifluoro-N-methyl-	2	91	3.109	-17194754
tert-Butyldimethylsilanol	3	86	3.556	7644588
tert-Butyldimethylsilanol	4	83	3.719	936737912
tert-Butyldimethylsilanol	5	72	3.828	1933369172
tert-Butyldimethylsilanol	6	91	3.970	21008915
tert-Butyldimethylsilanol	7	86	4.602	4466276
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	8	35	4.798	180071226
2-Dichloromethyl(dimethyl)silyloxypropane	9	78	5.495	4901325
Acetamide, 2,2,2-trifluoro-N-methyl-	10	43	5.692	4268176
Cyclotetrasiloxane, octamethyl-	11	60	6.378	2782524
2-Ethylcyclohexanol, tert-butyldimethylsilyl ether	12	27	7.282	2568529
tert-Butyldimethylsilanol	13	38	7.609	763242
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	90	8.481	916654184

Butyl 2-(tert-butyldimethylsilyloxy)acetate	15	53	8.568	4102291
1-Dichloromethyl(dimethyl)silyloxypentane	16	50	9.189	2524350
4-Methyl-1-dimethyl(isopropyl)silyloxypentane	17	43	9.364	1836674
tert-Butyldimethylsilanol	18	38	9.407	2152052
Silanol, trimethyl-, propanoate	19	10	9.963	616219
tert-Butyldimethylsilanol	20	43	11.085	1085371
N-(7-Methylbenzo(b)thien-3-yl)acetamide	21	45	12.306	39194391
Lactic acid ditbdms	22	76	13.363	26720670
2-Pentamethyldisilanyloxypentane	23	42	13.570	2649739
1-Pyrrol[tert-butyl(dimethyl)silyl]oxymorphopropan-2-ol	24	40	14.191	2261752
Tris(tert-butyldimethylsilyl) borate	25	81	15.738	575342325
Heneicosanoic acid, tert-butyldimethylsilyl ester	26	74	18.201	3300607
Cyclic octaatomic sulfur	27	62	19.639	1909175
Run 3				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.957	-82776776
Acetamide, 2,2,2-trifluoro-N-methyl-	2	91	3.109	-7664021
tert-Butyldimethylsilanol	3	90	3.556	5686926
tert-Butyldimethylsilanol	4	83	3.719	897564615
tert-Butyldimethylsilanol	5	72	3.828	1939362016
tert-Butyldimethylsilanol	6	90	3.970	26536084
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	7	53	4.798	-61282786
Silanol, trimethyl-, acetate	8	78	5.496	4550713
Acetamide, 2,2,2-trifluoro-N-methyl-	9	50	5.692	3785483
Cyclotetrasiloxane, octamethyl-	10	53	6.378	2591378
Trichloroacetic acid, 3-chloroprop-2-enyl ester	11	23	7.283	2482963
9,12-Octadecadiynoic acid, trimethylsilyl ester	12	23	7.609	858887
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	13	90	8.481	895029232
Butyl 2-(tert-butyldimethylsilyloxy)acetate	14	53	8.568	4008648
3-Methyl-1-dichloromethyl(dimethyl)silyloxybutane	15	50	9.189	1753894
Benzenepropanoic acid, tert-butyldimethylsilyl ester	16	25	9.407	4691596
3-(Methylthio)-2-butanone	17	9	9.963	1109384

Benzenebutanoic acid, tert-butyldimethylsilyl ester	18	25	11.085	790673
N-(Chroman-7-yl)-N-methylacetamide	19	45	12.306	38312437
Lactic acid ditbdms	20	70	13.363	25232383
1-Methyl-2-pentamethyldisilanyloxycyclohexane	21	45	13.570	2322878
2-Pentamethyldisilanyloxybutane	22	38	14.191	2428023
2-Methylbutanoic acid, 3-(t-butyldimethylsilyloxy)-	23	38	15.291	14368488
Tris(tert-butyldimethylsilyl) borate	24	83	15.738	587768735
Phosphoric acid, tris(tert-butyldimethylsilyl)) ester	25	50	18.201	3533833
Cyclic octaatomic sulfur	26	70	19.639	2230061

Procedural Blank

Run 1

Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.935	-31787548
Toluene	2	93	3.349	14790969
tert-Butyldimethylsilanol	3	59	3.698	4476380397
D-(+)-Xylose, tetramethyl ether	4	45	4.330	12080782
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	5	43	6.389	1511962442 1
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	6	27	7.054	33095457
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	7	22	7.119	79288273
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	8	12	7.326	38658909
Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	9	38	7.402	70605578
Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	10	38	7.893	33437854
N-Ethyl-2,3-xylidine	11	38	8.427	7835953
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	12	72	8.536	541335966
Disiloxane, pentamethyl-	13	53	8.612	20244805
Bis(tert-butyldimethylsilyl) carbonate	14	91	11.913	26722770
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	15	30	12.131	2226959
1,3,4,6-Hexanetetrone, 1,6-diphenyl-	16	38	17.558	2654431
L-Cysteine, N,S-bis(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	17	94	20.881	4943382
1-(4-Hexyl-phenyl)-3-(4-nitro-phenyl)-propenone	18	40	21.633	2427655

Run 2

Acetamide, 2,2,2-trifluoro-N-methyl-	1	38	2.946	-8052703
Toluene	2	90	3.349	11700244
tert-Butyldimethylsilanol	3	64	3.698	4762806369
Butanoic acid, 2,3-dimethyl-, methyl ester	4	9	4.330	13007412
tert-Butyldimethylsilanol	5	25	4.765	4350655
7-Dimethyl(trimethylsilyl)silyloxytetradecane	6	47	4.940	7383251
tert-Butyldimethylsilyl acetate	7	39	5.506	3936094
1,4-Benzenedicarboxaldehyde	8	22	6.389	1556002870 6
N,N-Diethylaniline	9	40	7.119	38031276
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	10	38	7.195	54676875
2-Thiazolamine, 5-chloro-	11	12	7.304	37426128
Acetohydrazide, 2-(3,5-dimethylphenoxy)-N2-benzylideno-	12	27	7.402	82447905
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	13	25	7.762	30059011
Trisiloxane, octamethyl-	14	22	7.893	34653509
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	15	38	8.100	31463675
N-Ethyl-2,3-xylidine	16	50	8.427	10574653
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	17	90	8.536	546537716
Disiloxane, pentamethyl-	18	42	8.612	23543653
2-(4-Dimethylaminobenzyl)indan-1-ol	19	25	8.786	5715884
Benzene, (1-methoxyethenyl)-	20	27	9.778	1595738
Propanenitrile, 3-(ethylphenylamino)-	21	25	11.096	1413018
Bis(tert-butyldimethylsilyl) carbonate	22	91	11.913	30609187
tert-Butylpentamethyldisiloxane	23	43	12.120	3065170
Bis(tert-butyldimethylsilyl) sulfite	24	35	13.406	1532308
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	25	43	17.547	2630442
L-Cysteine, N,S-bis(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	26	94	20.881	6353941
9,12-Octadecadienoic acid, tert-butyldimethylsilyl ester, (Z,Z)-	27	42	21.633	1457068

Run 3

Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	3.000	128629536

tert-Butyldimethylsilanol	2	53	3.698	4867862334
D-(+)-Xylose, tetramethyl ether	3	59	4.330	12395626
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	4	43	6.411	11865040484
tert-Butyldimethylfluorosilane	5	47	6.792	4974856946
Acetohydrazide, 2-(3,5-dimethylphenoxy)-N2-benzylideno-	6	30	7.402	25235114
Trimethylsilyl 2,2,3,3,3-pentafluoropropanoate	7	32	7.904	4915103
N-Ethyl-2,3-xylidine	8	53	8.427	1972748
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	9	96	8.536	374607717
Disiloxane, pentamethyl-	10	59	8.612	14275554
Bis(tert-butyldimethylsilyl) carbonate	11	91	11.914	23744798
N,O-Bis(tert-butyldimethylsilyl)carbamate	12	38	12.131	2665881
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	13	38	17.547	2089711
L-Cysteine, N,S-bis(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	14	94	20.870	5305580

Table A22. GC-MS results of the 0.5 mL MTBSTFA derivatized hot water extraction of the remaining AZ-PT1/1, MET11791/1/2, and MET11791/3/2 residues following their DCM extraction, along with a procedural blank of the reaction of L-Cysteine with MTBSTFA and TBDMCS. Triplet analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT1/1				
Run 1				
Silane, chloro(1,1-dimethylethyl)dimethyl-	1	96	3.687	11392506696
2H-Pyran-2-one, 4-hydroxy-6-methyl-	2	32	3.807	1006699328
2H-Pyran-2-one, 4-hydroxy-6-methyl-	3	25	3.839	2103976986
Methyl trifluoroacetate	4	28	3.948	787724066
3-Pentenoic acid, 4-methyl-, methyl ester	5	47	4.003	2886439591
Methyl isovalerate	6	5	4.362	7974015
tert-Butyldimethylsilanol	7	7	4.493	9444653

Silane, bromo(1,1-dimethylethyl)dimethyl-	8	42	4.689	4731931
tert-Butyldimethylsilyl formate	9	64	4.798	129819270
Glutaric acid, 3-heptyl hexyl ester	10	9	5.103	14243250
9,12-Octadecadiynoic acid, trimethylsilyl ester	11	59	5.212	10541039
tert-Butyldimethylsilyl acetate	12	83	5.561	48598732
Silanol, trimethyl-, acetate	13	64	5.648	144712731
Acetamide, 2,2,2-trifluoro-N-(trimethylsilyl)-	14	64	5.877	39551051
tert-Butyldimethylsilyl trifluoromethanesulfonate	15	58	6.106	697011207
N,N-Dibutylbenzenesulphonamide	16	43	6.422	5924478646
N-(2-Chloroethyl)-N-ethylaniline	17	35	6.781	33282876
N,N-Dibutylbenzenesulphonamide	18	17	6.988	21266183
N,N-Dibutylbenzenesulphonamide	19	17	7.130	9111891
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	20	35	7.217	39508559
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	21	38	7.337	10730702
1H-Indol-3-ol-, acetate	22	37	7.446	95353963
2-Thiophenethiol	23	27	7.588	18910434
4-Methyl-benzofurazan	24	17	7.751	5417860
Pyrazon	25	22	7.893	5004057
2,3-Dihydro-2-acetoxy-2,5-dimethyl-3,6-diphenyl-1,4-dioxin	26	23	8.198	2178980
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	27	96	8.263	90999582
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	28	94	8.329	272885337
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	29	83	8.492	8188656334
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	30	94	8.852	26486900
N-Phenyl-N'-(2-piperazin-1-yl-ethyl)-oxalamide	31	23	8.928	63607868
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	32	86	9.102	46577809
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	33	93	9.200	24018970
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	34	50	9.375	18230941
Bis(tert-butyldimethylsilyl)amine	35	97	9.505	47754036
Bis(tert-butyldimethylsilyl)amine	36	96	9.582	75669862
Bis(tert-butyldimethylsilyl)amine	37	62	9.810	3232367995
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	38	46	9.985	25780830
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	39	91	10.203	11492641

Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	40	42	10.399	11632978
Ethanimidic acid, N-(trimethylsilyl)-, trimethylsilyl ester	41	43	10.660	9433244
4-Pyrimidinecarboxaldehyde, 2,6-bis[(trimethylsilyl)oxy]-	42	43	10.715	34452451
5-Phenoxymethyl-N-phenyl-2-thiazolin-2-amine	43	27	10.911	34547462
Tris(trimethylsilyl)borate	44	64	11.085	13523815
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	45	53	11.227	3583363
4-Methylvaleric acid, tert-butyldimethylsilyl ester	46	43	11.663	8450773
2-Butenoic acid, 2-[(trimethylsilyl)oxy]-, trimethylsilyl ester	47	59	11.783	42762655
Bis(tert-butyldimethylsilyl) carbonate	48	87	11.903	197710860
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	49	50	12.110	1816151
4-Acetamido-2-methallylphenol	50	64	12.306	122350877
Silanol, trimethyl-, carbonate (2:1)	51	37	12.927	2847565
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	52	78	13.559	-142682484
1-Pentamethyldisilyloxycyclohexane	53	50	13.657	888614
Thiophene, 2,2'-(1,2-ethenediyl)bis-, (E)-	54	32	13.733	3218266
7-Dimethyl(trimethylsilyl)silyloxytetradecane	55	50	13.984	14509639
Bis(dimethyl-t-butylsilyl) oxalate	56	91	14.071	23846271
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	57	91	14.223	387504288
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	58	91	14.322	434770324
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	59	91	14.529	2796181571
4-Pentamethyldisilyloxyhexadecane	60	53	15.389	1790488
4-Pentamethyldisilyloxyhexadecane	61	59	15.618	1344625
3,4-Dimethyl-1-pentamethyldisilyloxycyclohexane	62	50	15.880	3872194
Dimethylglyoxime, di(tert-butyldimethylsilyl) ether	63	53	16.141	11527874
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	64	55	16.305	5669543
tert-butyl(dimethyl)silyl-2-{[tert-butyl(dimethyl)silyl]oxy}pent-2-enoate	65	50	16.381	7436057
Bis(dimethyl-t-butylsilyl) succinate	66	62	16.468	6845001
Bis-N,N-(trimethylsilyl)formamide	67	49	16.566	3280533
4-Pentamethyldisilyloxyhexadecane	68	53	17.046	1555487
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	69	78	17.492	5939530

2-Methyl-1,4-butanediol, bis(tert-butyldimethylsilyl) ether	70	53	17.536	2207715
3,4-Dimethyl-1-pentamethyldisilyloxycyclohexane	71	38	17.612	2394676
1-Pentamethyldisilyloxycyclopentane	72	50	17.754	3174596
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	73	70	17.928	4234800
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	74	98	18.201	11982551
9,10-Anthracenedione, 1-hydroxy-3,8-dimethyoxy-6-methyl-	75	47	18.517	2669401
Chroman-4-one, 6-fluoro-3-(1,2,3,4-tetrahydro-4-oxo-2-thioxo-6-pyrimidyl)iminomethyl-2,3-dehydro-	76	47	18.593	4946009
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	77	70	18.854	1756925
Benzenepropanoic acid, .beta.,.beta.,3,4-tetramethyl-	78	43	18.920	1049413
2-Dodecenedioic acid, bis(tert-butyldimethylsilyl) ester, (Z)-	79	42	19.072	1974144
Isoborneol, pentamethyldisilanyl ether	80	45	19.563	1925551
3-Ethyl-6-pentamethyldisilyloxyoctane	81	38	19.628	3065685
1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	82	81	20.238	3378495
Octanedioic acid, bis(tert-butyldimethylsilyl) ester	83	46	20.500	6935475
1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	84	72	21.110	2399688
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	85	42	21.295	1737153
3-((1-Amino-2-naphthyl)methylene)-2-benzofuran-1(3H)-one tms	86	59	21.415	39515365
Hexadecanoic acid, dimethyl(isopropyl)silyl ester	87	72	21.535	11168240
9,12-Octadecadienoic acid, tert-butyldimethylsilyl ester, (Z,Z)-	88	64	21.611	9584604
Decanedioic acid, bis(tert-butyldimethylsilyl) ester	89	46	22.428	1763985
Diethylene glycol dibenzoate	90	64	23.376	5719588
trans-Vaccenic acid, tert-butyldimethylsilyl ester	91	43	23.485	4627076
Octadecanoic acid, tert-butyldimethylsilyl ester	92	89	23.801	5229228
Docosanoic acid, tert-butyldimethylsilyl ester	93	58	32.889	3209639
Run 2				
Furan, 2,3-dihydro-3-(1-methylpropyl)-	1	9	3.371	4272790538
Methyl trifluoroacetate	2	23	3.436	1137663199
2H-Pyran-2-one, 4-hydroxy-6-methyl-	3	32	3.491	897513227
Silane, chloro(1,1-dimethylethyl)dimethyl-	4	70	3.687	6184328204
Methyl trifluoroacetate	5	23	3.861	1665765563

Methyl trifluoroacetate	6	23	3.916	1380797135
Methyl trifluoroacetate	7	23	3.981	1793428837
1-Pentyn-3-ol, 3-methyl-	8	10	4.046	895013268
tert-Butyldimethylsilylamine	9	7	4.352	9302433
Silane, bromo(1,1-dimethylethyl)dimethyl-	10	83	4.700	6462128
tert-Butyldimethylsilyl formate	11	78	4.798	52547030
tert-Butyldimethylsilyl formate	12	72	4.842	87911237
Thiazole, 5-methoxy-	13	17	5.103	14682160
9,12-Octadecadiynoic acid, trimethylsilyl ester	14	38	5.245	9624815
tert-Butyldimethylsilyl nitrile	15	52	5.343	7378247
tert-Butyldimethylsilyl acetate	16	83	5.561	40133319
tert-Butyldimethylsilyl acetate	17	83	5.648	167121405
Acetamide, 2,2,2-trifluoro-N-(trimethylsilyl)-	18	72	5.833	28195040
Acetamide, 2,2,2-trifluoro-N-(trimethylsilyl)-	19	59	5.899	16361490
tert-Butyldimethylsilyl trifluoromethanesulfonate	20	58	6.084	50037269
tert-Butyldimethylsilyl trifluoromethanesulfonate	21	47	6.171	108089249
N,N-Dibutylbenzenesulphonamide	22	43	6.400	5977994556
2-Pyridinepropanamide, N-phenyl-	23	14	6.672	34597327
Benzene, (1-methoxyethenyl)-	24	16	6.781	38181331
N,N-Dibutylbenzenesulphonamide	25	17	6.999	21301004
4-Methyl-benzofurazan	26	25	7.174	7960193
O,O'-(2,2'-Biphenylylene)thiophosphoric acid chloride	27	10	7.217	9836502
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	28	23	7.283	16793011
4-Ethylbenzoic acid, 2-bromo-4-fluorophenyl ester	29	25	7.392	51450145
4-Ethylbenzoic acid, 2-bromo-4-fluorophenyl ester	30	25	7.446	27800861
2-Thiophenethiol	31	27	7.610	12133354
2-Thiophenethiol	32	38	7.653	8760294
4-(4-Methoxyphenyl)butyric acid, TMS	33	27	7.751	2470691
Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	34	37	7.936	3720404
(.+/-.)-p-Methoxyamphetamine, N-trimethylsilyl-	35	25	8.176	6383515
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	36	96	8.242	148407039
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	37	96	8.318	86484683

Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	38	92	8.492	7863391648
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	39	95	8.841	50825179
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	40	95	8.939	42451595
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	41	97	9.004	16590477
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	42	95	9.059	12984772
2H-Pyran-2-one, 6-hexyltetrahydro-	43	9	9.124	60812110
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	44	95	9.211	27021134
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	45	91	9.397	32949168
Bis(tert-butyldimethylsilyl)amine	46	93	9.484	46010698
Bis(tert-butyldimethylsilyl)amine	47	53	9.593	29165330
Bis(tert-butyldimethylsilyl)amine	48	62	9.822	3160200760
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	49	43	9.996	20255271
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	50	64	10.203	10726524
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	51	55	10.410	12937881
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	52	70	10.606	5924193
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	53	50	10.671	5206537
Propanedioic acid, bis(trimethylsilyl) ester	54	50	10.726	9914977
Isoborneol, pentamethyldisilanyl ether	55	35	10.889	34655215
Tris(trimethylsilyl)borate	56	59	11.086	15167847
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	57	83	11.434	5754616
Levulinic acid, tert-butyldimethylsilyl ester	58	64	11.663	15456290
2-Butenoic acid, 2-[(trimethylsilyl)oxy]-, trimethylsilyl ester	59	59	11.761	37520208
Bis(tert-butyldimethylsilyl) carbonate	60	91	11.903	187086789
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	61	76	12.099	7246462
N-(Chroman-7-yl)-N-methylacetamide	62	45	12.306	110411513
2-Pentamethyldisilanyloxybutane	63	50	12.611	1183288
Silanol, trimethyl-, carbonate (2:1)	64	50	12.938	3076841
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	65	87	13.134	2406308
Bis(tert-butyldimethylsilyl) sulfite	66	74	13.406	276562123
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	67	80	13.559	10227489
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	68	55	13.657	1385685

Thianaphthene-3-acetic acid	69	43	13.744	3861319
Lactic acid, tert-butyldimethylsilyl ester	70	50	13.984	12028322
Bis(dimethyl-t-butylsilyl) oxalate	71	91	14.082	31975561
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	72	91	14.235	108387168
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	73	91	14.540	2883180802
7-Dimethyl(trimethylsilyl)silyloxytetradecane	74	53	14.921	3755238
4-Pentamethyldisilanyloxyoctane	75	53	15.313	3630979
Tris(tert-butyldimethylsilyl) borate	76	58	15.716	28674632
Dimethylglyoxime, di(tert-butyldimethylsilyl) ether	77	83	16.152	7932419
Dimethylglyoxime, di(tert-butyldimethylsilyl) ether	78	50	16.392	10209576
Bis(dimethyl-t-butylsilyl) succinate	79	78	16.468	11856301
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	80	52	16.566	3466233
2-Pentamethyldisilanyloxypentane	81	40	17.046	1173858
Bis-N,N-(trimethylsilyl)formamide	82	49	17.264	838075
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	83	83	17.493	14226695
1-Pentamethyldisilyloxycyclopentane	84	30	17.612	8886456
6-Ethyl-3-pentamethyldisilyloxydecane	85	53	17.754	1585627
Heneicosanoic acid, tert-butyldimethylsilyl ester	86	53	17.809	2497465
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	87	55	17.950	5066679
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	88	98	18.201	53611943
4-Pentamethyldisilanyloxyoctane	89	38	18.266	3405714
1-Pentamethyldisilyloxycyclopentane	90	50	18.517	1276022
Bis(dimethyl-t-butylsilyl) adipate	91	55	18.593	9420323
Isoborneol, pentamethyldisilanyl ether	92	58	18.713	1486592
4-Pentamethyldisilanyloxyoctane	93	64	18.844	2973378
3-Ethyl-6-pentamethyldisilyloxyoctane	94	43	19.073	1881369
5-Dimethyl(trimethylsilyl)silyloxytridecane	95	38	19.563	2369158
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	96	42	19.628	2479689
1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	97	94	20.238	14158821
Octanedioic acid, bis(tert-butyldimethylsilyl) ester	98	72	20.500	7514772
Tropic acid, tert-butyldimethylsilyl ether, tert-butyldimethylsilyl ester	99	53	21.110	873343
Nonanedioic acid, bis(tert-butyldimethylsilyl) ester	100	87	21.404	27955886

Hexadecanoic acid, dimethyl(isopropyl)silyl ester	101	64	21.535	4543082
Silane, diphenyldecyloxy(2-methoxyethoxy)-	102	64	21.611	8046520
3-Ethyl-6-pentamethyldisilyloxyoctane	103	38	22.429	1323219
Octadecanoic acid, dimethyl(isopropyl)silyl ester	104	59	23.802	2860491
Run 3				
3-Pentenoic acid, 4-methyl-, methyl ester	1	9	3.403	4779042288
Ditrifluoromethyl(chlorocarbonyloxy)amine	2	9	3.447	760409129
3-Pentenoic acid, 4-methyl-, methyl ester	3	9	3.480	632089610
Silane, chloro(1,1-dimethylethyl)dimethyl-	4	94	3.687	5721194399
Methyl trifluoroacetate	5	23	3.818	2941587038
3-Pentenoic acid, 4-methyl-, methyl ester	6	25	3.959	942172046
3-Pentenoic acid, 4-methyl-, methyl ester	7	25	4.003	3029480077
tert-Butyldimethylsilylamine	8	7	4.395	9224134
tert-Butyldimethylsilanol	9	7	4.482	8122697
Silane, bromo(1,1-dimethylethyl)dimethyl-	10	42	4.689	7521400
tert-Butyldimethylsilyl formate	11	56	4.809	142344164
Thiazole, 5-methoxy-	12	17	5.103	13641629
2,2-Dimethyl-1-dimethyl(dichloromethyl)silyloxypropane	13	25	5.234	9745920
tert-Butyldimethylsilyl nitrile	14	49	5.365	7335286
tert-Butyldimethylsilyl acetate	15	83	5.572	36643350
tert-Butyldimethylsilyl acetate	16	83	5.659	170075197
Acetamide, 2,2,2-trifluoro-N-(trimethylsilyl)-	17	56	5.866	46123267
tert-Butyldimethylsilyl trifluoromethanesulfonate	18	58	6.084	540940183
N,N-Dibutylbenzenesulphonamide	19	43	6.411	6578124267
Propanoic acid, t-butyldimethylsilyl ester	20	35	6.803	30085663
Propanoic acid, 3-amino-3-(4-ethylphenyl)-	21	14	7.010	19653458
4-Methyl-benzofurazan	22	23	7.152	13228083
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	23	27	7.250	29202653
3-Chloropropyl(chloromethyl)dichlorosilane	24	27	7.392	37285481
3-Chloropropyl(chloromethyl)dichlorosilane	25	35	7.468	62871396
Thiophene, 2-(cyclopentylthio)-	26	43	7.609	16369523

Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	27	38	7.784	4042396
Pyrazon	28	12	7.860	2898792
2-Thiazolamine, 5-chloro-	29	16	7.904	3869097
S(-)-Cathinone, N-trimethylsilyl-	30	23	8.165	7316791
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	31	96	8.231	124691389
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	32	93	8.372	295174007
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	33	91	8.492	7631279188
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	34	95	8.819	52011061
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	35	95	8.939	28470186
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	36	95	8.982	36267840
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	37	95	9.059	10578816
Hexanoic acid, 3-chloroprop-2-enyl ester	38	9	9.113	52483314
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	39	95	9.211	14514579
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	40	95	9.255	16867065
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	41	55	9.386	28544882
Bis(tert-butyldimethylsilyl)amine	42	94	9.462	33137819
Bis(tert-butyldimethylsilyl)amine	43	94	9.604	38471588
Bis(tert-butyldimethylsilyl)amine	44	60	9.647	28966055
Bis(tert-butyldimethylsilyl)amine	45	62	9.811	3133700241
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	46	89	9.985	24765298
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	47	45	10.399	13079175
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	48	64	10.584	6348534
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	49	60	10.682	5333239
1-Methyl-2-pentamethyldisilanyloxycyclohexane	50	37	10.737	9132668
Glyoxylic acid, di-TMS	51	43	10.791	12718978
Bis-N,N-(trimethylsilyl)formamide	52	30	10.889	34868837
Tris(trimethylsilyl)borate	53	58	11.085	15106206
2,2-Dimethyl-1-pentamethyldisilanyloxypropane	54	40	11.423	5390251
1-Dimethylthexylsilyloxyheptane	55	50	11.663	14286445
Bis(tert-butyldimethylsilyl) carbonate	56	59	11.739	25740862
Bis(tert-butyldimethylsilyl) carbonate	57	91	11.903	195868617
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	58	53	11.946	40518902

N-(Chroman-7-yl)-N-methylacetamide	59	42	12.306	120090329
Ethanimidic acid, N-(trimethylsilyl)-, trimethylsilyl ester	60	53	12.404	1590425
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	61	83	12.600	1246222
1-Methyl-2-pentamethyldisilanyloxycyclohexane	62	38	12.927	2418428
Ethanimidic acid, N-(trimethylsilyl)-, trimethylsilyl ester	63	53	13.134	1739121
Bis(tert-butyldimethylsilyl) sulfite	64	90	13.406	295907293
Acetic acid, [(tert-butyldimethylsilyl)oxy]-, tert-butyldimethylsilyl ester	65	80	13.559	11571461
4-Pentamethyldisilyloxyhexadecane	66	59	13.657	1711134
Ethanimidic acid, N-(trimethylsilyl)-, trimethylsilyl ester	67	43	13.744	3964468
2-Ethyl-1-Pentamethyldisilyloxyhexane	68	50	13.973	13989814
Bis(dimethyl-t-butylsilyl) oxalate	69	91	14.071	27632955
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	70	86	14.234	62563434
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	71	91	14.311	459359331
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	72	91	14.529	2618852663
2-Pentamethyldisilanyloxybutane	73	59	14.921	3899799
Isoborneol, pentamethyldisilanyl ether	74	53	15.313	4789510
Bis(dimethyl-t-butylsilyl) succinate	75	59	15.400	4918404
2-Pentamethyldisilanyloxypentane	76	53	15.618	7362240
Tris(tert-butyldimethylsilyl) borate	77	58	15.716	73769129
Isoborneol, pentamethyldisilanyl ether	78	49	15.945	2111483
1,3-Dimethyl-5-pentamethyldisilyloxycyclohexane	79	53	16.109	10479568
6-Ethyl-3-pentamethyldisilyloxydecane	80	59	16.218	2764724
tert-butyl(dimethyl)silyl 2-{[tert-butyl(dimethyl)silyl]oxy}-3-methylbut-2-enoate	81	49	16.381	11368027
Bis(dimethyl-t-butylsilyl) succinate	82	87	16.468	10131067
3-Dimethyl(trimethylsilyl)silyloxytetradecane	83	53	16.566	3635614
2-Methyl-1-pentamethyldisilyloxypropane	84	50	17.046	1151443
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	85	83	17.492	16463784
Bis(dimethyl-t-butylsilyl) adipate	86	40	17.612	8255465
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	87	60	17.776	3649375
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	88	55	17.950	4264115

Heneicosanoic acid, tert-butyldimethylsilyl ester	89	64	18.015	4073587
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	90	98	18.201	49410190
4-Pentamethyldisilanyloxyoctane	91	38	18.266	3426126
Isoborneol, pentamethyldisilanyl ether	92	62	18.506	1743348
Bis(dimethyl-t-butylsilyl) adipate	93	87	18.593	9367296
Isoborneol, pentamethyldisilanyl ether	94	62	18.713	1517089
2-Pentamethyldisilanyloxypentane	95	59	18.833	1814439
Isoborneol, pentamethyldisilanyl ether	96	38	19.072	2380684
Isoborneol, pentamethyldisilanyl ether	97	43	19.563	2259669
1-Methyl-2-pentamethyldisilanyloxycyclohexane	98	43	19.628	3210373
1,2-Benzenedicarboxylic acid, bis(tert-butyldimethylsilyl) ester	99	93	20.238	8376270
Octanedioic acid, bis(tert-butyldimethylsilyl) ester	100	87	20.489	6456263
Isoborneol, pentamethyldisilanyl ether	101	49	21.110	700434
Nonanedioic acid, bis(tert-butyldimethylsilyl) ester	102	46	21.404	19751968
Benzo[b]thiophen-2-amine, 3-phenyl-N-(phenylmethylene)-	103	64	21.535	4818144
9,12-Octadecadienoic acid, tert-butyldimethylsilyl ester, (Z,Z)-	104	56	21.611	11368277
1,3-Dimethyl-5-pentamethyldisilyloxycyclohexane	105	35	22.429	1124377
Octadecanoic acid, benzyldimethylsilyl ester	106	59	23.801	3911956

MET11791/1/2

Run 1

Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.902	727469497
Acetamide, 2,2,2-trifluoro-N-methyl-	2	58	3.305	5603546570
tert-Butyldimethylsilanol	3	64	3.970	7187575779
tert-Butyldimethylsilanol	4	9	4.798	23170553
tert-Butyldimethylsilanol	5	7	4.874	25747514
tert-Butyldimethylsilanol	6	7	5.528	14274735
Cyclotetrasiloxane, octamethyl-	7	87	6.389	25178360
1,1,3,3-Tetramethyl-1,3-bis[(2Z)-pent-2-en-1-yloxy]disiloxane	8	32	6.454	5031672
7-Amino-2-trifluoromethylphenothiazine	9	9	7.304	4705245
2H-Thiopyran-3(4H)-one, dihydro-	10	50	7.620	10371648
Lactic acid, tert-butyldimethylsilyl ether	11	38	7.838	949325

Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	12	93	8.339	9821163
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	13	92	8.514	3647476734
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	89	8.710	6608010
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	15	91	8.764	12980963
Tris(trimethylsilyl)borate	16	53	11.085	11240403
Disilathiane, hexamethyl-	17	43	12.306	28452290
1-Phenylethanol, tert-butyldimethylsilyl ether	18	78	13.341	3087597
tert-Butyldimethylsilanol	19	64	13.755	1745516
tert-Butyldimethylsilanol	20	32	15.389	4871030
Tris(tert-butyldimethylsilyl) borate	21	87	15.738	43334878
1-Ethyl-2-pentamethyldisilanyloxycyclohexane	22	10	15.547	1248693
Heneicosanoic acid, tert-butyldimethylsilyl ester	23	40	18.201	1532256
trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	24	72	19.072	4300298
3-Chloro-4-fluoroiodobenzene	25	23	19.639	16328135
Run 2				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	2.891	20474860
tert-Butyldimethylsilanol	2	50	3.905	5451754921
tert-Butyldimethylsilanol	3	64	3.959	1209738343
tert-Butyldimethylsilanol	4	52	4.809	13778630
tert-Butyldimethylsilanol	5	7	4.875	4846969
tert-Butyldimethylsilanol	6	9	5.528	4743249
tert-Butyldimethylsilanol	7	50	5.583	1977753
tert-Butyldimethylsilanol	8	7	5.692	2182482
Cyclotetrasiloxane, octamethyl-	9	74	6.389	21513807
tert-Butyldimethylsilanol	10	9	6.455	1826451
tert-Butyldimethylsilanol	11	9	7.304	4304636
2H-Thiopyran-3(4H)-one, dihydro-	12	43	7.620	9173522
4-Pentamethyldisilanyloxyoctane	13	9	7.860	1860995
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	92	8.329	23994460
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	15	92	8.514	3432045951
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	16	90	8.765	23213657

1-Ethyl-2-pentamethyldisilanyloxycyclohexane	17	50	9.037	689625
Trisiloxane, octamethyl-	18	47	11.086	10814616
N-(Chroman-7-yl)-N-methylacetamide	19	42	12.306	24274550
1-Phenylethanol, benzyldimethylsilyl ether	20	56	13.341	3071976
tert-Butyldimethylsilanol	21	9	13.744	2272890
tert-Butyldimethylsilanol	22	9	14.779	1158418
Dodecandioic acid, tert-butyldimethylsilyl ester	23	40	15.390	11758054
Tris(tert-butyldimethylsilyl) borate	24	64	15.738	228151526
Silane, (1,1-dimethylethyl)dimethyl(1-phenylpropoxy)-	25	9	17.547	1038050
trans-Traumatic acid, bis(tert-butyldimethylsilyl) ester	26	64	19.073	2849785
4-(4-Chlorophenylamino)pyrido[3,2-c]pyridazine	27	9	19.639	12305565
Run 3				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	2.891	23676485
tert-Butyldimethylsilanol	2	50	3.927	6817995003
tert-Butyldimethylsilanol	3	50	4.809	14092312
tert-Butyldimethylsilanol	4	9	4.875	3611648
tert-Butyldimethylsilanol	5	42	5.528	7394653
tert-Butyldimethylsilanol	6	9	5.692	1084653
Cyclotetrasiloxane, octamethyl-	7	74	6.389	20236476
tert-Butyldimethylsilanol	8	9	7.304	4605970
3-Amino-N-butyric acid, bis(trimethylsilyl) deriv.	9	38	7.620	10541734
Silane, (1,1-dimethylethyl)dimethyl(1-phenylpropoxy)-	10	9	7.838	4495814
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	11	90	8.361	32072392
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	12	92	8.514	3562946992
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	13	90	8.765	29467862
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	86	8.939	17800780
(.+/-.)-2-Phenylbutyric acid, tert-butyldimethylsilyl ester	15	45	11.086	11513039
7-Acetamido-2,2-dimethyl-2,3-dihydrobenzofuran	16	50	12.306	25000868
1-Phenylethanol, tert-butyldimethylsilyl ether	17	64	13.341	2580479
tert-Butyldimethylsilanol	18	9	13.744	2465691
tert-Butyldimethylsilanol	19	9	14.856	13677985

tert-Butyldimethylsilanol	20	9	14.921	2749074
Silane, (1,1-dimethylethyl)dimethyl(1-phenylpropoxy)-	21	38	15.052	6746352
Naproxen, tert-butyldimethylsilyl ester	22	23	15.390	40910918
Tris(tert-butyldimethylsilyl) borate	23	83	15.738	473034729
1-Ethyl-2-pentamethyldisilanyloxycyclohexane	24	50	16.087	13056918
Silane, [[(3.beta.,5.alpha.)-androstan-3-yl]oxy]trimethyl-	25	53	17.046	1009176
Geranylgeraniol, tert-butyldimethylsilyl ether	26	38	17.547	1045997
2-Methyl-2-hexanol, benzyldimethylsilyl ether	27	25	19.073	1977267
3-Chloro-4-fluoroiodobenzene	28	35	19.639	10871227

MET11791/3/2

Run 1

Acetamide, 2,2,2-trifluoro-N-methyl-	1	83	3.033	990801460
3-Buten-1-ol, 3-methyl-	2	4	3.120	13568414
tert-Butyldimethylsilanol	3	72	3.774	1940091951
Silanol, trimethyl-	4	42	3.861	1807825319
tert-Butyldimethylsilanol	5	9	4.798	11370566
tert-Butyldimethylsilanol	6	42	5.496	1981278
tert-Butyldimethylsilanol	7	9	5.703	1958578
Cyclotetrasiloxane, octamethyl-	8	43	6.378	1617770
Butanoic acid, 3-(methylthio)-	9	7	7.293	2386955
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	10	42	8.339	7753306
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	11	86	8.481	753086551
Butyl 2-(tert-butyldimethylsilyloxy)acetate	12	50	8.568	2948388
Butanoic acid, dimethyl(isopropyl)silyl ester	13	10	9.189	1373328
1-Butanol, 3-t-butyldimethylsilyloxy-	14	9	9.364	1445981
tert-Butyldimethylsilanol	15	40	9.963	888910
tert-Butyldimethylsilanol	16	9	11.085	610085
7-Acetamido-2,2-dimethyl-2,3-dihydrobenzofuran	17	43	12.306	14750830
Lactic acid, tert-butyldimethylsilyl ether, tert-butyldimethylsilyl ester	18	50	13.363	7107658
tert-Butyldimethylsilanol	19	7	13.744	1702270
Acetate, 2-[(acetyloxy)methyl]-4,4-dimethoxybutyl ester	20	42	14.180	1295889

Tris(tert-butyldimethylsilyl) borate	21	30	15.716	3480726
1-Methyl-2-pentamethyldisilanyloxycyclohexane	22	25	17.536	859619
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	23	83	18.201	5411396
3-Chloro-4-fluoroiodobenzene	24	9	19.639	5395588
Run 2				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	83	3.076	-894167025
tert-Butyldimethylsilanol	2	72	3.774	1894539357
Silanol, dimethyl(1,1,2-trimethylpropyl)-	3	50	3.883	2263389365
tert-Butyldimethylsilanol	4	9	4.798	5982220
tert-Butyldimethylsilanol	5	9	5.506	2441939
tert-Butyldimethylsilanol	6	50	5.572	1900489
tert-Butyldimethylsilanol	7	9	5.702	1994212
Benzene, 1,4-dibromo-2-nitro-	8	9	6.378	1928230
Pentalene-1,5-dione, 3a-(2,2-dimethoxy)ethyl-hexahydro	9	7	7.293	3069150
1-Ethyl-2-pentamethyldisilanyloxycyclohexane	10	40	8.361	4488035
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	11	89	8.481	801466058
tert-Butylpentamethyldisiloxane	12	22	8.568	5138813
Propane, 1,1,1-triethoxy-	13	38	9.189	2741157
tert-Butyldimethylsilanol	14	9	9.364	1924854
tert-Butyldimethylsilanol	15	7	9.963	1838312
1-Phenylethanol, benzyldimethylsilyl ether	16	7	10.399	962163
tert-Butyldimethylsilanol	17	40	11.085	756331
N-(Chroman-7-yl)-N-methylacetamide	18	42	12.306	16997490
Lactic acid ditbdms	19	89	13.363	7324669
tert-Butyldimethylsilanol	20	9	13.744	1888698
Undecanal dimethyl acetal	21	7	14.180	1416496
2-Methyl-1-isopropyl(dimethyl)silyloxypropane	22	9	15.466	3793844
Tris(tert-butyldimethylsilyl) borate	23	76	15.727	49931716
2-Pentamethyldisilanyloxypentane	24	10	17.547	994664
Phosphoric acid, tri(tert-butyldimethylsilyl) ester	25	35	18.201	984008
3-Chloro-4-fluoroiodobenzene	26	25	19.639	5501992

Run 3				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	3.00	618541561
Acetamide, 2,2,2-trifluoro-N-methyl-	2	64	3.120	6799157
Silanol, trimethyl-	3	59	3.763	1946815417
Silanol, trimethyl-	4	72	3.839	1633586527
tert-Butyldimethylsilanol	5	87	3.970	62483858
tert-Butyldimethylsilanol	6	43	7.282	2277638
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	7	72	8.481	731013383
2-Methyl-2-hexanol, benzyldimethylsilyl ether	8	35	8.557	3020984
N-(7-Methylbenzo(b)thien-3-yl)acetamide	9	38	12.306	11795648
tert-Butyldimethylsilanol	10	42	13.363	3370503
Tris(tert-butyldimethylsilyl) borate	11	58	15.716	27461566
tert-Butyldimethylsilanol	12	25	19.639	2576826
Procedural Blank				
Run 1				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	2.913	1009027138
Acetamide, 2,2,2-trifluoro-N-methyl-	2	91	3.131	79708699
Toluene	3	94	3.338	167972120
tert-Butyldimethylsilanol	4	72	3.730	2169616671
tert-Butyldimethylsilanol	5	72	3.818	1684630934
tert-Butyldimethylsilanol	6	86	3.981	99530935
tert-Butyldimethylsilanol	7	52	4.657	18772353
tert-Butyldimethylsilanol	8	53	4.722	4836073
tert-Butyldimethylsilyl isocyanate	9	43	4.809	8952395
1,3-Dimethyl-5-pentamethyldisilyloxycyclohexane	10	72	4.864	17878244
tert-Butyldimethylsilanol	11	47	5.071	9086013
tert-Butyldimethylsilyl acetate	12	90	5.496	18379401
Butanoic acid, 2-oxo-, trimethylsilyl ester	13	47	6.182	3600279
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	14	37	6.389	7818209178
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	15	25	6.978	36145056

N,N-Dibutylbenzenesulphonamide	16	35	7.043	43453627
Cis-1-(2-furyl)-2-phenylcyclopropane	17	27	7.185	34014323
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	18	32	7.293	64159739
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	19	25	7.533	14355782
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	20	17	7.675	15448338
2-Buten-1-one, 1,3-diphenyl-	21	32	7.838	27014617
Silanol, trimethyl-, acetate	22	27	8.394	12580203
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	23	92	8.492	1173003275
1,3,4-Thiadiazol-2-amine, 5-(butylthio)-	24	47	8.568	26843036
2-(4-Dimethylaminobenzyl)indan-1-ol	25	14	8.765	12860501
Benzo[b]thiophene	26	18	9.102	4870479
Bis(tert-butyldimethylsilyl)amine	27	95	9.756	89431177
Tris(trimethylsilyl)borate	28	27	11.085	1150409
Bis(tert-butyldimethylsilyl) carbonate	29	91	11.903	49111453
3-Dimethyl(trimethylsilyl)silyloxytetradecane	30	50	12.110	2026838
Silanol, (1,1-dimethylethyl)dimethyl-, benzoate	31	47	13.341	1653288
Bis(tert-butyldimethylsilyl) sulfite	32	50	13.406	1787997
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	33	38	17.536	1571084
5-(2-Oxo-2H-chromen-3-yl)-2-furoic acid tbdms	34	45	21.535	3338268
Octadecanoic acid, dimethyl(isopropyl)silyl ester	35	59	23.802	1704410
Run 2				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	78	3.131	8701919
Toluene	2	93	3.338	76379600
tert-Butyldimethylsilanol	3	64	3.719	1798916968
tert-Butyldimethylsilanol	4	72	3.796	1232626059
tert-Butyldimethylsilanol	5	90	3.981	41209782
tert-Butyldimethylsilanol	6	72	4.624	2665840
tert-Butyldimethylsilanol	7	53	4.656	2031233
tert-Butyldimethylsilyl isocyanate	8	38	4.798	4223792
tert-Butylpentamethyldisiloxane	9	70	4.863	6283948
Methyl 2,4-di-O-acetyl-3,6-di-O-methyl-.beta.-D-glucopyranoside	10	38	5.070	2786824

Silanol, trimethyl-, acetate	11	83	5.495	5561461
Butanoic acid, 2-oxo-, trimethylsilyl ester	12	38	6.182	2924858
N,N-Dibutylbenzenesulphonamide	13	37	6.400	7107463845
Imidazo[1,2-a]pyridin-2(3H)-one	14	12	6.988	82826116
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	15	25	7.173	31260773
Acetohydrazide, 2-(3,5-dimethylphenoxy)-N2-benzylideno-	16	38	7.293	41293378
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	17	25	7.424	23120163
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	18	25	7.533	13283061
Benzo[b]thiophene	19	18	7.675	17710654
Buten-1-one, 1,3-diphenyl-	20	32	7.827	18539753
N-(Trimethylsilyl)acetamide	21	38	8.394	11632113
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	22	90	8.492	1001596585
1,3,4-Thiadiazol-2-amine, 5-(butylthio)-	23	47	8.568	24031722
N-(2-Chloroethyl)-N-ethylaniline	24	38	8.764	13365356
Bis(tert-butyldimethylsilyl)amine	25	96	9.756	65817351
N-t-Butyldioxymethyl-N-ethylaniline	26	25	11.085	780168
Bis(tert-butyldimethylsilyl) carbonate	27	91	11.902	35692542
1-Pentamethyldisilyloxytetradecane	28	43	12.120	2148489
Silanol, (1,1-dimethylethyl)dimethyl-, benzoate	29	72	13.341	3834989
Bis(tert-butyldimethylsilyl) sulfite	30	38	13.406	1459384
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	31	38	17.536	962012
Hexadecanoic acid, tert-butyldimethylsilyl ester	32	72	21.535	2443939
Isoindole-1,3(1H,3H)-dione, 5-benzoyl-2-(4-methylphenyl)-	33	43	23.812	4702229
Run 3				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	64	2.902	651579047
Acetamide, 2,2,2-trifluoro-N-methyl-	2	86	3.131	68430395
Toluene	3	91	3.338	134249775
tert-Butyldimethylsilanol	4	78	3.730	1721906552
tert-Butyldimethylsilanol	5	59	3.796	1261153508
tert-Butyldimethylsilanol	6	91	3.981	76642754
tert-Butyldimethylsilanol	7	59	4.657	11688292

tert-Butyldimethylsilanol	8	35	4.798	7103217
3-Ethyl-6-pentamethyldisilyloxyoxtane	9	64	4.864	10552674
4,4-Dimethyl-2-pentanol, tert-butyldimethylsilyl ether	10	38	5.071	6534898
Silanol, trimethyl-, acetate	11	78	5.496	8619138
Hexanoic acid, trimethylsilyl ester	12	33	6.182	2567967
N,N-Dibutylbenzenesulphonamide	13	37	6.400	7151290259
Norfluoxetine	14	33	6.977	59421614
N,N-Dibutylbenzenesulphonamide	15	35	7.174	25252722
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	16	32	7.293	43151769
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	17	25	7.838	11093374
N,O-Bis-(trimethylsilyl)-N-methylaminopropionic acid	18	14	8.394	6091532
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	19	92	8.492	931846323
Disiloxane, pentamethyl-	20	58	8.568	16049693
N-(2-Chloroethyl)-N-ethylaniline	21	35	8.764	2031421
Bis(tert-butyldimethylsilyl)amine	22	96	9.756	57908161
Tris(trimethylsilyl)borate	23	27	11.085	1027614
Bis(tert-butyldimethylsilyl) carbonate	24	91	11.903	34629561
1-Dimethyl(trimethylsilylmethyl)silyloxycyclopentane	25	50	12.121	2433580
Silanol, (1,1-dimethylethyl)dimethyl-, benzoate	26	59	13.341	2913467
Bis(tert-butyldimethylsilyl) sulfite	27	49	13.406	1292397
tert-Butylpentamethyldisiloxane	28	43	17.536	801150
6-O-Demethylsalutaridine	29	72	21.535	1437477
Cyclopenta[cd]azulene, 4-(4-ethylphenyl)-1-phenyl-5,6,7,8-tetrahydro-2,2a,8a-triaza-	30	35	23.801	3406862

Table A23. GC-MS results of the 0.5 mL MTBSTFA derivatized hot water extraction of the remaining AZ-PT2/1 residue following its DCM extraction. These analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT2/1				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	2.913	-172320461

Acetamide, 2,2,2-trifluoro-N-methyl-	2	58	3.164	-248469042
tert-Butyldimethylsilanol	3	91	3.752	76024999
Acetamide	4	90	4.090	104768
Acetamide	5	91	4.537	47696835
tert-Butyldimethylsilyl acetate	6	91	5.474	26110544
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	7	91	8.503	3521372325
Tris(trimethylsilyl)borate	8	78	11.074	11106511
Procedural Blank				
Acetamide, 2,2,2-trifluoro-N-methyl-	1	72	3.033	747115640
Acetamide, 2,2,2-trifluoro-N-methyl-	2	64	3.131	10291547
tert-Butyldimethylsilanol	3	72	3.534	8956022
tert-Butyldimethylsilanol	4	64	3.872	4567817556
tert-Butyldimethylsilanol	5	91	3.981	50955891
tert-Butyldimethylsilyl isocyanate	6	83	4.776	26111731
Cyclotetrasiloxane, octamethyl-	7	87	6.367	9733612
7-Methylthieno[3,2-b]pyridine	8	37	6.422	16809721
2H-Imidazole-2-thione, 1,3-dihydro-1-methyl-	9	38	7.555	3970002
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	10	92	8.470	989697141
Butyl 2-(tert-butyldimethylsilyloxy)acetate	11	40	8.546	4823347
4-Thiazolemethanol, 2-(4-chlorophenyl)-	12	46	10.595	3336514
Tris(trimethylsilyl)borate	13	72	11.074	31749335
2-Acetylamino-3-(4-ethoxy-phenyl)-acrylic acid	14	43	15.596	31354059

Table A24. GC-MS results of the 0.5 mL MTBSTFA derivatized hot water extraction of the remaining AZ-PT3/1 and AZ-PT3/2 residue following its DCM extraction. The analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT3/1				

tert-Butyldimethylsilanol	1	91	3.600	32045027

AZ-PT3/2

Phosphorocyanidothioic difluoride	1	32	3.142	1263410846
3-Pentenoic acid, 4-methyl-, methyl ester	2	35	3.621	7971879965
3,4-Dimethyl cyclohexanone	3	16	3.665	894573995
tert-Butyldimethylsilanol	4	90	3.850	1276678356
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	5	27	4.809	24480758
1-Dimethyl(isopropyl)silyloxypropane	6	17	5.539	9234829
2,4-Dinitro-6-isopropylphenol	7	15	7.239	4714923
Silanamine, N-(2,2-dimethylpropyldiene)-1,1,1-trimethyl-	8	25	7.915	10751524
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	9	91	8.525	4748987237

Procedural Blank

Acetamide, 2,2,2-trifluoro-N-methyl-	1	83	3.229	868582671
tert-Butyldimethylsilanol	2	64	3.720	8399207685
tert-Butyldimethylsilyl formate	3	42	4.744	407490700
1-Dimethyl(isopropyl)silyloxypropane	4	27	5.615	25320170
Homophthalic anhydride	5	32	6.389	17721124114
tert-Butyldimethylsilyl-2,2,3,3,3-pentafluoropropanoate	6	38	7.043	694934847
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	7	32	7.424	86092517
3H-1,2-Benzodithiole-3-thione	8	11	7.566	39170629
2-Allylphenol	9	35	7.642	58314915
N-Ethyl-2,3-xylidine	10	38	8.067	40665639
1-(2,6-Dimethyl-4-propoxy-phenyl)-2-methyl-propan-1-one	11	49	8.187	60945268
(+/-)-p-Methoxyamphetamine, N-trimethylsilyl-	12	38	8.438	101998785

Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	13	91	8.536	102034137 7
Disiloxane, pentamethyl-	14	58	8.601	45523514
Acetamide, 2,2,2-trifluoro-N-methyl-	15	22	8.721	26277618
Silane, dimethyl(oct-3-en-2-yloxy)propoxy-	16	22	8.993	35070911
Bis(trimethylsilyl) butylboronate	17	47	9.070	66630526
Guanine	18	43	9.135	194629943
Cyclotrisiloxane, hexamethyl-	19	43	9.211	51409045
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	20	32	9.331	222059410
4-(Methylthio)benzonitrile	21	49	9.440	24211741
Cyclotetrasiloxane, octamethyl-	22	53	9.713	12923801
Bis(tert-butyldimethylsilyl)amine	23	95	9.756	7739739
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	24	38	10.148	20199108
1H-Indole, 1-ethyl-2-phenyl-	25	35	10.214	8941607
N,2,4,6-Tetramethylbenzenamine	26	25	10.377	12384444
Silane, dimethyl(dimethyl(but-2-enyloxy)silyloxy)(but-2-enyloxy)-	27	43	10.486	10407533
4-[p-Anisyl]-2H-1,3-[3H]-oxazine-2,6-dione	28	38	10.606	13857398
1H-1,2,3-Triazole, 4,5-diphenyl-	29	58	10.726	34465791
4-Pyrimidinecarboxaldehyde, 2,6-bis[(trimethylsilyl)oxy]-	30	37	10.922	265982511
Tris(trimethylsilyl)borate	31	72	11.075	191068006
Benzoic acid, 3-methoxy-4-methyl-	32	22	11.238	30890297
(+)-p-Bromo-.alpha.-phenethylamine	33	16	11.347	9972885
L-Leucine, N-allyloxycarbonyl-N-methyl-, heptyl ester	34	50	11.412	75485226
Bis-N,N-(trimethylsilyl)formamide	35	68	11.456	149543771
Oxalic acid, monoamide, N-ethyl-N-(3-methylphenyl)-, pentyl ester	36	10	11.576	35500537
trans-4-(2-(5-Nitro-2-furyl)vinyl)-2-quinolinamine	37	38	11.652	11247611
Butanoic acid, 3-[(trimethylsilyl)oxy]-, trimethylsilyl ester	38	59	11.892	34319457
2-Trimethylsilyl-3-trimethylsilylamino-1,2,4-triazole	39	40	11.935	128336121
2-[m-Acetamidophenoxy]-5-nitrothiazole	40	59	12.001	33370985
Spiro[1,3-dithiolane-2,6'(5'H)-[2,5]methano[2H]furo[3,2-b]pyran], tetrahydro-	41	53	12.121	551751716
Cyclotrisiloxane, hexamethyl-	42	46	12.197	17206542

Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	43	25	12.992	21314277
1,2-Benzenedicarboxylic acid, dipropyl ester	44	38	13.101	61160503
4-Benzyloxy-1-dimethyl(tert-butyl)silyloxybenzene	45	43	13.308	265113620
Tetrasiloxane, decamethyl-	46	62	13.417	52326893
N-(Trimethylsilyl)-N-((trimethylsilyl)oxy)benzamide	47	42	13.864	23798447
4-Thiazoline, 4-(4-methylthiophenyl)-5-phenyl-2-phenylimino-	48	30	14.126	21547442
Benzeneacetic acid, 4-[(tert-butyldimethylsilyl)oxy]-3-methoxy-, tert-butyldimethylsilyl ester	49	40	14.180	14529574
Pyridazin-3(2H)-one, 5-chloro-2-(3-trifluoromethylphenyl)-4-methylamino-	50	35	14.431	11261196
Naphtho[2,1-b]thiophene	51	49	14.714	16765565
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	52	47	14.965	52657543
Tris(trimethylsilyl)borate	53	25	15.313	287443988
Pentasiloxane, dodecamethyl-	54	41	15.531	14389334
Trimethyl[4-(1-methyl-1-methoxyethyl)phenoxy]silane	55	43	15.586	15424310
Tris(tert-butyldimethylsilyloxy)arsane	56	59	15.847	30119519
Pyrimidine-2(1H)-thione, 1-butyl-6-hydroxy-4-methyl-5-propyl-	57	55	16.141	10214857
Trifluoroacetic acid, 2-naphthyl ester	58	25	17.078	26402222
2-Phenyl-4-[(2-propyn-1-yl)thio]quinazoline	59	30	17.198	295457081
Propanoic acid, 2-(1,3-dioxo-2,3-dihydro-1H-2-isoindolyl)-3-hydroxy-, methyl ester	60	91	17.961	10984877
2-Isopropenyl-3-methylpyrazine	61	25	18.179	11291944
Hexahydro-1-methyl-4-[2-[(2-methyl-1-phenyl-1-propenyl)amino]benzoyl]pyrazine	62	15	18.865	14785109

Table A25. GC-MS results of the 0.5 mL MTBSTFA derivatized hot water extraction of the AZ-PT3/3 powder. Triplet analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT3/3				
Run 1				

tert-Butyldimethylsilanol	1	90	3.741	161539780
Proline, trimethylsilyl ester	2	16	5.266	2114391
1-Dimethyl(isopropyl)silyloxypropane	3	27	5.451	1804768
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	4	28	6.388	685294014
3-Ethylthiolane	5	46	7.620	8673382
Bis-N,N-(trimethylsilyl)formamide	6	78	8.459	17408107
Azulene	7	94	9.374	24903182
Bis(tert-butyldimethylsilyl) carbonate	8	90	11.891	34093436
3-Fluoro-4-piperazin-1-yl-benzonitrile	9	19	12.283	6848294
Bis(tert-butyldimethylsilyl) sulfite	10	91	13.373	16189358
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	11	29	13.852	1271129
Bis(dimethyl-t-butylsilyl) fumarate	12	20	15.356	987267
2',6'-Dihydroxyacetophenone, bis(trimethylsilyl) ester	13	17	15.509	1075198
Hexadecanoic acid, tert-butyldimethylsilyl ester	14	29	21.491	258699
Run 2				
tert-Butyldimethylsilanol	1	91	3.741	167713280
Proline, trimethylsilyl ester	2	17	5.255	2290174
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	3	28	6.388	687046833
3-Ethylthiolane	4	49	7.620	9915266
tert-Butylpentamethyldisiloxane	5	83	8.459	21640802
Naphthalene	6	94	9.374	32129709
tert-Butyl-[2-(tert-butyldimethylsilyl)oxyethoxy]dimethylsilane	7	74	11.902	43768253
3-Fluoro-4-piperazin-1-yl-benzonitrile	8	18	12.283	7658550
Bis(tert-butyldimethylsilyl) sulfite	9	89	13.373	16949087
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	10	30	13.852	1687991
Bis(dimethyl-t-butylsilyl) fumarate	11	17	15.356	1283427
2',6'-Dihydroxyacetophenone, bis(trimethylsilyl) ester	12	14	15.509	927627
Hexadecanoic acid, tert-butyldimethylsilyl ester	13	20	21.502	339758
Run 3				
tert-Butyldimethylsilanol	1	91	3.741	154487223

Proline, trimethylsilyl ester	2	14	5.255	1683771
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	3	28	6.378	686655139
3-Ethylthiolane	4	46	7.609	9002128
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	5	95	8.448	17867576
Naphthalene	6	94	9.374	30727294
Bis(tert-butyldimethylsilyl) carbonate	7	91	11.891	40177170
Disilathiane, hexamethyl-	8	20	12.273	6492351
Bis(tert-butyldimethylsilyl) sulfite	9	89	13.373	13000356
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	10	30	13.853	1631399
Bis(dimethyl-t-butylsilyl) fumarate	11	17	15.356	985385
2',6'-Dihydroxyacetophenone, bis(trimethylsilyl) ester	12	15	15.509	787779
Hexadecanoic acid, tert-butyldimethylsilyl ester	13	36	21.491	386534
Procedural Blank				
Run 1				
tert-Butyldimethylsilanol	1	74	3.632	47508232
Azuleno(2,1-b)thiophene	2	18	6.378	877423848
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	3	95	8.470	13084455
Naphthalene	4	94	9.407	53818831
Run 2				
tert-Butyldimethylsilanol	1	74	3.632	56051578
Azuleno(2,1-b)thiophene	2	18	6.399	869184367
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	3	96	8.470	13573578
Naphthalene	4	94	9.407	54721216
Run 3				
tert-Butyldimethylsilanol	1	74	3.632	59975835
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	2	28	6.356	882611777
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	3	95	8.470	14168024
Naphthalene	4	94	9.407	52290937

Table A26. GC-MS results of the 0.2 mL MTBSTFA derivatized hot water extraction of the AZ-PT3/3 powder. Duplicate analyses were executed at MacEwan University and all organic and inorganic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
AZ-PT3/3				
Run 1				
3-Pentenoic acid, 4-methyl-, methyl ester	1	25	3.327	1130766246
tert-Butyldimethylsilanol	2	64	3.904	5951619917
Glycolaldehyde dimethyl acetal	3	36	3.991	1936761326
tert-Butyldimethylsilyl nitrile	4	90	5.103	101148247
Proline	5	11	5.332	8148901
tert-Butyldimethylsilanol	6	9	5.342	12429112
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	7	32	6.345	7753743826
trans-2-Trimethylsilyl-cyclopropane-1-carboxylic acid	8	14	6.661	37935634
2-Propenoic acid, 3-phenyl-, trimethylsilyl ester, (E)-	9	17	6.737	29599242
Benzene, 1-(3-chloro-2-propenyloxy)-2-(3-chloro-2-propenyl)-	10	38	6.803	42463021
Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	11	9	7.271	17773886
2H-Thiopyran-3(4H)-one, dihydro-	12	59	7.598	250753600
1,3-bis[(2Z)-Hex-2-en-1-yloxy]-1,1,3,3-tetramethyldisiloxane	13	64	8.339	50574257
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	96	8.448	1078780788
Cyclopentasiloxane, decamethyl-	15	94	8.720	16867168
1-Methyl-5-mercaptotetrazole	16	9	8.993	11047454
Succinimide	17	9	9.058	35170785
4-Phenylbut-3-ene-1-yne	18	83	9.363	874031730
Bis(tert-butyldimethylsilyl)amine	19	96	9.712	31275921
2-Acetamidothiazole	20	59	10.453	8148525
Tris(trimethylsilyl)borate	21	64	11.041	45095621
Tert-Butyl-[2-(tert-butyldimethylsilyl)oxyethoxy]dimethylsilane	22	72	11.891	1913857708
Disilathiane, hexamethyl-	23	43	12.626	38452005
Acenaphthylene	24	94	12.981	2283200
Bis(tert-butyldimethylsilyl) sulfite	25	87	13.351	171645247

Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	26	32	13.831	12796550
Propanedioic acid, methyl-, bis(trimethylsilyl) ester	27	53	13.842	13139229
Bis(dimethyl-t-butylsilyl) fumarate	28	52	15.334	3051782
Pentasiloxane, dodecamethyl-	29	81	15.498	6099504
Tropine, tert-butyldimethylsilyl ether	30	30	16.086	10759810
Bis(dimethyl-t-butylsilyl) succinate	31	38	16.413	5103863
Butanedioic acid, methyl-, bis(tert-butyldimethylsilyl) ester	32	90	16.522	6574080
Itaconic acid, bis(tert-butyldimethylsilyl) ester	33	90	16.762	6152440
9H-Fluorene, 9-methylene-	34	81	16.882	1696641
Myristic acid, 2,3-bis(trimethylsiloxy)propyl ester	35	31	17.971	1327618
Bis(dimethyl-t-butylsilyl) adipate	36	83	18.538	1308959
Camphoric acid, bis(tert-butyldimethylsilyl) ester	37	84	19.442	1049339
Hexadecanoic acid, tert-butyldimethylsilyl ester	38	91	21.469	8345084
3-Tripropylsilyloxytridecane	39	59	21.480	8308342
Octadecanoic acid, tert-butyldimethylsilyl ester	40	87	23.725	4959555
Run 2				
Difluoroisothiocyanatophosphine	1	33	3.305	758638620
tert-Butyldimethylsilanol	2	78	3.577	115589131
tert-Butyldimethylsilanol	3	64	3.893	5473972973
tert-Butyldimethylsilanol	4	64	3.969	1831999837
tert-Butyldimethylsilyl nitrile	5	90	5.092	86576499
tert-Butyldimethylsilanol	6	9	5.321	14122349
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	7	37	6.345	7381276549
Silanol, trimethyl-, propanoate	8	12	6.803	42036933
Isophthalaldehyde	9	25	6.955	27813776
Isophthalaldehyde	10	25	7.020	40816946
Sydnone, 4-bromo-3-phenyl-	11	12	7.271	9289311
2H-Thiopyran-3(4H)-one, dihydro-	12	59	7.598	222489234
1,3-bis[(2Z)-Hex-2-en-1-yloxy]-1,1,3,3-tetramethyldisiloxane	13	50	8.339	40771264
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	96	8.448	1029333838
Cyclopentasiloxane, decamethyl-	15	93	8.731	1353480

Succinimide	16	9	9.058	29706951
Azulene	17	74	9.363	772213278
Bis(tert-butyldimethylsilyl)amine	18	97	9.712	27046155
2-Acetamidothiazole	19	42	10.453	6670207
Tris(trimethylsilyl)borate	20	72	11.041	39326277
Bis(tert-butyldimethylsilyl) carbonate	21	60	11.902	1884099387
Propanedioic acid, bis(trimethylsilyl) ester	22	59	12.076	5319918
7-Acetamido-2,2-dimethyl-2,3-dihydrobenzofuran	23	50	12.626	33413636
Acenaphthylene	24	89	12.992	1732907
Bis(tert-butyldimethylsilyl) sulfite	25	91	13.351	149652902
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	26	29	13.831	9515992
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	27	49	13.842	12138068
Bis(dimethyl-t-butylsilyl) fumarate	28	54	15.334	3913062
Pentasiloxane, dodecamethyl-	29	68	15.498	5824540
Dicyclohexylcarbodimide	30	49	16.086	9725178
9H-Fluorene, 9-methylene-	31	83	16.871	1339930
Camphoric acid, bis(tert-butyldimethylsilyl) ester	32	79	19.431	1424343
Hexadecanoic acid, tert-butyldimethylsilyl ester	33	66	21.469	1242798
Procedural Blank				
Run 1				
No peaks detected.	-		-	-
Run 2				
No peaks detected.	-		-	-

Appendix B

Table B1. Organic compounds detected in DCM rinses of Tarda A, Tarda B, and procedural blank. The compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Tarda A [run 1]				
o-Xylene	1	95	4.569	566608
Cyclopentasiloxane, decamethyl-	2	91	8.731	213477
Eicosane	3	91	22.657	184391
Eicosane	4	92	23.910	253298
Tetracosane	5	87	25.457	284742
Heneicosane	6	86	27.408	304817
Nonadecane, 9-methyl-	7	90	29.903	253438
Hexasiloxane, tetradecamethyl-	8	53	31.69	178287
Eicosane	9	96	33.096	203403
N-Benzyl-N-ethyl-p-isopropylbenzamide	10	27	37.323	334547
Tarda A [run 2]				
2-Ethylacridine	1	7	3.697	3546
N,N-Dibenzyl-1-(benzylthio)-3,4,4-trichloro-2-nitro-1,3-butadienylamine	2	1	4.470	6014
Ammonia	3	2	6.791	3455
Cyclopentasiloxane, decamethyl-	4	74	8.720	4101
Hydrazine, 1,2-dimethyl-	5	2	10.267	5152
Acetic acid, [bis[(trimethylsilyl)oxy]phosphinyl]-, trimethylsilyl ester	6	9	11.183	3525
2,3,4,5-Tetrahydropyridazine	7	4	16.402	6917
Nitrous oxide	8	2	16.99	3556
2-1 Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	9	3	17.394	4769
Indolizine, 2-(4-methylphenyl)-	10	2	17.557	3836

Tarda B [run 1]				
Dodecane, 2,6,10-trimethyl-	1	32	21.621	10883
6,6-Diethylhoctadecane	2	72	22.657	22650
6,6-Diethylhoctadecane	3	59	23.910	27125
Phthalic acid, di(2-propylpentyl) ester	4	80	24.727	46054
Tetrapentacontane	5	38	25.457	36663
6,6-Diethylhoctadecane	6	50	27.407	42499
Eicosane	7	55	29.881	39753
2-Methyl-pentanoic acid [4-(2-methyl-pentanoylsulfamoyl)-phenyl]-amide	8	32	33.106	25195
γ-Cyano-3-methyl-5,10-dihydrobenzo[f]indolizine	9	7	37.171	11280
2-Ethylbutyric acid, 2,7-dimethyloct-5-yn-7-en-4-yl ester	10	12	37.258	17046
Tarda B [run 2]				
Nonahexacontanoic acid	1	28	20.728	8323
Di-n-decylsulfone	2	47	21.622	12097
Octadecane, 1-chloro-	3	59	22.657	20409
Eicosane, 2-methyl-	4	43	23.899	24505
Phthalic acid, di(2-propyllpentyl) ester	5	86	24.727	48038
Eicosane	6	58	25.457	36823
Hexatriacontane	7	53	27.408	39501
13-Methylhentriacontane	8	43	29.903	39381
Tetratracontane	9	37	33.074	33229
Di-n-decylsulfone	10	32	37.236	16515
Procedural Blank [run 1]				
Methylene chloride	1	95	4.569	482806
Octane, 2,4,6-trimethyl-	2	46	21.622	46038
Eicosane	3	50	22.657	80940
Pentacosane	4	70	23.910	109366
Heneicosane	5	55	25.446	131534
Tetratetracontane	6	52	27.408	141979

Eicosane	7	50	29.892	113458
Hentriacontane	8	50	33.106	100614
Eicosane	9	48	37.225	86651
Procedural Blank [run 2]				
Methylene chloride	1	94	4.569	795582
Heneicosane	2	41	21.622	58369
Heneicosane	3	55	22.657	96608
Heneicosane	4	81	23.910	119357
Eicosane	5	70	25.457	150072
Hexacosane	6	87	27.407	189888
Eicosane	7	64	29.892	137175
Eicosane	8	62	33.084	103581
Eicosane	9	52	37.225	78619

Table B2. Organic compounds detected in DCM extractions of Tarda A, Tarda B, the Tarda sand sample, and the procedural blank. The compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	**Peak**	**Quality (%)**	**Retention Time (min)**	**Peak Area**
Tarda A [run 1]				
Cyclic octaatomic sulfur	1	40	19.573	36625
Heptadecane	2	86	20.717	61077
Heptadecane	3	86	21.621	127054
Heneicosane	4	86	22.657	186379
Heneicosane	5	78	23.910	257977
Octadecane	6	83	25.457	271248
Heneicosane	7	72	27.407	331967
Nonadecane, 9-methyl-	8	90	29.903	257131
Heptadecane	9	64	33.106	224447
Eicosane	10	96	37.225	154258
Tarda A [run 2]				

Cyclic octaatomic sulfur	1	98	19.584	85016
Heneicosane	2	86	20.717	81001
Heneicosane	3	86	21.622	156975
Nonadecane, 9-methyl-	4	90	22.657	228042
Heptadecane	5	86	23.910	294720
Eicosane	6	83	25.457	329891
Heneicosane	7	86	27.419	448734
Pentadecane, 8-hexyl-	8	90	29.903	328632
Pentadecane, 8-hexyl-	9	72	33.096	247797
Heneicosane	10	64	37.225	200447
Tarda B [run 1]				
Cyclic octaatomic sulfur	1	95	19.584	194687
Eicosane	2	87	21.622	277471
Nonadecane	3	86	22.657	409782
Pentacosane	4	81	23.910	503950
Phthalic acid, di(2-propylpentyl) ester	5	91	24.727	318140
Tetracosane	6	83	25.457	605019
Eicosane	7	80	27.419	701563
Octacosane	8	91	29.903	563223
Tetracosane	9	91	33.106	378748
Tetratetracontane	10	59	37.236	350005
Tarda B [run 2]				
Cyclopentasiloxane, decamethyl-	1	90	8.731	46142
Cyclohexanol, 5-methyl-2-(1-methylethyl)-	2	90	9.113	47357
o-Cymene	3	72	9.320	46513
Propanol, 2-methyl-3-phenyl-	4	98	10.126	191164
Bicyclo[4.1.0]heptane, 7-(1-methylethyldiene)-	5	46	10.791	43773
Diethyl phthalate	6	98	14.681	199942
Hexathiane	7	83	15.422	36432
Hexathiane	8	81	15.629	33253
Hexathiane	9	87	16.010	41325

Phthalic acid, isobutyl non-5-yn-3-yl ester	10	78	17.666	187579
Dibutyl phthalate	11	76	18.603	102620
Dihydropyrimidine-2-methyl thiosulfuric acid	12	53	18.712	44500
Cyclic octaatomic sulfur	13	81	18.876	34809
Cyclic octaatomic sulfur	14	95	19.584	261652
Heneicosane	15	72	19.813	84842
Silane, [[4-[1,2-bis[(trimethylsilyl)oxy]ethyl]-1,2-phenylene]bis(oxy)]bis[trimethyl-	16	38	20.140	96479
Nonadecane, 9-methyl-	17	93	20.717	199486
Nonadecane, 9-methyl-	18	93	21.622	323676
Hexacosane	19	74	22.657	459787
Pentacosane	20	87	23.910	595846
Di-n-octyl phthalate	21	72	24.738	376729
3,6-Dioxa-2,4,5,7-tetrasilaoctane, 2,2,4,4,5,5,7,7-octamethyl-	22	25	24.945	54896
Hexacosane	23	89	25.457	715308
Heptacosane	24	90	27.418	904636
Pentasiloxane, dodecamethyl-	25	35	27.724	55965
Octacosane	26	90	29.903	679427
Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-	27	38	31.690	61492
Cholestra-3,5-diene	28	64	32.888	66618
Heneicosane	29	72	33.106	483477
Tetratetracontane	30	49	37.247	408916
Tarda Sand [run 1]				
Cyclopentasiloxane, decamethyl-	1	78	8.731	19616
Cyclopentasiloxane, decamethyl-	2	74	11.194	15162
n-Hexadecanoic acid	3	95	18.483	63754
1,2-Benzenedicarboxylic acid, butyl 2-ethylhexyl ester	4	78	18.603	34975
Heptadecane	5	86	18.876	28846
Heptadecane	6	86	19.824	110238
Sulfurous acid, butyl heptadecyl ester	7	43	20.194	15437
Octadecanoic acid	8	93	20.369	29928
Docosane	9	76	20.717	278509

Eicosane	10	93	21.622	536577
Octadecane, 1,1'-[1,3-propanediylbis(oxy)]bis-	11	22	22.254	13306
Tetracosane	12	98	22.657	788744
Decan-1-one, 1-(2,6-dimethyl-1-piperidyl)-	13	25	23.332	15686
Morphinan, 7,8-didehydro-3-methoxy-17-methyl-6-methylene-, (-)-	14	11	23.409	16344
Indolizine, 3-methyl-	15	22	23.659	17952
Eicosane	16	95	23.910	1115142
Phthalic acid, di(6-methylhept-2-yl) ester	17	38	24.727	12932
11-Methylnonacosane	18	50	24.836	15113
Octadecane	19	95	25.457	1213311
2-methylhexacosane	20	46	26.623	26741
1H-Indole, 4-methyl-	21	32	27.048	19542
Heptacosane	22	91	27.419	1351093
11-Methylnonacosane	23	47	28.911	27201
Octacosane	24	91	29.903	1028076
Pentasiloxane, dodecamethyl-	25	27	31.679	19580
Octadecane, 1,1'-[1,3-propanediylbis(oxy)]bis	26	35	31.810	18597
Gibb-3-ene-1,10-dicarboxylic acid, 2,4a-dihydroxy-1-methyl-8-methylene-, 1,4a-lactone, 10-methyl ester, (1.alpha.,2.beta.,4a.alpha.,4b.beta.,10.beta.)-	27	17	32.725	15883
Eicosane	28	83	33.117	852464
Fumaric acid, 2-decyl tridecyl ester	29	32	35.558	22695
Methoxyacetic acid, 4-hexadecyl ester	30	72	37.247	569967
Tarda Sand [run 2]				
Cyclopentasiloxane, decamethyl-	1	83	8.731	8697
Cyclopentasiloxane, decamethyl-	2	83	11.183	14224
Silanamine, N-[2,6-dimethyl-4-[(trimethylsilyl)oxy]phenyl]-1,1,1-trimethyl-	3	32	13.417	7432
Octatriene, 1,3-trans-5-trans-	4	8	15.509	6429
2-Propenamide	5	4	17.895	6388
Heptane, 3,3-dimethyl-	6	25	18.167	8850

Pentadecanoic acid	7	38	18.483	23784
Phthalic acid, 3-fluorophenyl heptadecyl ester	8	59	18.603	21445
Heptadecane	9	56	18.876	15378
Heneicosane	10	81	19.824	51804
Heneicosane	11	72	20.205	166257
Docosane	12	93	20.717	126511
Eicosane	13	96	21.622	199834
Eicosane	14	94	22.657	249438
2-(Acetoxymethyl)-3-(methoxycarbonyl)biphenylene	15	27	23.343	11363
Silicic acid, diethyl bis(trimethylsilyl) ester	16	38	23.670	7800
Pentacosane	17	94	23.910	271018
Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-	18	22	24.520	13527
Eicosane	19	95	25.457	268712
Silicic acid, diethyl bis(trimethylsilyl) ester	20	28	25.980	9291
Silicic acid, diethyl bis(trimethylsilyl) ester	21	50	26.590	9112
1,2-Bis(trimethylsilyl)benzene	22	25	26.852	7495
7-Chloro-4-methoxy-3-methylquinoline	23	16	27.037	8330
Nonadecane	24	91	27.408	525906
Octacosane	25	96	29.903	217975
Benz[b]-1,4-oxazepine-4(5H)-thione, 2,3-dihydro-2,8-dimethyl-	26	35	30.437	10026
Eicosane	27	86	33.085	158961
Eicosane	28	52	36.408	22575
Octacosane	29	47	37.247	105911
Silicic acid, diethyl bis(trimethylsilyl) ester	30	42	37.432	8713
Procedural Blank [run 1]				
Eicosane, 7-hexyl-	1	45	21.622	36262
Heneicosane	2	55	22.657	68413
Pentacosane	3	87	23.899	92293
Heneicosane	4	74	25.446	124417
Hentriacontane	5	72	27.397	125597
Octadecane, 3-ethyl-5-(2-ethylbutyl)-	6	43	29.903	105760
Tetracosane, 11-decyl-	7	43	33.095	97255

Methylene chloride	8	46	37.214	67607
Procedural Blank [run 2]				
Hentriacontane	1	72	21.621	46815
Dodecane, 3-methyl-	2	52	22.657	87173
Hexacosane	3	72	23.910	109392
Hexacosane	4	74	25.446	141345
2-methyloctacosane	5	72	27.407	207621
Hentriacontane	6	64	29.881	131951
Hentriacontane	7	49	33.084	106385
Eicosane	8	38	37.225	89771

Table B3. Organic compounds detected in hot water extractions of Tarda A, Tarda B, the Tarda sand sample, and the procedural blank. The compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Tarda A [run 1]				
Carbonic acid, dimethyl ester	1	4	3.207	-1399000000
tert-Butyldimethylsilanol	2	59	3.904	7762125069
Silane, trimethyl(2-methylpropoxy)-	3	9	4.721	35747312
Threonine	4	9	4.983	3101148
tert-Butyldimethylsilyl nitrile	5	70	5.157	46688831
tert-Butyldimethylsilanol	6	9	5.375	34747312
Silane, (1,2-dimethylpropoxy)trimethyl-	7	12	5.430	4680619
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	8	37	6.323	10935000000
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	9	27	6.803	684530696
Benzene, (1-methoxyethenyl)-	10	16	6.933	195137184
Sydnone, 4-bromo-3-phenyl-	11	12	7.315	45294476
Trimethylsilyl isothiocyanate	12	59	7.642	485670008
N-(Trimethylsilyl)acetamide	13	38	8.372	30658504
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	96	8.470	1104465459
Benzene, 1,1'-(oxydi-2,1-ethanediyl)bis[3-ethyl-	15	43	8.546	9123154

Cyclopentasiloxane, decamethyl-	16	93	8.731	25676161
Phenol, 4-(2-propenyl)-	17	43	9.015	7726036
Isothiazole, 3-methyl-	18	9	9.058	9431092
2-Hexanol, tert-butyldimethylsilyl ether	19	52	9.374	11830438
Bis(tert-butyldimethylsilyl)amine	20	96	9.723	72536479
Levulinic acid, tert-butyldimethylsilyl ester	21	56	10.714	37462276
Acetamide, 2,2,2-trifluoro-N-methyl-N-(trimethylsilyl)-	22	12	10.889	6864054
Tris(trimethylsilyl)borate	23	64	11.041	23992972
1-Pentamethyldisilyloxyhexane	24	59	11.412	13809981
1H-Benzo[b]1,4-diazepin-2(3H)-one, 4,5-dihydro-5-acetyl-7-amino-4-methyl-	25	56	11.869	645619214
2-Octanol, tert-butyldimethylsilyl ether	26	59	12.011	4806816
2-Butenoic acid, 2-[(trimethylsilyl)oxy]-, trimethylsilyl ester	27	53	12.076	34800813
tert-Butyl-[2-(tert-butyldimethylsilyl)oxyethoxy]dimethylsilane	28	83	12.316	7931968
Butanedioic acid, bis(trimethylsilyl) ester	29	13	12.458	1427497
Benzenesulfonamide, p-(3,3-dimethyl-1-triazeno)-	30	14	12.643	1176682
1-Pentamethyldisilyloxybutane	31	11	12.861	632563
2-Ethylhexanoic acid, trimethylsilyl ester	32	64	13.264	17680796
Bis(tert-butyldimethylsilyl) sulfite	33	91	13.373	646805945
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	34	31	13.722	602432
Acetic acid, [(trimethylsilyl)oxy]-, trimethylsilyl ester	35	47	13.842	35408762
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	36	33	13.852	35389714
Dibutylamine, N-(2-(trimethylsiloxy)ethyl)-	37	47	14.234	10048337
1-Triethylsilyloxyoctane	38	56	14.452	12224166
Urea, N,N'-bis(tert-butyldimethylsilyl)-	39	94	15.215	18645704
Bis(dimethyl-t-butylsilyl) fumarate	40	38	15.334	22042727
Pentasiloxane, dodecamethyl-	41	64	15.498	8656432
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	42	33	15.552	4491191
Androsta-1,4,6-triene-3,17-dione	43	10	16.064	2019408
Methylmaleic acid, bis(trimethylsilyl) ester	44	58	16.152	1455090
Hexasiloxane, tetradecamethyl-	45	50	17.372	5162706
2-Fluoro-4-iodoaniline	46	22	17.764	19939857
Cyclic octaatomic sulfur	47	87	19.573	1494284

1-Monolinoleoglycerol trimethylsilyl ester	48	24	20.565	6393396
Hexadecanoic acid, tert-butyldimethylsilyl ester	49	84	21.469	4656917
3-Tripropylsilyloxytridecane	50	50	21.480	5359189
Octadecanoic acid, tert-butyldimethylsilyl ester	51	75	23.714	4029162

Tarda A [run 2]

1,3,5-Triazine, 2,4,6-trimethoxy-	1	1	3.217	-1347000000
tert-Butyldimethylsilanol	2	72	3.828	4848892390
tert-Butyldimethylsilanol	3	59	3.904	2941482337
Propanoic acid, nonyl ester	4	12	4.994	2333948
tert-Butyldimethylsilyl nitrile	5	60	5.135	38837584
Methanamine, N,N-dimethyl-, N-oxide	6	4	5.417	8860052
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	7	37	6.323	11325000000
2-Allylphenol	8	47	6.933	296349282
2-Thiazolamine, 5-chloro-	9	12	7.107	220197409
4-Methyl-benzofurazan	10	28	7.314	75686133
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	11	25	7.391	120353251
Trimethylsilyl isothiocyanate	12	59	7.641	587009512
(.+/-.)-p-Methoxyamphetamine, N-trimethylsilyl-	13	35	8.371	43073594
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	14	96	8.470	1126830547
Benzaldehyde, 2,4-dimethyl-	15	47	8.546	16269435
Cyclopentasiloxane, decamethyl-	16	93	8.731	28753549
Isophthalaldehyde	17	43	9.014	8028591
2-Cyano-3,3-bis(trifluoromethyl)aziridine	18	35	9.058	10002193
Pentanoic acid, tert-butyldimethylsilyl ester	19	53	9.374	11701858
Bis(tert-butyldimethylsilyl)amine	20	96	9.723	70654448
Hexanoic acid, benzyldimethylsilyl ester	21	64	10.714	36181132
2-Cyano-3,3-bis(trifluoromethyl)aziridine	22	25	10.889	6543347
Tris(trimethylsilyl)borate	23	72	11.041	22286233
1-Pentamethyldisilyloxydecane	24	59	11.412	16632702
1H-Benzo[b]1,4-diazepin-2(3H)-one, 4,5-dihydro-5-acetyl-7-amino-4-methyl-	25	56	11.869	670122537
4-Oxohexanoic acid, tert-butyldimethylsilyl ester	26	53	12.011	5035372

3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	27	62	12.065	41489961
Propanedioic acid, bis(trimethylsilyl) ester	28	39	12.305	6365711
Propanoic acid, 2-methyl-3-[(trimethylsilyl)oxy]-, trimethylsilyl ester	29	53	12.316	8342118
Octanoic acid, tert-butyldimethylsilyl ester	30	50	13.264	14298912
Bis(tert-butyldimethylsilyl) sulfite	31	80	13.362	678197038
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	32	23	13.722	427319
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	33	31	13.831	34210219
2-Ethyl-3-hydroxypropionic acid, di-TMS	34	50	13.841	34041467
Dibutylamine, N-(2-(trimethylsiloxy)ethyl)-	35	30	14.234	1011613
1-Triethylsilyloxyoctane	36	50	14.452	11397250
Urea, N,N'-bis(tert-butyldimethylsilyl)-	37	88	15.214	17787768
Bis(dimethyl-t-butylsilyl) fumarate	38	38	15.334	20480529
Pentasiloxane, dodecamethyl-	39	60	15.498	8650096
Phosphoric acid, tris(tert-butyldimethylsilyl) ester	40	33	15.552	5037863
Methylmaleic acid, bis(trimethylsilyl) ester	41	53	16.151	1539010
1H-Thieno[2,3-b:4,5-b']dipyridin-2-one, 4-hydroxy-7-thiophen-2-yl-9-trifluoromethyl-	42	14	17.764	18987586
Cyclic octaatomic sulfur	43	91	19.562	2970681
Anisuric acid, bis(O_trimethylsilyl)-	44	19	20.564	433405
Hexadecanoic acid, tert-butyldimethylsilyl ester	45	77	21.469	3702198
Octadecanoic acid, tert-butyldimethylsilyl ester	46	68	23.714	2982895
Tarda B [run 1]				
tert-Butyldimethylsilanol	1	72	3.773	3866748335
Silanol, trimethyl-	2	36	3.828	3107133738
Triethylsilanol	3	50	4.710	36530067
tert-Butyldimethylsilyl nitrile	4	81	5.146	100432860
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	5	27	6.323	11758734141
Benzo[c]thiophene	6	30	6.857	557182629
Benzo[b]thiophene	7	25	6.933	78683670
N-(2-Chloroethyl)-N-ethylaniline	8	47	6.966	292809312
Isophthalaldehyde	9	35	7.336	82083968

Trimethylsilyl isothiocyanate	10	59	7.652	464024029
Phenylpropanolamine, bis(trimethylsilyl)	11	22	8.372	33183730
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	12	96	8.470	931655768
1-(3-Methylbutyl)-2,3,4-trimethylbenzene	13	18	8.547	8778455
Isophthalaldehyde	14	50	8.557	22536236
Cyclopentasiloxane, decamethyl-	15	90	8.731	33401915
Isophthalaldehyde	16	46	9.014	3948384
Isophthalaldehyde	17	35	9.058	2002224
Bis(tert-butyldimethylsilyl)amine	18	96	9.723	25184220
Pentanoic acid, 3-methyl-, tert-butyldimethylsilyl ester	19	33	10.714	4151639
Tris(trimethylsilyl)borate	20	52	11.041	13230980
Bis-N,N-(trimethylsilyl)formamide	21	53	11.412	10613282
Bis(tert-butyldimethylsilyl) carbonate	22	91	11.869	374510840
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	23	62	12.065	30400010
N-(7-Methylbenzo(b)thien-3-yl)acetamide	24	45	12.262	25921685
Propanedioic acid, bis(trimethylsilyl) ester	25	34	12.316	3246318
Bis(tert-butyldimethylsilyl) sulfite	26	74	13.362	486138238
Octanoic acid, tert-butyldimethylsilyl ester	27	32	13.264	1905215
Proline, 1-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	28	7	13.722	282775
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	29	14	13.831	1655396
Dibutylamine, N-(2-(trimethylsiloxy)ethyl)-	30	37	14.234	2680196
Urea, N,N'-bis(tert-butyldimethylsilyl)-	31	93	15.214	19642449
Bis(dimethyl-t-butylsilyl) fumarate	32	49	15.323	11186070
Benzenemethanol, 4-amino-.alpha.,.alpha.-bis(4-aminophenyl)-	33	47	15.334	11950213
Pentasiloxane, dodecamethyl-	34	46	15.498	7469336
Astrosta-1,4,6-triene-3,17-dione	35	10	16.054	3073832
Methylmaleic acid, bis(trimethylsilyl) ester	36	36	16.152	515435
2-Fluoro-4-iodoaniline	37	22	17.764	14320763
Camphoric acid, bis(tert-butyldimethylsilyl) ester	38	56	19.431	2747930
Anisuric acid, bis(O_trimethylsilyl)-	39	24	20.554	534924
Hexadecanoic acid, tert-butyldimethylsilyl ester	40	86	21.469	3888657
Octadecanoic acid, tert-butyldimethylsilyl ester	41	82	23.714	5952464

Tarda B [run 2]

tert-Butyldimethylsilanol	1	46	3.751	3640413387
tert-Butyldimethylsilanol	2	46	3.839	3579518883
Triethylsilanol	3	50	4.699	32153350
tert-Butyldimethylsilyl nitrile	4	81	5.146	119888529
Benzo[b]thiophene	5	18	6.323	11236413983
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	6	37	6.857	602227329
2-Allylphenol	7	47	6.966	362566019
Isophthalaldehyde	8	38	7.336	167283070
Trimethylsilyl isothiocyanate	9	59	7.652	380833950
Phenylpropanolamine, bis(trimethylsilyl)	10	14	8.372	14573537
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	11	96	8.470	926076772
Isophthalaldehyde	12	50	8.557	9129633
Cyclopentasiloxane, decamethyl-	13	90	8.731	25060364
Isophthalaldehyde	14	47	9.014	3269324
Isophthalaldehyde	15	27	9.058	1972009
Bis(tert-butyldimethylsilyl)amine	16	93	9.723	25656822
Pentanoic acid, 3-methyl-, tert-butyldimethylsilyl ester	17	32	10.703	4132406
4-Methylvaleric acid, tert-butyldimethylsilyl ester	18	38	10.714	5101766
Tris(trimethylsilyl)borate	19	52	11.041	12920512
Bis-N,N-(trimethylsilyl)formamide	20	49	11.412	10794842
Bis(tert-butyldimethylsilyl) carbonate	21	91	11.858	384500532
2-Ethylhexanoic acid, trimethylsilyl ester	22	23	11.978	1186708
3,8-Dioxa-2,9-disiladecane, 2,2,9,9-tetramethyl-	23	62	12.065	33912641
N-(Chroman-7-yl)-N-methylacetamide	24	45	12.262	27682233
Propanedioic acid, bis(trimethylsilyl) ester	25	39	12.305	3132372
(.+/-.)-3-Hydroxybutyric acid, trimethylsilyl ether, trimethylsilyl ester	26	46	12.316	5131397
Octanoic acid, tert-butyldimethylsilyl ester	27	29	13.253	1578479
Bis(tert-butyldimethylsilyl) sulfite	28	83	13.362	508880743
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	29	16	13.831	1472172
Dibutylamine, N-(2-(trimethylsiloxy)ethyl)-	30	29	14.234	1449882
Sulfuric acid, bis(tert-butyldimethylsilyl) ester	31	62	14.419	16344679

Urea, N,N'-bis(tert-butyldimethylsilyl)-	32	89	15.214	19036191
Bis(dimethyl-t-butylsilyl) fumarate	33	50	15.334	10971150
Pentasiloxane, dodecamethyl-	34	43	15.498	7106302
Astrosta-1,4,6-triene-3,17-dione	35	10	16.053	3597626
Methylmaleic acid, bis(trimethylsilyl) ester	36	21	16.162	325561
2,4-Diphenylthiazole	37	22	17.764	12542421
Camphoric acid, bis(tert-butyldimethylsilyl) ester	38	57	19.431	2391262
Anisuric acid, bis(O_trimethylsilyl)-	39	12	20.565	689447
Hexadecanoic acid, tert-butyldimethylsilyl ester	40	83	21.469	1948465
Octadecanoic acid, tert-butyldimethylsilyl ester	41	69	23.714	1030050
Tarda Sand [run 1]				
Carbonic acid, dimethyl ester	1	1	3.457	974391672
tert-Butyldimethylsilanol	2	90	3.653	15115510637
Cyclotetrasiloxane, octamethyl-	3	81	6.388	123311026
4-(Methylthio)benzonitrile	4	23	6.541	31777931
Ethanol, 2-(trimethylsilyl)-	5	54	7.195	2090695
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	6	96	8.448	1062723880
Disiloxane, pentamethyl-	7	50	8.535	11826519
Cyclopentasiloxane, decamethyl-	8	93	8.720	31226075
1-Ethyl-2-pentamethyldisilanyloxycyclohexane	9	37	8.993	7990852
4-Cyanothiophenol	10	40	9.919	1340698
Tris(trimethylsilyl)borate	11	47	11.041	12677121
Tetrasiloxane, decamethyl-	12	49	13.384	10162136
Pentasiloxane, dodecamethyl-	13	49	15.498	10252214
Hexasiloxane, tetradecamethyl-	14	46	17.372	4954846
Dimethylgloxime, di(tert-butyldimethylsilyl) ether	15	31	19.224	2556118
1-Monolinoleoylglycerol trimethylsilyl ester	16	52	20.564	1102799
Hexadecanoic acid, tert-butyldimethylsilyl ester	17	73	21.469	2135532
Octadecanoic acid, tert-butyldimethylsilyl ester	18	86	23.714	2528380
Tarda Sand [run 2]				
Carbonic acid, dimethyl ester	1	2	3.239	4970345

tert-Butyldimethylsilanol	2	86	3.621	896524535
tert-Butyldimethylsilanol	3	91	3.675	1719305886
Cyclotetrasiloxane, octamethyl-	4	81	6.378	111754655
1,1,3,3-Tetramethyl-1,3-bis[(2Z)-pent-2-en-1-yloxy]disiloxane	5	36	6.519	28997190
Ethanol, 2-(trimethylsilyl)-	6	52	7.184	1392066
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	7	96	8.437	982303645
1,3,4-Thiadiazol-2-amine, 5-(butylthio)-	8	43	8.524	11102276
Cyclopentasiloxane, decamethyl-	9	93	8.709	27603415
1-Ethyl-2-pentamethyldisilanyloxycyclohexane	10	38	8.982	6585898
4-Cyanothiophenol	11	43	9.908	1452086
Tris(trimethylsilyl)borate	12	46	11.030	11757064
Tetrasiloxane, decamethyl-	13	43	13.384	9847458
Pentasiloxane, dodecamethyl-	14	49	15.498	9204413
Dimethylgloxime, di(tert-butyldimethylsilyl) ether	15	52	19.235	2698488
1-Monolinoleoylglycerol trimethylsilyl ester	16	36	20.565	589211
Hexadecanoic acid, tert-butyldimethylsilyl ester	17	71	21.469	2463922
Octadecanoic acid, tert-butyldimethylsilyl ester	18	85	23.714	2961419
Procedural Blank [run 1]				
N-(2-Acetylcyclohexylidene)-4-chloroaniline	1	17	3.337	1413896121
tert-Butyldimethylsilanol	2	46	3.795	4624916974
tert-Butyldimethylsilanol	3	72	3.860	1351965282
tert-Butyldimethylsilanol	4	46	3.893	3549105716
2-Butenoic acid, 3-methyl-	5	27	4.743	11120245
tert-Butyldimethylsilyl isocyanate	6	25	4.841	15571996
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	7	32	6.323	14012469182
Benzo[b]thiophene	8	18	7.206	172851719
4-Methyl-benzofurazan	9	33	7.293	76268346
3-Methylphenylacetylene	10	42	7.402	404905814
Isophthalaldehyde	11	25	7.587	58367712
Heptyl S-2-(diisopropylamino)ethyl isopropylphosphonothiolate	12	32	7.631	172049683
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	13	16	7.729	136143221
N-(2-Chloroethyl)-N-ethylaniline	14	50	7.892	102594557

4-(Methylthio)benzonitrile	15	49	8.393	104759890
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	16	93	8.502	1494130036
Benzene, (1-methoxyethenyl)-	17	52	8.568	32036823
Cyclopentasiloxane, decamethyl-	18	90	8.742	68015820
1H-Indene, 1-methyl-	19	25	8.840	31247180
Isophthalaldehyde	20	35	8.949	44012695
Isophthalaldehyde	21	43	9.025	23795066
2-Thiazolamine, 5-chloro-	22	14	9.069	41071873
Benzenesulfonamide, N-(3-chloropropyl)-N-methyl-	23	23	9.287	16258971
Azulene	24	86	9.363	234555362
2-Allylphenol	25	38	9.428	7933017
Bis(tert-butyldimethylsilyl)amine	26	97	9.734	79813889
Propanenitrile, 3-(ethylphenylamino)-	27	16	10.464	9408941
Silane, trimethylphenoxy-	28	64	10.605	34442011
Naphthalene, 2-methyl-	29	97	10.910	70389001
Tris(trimethylsilyl)borate	30	64	11.041	48449388
Naphthalene, 1-methyl-	31	95	11.150	47655972
4-Pentamethyldisilyloxyhexadecane	32	27	11.412	7461526
tert-Butyl-[2-(tert-butyldimethylsilyl)oxyethoxy]dimethylsilane	33	72	11.902	3011001766
Naphthalene, 2-ethenyl-	34	49	12.044	22071564
Bis(tert-butyldimethylsilyl) carbonate	35	59	12.098	79797638
1H-Purin-6-amine, N,N-dimethyl-	36	22	12.293	7077499
Naphthalene, 2-ethenyl-	37	38	12.512	10675474
Naphthalene, 1,4-dimethyl-	38	91	12.599	13941897
Naphthalene, 2-ethenyl-	39	76	12.708	35720048
Biphenylene	40	87	13.002	60130364
Bis(tert-butyldimethylsilyl) sulfite	41	64	13.351	19395367
Tetrasiloxane, decamethyl-	42	49	13.384	18464482
1-Naphthalenecarbonitrile	43	58	13.547	7386450
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	44	35	13.831	90161526
Propanedioic acid, bis(trimethylsilyl) ester	45	47	13.842	95866861
Fluorene-9-methanol	46	59	14.408	11318032
Benzene, 1,1'-(diazomethylene)bis-	47	64	14.572	12143535

Fluorene	48	93	14.626	12592842
Fluorene	49	83	15.127	5805693
Pentasiloxane, dodecamethyl-	50	46	15.498	10167783
Phenanthrene	51	93	16.882	73558922
Dibenzo[b,e]7,8-diazabicyclo[2.2.2]octa-2,5-diene	52	87	16.980	25449635
3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetrasiloxane	53	43	17.361	8595367
Phenanthrene, 2-methyl-	54	97	18.069	7573946
Phenanthrene, 2-methyl-	55	96	18.124	7893885
Phenanthrene, 1-methyl-	56	80	18.320	11117611
Naphthalene, 2-phenyl-	57	83	18.810	8915448
Fluoranthene	58	96	19.726	18716047
Fluoranthene	59	96	19.954	12249894
Pyrene	60	96	20.227	28944903
Procedural Blank [run 2]				
Thiazole, 4-ethyl-2-methyl-	1	38	3.403	2370504998
tert-Butyldimethylsilanol	2	46	3.795	4605234350
tert-Butyldimethylsilanol	3	46	3.850	1064472260
tert-Butyldimethylsilanol	4	46	3.926	4210414895
tert-Butyldimethylsilyl isocyanate	5	30	4.743	25804343
tert-Butyldimethylsilyl isocyanate	6	25	4.830	48439489
tert-Butyldimethylsilyl nitrile	7	91	5.048	309317700
tert-Butyldimethylsilyl nitrile	8	90	5.223	846650191
tert-Butyldimethylsilyl nitrile	9	90	5.277	489529812
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	10	32	6.323	12787584255
tert-Butyldimethylsilyl 2,2,3,3,3-pentafluoropropanoate	11	47	6.966	966794513
Benzo[b]thiophene	12	18	7.217	191401488
3-Methylphenylacetylene	13	42	7.413	286450704
Isophthalaldehyde	14	25	7.598	71565734
Heptyl S-2-(diisopropylamino)ethyl isopropylphosphonothiolate	15	32	7.642	132989531
N-(2-Chloroethyl)-N-ethylaniline	16	43	7.685	48600523
2-Allylphenol	17	27	7.740	137931741

Benzene, (1-methoxyethenyl)-	18	32	7.892	104797026
4-(Methylthio)benzonitrile	19	43	8.404	112891637
Disiloxane, 1,3-bis(1,1-dimethylethyl)-1,1,3,3-tetramethyl-	20	96	8.502	1542937024
Phenol, 4-(2-propenyl)-	21	50	8.579	30497202
2-Allylphenol	22	43	8.644	34025185
Cyclopentasiloxane, decamethyl-	23	93	8.753	59331816
Benzene, (1-methyl-2-cyclopropen-1-yl)-	24	46	8.840	33764644
1H-Indene, 3-methyl-	25	30	8.927	23990295
N-(2-Chloroethyl)-N-ethylaniline	26	37	8.960	23137233
1,4-Benzenedicarboxaldehyde	27	43	9.025	24978234
Diethyl 1,1-cyclobutanedicarboxylate	28	25	9.069	43749645
Dibenzothiophene	29	14	9.287	17799607
Azulene	30	86	9.374	257877369
Pyrido[2,3-d]pyrimidine-5(8H)-one, 2-methoxy-4,7-dimethyl-	31	27	9.429	7933521
Bis(tert-butyldimethylsilyl)amine	32	97	9.734	85747068
Thiourea, N-[2-(1-cyclohexen-1-yl)ethyl]-	33	14	10.464	9300822
Dimethyl-(isopropyl)-silyloxybenzene	34	72	10.605	35814773
Naphthalene, 1-methyl-	35	97	10.911	75627605
Tris(trimethylsilyl)borate	36	64	11.041	50115417
Naphthalene, 2-methyl-	37	95	11.150	51794751
Bis-N,N-(trimethylsilyl)formamide	38	25	11.412	6507102
tert-Butyl-[2-(tert-butyldimethylsilyl)oxyethoxy]dimethylsilane	39	72	11.891	2991313806
Naphthalene, 2-ethenyl-	40	49	12.044	24840501
2-Hydroxycyclohexane-1-carboxylic acid, bis(trimethylsilyl) deriv.	41	59	12.098	89252979
6-Phenyl-[1,3]thiazine-2,4-dione	42	18	12.283	7581969
.beta.-(1-Naphthyl)acrylic acid	43	32	12.512	12277147
Naphthalene, 1,4-dimethyl-	44	91	12.599	19641539
Naphthalene, 2-ethenyl-	45	76	12.708	40057403
Naphthalene, 1,4-dimethyl-	46	83	12.850	7441513
Biphenylene	47	86	13.003	71554366
Bis(tert-butyldimethylsilyl) sulfite	48	64	13.351	19286636
Tetrasiloxane, decamethyl-	49	49	13.384	20249748

1-Naphthalenecarbonitrile	50	62	13.547	8514939
Glycine, N-(tert-butyldimethylsilyl)-, tert-butyldimethylsilyl ester	51	36	13.831	96728680
tert-Butylpentamethyldisiloxane	52	47	13.842	103175546
3-Fluoro-4-methoxyphenylacetic acid	53	38	13.907	8795783
1H-Phenalene	54	59	14.408	14444889
Benzene, 1,1'-(diazomethylene)bis-	55	91	14.572	13186617
Fluorene	56	91	14.626	14037892
Fluorene	57	83	15.127	6177288
Pentasiloxane, dodecamethyl-	58	30	15.498	10666452
Benzene, 1-nitro-4-(2-phenylethenyl)-	59	43	16.064	4913927
Phenanthrene	60	93	16.882	78417744
Diphenylacetylene	61	87	16.980	26713854
Trisiloxane, 1,1,1,5,5,5-hexamethyl-3,3-bis[(trimethylsilyl)oxy]-	62	38	17.361	9477208
Anthracene, 2-methyl-	63	96	18.069	7999419
Phenanthrene, 2-methyl-	64	97	18.124	8469664
Phenanthrene, 2-methyl-	65	50	18.320	16433287
Phenanthrene, 2-methyl-	66	96	18.375	6722863
Naphthalene, 2-phenyl-	67	78	18.810	9337008
Fluoranthene	68	96	19.715	18879887
Fluoranthene	69	96	19.954	13853764
Pyrene	70	96	20.227	30763767

Table B4. Organic compounds detected in DCM swabs of packaging materials for Tarda A, Tarda B, and the Tarda sand sample. The compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Tarda A Packaging [run 1]				
2-(Acetoxymethyl)-3-(methoxycarbonyl)biphenylene	1	37	22.668	6854
Morpholine, 4-phenyl-	2	72	23.627	218021
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	3	53	23.768	1226922
Morpholine, 4-phenyl-	4	53	24.117	45495
3-Phenylbut-1-ene	5	9	27.059	12733

Tricyclo[6.6.0.0(3,6)]tetradeca-1(8),4,11-triene	6	13	27.397	11211
tert-Butyl(5-isopropyl-2-methylphenoxy)dimethylsilane	7	32	27.713	7156
Silicic acid, diethyl bis(trimethylsilyl) ester	8	32	34.937	7209
Anthracene, 9,10-dihydro-9,9,10-trimethyl-	9	17	35.841	7575
Thieno[2,3-b]pyridine-2-carboxamide, 3-amino-6-methyl-	10	9	37.814	6880
Tarda A Packaging [run 2]				
n-Hexadecanoic acid	1	87	18.494	28616
Methane	2	2	18.974	7609
1-Nitro-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid diethylamide	3	9	21.001	8826
3-Ethoxy-1,1,1,5,5,5-hexamethyl-3-(trimethylsiloxy)trisiloxane	4	23	22.657	10266
Morpholine, 4-phenyl-	5	72	23.605	233442
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	6	59	23.768	1322366
Morpholine, 4-phenyl-	7	53	24.117	58724
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	8	37	25.773	10255
Cyclopropane, 1-phenyl-1(3-phenyl-3-butenyl)-	9	25	27.059	13458
Benzene, 1,1'-(2-butene-1,4-diyl)bis-	10	35	27.386	15510
Tarda A Packaging Blank [run 1]				
Ethanone, 1-[2-(dimethylamino)phenyl]-	1	42	23.616	12262
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	2	64	23.812	124130
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	3	9	25.577	5933
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	4	9	30.230	9950
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	5	42	30.339	7816
(+-)-5-(1-Acetoxy-1-methylethyl)-2-methyl-2-cyclohexen-1-one semicarbazone	6	9	33.074	6780
4-[N-Methylpiperazino]-5-nitro veratrole	7	9	34.959	5842
1,1,1,3,5,5,5-Heptamethyltrisiloxane	8	38	35.471	6081
7-Chloro-4-methoxy-3-methylquinoline	9	25	39.655	6166
1,4-Bis(trimethylsilyl)benzene	10	23	40.799	6100

Tarda A Packaging Blank [run 2]				
Nitrous oxide	1	2	19.105	4686
Formamide, N-methyl-N-[(4-methylphenyl)methyl]-	2	64	23.638	35152
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	3	53	23.812	123581
Benzenamine, 4-bromo-2-chloro-	4	9	33.477	5727
Arsenous acid, tris(trimethylsilyl) ester	5	38	34.501	4794
3,5-Ethanoquinolin-10-one, decahydro-1,7-dimethyl-, [3R-(3.alpha.,4a.beta.,5.alpha.,7.beta.,8a.beta.)]-	6	9	37.029	4648
2-Ethylacridine	7	7	34.149	4850
Tris(tert-butyldimethylsilyloxy)arsane	8	9	38.195	4636
Tris(tert-butyldimethylsilyloxy)arsane	9	23	40.342	5084
1-Nitro-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid diethylamide	10	38	40.647	6410
Tarda B Packaging [run 1]				
n-Hexadecanoic acid	1	76	18.484	45297
Octadecanoic acid	2	49	20.379	11597
Dodecahydropyrido[1,2-b]isoquinolin-6-one	3	10	21.197	9463
2-Hydroxy-16-methyl-heptadecanoic acid, pyrrolidide	4	12	21.622	19722
9-Borabicyclo[3.3.1]nonane, 9-[3-(dimethylamino)propyl]-	5	17	23.332	10753
Morpholine, 4-phenyl-	6	56	23.627	350672
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	7	59	23.768	1870205
Morpholine, 4-phenyl-	8	49	24.128	86250
Ethyl 4-cyano-4-phenylvalerate	9	38	27.059	27021
1H-Indene, 1-hexadecyl-2,3-dihydro-	10	35	27.386	37127
Tarda B Packaging [run 2]				
n-Hexadecanoic acid	1	95	18.472	123058
Octadecanoic acid	2	95	20.368	51047
Phenyl tert-butyl ketone	3	25	20.488	13001
Methyl 4-O-acetyl-2,3,6-tri-O-ethyl-.alpha.-d-galactopyranoside	4	25	21.621	30905
Ether, bis(p-tert-butylphenyl)	5	38	23.332	15547

Morpholine, 4-phenyl-	6	64	23.637	417936
Diethylene glycol dibenzoate	7	64	23.768	1868242
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	8	56	24.117	110357
1-Naphthalenol, 1,2,3,4-tetrahydro-, acetate	9	25	27.070	41438
1H-Indene, 1-hexadecyl-2,3-dihydro-	10	43	27.386	52309
Tarda B Packaging Blank [run 1]				
Arsenous acid, tris(trimethylsilyl) ester	1	28	21.948	6420
Morpholine, 4-phenyl-	2	64	23.627	55295
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	3	53	23.790	284683
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	4	7	27.408	5611
1,1,1,3,5,5,5-Heptamethyltrisiloxane	5	9	28.040	5932
Hexahydropyridine, 1-methyl-4-[4,5-dihydroxyphenyl]-	6	9	29.554	6477
Cyclohexa-2,5-diene-1,4-dione, 2-methyl-5-(4-morpholinyl)-	7	9	30.219	6018
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	8	25	30.328	6938
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	9	25	34.937	4395
3-Phenyl-2H-chromene	10	9	36.005	4941
Tarda B Packaging Blank [run 2]				
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	1	3	20.085	7351
Arsenous acid, tris(trimethylsilyl) ester	2	36	22.602	5158
Morpholine, 4-phenyl-	3	64	23.616	55395
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	4	59	23.779	300902
Benzamide, N-acetyl-	5	25	24.117	11976
7-Hydroxy-7,8,9,10-tetramethyl-7,8-dihydrocyclohepta[d,e]naphthalene	6	9	36.778	5308
4-Bromo-3-chloroaniline	7	9	37.171	5764
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	8	38	37.814	5275
Pyrido[2,3-d]pyrimidine, 4-phenyl-	9	5	38.380	7207
4-Bromo-3-chloroaniline	10	9	39.688	5841

Table B5. Organic compounds detected in DCM swabs of materials used for subsampling Tarda A, Tarda B, and the Tarda sand sample. The compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Aluminum Foil [run 1]				
Morpholine, 4-phenyl-	1	72	23.637	448113
Diethylene glycol dibenzoate	2	59	23.768	2581057
Morpholine, 4-phenyl-	3	64	24.128	146491
Aluminum Foil [run 2]				
Morpholine, 4-phenyl-	1	72	23.627	461009
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	2	64	23.757	2800759
1,3-Dioxolane, 2,4-dimethyl-2-phenyl-	3	53	24.117	139949
Aluminum Foil Blank [run 1]				
1-Propanamine, 3-(methylthio)-	1	1	16.195	6030
n-Hexadecanoic acid	2	59	18.505	16077
Tetradecanoic acid	3	12	20.380	17147
Silicic acid, diethyl bis(trimethylsilyl) ester	4	64	22.297	7999
Morpholine, 4-phenyl-	5	72	23.627	80020
Diethylene glycol dibenzoate	6	58	23.779	471543
1-(2-Acetoxyethyl)-3,6-diazahomoadamantan-9-one oxime	7	25	26.449	6537
Cyclotetrasiloxane, octamethyl-	8	17	27.386	6288
2-Pyridinamine, N-(4,5-dihydro-5-methyl-2-thiazolyl-3-methyl-	9	37	30.687	6356
9-Borabicyclo[3.3.1]nonane, 9-[3-(dimethylamino)propyl]-	10	9	32.420	6905
Aluminum Foil Blank [run 2]				
Ethene, trifluoro-	1	2	14.724	5183
n-Hexadecanoic acid	2	53	18.505	7294
Tetradecanoic acid	3	9	20.390	11012
1-Nitro-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid diethylamide	4	9	20.532	6948

6-Styrylpehnanthridine	5	38	20.935	5135
7-Chloro-4-methoxy-3-methylquinoline	6	40	21.567	4898
Morpholine, 4-phenyl-	7	64	23.616	83660
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	8	59	23.779	473611
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	9	47	33.215	4810
Arsenous acid, tris(trimethylsilyl) ester	10	25	35.122	4894
Scale [run 1]				
2-(1-Phenyl-ethylamino)-2-thioxo-acetamide	1	9	20.510	7356
Ethanone, 1-[2-(dimethylamino)phenyl]-	2	56	23.627	361390
Diethylene glycol dibenzoate	3	47	23.768	2192697
Benzamide, N-propyl-	4	59	24.117	124114
1,2-Benzenedicarboxylic acid, mono(2-ethylhexyl) ester	5	25	24.716	15249
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	6	47	30.873	7159
2H-1,3,4-Benzotriazepine-2-thione, 5-benzyl-1,3-dihydro-3-methyl-	7	35	30.982	7059
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	8	38	33.455	9150
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	9	32	35.700	5555
Silicic acid, diethyl bis(trimethylsilyl) ester	10	64	37.683	6071
Scale [run 2]				
Allene	1	2	14.310	6987
Acetaldehyde	2	2	15.901	7015
Morpholine, 4-phenyl-	3	72	23.627	374419
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	4	59	23.768	2264940
1H-Isoindole-1,3(2H)-dione, 2-hydroxy-	5	40	24.117	123550
1-(4-Methoxy-phenyl)-5,5-dioxo-hexahydro-5λ6)-thieno[3,4-b]pyrrol-2-one	6	46	24.716	10164
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	7	27	31.537	8244

Tris(tert-butyldimethylsilyloxy)arsane	8	27	37.955	7447
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	9	37	39.306	8484
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	10	38	40.483	7603
Scale Blank [run 1]				
Morpholine, 4-phenyl-	1	64	23.605	63062
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	2	59	23.779	402612
4,5-Dihydrooxazole-5-one, 4-chloromethylene-2-phenyl-	3	10	24.117	21031
Benzene, 1-phenyl-4-(2-cyano-2-phenylethenyl)-	4	16	26.601	6355
2-(Acetoxymethyl)-3-(methoxycarbonyl)biphenylene	5	25	27.680	6551
1,2-Dihydroanthra[1,2-d]thiazole-2,6,11-trione	6	25	28.552	6484
7H-Dibenzo[b,g]carbazole, 7-methyl-	7	9	34.414	6272
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	8	42	34.675	6646
Arsenous acid, tris(trimethylsilyl) ester	9	25	34.795	5528
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	10	37	36.081	7106
Scale Blank [run 2]				
1,2-Dihydroanthra[1,2-d]thiazole-2,6,11-trione	1	9	23.191	5095
Morpholine, 4-phenyl-	2	64	23.615	64548
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	3	59	23.779	388243
Cyclotrisiloxane, hexamethyl-	4	9	26.732	5163
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	5	25	27.767	7632
Methyltris(trimethylsiloxy)silane	6	23	33.346	6309
7,7,9,9,11,11-Hexamethyl-3,6,8,10,12,15-hexaoxa-7,9,11-trisilaheptadecane	7	25	33.607	5588
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	8	5	36.037	8733
N-Methyl-1-adamantaneacetamide	9	9	38.271	8333
Arsenous acid, tris(trimethylsilyl) ester	10	50	40.472	6197

Sterile Knife [run 1]				
No hits.	-	-	-	-
Sterile Knife [run 2]				
4-(Benzoylmethyl)-6-methyl-2H-1,4-benzoxazin-3-one	1	2	17.928	9690
N-Benzolglycine ethyl ester	2	42	20.510	8327
Morpholine, 4-phenyl-	3	72	23.627	267885
Diethylene glycol dibenzoate	4	58	23.768	1632131
Morpholine, 4-phenyl-	5	49	24.117	75730
7-Chloro-4-methoxy-3-methylquinoline	6	35	30.339	8625
Cyclotetrasiloxane, octamethyl-	7	17	37.879	6773
Silicic acid, diethyl bis(trimethylsilyl) ester	8	28	38.042	12396
Silicic acid, diethyl bis(trimethylsilyl) ester	9	64	38.674	7744
2’,4’-Dihydroxyacetophenone, bis(trimethylsilyl) ether	10	32	40.233	6810
Sterile Knife Blank [run 1]				
N-Benzolglycine ethyl ester	1	7	20.510	10541
Morpholine, 4-phenyl-	2	39	23.605	118752
Diethylene glycol dibenzoate	3	58	23.768	663114
Morpholine, 4-phenyl-	4	43	24.128	25556
1-Nitro-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid diethylamide	5	36	30.568	6541
Silicic acid, diethyl bis(trimethylsilyl) ester	6	33	31.701	6300
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	7	9	32.431	10108
Arsenous acid, tris(trimethylsilyl) ester	8	10	35.100	7126
Silicic acid, diethyl bis(trimethylsilyl) ester	9	33	39.285	5758
Sterile Knife Blank [run 2]				
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	1	37	23.376	6007
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	2	40	23.627	131578
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	3	53	23.779	712659
Benzeneacetic acid, 2-acetyl-3-methoxy-	4	50	24.117	28903

Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	5	32	25.664	7871
Silicic acid, diethyl bis(trimethylsilyl) ester	6	17	27.408	9027
Silicic acid, diethyl bis(trimethylsilyl) ester	7	17	29.413	5891
Phenol, 4-[2-(5-nitro-2-benzoxazolyl)ethenyl]-	8	9	32.997	6500
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	9	27	34.512	8284
2-Ethylacridine	10	25	39.426	6088
Tweezers [run 1]				
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	1	3	17.797	7909
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	2	3	19.508	6986
N-Benzolglycine ethyl ester	3	40	20.532	6845
Morpholine, 4-phenyl-	4	72	23.627	231555
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	5	50	23.768	1396324
Morpholine, 4-phenyl-	6	46	24.117	65977
Silicic acid, diethyl bis(trimethylsilyl) ester	7	38	25.675	8379
Silicic acid, diethyl bis(trimethylsilyl) ester	8	50	35.896	7044
Silicic acid, diethyl bis(trimethylsilyl) ester	9	78	36.528	6276
Silicic acid, diethyl bis(trimethylsilyl) ester	10	59	37.214	6412
Tweezers [run 2]				
1H-Imidazolo[1,2-a]pyridine-6-carbonitrile, 2,3-dihydro-7-methyl-1-(4-methoxyphenyl)-5-oxo-	1	3	20.194	6684
4-Cyanobenzophenone	2	45	20.521	6740
1-(3,4-Methylenedioxyphenyl)-2-propanone oxime, methyl ether	3	9	20.902	6348
Glyoxylamide, N-phenyl-	4	28	23.627	236894
Diethylene glycol dibenzoate	5	58	23.768	1476898
Benzamide, N-propyl-	6	59	24.117	89175
Carbonic acid, monoamide, N-(2-ethylphenyl)-, propyl ester	7	9	36.593	6312
Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-	8	9	36.833	6635

2-Ethylacridine	9	25	36.920	6011
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	10	47	37.639	6387
Tweezers Blank [run 1]				
Morpholine, 4-phenyl-	1	72	23.605	98061
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	2	53	23.779	503352
Silicic acid, diethyl bis(trimethylsilyl) ester	3	36	25.087	11477
Chalcone	4	25	25.261	6880
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	5	38	26.645	6938
2-Ethylacridine	6	47	27.560	6670
Tris(tert-butyldimethylsilyloxy)arsane	7	38	33.978	6922
Thieno[2,3-b]pyridine-2-carboxamide, 3-amino-6-methyl-	8	9	37.530	6383
Silicic acid, diethyl bis(trimethylsilyl) ester	9	74	37.661	6463
1,4-Bis(trimethylsilyl)benzene	10	28	40.788	7598
Tweezers Blank [run 2]				
Indolizine, 2-(4-methylphenyl)-	1	2	12.654	6921
Indolizine, 2-(4-methylphenyl)-	2	2	14.801	5231
1H-Pyrrole, 1,1',1''-borylidynetris-	3	7	20.151	5181
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	4	56	23.616	86113
Diethylene glycol dibenzoate	5	50	23.779	538125
Morpholine, 4-phenyl-	6	43	24.117	27995
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	7	25	30.480	5433
Silicic acid, diethyl bis(trimethylsilyl) ester	8	39	36.746	7295
1-Nitro-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid diethylamide	9	39	40.549	5798
Glass Vial [run 1]				
1,2-Propadiene-1,3-dione	1	1	19.235	6765
2-Ethylacridine	2	38	23.212	10636

Morpholine, 4-phenyl-	3	72	23.605	142238
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	4	59	23.779	843037
Morpholine, 4-phenyl-	5	38	24.128	34010
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	6	37	29.129	7908
Silicic acid, diethyl bis(trimethylsilyl) ester	7	38	29.271	7156
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	8	38	29.358	8369
Morphinan, 6,7,8,14-tetradehydro-3-methoxy-17-methyl-	9	16	37.018	6589
Anthracene, 9,10-dihydro-9,9,10-trimethyl-	10	17	38.598	7930
Glass Vial [run 2]				
Ethylene oxide	1	1	19.126	7443
Morpholine, 4-phenyl-	2	72	23.627	149615
1,3-Dioxolane, 2-phenyl-2-(phenylmethyl)-	3	53	23.768	911232
Methyl octyl phthalate	4	50	24.128	49838
Silicic acid, diethyl bis(trimethylsilyl) ester	5	56	28.606	7372
Bendazol	6	9	29.325	6367
1,2-Dihydroanthra[1,2-d]thiazole-2,6,11-trione	7	25	30.077	6101
Silicic acid, diethyl bis(trimethylsilyl) ester	8	64	32.954	6193
Arsenous acid, tris(trimethylsilyl) ester	9	35	35.667	7291
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	10	7	40.701	7089
Glass Vial Blank [run 1]				
4-Cyanobenzophenone	1	9	20.532	5811
Benz[b]-1,4-oxazepine-4(5H)-thione, 2,3-dihydro-2,8-dimethyl-	2	9	21.981	6284
Morpholine, 4-phenyl-	3	80	23.615	143898
1,3-Dioxolane, 2-phenyl-2-(phenylmethyl)-	4	59	23.768	847598
1,2-Benzenedicarboxylic acid, ethyl methyl ester	5	49	24.128	26425
Tris(tert-butyldimethylsilyloxy)arsane	6	17	30.687	7963
Silicic acid, diethyl bis(trimethylsilyl) ester	7	72	31.014	7809
1,2-Dihydroanthra[1,2-d]thiazole-2,6,11-trione	8	16	31.167	5820

Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	9	38	35.024	6689
7-Chloro-4-methoxy-3-methylquinoline	10	37	37.944	6233
Glass Vial Blank [run 2]				
4-Sulfamoyl-thiophene-2-carboxylic acid	1	5	19.606	6288
Morpholine, 4-phenyl-	2	72	23.605	146303
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	3	59	23.768	887729
Morpholine, 4-phenyl-	4	50	24.128	38856
Arsenous acid, tris(trimethylsilyl) ester	5	28	25.969	6262
Tert-Butyl(5-isopropyl-2-methylphenoxy)dimethylsilane	6	25	26.503	5787
N-Methyl-1-adamantaneacetamide	7	9	32.300	10609
2-Propen-1-one, 1,3-diphenyl-, (E)-	8	25	37.105	5981
2-Ethylacridine	9	37	38.936	6159
Silicic acid, diethyl bis(trimethylsilyl) ester	10	42	40.178	5598
Mortar and Pestle for Tarda A [run 1]				
Methane	1	2	17.819	6021
Cyclopentanecarboxamide, 3-ethenyl-2-(3-pentenyldiene)-N-phenyl-, [1.alpha.,2Z(E),3.alpha.]-	2	16	22.177	6302
2-Propen-1-one, 1,3-diphenyl-, (E)-	3	32	23.234	6983
Benzamide, N-propyl-	4	50	23.627	134739
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	5	59	23.779	798277
Benzamide, N-propyl-	6	47	24.128	33147
Silicic acid, diethyl bis(trimethylsilyl) ester	7	36	24.793	5889
Silicic acid, diethyl bis(trimethylsilyl) ester	8	39	26.983	6669
2-Ethylacridine	9	9	28.127	5603
Silicic acid, diethyl bis(trimethylsilyl) ester	10	45	38.762	5596
Mortar and Pestle for Tarda A [run 2]				
Methane	1	2	14.833	7926
Arsenous acid, tris(trimethylsilyl) ester	2	47	23.027	7609
Morpholine, 4-phenyl-	3	72	23.627	137142

2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	4	53	23.768	831501
Heptyl methyl phthalate	5	42	24.117	30903
Silicic acid, diethyl bis(trimethylsilyl) ester	6	25	25.479	6337
Cyclotetrasiloxane, octamethyl-	7	32	29.478	6502
Silicic acid, diethyl bis(trimethylsilyl) ester	8	78	30.578	6763
Hexahydropyridine, 1-methyl-4-[4,5-dihydroxyphenyl]-	9	35	32.409	9199
3,3-Diisopropoxy-1,1,1,5,5,5-hexamethyltrisiloxane	10	47	40.592	6781
Mortar and Pestle for Tarda A Blank [run 1]				
Morpholine, 4-phenyl-	1	72	23.627	128343
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	2	53	23.768	813261
1,2-Benzenedicarboxylic acid, ethyl methyl ester	3	47	24.117	52522
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	4	7	31.134	4884
3,5-Dimethylbenzaldehyde thiocarbamoylhydrazone	5	27	32.006	6790
Morphinan, 7,8-didehydro-3-methoxy-17-methyl-6-methylene-, (-)-	6	9	33.760	5278
Cyclotrisiloxane, hexamethyl-	7	37	35.820	5977
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	8	9	36.301	4925
Pyridine, 3-(5-ethyl-1,2,4-oxadiazol-3-yl)-2-methoxy-6-phenyl-	9	9	37.301	5736
Silicic acid, diethyl bis(trimethylsilyl) ester	10	74	40.429	4675
Mortar and Pestle for Tarda A Blank [run 2]				
4-(Benzoylmethyl)-6-methyl-2H-1,4-benzoxazin-3-one	1	4	20.532	5984
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	2	7	21.458	6094
Anthracene, 9,10-dihydro-9,9,10-trimethyl-	3	25	22.155	8611
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	4	42	22.253	5974
Benzonitrile, 3,4-dimethoxy-	5	47	23.615	142340
Diethylene glycol dibenzoate	6	53	23.768	847214
Benzamide, N-propyl-	7	59	24.117	39865
Acetamide, 2-[4-(1-oxo-3-phenyl-2-propenyl)phenyloxy]-	8	9	26.852	6319

2-Ethylacridine	9	50	39.252	6215
Tris(tert-butyldimethylsilyloxy)arsane	10	23	40.298	6512
Mortar and Pestle for Tarda B [run 1]				
Allene	1	2	15.988	8374
1,2-Dichloro-4-fluoro-5-nitrobenzene	2	2	19.878	7683
Ethanone, 1-[2-(dimethylamino)phenyl]-	3	56	23.627	194345
Diethylene glycol dibenzoate	4	59	23.768	1048084
Morpholine, 4-phenyl-	5	43	24.117	34291
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	6	35	25.043	9168
Silicic acid, diethyl bis(trimethylsilyl) ester	7	39	25.272	8244
1,2-Dihydroanthra[1,2-d]thiazole-2,6,11-trione	8	16	30.306	8725
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	9	9	30.459	8826
Silicic acid, diethyl bis(trimethylsilyl) ester	10	38	33.063	7875
Mortar and Pestle for Tarda B [run 2]				
2,4-Dibenzoylpentadioic acid, dimethyl ester	1	1	17.546	5981
Morpholine, 4-phenyl-	2	72	23.627	179070
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	3	59	23.768	1123146
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	4	72	24.128	59025
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	5	43	29.696	8079
2-(Acetoxymethyl)-3-(methoxycarbonyl)biphenylene	6	37	29.837	10791
Silicic acid, diethyl bis(trimethylsilyl) ester	7	38	33.608	6696
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	8	25	33.760	7282
Arsenous acid, tris(trimethylsilyl) ester	9	25	33.891	8184
2-Ethylacridine	10	43	37.683	7787
Mortar and Pestle for Tarda B Blank [run 1]				
Pterin-6-carboxylic acid	1	4	19.682	6557
Cyclopentanecarboxamide, 3-ethenyl-2-(3-pentenyldiene)-N-phenyl-, [1.alpha.,2Z(E),3.alpha.]-	2	25	21.316	5644

Morpholine, 4-phenyl-	3	72	23.605	83666
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	4	45	23.779	496240
1,2-Benzenedicarboxylic acid, ethyl methyl ester	5	35	24.128	22188
Arsenous acid, tris(trimethylsilyl) ester	6	25	29.794	8565
Benzene, 1-phenyl-4-(2-cyano-2-phenylethenyl)	7	16	30.665	5547
1-Nitro-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid diethylamide	8	64	30.916	5621
4-[N-Methylpiperazino]-5-nitro veratrole	9	9	35.656	5771
Arsenous acid, tris(trimethylsilyl) ester	10	33	36.833	6266
Mortar and Pestle for Tarda B Blank [run 2]				
Benzamide, N-propyl-	1	72	23.626	90552
Diethylene glycol dibenzoate	2	64	23.779	518780
1,2-Benzenedicarboxylic acid, ethyl methyl ester	3	37	24.128	15828
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	4	9	25.544	5260
Silicic acid, diethyl bis(trimethylsilyl) ester	5	38	25.762	8317
1,2-Dihydroanthra[1,2-d]thiazole-2,6,11-trione	6	25	33.466	5708
Morphinan, 7,8-didehydro-3-methoxy-17-methyl-6-methylene-, (-)-	7	9	34.479	5636
7-Chloro-4-methoxy-3-methylquinoline	8	32	34.588	5945
1-Heptene, 1,3-diphenyl-1-(trimethylsilyloxy)-	9	9	38.838	5212
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	10	9	39.067	5576

Appendix C

Table C1. GC-MS results of 0.5 mL DCM swabs from the curation materials and their corresponding procedural blanks. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Fisherbrand nitrile gloves				
Morpholine, 4-phenyl-	1	72	23.572	13113643
Diethylene glycol dibenzoate	2	59	23.757	197721640
Fisherbrand nitrile gloves [blank]				
Phosphine	1	3	9.331	610340
Hydrogen sulfide	2	3	11.139	695210
Urea	3	2	12.425	561585
n-Hexadecanoic acid	4	94	18.375	518247
2-Furanmethanamine	5	56	19.246	601311
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	6	40	23.452	3114900
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	7	72	23.605	10354108
.gamma.-Cyano-3-methyl-5,10-dihydrobenzo[f]indolizine	8	7	25.544	619369
1-Methyl-2-phenylbenzimidazole	9	5	37.705	483938
MAPA Professional nitrile gloves				
Ethanol, 2-chloromethoxy-, benzoate	1	59	15.738	400173
n-Hexadecanoic acid	2	98	18.385	1708847
Octadecanoic acid	3	97	20.270	675968
Benzoic acid, 2-propenyl ester	4	72	20.379	448843
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	5	38	22.831	432619
Ethanone, 1-[2-(dimethylamino)phenyl]-	6	56	23.463	10139519
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	7	59	23.637	37594631
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	8	74	23.964	1514168
Hexasiloxane, tetradecamethyl-	9	36	24.782	470474

Hexatriacontane	10	72	25.272	692191
MAPA Professional nitrile gloves [blank]				
1,5-Hexadiene, 3,3,4,4-tetrafluoro-	1	1	14.234	400173
n-Hexadecanoic acid	2	97	18.385	1708847
Ammonia	3	2	18.854	675968
Methyl 3-(1-pyrrolo)thiophene-2-carboxylate	4	4	20.652	448843
Morpholine, 4-phenyl-	5	45	23.452	432619
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	6	64	23.616	10139519
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	7	83	23.964	37594631
Anthranilic acid, N-methyl-, butyl ester	8	9	26.111	1514168
2,3-Dihydroxy-6-nitroquinoxaline	9	9	35.493	470474
6,8-Dichloro-2-trifluoromethyl-4-quinolinol	10	5	39.862	692191
Kimberly-Clark co-polymer vinyl gloves				
n-Hexadecanoic acid	1	97	18.385	1251930
Silane, [[4-[1,2-bis[(trimethylsilyl)oxy]ethyl]-1,2-phenylene]bis(oxy)]bis[trimethyl-	2	42	20.052	914273
3-Trimethylsilyloxystearic acid, trimethylsilyl ester	3	23	21.349	561031
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	4	45	22.831	612978
Ethanone, 1-[2-(dimethylamino)phenyl]-	5	56	23.452	7999885
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	6	72	23.616	31682660
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	7	74	23.964	1153230
Hydrogen chloride	8	2	35.155	587005
3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetrasiloxane	9	38	36.789	1033751
Kimberly-Clark co-polymer vinyl gloves [blank]				
5-(p-Aminophenyl)-4-(O-tolyl)-2-thiazolamine	1	9	6.345	61178
Nitrosyl chloride	2	1	7.042	229226
Methional	3	2	7.947	350838
Methional	4	4	13.961	70489

Methan-d3-ol	5	3	14.931	165915
1,1,1,3,5,5,5-Heptamethyltrisiloxane	6	17	28.323	175924
Uline green PET tape				
Hydrogen sulfide	1	3	10.529	145761
Benzoic acid, pent-2-yl ester	2	42	16.130	380837
n-Hexadecanoic acid	3	96	18.440	166243
Benzoic acid, 2-propenyl ester	4	64	20.445	141191
Morpholine, 4-phenyl-	5	72	23.572	1644373
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	6	64	23.757	20333632
Benzamide, N-propyl-	7	53	24.073	934748
1,2-Cyclobutanedicarboxylic acid, 3-methyl-, dimethyl ester	8	1	35.700	248125
Uline green PET tape [blank]				
2-Propenoic acid	1	1	8.393	140968
Propanoic acid, 2,2-dimethyl-, potassium salt	2	1	12.305	500993
Propyne	3	2	12.981	17005
Methane	4	1	22.570	199684
Morpholine, 4-phenyl-	5	80	23.561	433384
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	6	64	23.714	1988341
1,2-Cyclobutanedicarboxylic acid, 3-methyl-, dimethyl ester	7	1	25.653	385702
Methane	8	1	26.884	591724
Methane	9	1	26.663	182406
1,3,5-Triazine, 2,4,6-tris(cyanomethoxy)-	10	2	33.575	340495
UltraTape cleanroom tape #1153				
Hydrogen sulfide	1	3	7.805	97208
Allene	2	2	14.386	246504
Ethanol, 2-fluoro-	3	1	14.877	153177
Allene	4	2	17.023	334037
Tridecanoic acid	5	38	18.440	127973
Allene	6	5	19.464	176517

Morpholine, 4-phenyl-	7	72	23.550	552623
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	8	64	23.714	2070356
UltraTape cleanroom tape #1153 [blank]				
Hydrogen sulfide	1	3	11.259	89394
Methane	2	2	11.357	84505
Methane	3	2	15.509	194347
Propanal, 2,2-dimethyl-, oxime	4	1	18.069	362930
Tridecanoic acid	5	43	18.440	101202
Ammonia	6	2	20.053	78752
Morpholine, 4-phenyl-	7	80	23.561	366571
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	8	64	23.714	1454965
1,3,5-Triazine, 2,4,6-tris(cyanomethoxy)-	9	2	37.182	407477
Ketene	10	1	38.674	397846
UltraTape cleanroom tape #1154				
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	1	56	23.725	32606869
UltraTape cleanroom tape #1154 [blank]				
Diethylene glycol dibenzoate	1	56	23.605	17108798
UltraTape cleanroom tape #1160				
Ethanone, 1-[2-(dimethylamino)phenyl]-	1	56	23.583	22006972
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	2	40	23.637	27863690
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	3	64	23.779	397162582
UltraTape cleanroom tape #1160 [blank]				
n-Hexadecanoic acid	1	99	18.385	2599174
Ethanone, 1-[2-(dimethylamino)phenyl]-	2	64	23.463	12556209
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	3	59	23.627	49500687
Alcan aluminum foil				

2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	1	64	23.746	122184050
Alcan aluminum foil [blank]				
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	1	59	23.725	37780573
Alcan aluminum foil, combusted				
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	1	59	23.736	71471161
Alcan aluminum foil, combusted [blank]				
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	1	59	23.615	11894405
Uline PVC shrink film				
Diethylene glycol dibenzoate	1	59	23.735	58932024
Uline PVC shrink film [blank]				
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	1	72	23.605	8506035
Shippers Supply plastic reclosable bags				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.627	63078850
Diethylene glycol dibenzoate	2	64	23.768	343930779
Shippers Supply plastic reclosable bags [blank]				
2-[[2-[Dimethylamino]propyl]amino-4-[trichloromethyl[-6-[.alpha.,.alpha.-trichloro-m-tolyl]-S-triazine	1	1	14.179	455693
Hydroxylamine	2	3	14.626	615186
n-Propyl benzoate	3	23	16.217	450630
n-Hexadecanoic acid	4	98	18.385	779742
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	5	40	23.463	4579717
Diethylene glycol dibenzoate	6	72	23.605	16366981
Thieno[2,3-b]pyridine-2-carboxamide, 3-amino-6-methyl-	7	9	29.402	453162
Uline reclosable bags				

(2-Phenyloxiran-2-yl)methyl benzoate	1	78	23.638	110807253
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	2	64	23.790	506966968
13-Docosenamide, (Z)-	3	93	29.315	36576102
Uline reclosable bags [blank]				
Didecyl phosphite	1	1	11.532	630948
1,6:3,4-Dianhydro-2-deoxy-.beta.-d-ribo-hexopyranose	2	1	16.359	726186
n-Hexadecanoic acid	3	64	18.385	565472
Morpholine, 4-phenyl-	4	45	23.452	3680531
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	5	72	23.605	11601114
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	6	74	23.964	619044
Quinoline, 4-chloro-6-methoxy-2-methyl-	7	5	30.350	698408
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	8	3	33.567	412696
Benzothiophene-3-carboxylic acid, 4,5,6,7-tetrahydro-2-amino-6-ethyl-, ethyl ester	9	5	36.016	420632
Benchmark Products Precision Clean II				
Benzoic acid, 2-(4-nitrophenoxy)ethyl ester	1	59	23.725	72632235
Benchmark Products Precision Clean II [blank]				
Methyl fluoride	1	4	4.623	17894529
Methane	2	2	9.331	597366
Formamide	3	2	12.687	502846
n-Hexadecanoic acid	4	72	18.385	514189
Ethanone, 1-[2-(dimethylamino)phenyl]-	5	56	23.452	3625788
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	6	72	23.605	12261136
1-Propanol, 2-[2-(benzoyloxy)propoxy]-, benzoate	7	74	23.953	854461
Methane	8	4	26.264	499066
Methane	9	2	31.265	567120
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	10	3	39.197	495285

Benchmark Products ZipClean pouches				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.637	84588351
Diethylene glycol dibenzoate	2	64	23.790	518007725
Benchmark Products ZipClean pouches [blank]				
n-Hexadecanoic acid	1	95	18.385	3200315
Benzoic acid, 2,5-bis(trimethylsiloxy)-trimethylsilyl ester	2	38	20.052	1697629
2H-1,4-Benzodiazepin-2-one, 7-chloro-1,3-dihydro-5-phenyl-1-(trimethylsilyl)-3-[(trimethylsilyl)oxy]-	3	30	21.349	1892572
Cyclononasiloxane, octadecamethyl-	4	58	22.831	1778855
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	5	40	23.452	13865322
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	6	59	23.626	49767328
Morpholine, 4-phenyl-	7	72	23.964	2810429
Dithioerythritol, O,O',S,S'-tetrakis(trimethylsilyl)-	8	35	24.781	1860081
Hexasiloxane, tetradecamethyl-	9	37	27.516	1803223
Hexasiloxane, tetradecamethyl-	10	37	31.341	2558627
Glad freezer bags				
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	1	59	23.724	57568639
Glad freezer bags [blank]				
Hydrazine	1	1	12.447	486010
n-Hexadecanoic acid	2	98	18.375	779715
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	3	45	21.349	547199
Benzamide, N-propyl-	4	78	23.452	2839140
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	5	72	23.605	8966717
3,4-Xylyl isothiocyanate	6	72	23.953	1187054
1H-Pyrazole, 1-propyl-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-	7	9	28.312	475521
Isooctyl mercaptoacetate	8	9	29.576	858385
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	9	9	34.686	687058

Ammonia	10	2	38.348	655590
Sealed Air air pillows				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.616	36700437
Diethylene glycol dibenzoate	2	64	23.757	201026227
Sealed Air air pillows [blank]				
n-Hexadecanoic acid	1	98	18.385	2578764
Undecane, 3,6-dimethyl-	2	50	21.513	795820
Hexasiloxane, tetradecamethyl-	3	37	22.831	834081
Ethanone, 1-[2-(dimethylamino)phenyl]-	4	56	23.463	13796769
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	5	59	23.626	51697712
Morpholine, 4-phenyl-	6	72	23.964	2456330
Hexasiloxane, tetradecamethyl-	7	37	24.792	1231991
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	8	42	27.484	933558
Tetratetracontane	9	64	29.576	841733
Pentasiloxane, dodecamethyl-	10	38	31.352	1362077
Sekisui Voltek Inc Volara foam				
Diethylene glycol dibenzoate	1	59	23.736	80127632
Sekisui Voltek Inc Volara foam [blank]				
Aminoguanidine	1	2	4.612	13537550
n-Hexadecanoic acid	2	96	18.385	1387165
Ethanone, 1-[2-(dimethylamino)phenyl]-	3	56	23.452	4973496
Diethylene glycol dibenzoate	4	80	23.605	18439150
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	5	74	23.953	866978
N-Methyl-1-adamantaneacetamide	6	5	32.398	592083
1-(2-Adamantylidene)semicarbazide	7	4	36.430	680895
2-Bromo-4-chloroaniline	8	7	36.561	604770
Fisher Scientific glass vials				

2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	1	64	23.746	97300161
Fisher Scientific glass vials [blank]				
2-[[2-[Dimethylamino]propyl]amino-4-[trichloromethyl]-6-[.alpha.,.alpha.,.alpha.-trichloro-m-tolyl]-Striazine	1	1	14.441	1016960
Methane	2	2	15.737	585123
Methane	3	2	17.241	497767
1,2,3,4-Cyclopentanetetrol, (1.alpha.,1.beta.,3.beta.,4.alpha.)-	4	25	20.270	593364
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	5	40	23.452	2220171
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	6	72	23.605	8841128
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	7	33	23.975	660942
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	8	5	31.450	735112
Fisher Scientific glass vials, combusted				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.605	19307173
Diethylene glycol dibenzoate	2	64	23.746	137713962
Fisher Scientific glass vials, combusted [blank]				
Morpholine, 4-phenyl-	1	72	23.572	10228253
Diethylene glycol dibenzoate	2	64	23.746	155904489
Cargille Inc plastic boxes				
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	1	64	23.735	77324041
Cargille Inc plastic boxes [blank]				
Ketene	1	2	13.210	652050
n-Hexadecanoic acid	2	98	18.385	787350
Morpholine, 4-phenyl-	3	40	23.452	2481049
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	4	72	23.605	8942860
Morpholine, 4-phenyl-	5	72	23.964	671611
2-Pyridinemethanol 3,5-dichloro-4-hydroxy-6-methyl-	6	9	32.322	523270
Pyridine, 1,2,3,6-tetrahydro-1-methyl-4-[4-chlorophenyl]-	7	5	33.204	753117

3-Isopropoxy-1,1,1-5,5,5-hexamethyl-3-(trimethylsiloxy)trisiloxane	8	9	34.414	511859
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	9	3	40.331	474366
Savillex PFA jar				
Ethanone, 1-[2-(dimethylamino)phenyl]-	1	56	23.583	38580830
(3-Phenyloxiran-2-yl)methyl benzoate	2	78	23.616	37925523
Diethylene glycol dibenzoate	3	64	23.757	299761306
Savillex PFA jar [blank]				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.616	66822604
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	2	64	23.757	287252290

Table C2. GC-MS results of 0.5 mL DCM swabs from the laboratory surfaces and their corresponding procedural blanks. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Keyboard				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.594	40491293
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	2	40	23.626	49824243
3,6,9,12-Tetraoxatetradecane-1,14-diyl dibenzoate	3	64	23.768	366560401
Keyboard [blank]				
Hydrogen sulfide	1	3	13.329	446726
Methane	2	5	14.201	425453
Furan, 2,3-dihydro-	3	2	15.117	372272
n-Hexadecanoic acid	4	96	18.385	918270
Propanoic acid, anhydride	5	1	18.658	441408
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	6	40	23.452	3577353

2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	7	56	23.605	10184288
Hydrogen chloride	8	2	36.255	439635
Class 1000 Cleanroom inner doorknob				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.627	141478029
Diethylene glycol dibenzoate	2	64	23.779	452713913
Morpholine, 4-phenyl-	3	59	24.095	22065154
Class 1000 Cleanroom inner doorknob [blank]				
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	1	40	23.616	29857786
Diethylene glycol dibenzoate	2	59	23.746	160254699
Class 1000 Cleanroom counter				
Toluene	1	91	3.294	48261436
Ethanone, 1-[2-(dimethylamino)phenyl]-	2	56	23.594	181596300
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	3	59	23.801	580482499
Morpholine, 4-phenyl-	4	64	24.106	30874849
Class 1000 Cleanroom counter [blank]				
Morpholine, 4-phenyl-	1	45	23.605	19379623
2,2’-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	2	64	23.735	107639821
Class 1000 Cleanroom cabinets				
Ammonia	1	2	13.547	580450
Phosphine	2	3	17.241	495462
n-Hexadecanoic acid	3	93	18.385	480996
Ammonia	4	2	18.658	482804
Heptadecanoic acid, heptadecyl ester	5	9	22.537	526202
Morpholine, 4-phenyl-	6	40	23.463	2976389
1,3-Dioxolane, 2-(methoxymethyl)-2-phenyl-	7	56	23.605	11030360
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	8	3	25.424	596724
Tin(IV) chloride	9	1	30.153	428557

Thiourea, N-(1,1-dimethylethyl)-N'-phenyl-	10	5	38.064	484613
Class 1000 cleanroom cabinets [blank]				
Diethylene glycol dibenzoate	1	50	23.725	18392665
Freezer counter				
Morpholine, 4-phenyl-	1	45	23.605	41476094
Diethylene glycol dibenzoate	2	64	23.735	190807532
Freezer counter [blank]				
Diethylene glycol dibenzoate	1	64	23.724	61815506
Laboratory room counter				
Propylene oxide	1	5	15.748	984801
Formaldehyde, dimethylhydrazone	2	2	16.555	576917
1,3,2-Dioxaborolan-4-one, 2-ethyl-	3	1	17.089	786371
Benzoic acid, 3,3-dimethylbut-2-yl ester	4	38	20.401	848840
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	5	40	23.463	6893610
2-(2-(2-Methoxyethoxy)ethoxy)ethyl benzoate	6	56	23.615	23738123
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	7	74	23.964	1289796
Hydrogen sulfide	8	3	31.962	521798
Laboratory room counter [blank]				
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	1	37	17.078	799310
n-Hexadecanoic acid	2	96	18.386	1378809
3-Isopropoxy-1,1,1-7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetrasiloxane	3	40	18.625	604478
Benzeneacetic acid, .alpha.,3,4-tris[(trimethylsilyl)oxy]-, trimethylsilyl ester	4	47	20.053	1243926
Cyclononasiloxane, octadecamethyl-	5	47	21.349	1034107
Cyclononasiloxane, octadecamethyl-	6	83	22.831	1288887
Morpholine, 4-phenyl-	7	64	23.463	8512647
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	8	72	23.616	32421996

Morpholine, 4-phenyl-	9	72	23.954	1438757
N-Benzyl-N-ethyl-p-isopropylbenzamide	10	25	24.793	1233934
Laboratory light switch				
Ethanone, 1-[2-(dimethylamino)phenyl]-	1	56	23.583	87221603
Diethylene glycol dibenzoate	2	64	23.757	348286185
Laboratory light switch [blank]				
Toluene	1	91	3.294	243308323
1-Propanol, 2-[2-benzoyloxy)propoxyl-, benzoate	2	40	23.616	64106767
Diethylene glycol dibenzoate	3	64	23.757	287483568

Table C3. GC-MS results of 0.5 mL DCM rinse of the quartz beads procedural blank prior to being stored in various curation materials for two weeks. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Quartz beads				
Benzene, 1,3-dimethyl-	1	95	4.547	1356531
Heneicosane	2	80	20.695	136823
Heneicosane	3	86	21.589	169791
Eicosane	4	91	22.624	313086
Diethylene glycol dibenzoate	5	53	23.714	171458
Tetracosane	6	91	23.866	308318
Tetracosane	7	87	25.403	296799
Tetratetracontane	8	87	27.331	278749
Heneicosane	9	83	29.816	230726
Hentriacontane	10	80	32.997	259880
DCM Blank				
Bactobolin	1	1	11.597	42465
Methanamine, N,N-difluoro-	2	1	12.153	49010

Nitrous oxide	3	2	12.567	46298
Nitrous oxide	4	2	15.389	41917
Methyl fluoride	5	4	17.808	41862
n-Hexadecanoic acid	6	50	18.440	55130
Diethylene glycol dibenzoate	7	50	23.714	111189
Silicic acid, diethyl bis(trimethylsilyl) ester	8	28	24.389	71435
2-Ethylacridine	9	32	34.359	49862
Hydroxydesmethylimipramine, 2-	10	4	39.350	44817

Table C4. GC-MS results of 0.5 mL DCM rinses of quartz beads from the curation materials stored in a room temperature Class 1000 clean room for two weeks and the procedural blank. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Alcan aluminum foil				
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	1	3	11.499	62042
Vinyl ether	2	4	12.174	44889
Phosphorisocyanatidothioic difluoride	3	2	12.566	50989
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	4	3	14.157	54743
Methane	5	2	14.375	49217
Allene	6	2	16.446	51771
Heptacosane	7	78	25.261	69237
Pyrido[1,2-a][1,3]benzimidazole-3-acetic acid, 4-cyano-1,5-dihydro-1-oxo-, methyl ester	8	9	30.044	51406
Spirohexan-4-one, 5,5-dichloro-6,6-dimethyl-	9	1	32.474	44681
Alcan aluminum foil, combusted				
Sulfurous acid, 2-ethylhexyl tetradecyl ester	1	78	22.537	19607
Hexatriacontane	2	83	23.746	23250
Octadecane, 1-chloro-	3	78	25.261	24208

Heptacosane	4	86	27.179	29952
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	5	3	28.977	34157
Eicosane	6	72	29.62	20461
Hydrogen sulfide	7	3	33.924	15465
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	8	3	34.065	16236
Uline PVC shrink film				
Methane	1	2	11.902	198635
2,3-Pyridinedicarbonitrile	2	2	15.498	245989
Methane	3	2	19.235	269037
Heptacosane	4	78	23.757	368355
Heptadecane	5	78	25.261	494073
Heptacosane	6	72	27.168	484854
Terephthalic acid, 4-octyl octyl ester	7	86	28.312	1211087
2,3-Dihydroxy-6-nitroquinoxaline	8	5	31.723	228388
Tetratetracontane	9	72	32.725	484016
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	10	3	38.631	206178
Shippers Supply plastic reclosable bags				
Silane, trichlorooctadecyl-	1	78	12.098	996961
Silane, trichlorooctadecyl-	2	78	14.561	2166060
Silane, trichlorooctadecyl-	3	72	16.773	829128
Cyclopentane, heneicosyl-	4	86	17.459	854948
Nonadecane, 9-methyl-	5	87	21.523	985486
Eicosane	6	72	22.537	1335498
Heptacosane	7	72	23.757	1417263
Heptacosane	8	72	25.272	1437346
Heptacosane	9	72	27.168	2193315
Dodecane, 2,7,10-trimethyl-	10	64	29.608	2128764
Uline reclosable bags				
Methane	1	2	13.961	101733

Methyl vinyl ketone	2	2	14.506	92540
Indolizine, 2-(4-methylphenyl)-	3	2	15.378	116887
Cyclopentane, heneicosyl-	4	56	19.475	97692
3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetrasiloxane	5	25	21.349	89509
6-(2-Formylhydrazino)-N,N'-bis(isopropyl)-1,3,5-triazine-2,4-diamine	6	4	24.400	85569
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	7	3	25.849	116988
Chroman-4-one, 2,3-dehydro-3-hydroxy-2-(4-dimethylaminophenyl)-	8	3	26.525	86883
Benchmark Products Precision Clean II				
Methane	1	2	14.779	14053
Heptasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13-tetradecamethyl-	2	23	15.334	14551
meso-3,4-Dicyclohexyl-2,2,5,5-tetramethylhexane	3	4	21.251	19166
Allene	4	5	24.389	14636
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	5	3	29.685	18651
Propanamide, 2,2-dimethyl-N-(4-methylphenyl)-	6	4	36.680	15820
Benchmark Products Precision Clean II, heat sealed				
No peaks detected				
Benchmark Products ZipClean pouches				
Formamide	1	4	9.374	17906
Methane	2	2	10.736	13575
Methane	3	2	11.379	16661
Hydrogen sulfide	4	3	13.449	14139
Phenol, 2,4-bis(1,1-dimethylethyl)	5	93	13.547	13591
Hydrogen sulfide	6	3	14.277	16645
Methane	7	2	15.443	13658
Hexamethylenetriperoxidediamine	8	5	34.883	15433
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	9	3	35.100	15185
Phenanthrene, 4-methoxy-	10	3	37.966	29141

Glad freezer bags				
Ammonia	1	2	15.476	71243
8,10-Dioxaheptadecane	2	9	18.069	71729
Fisher Scientific glass vials				
No peaks detected				
Fisher Scientific glass vials, combusted				
No peaks detected				
Cargille Inc plastic boxes				
Butanoic acid, 2-methyl-, 2-methyl butyl ester	1	64	11.924	9121719
Cyclododecane	2	72	12.795	3756002
Propanoic acid, 3-mercapto-, 2-ethylhexyl ester	3	72	13.264	4829145
Dodecanoic acid	4	98	14.005	5902288
2-Amino-2-oxo-acetic acid, N-[3,4-dimethylphenyl]-, ethyl ester	5	50	14.223	2414573
Diethyl Phthalate	6	98	14.484	25218869
Octane, 1,1'-oxybis-	7	90	15.258	6975432
Dodecyl acrylate	8	90	15.596	56071741
Oxalic acid, cyclobutyl octadecyl ester	9	64	15.672	9390004
Tetradecanoic acid	10	96	16.326	7512004
Eicosane	11	64	16.762	4829145
Sulfurous acid, octadecyl 2-pentyl ester	12	47	16.838	4829145
Isopropyl myristate	13	52	17.045	5902288
Tetracontane, 3,5,24-trimethyl-	14	86	17.394	4426716
n-Hexadecanoic acid	15	94	18.440	80351609
Octadecanoic acid	16	91	20.303	28572442
Butyl 2-(2-(2-methoxyethoxy)ethoxy)acetate	17	64	20.968	6707146
Tri(propylene glycol) propyl ether	18	59	21.589	16902008
Tri(propylene glycol) propyl ether	19	50	21.687	10865577
Diisooctyl adipate	20	91	22.624	944097873
.alpha.-Benzylsuccinic acid	21	38	23.256	15158150

Oxirane, [(hexadecyloxy)methyl]-	22	46	23.703	6170574
2-Propanol, 1-[1-methyl-2-(2-propenyloxy)ethoxy]-	23	53	23.888	16902008
Propanol, [(butoxymethylethoxy)methylethoxy]-	24	72	23.964	7109575
Propanol, [(butoxymethylethoxy)methylethoxy]-	25	64	24.879	8316861
Hexaethylene glycol dimethyl ether	26	53	24.923	7109575
Methyl 2,5,8,11,14,17,20-heptaoxadocosan-22-oate	27	59	24.988	1878001
Methyl 2,5,8,11,14,17,20-heptaoxadocosan-22-oate	28	53	29.042	20523867
Methyl 2,5,8,11-tetraoxatridecan-13-oate	29	78	30.992	15963008
Methyl 2,5,8,11,14,17,20,23,26,29-decaoxahentriacontan-31-oate	30	78	38.914	3621859
Savillex PFA jar				
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	1	3	4.612	353053

Table C5. GC-MS results of 0.5 mL DCM rinses of quartz beads from the curation materials stored in a freezer (-15°C) for two weeks and the procedural blank. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Alcan aluminum foil				
Methane	1	2	12.098	73120
n-Hexadecanoic acid	2	87	18.385	84840
2,4,4-Trimethyl-1-pentanol, trifluoroacetate	3	2	19.159	83252
Plumbane, triethylmethyl-	4	37	33.455	69036
Hydrogen sulfide	5	3	33.608	67675
Purine-2,6-dione, 8-(3-ethoxypropylamino)-1,3-dimethyl-3,9-dihydro-	6	40	38.151	77883
Chalcone	7	7	38.936	64651
1-Methyl-2-[(2-thienylcarbonyl)methylidene]pyrrolidine	8	5	40.777	63970
Alcan aluminum foil, combusted				
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	1	3	7.119	8519
Ketene	2	2	7.696	7172

Hydroxylamine	3	3	14.931	8624
1,2,3-Propatriol, 1-indol-4-yl(ether)	4	5	34.207	7750
Propanamide, N-(4-methoxyphenyl)-2,2-dimethyl-	5	4	36.702	7767
1,3,5-Triazine, 2-chloro-4,6-bis(methylthio)-	6	9	40.647	7129
Uline PVC shrink film				
Methane	1	2	9.189	13828
Methane	2	2	16.293	42875
Ammonia	3	2	29.118	14111
2,3,4,5,6-Pentafluorophenylacetonitrile	4	4	29.184	27891
Cobalt, (.eta.5-2,4-cyclopentadien-1-yl)[(1,2,3,4-.eta.)-5-(3,3,3-trifluoro-1-propynyl)-1,3-cyclopentadiene]-	5	5	35.198	13261
Acetamide, N-[4-(trimethylsilyl)phenyl]-	6	4	35.591	18004
Shippers Supply plastic reclosable bags				
Acetylene	1	2	9.428	24186
Formamide	2	2	12.992	13466
2-Fluoro-.beta.-alanine	3	1	13.896	19211
1-Oxa-3,4-diazacyclopentadiene	4	2	14.419	21506
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	5	3	26.394	13533
1,4-Dioxane	6	4	33.727	11942
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	7	38	36.866	13718
Hydroxylamine	8	3	37.094	16130
Uline reclosable bags				
Phosphine	1	3	12.599	7175
Formamide	2	2	14.986	7228
Hydrogen sulfide	3	3	18.015	8056
Hydrogen sulfide	4	3	19.224	7760
Carbonic acid, monoamide, N-(2-ethylphenyl)-, propyl ester	5	5	28.018	8747
1,3,5-Triazine, 2-chloro-4,6-bis(methylthio)-	6	9	35.362	6742
Hexahydropyridine, 1-methyl-4-[4,5-dihydroxyphenyl]-	7	9	40.232	7851

Benchmark Products Precision Clean II

Methane	1	2	12.556	15502
Methane	2	2	16.13	22960
Methane	3	2	16.457	21117
Methane	4	2	16.631	16781
Anhydro-5-mercapto-2-methyl-3-phenyl-1,3,4-thiadiazolium	5	5	27.353	32348
Methane	6	2	29.413	18971
Methyl 2-(2-(2-methoxyethoxy)ethoxy)acetate	7	9	29.5	22353
Ammonia	8	2	33.052	20532
1H-Indole-3-carboxaldehyde, 2-(1,1-dimethyl-2-propenyl)-6-(3-methyl-2-butenyl)-	9	45	39.448	19968

Benchmark Products Precision Clean II, heat sealed

No peaks detected

Benchmark Products ZipClean pouches

Cyclohexasiloxane, dodecamethyl-	1	72	11.107	14868
Furan, 2,3-dihydro-	2	2	13.144	16381
But-2-enedioic acid	3	33	15.803	22198
Phenanthrene, 4-methoxy-	4	3	20.728	13206
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	5	3	26.634	11960
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	6	3	39.459	11455
(5S,6aR,10aS)-5-Propyldecahydrodipyrrolo[1,2-a:1',2'-c]pyrimidine	7	5	39.731	12004
(5S,6aR,10aS)-5-Propyldecahydrodipyrrolo[1,2-a:1',2'-c]pyrimidine	8	5	40.102	16099

Glad freezer bags

No peaks detected

Fisher Scientific glass vials

No peaks detected

Fisher Scientific glass vials, combusted				
No peaks detected				
Cargille Inc plastic boxes				
2-[p-Fluorophenyl]-8-methylcinchoninic acid	1	5	4.612	217020
Savillex PFA jar				
2-1-Phenyl ethylidene-hydrazono-3-methyl-2,3-dihydrobenzothiazole	1	3	4.590	772638

Table C6. GC-MS results of 0.5 mL DCM rinses of Allende from the curation materials stored in a room temperature Class 1000 clean room for two weeks and the procedural blank. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Alcan aluminum foil				
No peaks detected				
Alcan aluminum foil, combusted				
No peaks detected				
Cargille Inc plastic boxes				
Ibuprofen	1	98	14.822	1752376
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	2	37	18.407	288100
Oxalic acid, isobutyl tetradecyl ester	3	50	19.421	570139
Benzoic acid, 2,4-bis[(trimethylsilyl)oxy]-, trimethylsilyl ester	4	55	20.052	192465
Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	5	38	21.349	559272
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	6	40	22.831	641654
Hexasiloxane, tetradecamethyl-	7	22	24.792	439647
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	8	25	27.506	435271
Pentasiloxane, dodecamethyl-	9	35	31.385	353290
Phenol, 2-[4-(2-hydroxyethylamino)-2-quinazolinyl]-	10	50	36.844	98962

DCM Blank
No peaks detected

Table C7. GC-MS results of 0.5 mL DCM rinses of Allende from the curation materials stored in a freezer (-15°C) for two weeks and the procedural blank. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
Alcan aluminum foil				
No peaks detected				
Alcan aluminum foil, combusted				
Methyl chloride	1	79	5.157	4795925
Methyl chloride	2	35	5.560	838789
Pentasiloxane, dodecamethyl-	3	43	13.351	90768
Nitrous oxide	4	2	14.681	13935
Nitrous oxide	5	2	17.797	6605
Pentasiloxane, dodecamethyl-	6	35	22.820	77035
Methyl chloride	7	43	24.574	5353
Heptasiloxane, hexadecamethyl-	8	19	24.792	27029
Pentasiloxane, dodecamethyl-	9	3	27.495	4956
1-Monolinoleoylglycerol trimethylsilyl ether	10	42	31.330	978
Cargille Inc plastic boxes				
No peaks detected				
DCM Blank				
No peaks detected				

Table C8. GC-MS results of 0.5 mL DCM rinses of Bruderheim stones and the procedural blank. Analysis was executed at MacEwan University and all organic compounds reported are best matches from the NIST 2011 Mass Spectral Library.

Compound	Peak	Quality (%)	Retention Time (min)	Peak Area
MET4170/B-195				
Cyclohexasiloxane, dodecamethyl-	1	91	11.107	861891
Trisiloxane, 1,1,1,5,5,5-hexamethyl-3,3-bis[(trimethylsilyl)oxy]-	2	47	13.340	278253
n-Hexadecanoic acid	3	91	18.385	130513
Pentasiloxane, dodecamethyl-	4	22	21.349	549361
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	5	53	22.831	713738
2,2'-(Ethane-1,2-diylbis(oxy))bis(ethane-2,1-diyl) dibenzoate	6	50	23.605	490340
Cyclononasiloxane, octadecamethyl-	7	50	24.781	865535
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	8	45	27.516	948240
1,1,1,5,7,7,7-Heptamethyl-3,3-bis(trimethylsiloxy)tetrasiloxane	9	36	31.341	1075295
Heptasiloxane, hexadecamethyl-	10	40	36.844	848370
MET4170/B-163				
Cyclopentasiloxane, decamethyl-	1	83	8.644	258884
Cyclohexasiloxane, dodecamethyl-	2	90	11.107	114487
Pentasiloxane, dodecamethyl-	3	43	13.340	87683
Ibuprofen	4	94	14.833	292729
n-Hexadecanoic acid	5	81	18.385	684628
9-Octadecenamide, (Z)-	6	89	22.188	193358
Thiazole, 4,5-dimethyl-2-(4-methylphenylsulfonylamino)-	7	43	22.297	119798
Nonanamide	8	38	22.439	607915
Dodecanamide	9	43	29.064	133
Silicic acid, diethyl bis (trimethylsilyl) ester	10	40	32.725	10765

MET4170/B-196
No peaks detected

DCM Blank
No peaks detected

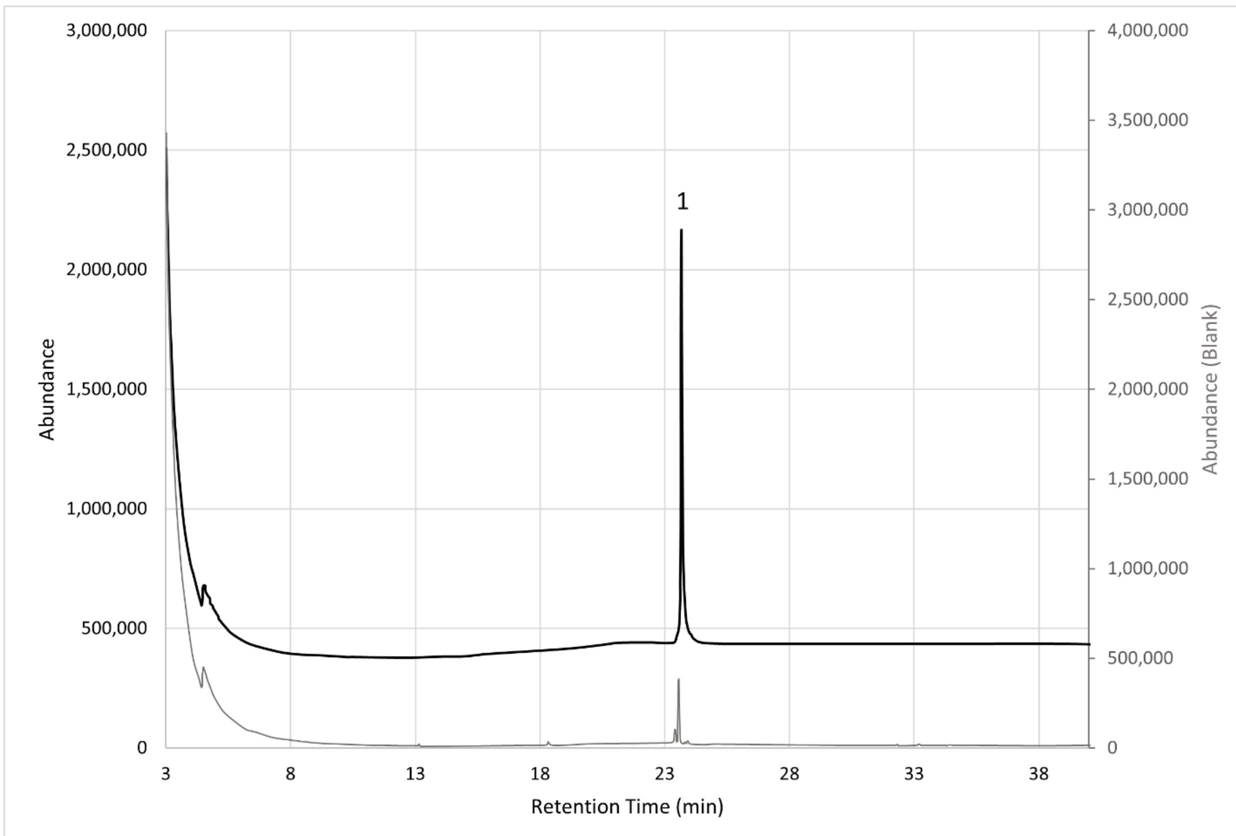


Figure C1. GC-MS trace for the DCM swab of the Cargille plastic box with its procedural blank in grey, offset for clarity.

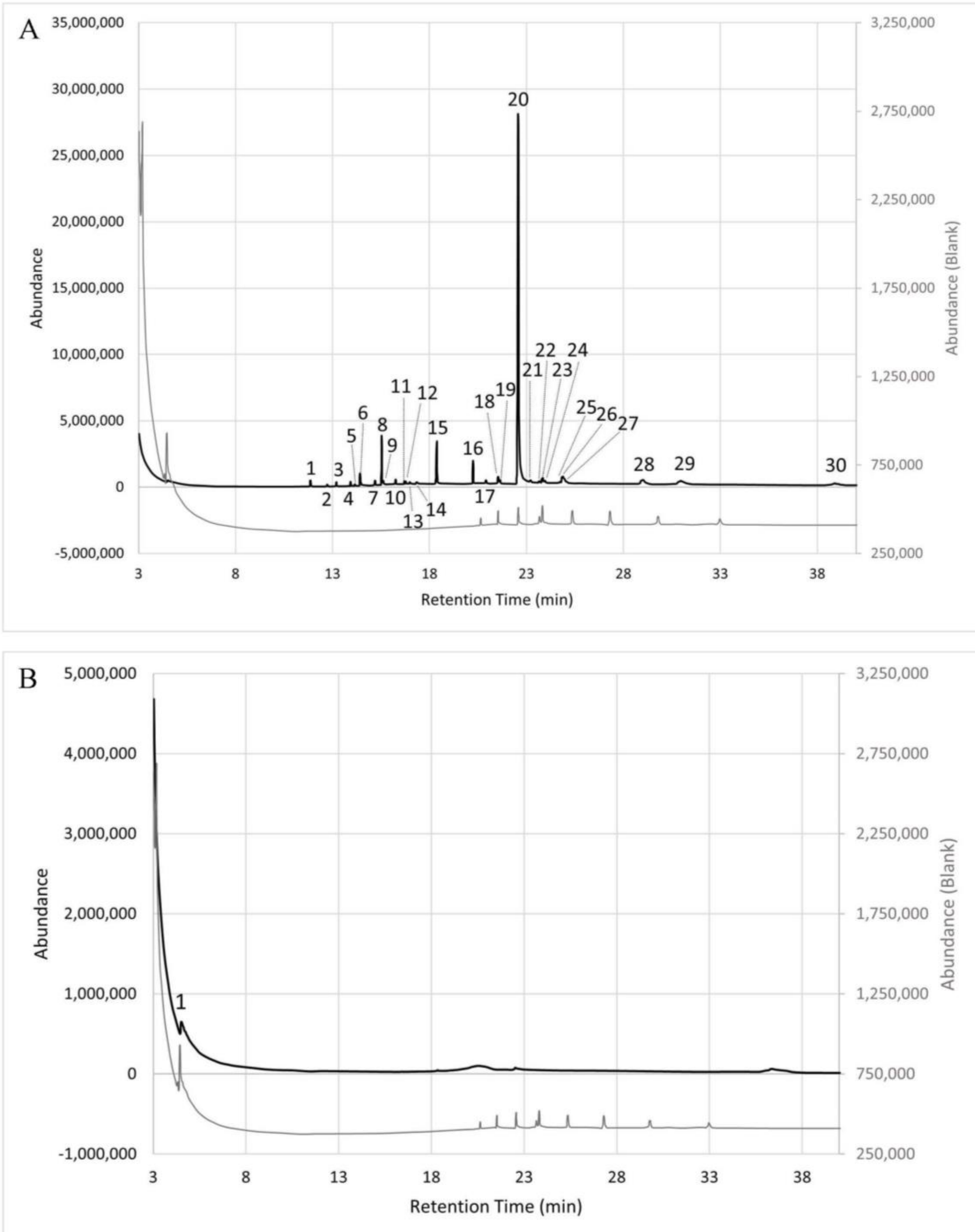
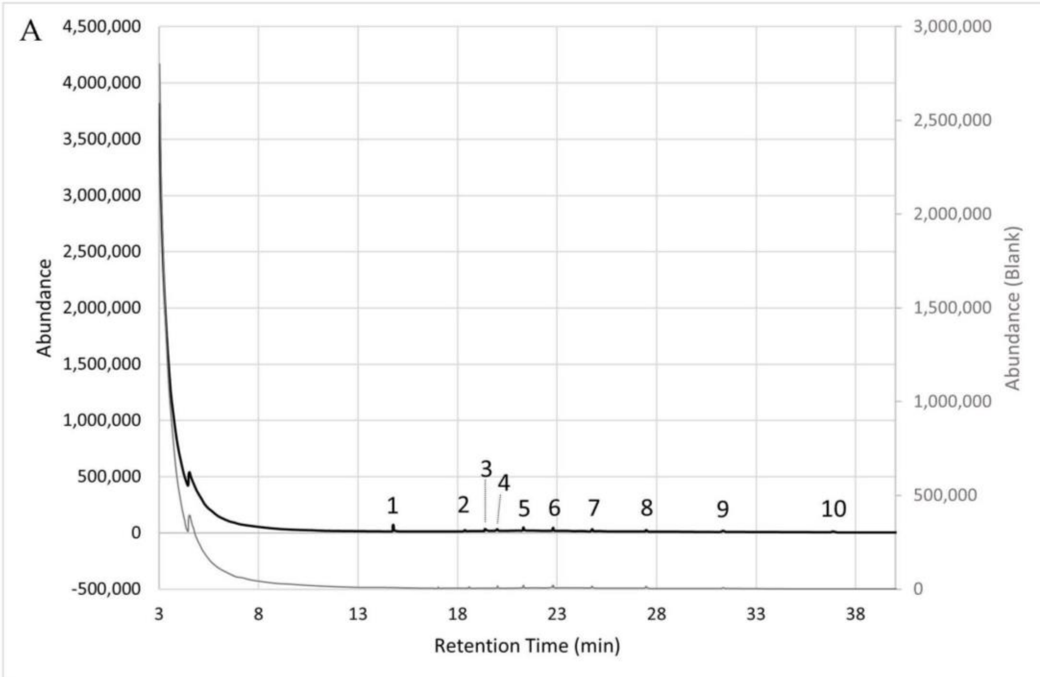


Figure C2. GC-MS trace for the DCM extraction of quartz beads stored in a a) Class 1000 cleanroom and b) freezer in the Cargille plastic box with their corresponding procedural blanks in grey, offset for clarity.



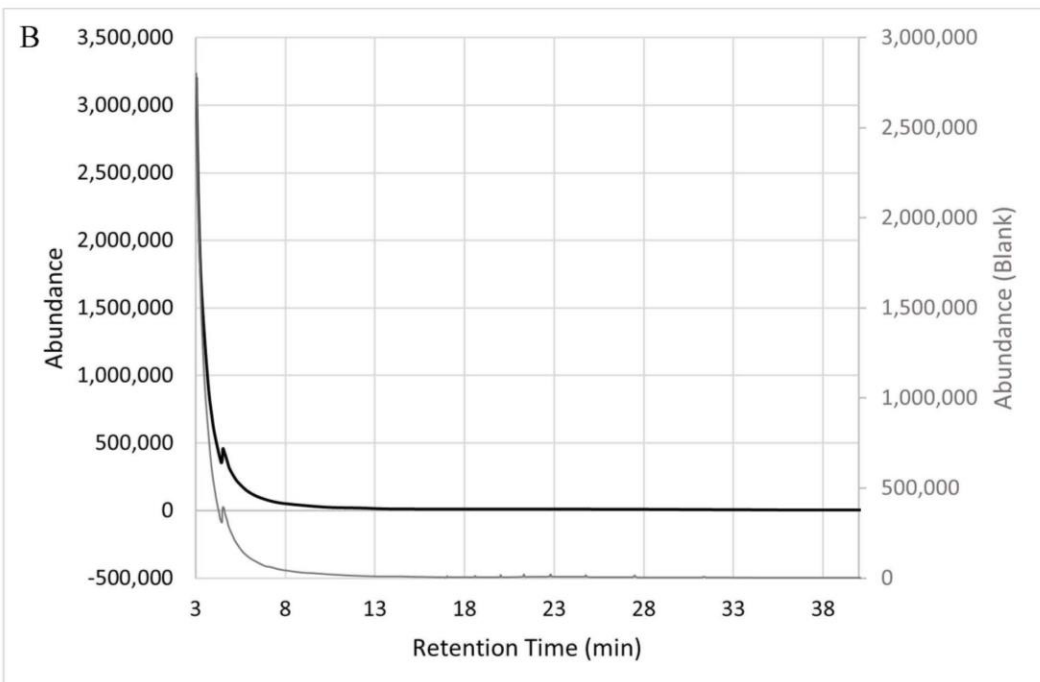


Figure C3. GC-MS trace for the DCM extraction of Allende stored in a a) Class 1000 cleanroom and b) freezer in the Cargille plastic box with their corresponding procedural blanks in grey, offset for clarity.

Appendix D

Table D1. QIIME2 output summary of the meteorite DNA extractions prior to any data manipulation. Next Generation Sequencing was executed at NASA Johnson Space Center and all ASV's reported are best matches from the SILVA v132 database.

OTU ID	Taxon	Confidence	MET6568 (PowerSoil)	MET11547/PR1 (PowerSoil)	MET11547/PR1a/p8 (PowerSoil)	MET11547/PR1 (QIAamp)	MET11621B (QIAamp)	MET4270/B-195 (QIAamp)	MET4270/B-163 (QIAamp)	MET4270/B-196 (QIAamp)
8ae518dbb29595b3f79214be0b589066	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99930	2	0	0	284	59	599	99	109
65d43491988bfe557da4d86a5ba25dae	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99999	24	4	0	16	114	8	53	38
535fb6c23e3c748cd567819291bd2c8a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Chitinophagales	0.83993	0	0	0	0	0	0	0	191

fb67b286b0f781b0de13d50179318995	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Stenotrophomonas	0.99997	0	0	0	0	0	0	0	171
7ff346973a282aa55de296afdb5d74af	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae	0.99991	140	0	0	0	9	0	1	0
7721b83369191a653e0b04818b83eb75	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.78761	0	0	0	134	0	0	0	0
820f6693f569e339f183638cd73a7fe6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Lawsonella	1.00000	8	5	0	14	26	8	17	52
122e20f0ace74b543f31b54ec9fcda89	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	0	0	0	0	0	108
d829bee4984f82ffc2453212157caf96	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae;D_5__Bradyrhizobium	0.81766	0	55	29	0	0	0	0	0
06f825b512d903b9230e1	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99907	19	8	1	8	28	16	0	1

a55d873 59ee										
394eda2 9c88663 2f514dd 94b5838 1186	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Haemophilus	0.90589	3	0	0	38	31	0	5	0
aa9b3a1 418d146 c262ec6 3305292 065a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.92550	6	13	0	20	18	0	0	16
4c77cf61 837295f 6fc858ba ee76f3bd a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99999	71	0	0	0	0	0	0	0
915ff35e 7b0e2d1 3597b63 7bfe81dd 9b	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.90970	0	0	70	0	0	0	0	0
cd44e95 0ef1472c 1a1e4bf2 10f37fb5 6	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.98465	0	0	0	0	0	0	58	0
5648dcc ee530d6 8ceb3e4 d7d22cf8 756	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99964	0	0	52	0	0	0	6	0

852c5cd dbc1493 e6e1ca87 0595c08 a7f	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus;D_6__uncultured bacterium	0.90509	0	58	0	0	0	0	0	0
c22b16c c6108c0 4f29fea3 b6d4c81 571	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	0	0	0	3	36	0	18	0
5905f27 4ad1a99 8759f4c2 f4f4667c bc	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.99787	0	0	0	0	0	52	0	0
77a920b d965da1 2d31f93c 1adf2c5e a1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium	0.81943	0	39	0	0	13	0	0	0
a537d8b ab85c83 b0e74c7 3c55790 324b	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Caulobacterales;D_4__Caulobacteraceae;D_5__Brevundimonas	0.99996	0	13	0	0	0	29	5	2
4a0b292 ba71658 2f9af466 94458c0 b9b	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	45	0	0	0	0
0df6c802 966e867 0279671	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Lactobacillaceae;D_5__Lactobacillus;D_6__Lactobacillus gasseri	0.79120	0	0	0	0	0	0	10	34

824da4f10a										
2bd9309f2f97cae51d18d06ea1ca519a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Granulicatella	0.91367	0	3	0	1	14	25	0	0
cc60312357314937af544b9333c06feb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.99654	1	39	3	0	0	0	0	0
22c08c3006abdc0bc2f5839b7bbaa5d5	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__Neisseria	0.79990	0	0	0	0	1	41	0	0
616a2b7f29cebc02c036a74f8cc4ab20	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__uncultured;D_6__uncultured bacterium	0.71583	0	0	0	0	42	0	0	0
036ecc78f1c4eb9a7a2ad728b7a1f4a3	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae	0.99995	2	0	39	0	0	0	0	0
cff3a447d647082ded4cb751499addc5	D_0__Bacteria;D_1__Chloroflexi;D_2__AD3;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.83901	0	40	0	0	0	0	0	0

9fd9efd1915ccef3c8fed3c25095d023	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__Singulisphaera;D_6__uncultured planctomycete	0.78679	0	0	0	0	39	0	0	0
e01d860cd102c569db13b02fc2a1964d	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45	1.00000	0	0	0	0	37	0	0	0
c06ccd1f7d57566ef669942328b1a946	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.98712	0	2	0	27	4	0	4	0
d1a42caffeab0edc22b82b9b2f4e6471	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.99994	0	0	37	0	0	0	0	0
d114fb4c335125128be28401522dd41a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Lactococcus	1.00000	0	4	0	0	24	0	4	3
c757ad670c5d796cb866c941c62c4e33	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Flavobacterium	0.99996	0	0	0	0	0	35	0	0
e5c19d7800b18015f3a917	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Enhydrobacter	1.00000	0	0	0	34	1	0	0	0

fc015fc42f										
1d9a051295fbd62bf700e15368d45418	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Marmoricola	0.77833	0	0	35	0	0	0	0	0
3333ed9280e0176380f4b3a95653517b	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473	0.98856	0	0	35	0	0	0	0	0
8847458da33a06f69a270a37a9f25566	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Kallotenuales;D_4__AKIW781;D_5__uncultured bacterium;D_6__uncultured bacterium	0.78646	0	35	0	0	0	0	0	0
49c38774e7c641195170257209321f60	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99864	0	0	0	8	2	18	3	2
886813d6c66ef41ef648c9b92ffde619	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.99996	0	0	0	29	1	2	0	0
0ed3a6836e138f14044f6950ad7280d2	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Actinomycetales;D_4__Actinomycetaceae;D_5__Actinomyces	1.00000	0	7	0	0	25	0	0	0

5a7b179b1b45f0fe2282f260bf073f60	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Propionibacteriaceae;D_5__Cutibacterium	0.99945	2	9	0	1	9	1	2	7
6400be98be706e381faa4df752eeba93	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Dermabacteraceae;D_5__Brachybacterium	0.99704	0	0	0	0	0	0	0	31
a1429d5b6762aee13e0f0da181a871a0	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides;D_6__Nocardioides sp. KAR81	0.73785	0	0	0	0	30	0	0	0
bfb73028d9c5e5ade8c5ceedf0100a0c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Nakamurellaceae;D_5__Nakamurella	0.99985	0	0	0	0	0	0	29	0
1f305da12d3d34e024c13ced5839cbab	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Kocuria	0.96059	0	0	0	0	0	0	0	29
0999f4e86c94093f74e23b12501455f8	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Bifidobacteriales;D_4__Bifidobacteriaceae;D_5__Scardovia	0.99997	0	0	0	29	0	0	0	0
01344f29aa14cf1d706092	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;	0.82525	0	29	0	0	0	0	0	0

a4e7721018	D_4__Neisseriaceae;D_5__Kingella;D_6__uncultured bacterium									
a93d16c36603c2a1073aad01415ee245	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 17	1.00000	0	0	0	0	0	0	28	0
41f3f39a0335a7392afa80327caf0f77	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus;D_6__uncultured organism	0.79001	0	10	0	6	4	0	0	8
432b01066dfe0725b4830272bff0caff	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Thermoactinomyces;D_6__Thermoactinomyces sp. JAM-FM1001	0.82835	28	0	0	0	0	0	0	0
a767ef0731668fa4127e737312962d4b	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.99909	0	25	3	0	0	0	0	0
0562e97bf8665edd5ae85899297a44a8	D_0__Bacteria;D_1__Deinococcus-Thermus;D_2__Deinococci;D_3__Thermales;D_4__Thermaceae;D_5__Thermus	1.00000	7	6	13	0	1	0	0	0
e93f4733f6dc68d595f5672d09318191	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Micromonospora	0.77532	0	0	0	0	0	0	27	0

45ca47bd6bdb8ad7c86be3eb6640b34a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus;D_6__uncultured bacterium	0.79178	0	0	27	0	0	0	0	0
39277856f18f889dce2a469fd8cb94d0	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Clostridiaceae 1;D_5__Clostridium sensu stricto 1	0.99574	0	0	0	0	0	0	26	0
f6edbcb91f18c1dcc550ce2c68333165	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Blastococcus	0.99900	0	0	0	0	18	0	8	0
c93ea8fa70c44c3705ad01813cd08824	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99925	7	0	19	0	0	0	0	0
70a60612f186462ac3e8cd7ffb50690c	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae;D_5__Paracoccus	0.93161	0	0	0	0	1	0	21	3
d91c46df68ffef3e8d1bae5919163103	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.90071	0	0	0	0	0	0	25	0
be80fe6e84c2bae9737bd5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Arthrobacter	0.78584	0	0	0	0	25	0	0	0

ee5b9ca751										
09bdb31b557c68f822511cbbd81b3b88	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.90181	11	0	14	0	0	0	0	0
5ecf536a6b5c36282076c2fab403d649	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Pleomorphomonadaceae;D_5__Pleomorphomonas	0.99969	0	0	0	0	24	0	0	0
e28d63b7fa1e2ad674229951a0b682b5	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__Gemmata;D_6__uncultured endolithic bacterium	0.79525	0	0	24	0	0	0	0	0
361e35cc1c01cd16a9a5a0f6d62b914b	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473;D_6__uncultured bacterium	0.77916	0	0	24	0	0	0	0	0
2740cf2417c92847cc298cbd71dd1fcd	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Veillonella	1.00000	0	2	0	12	0	7	2	0
bc56a7361c9a3b49f1f1c51874321e12	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Kocuria	0.98912	0	2	0	21	0	0	0	0

fd70ba3cd244f3b5728380880773f8a1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria	1.00000	0	0	0	0	0	0	0	23
75443264d44e3016df66e2c55f756b57	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.97560	0	0	23	0	0	0	0	0
cce35f022427e79f33969133e143430c	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verrucomicrobiae;D_3__Chthoniobacterales;D_4__Chthoniobacteraceae	0.99541	0	0	23	0	0	0	0	0
f98e774f7614679d54a27788f2250f46	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.93231	0	0	23	0	0	0	0	0
facd276257d8d1e8decd10491e197080	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.95714	0	23	0	0	0	0	0	0
fd496fd32dc8c08ade2e8b6c9d8ee13d	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	1.00000	2	0	0	0	9	0	10	1
81c39a88e8864bbecca553	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	0	0	0	0	0	0	22	0

201310edb0										
f12a73cdb5f7babe9f833b447144ee70	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria	0.99999	0	0	0	0	0	14	8	0
0e20ee1a9b62240b906f64c593cf0e73	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;D_5__uncultured Sphaerobacter sp.;D_6__uncultured Sphaerobacter sp.	0.78762	0	0	0	0	22	0	0	0
0f516c9bda71240c88c9313d790f5633	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;D_5__uncultured soil bacterium;D_6__uncultured soil bacterium	1.00000	0	0	0	0	22	0	0	0
07b5357048fc133ace777d0da62088df	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.99835	0	0	22	0	0	0	0	0
942ec60e75a4f9183b9b69cbf8960379	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Granulicatella	0.75931	0	20	0	1	0	0	0	1
702af9e944edfd5a1a7f0dce0d566376	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99982	0	0	0	0	0	0	21	0

82795c481094d92a0e7b9c073f308e46	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99941	0	21	0	0	0	0	0	0
b6825773b8b549f2ab996dcd37e1bedd	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Leptotrichiaceae;D_5__Leptotrichia	1.00000	0	21	0	0	0	0	0	0
8e175abe6a746b8f33bae9cd7c8192bb	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Ruminococcaceae;D_5__Faecalibacterium	0.99994	0	21	0	0	0	0	0	0
d1e742dba5b2568ebb0fb9c433193809	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99942	20	0	0	0	0	0	0	0
10186353ec5e08fc7253617f36442915	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae	1.00000	0	0	0	0	20	0	0	0
63afe8e6aac58bf0d670a82ca5bc574c	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99977	0	0	0	0	20	0	0	0
98681ff2bb6380bb37ee2d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Acidiphilium	0.97159	0	0	0	0	0	0	0	20

4cd82a4 93c										
d66072b b4e903a 9c1a957 28d2942 7410	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae;D_5__Curtobacterium	0.92073	0	0	20	0	0	0	0	0
9033ae7 a19aedb b7a4c6e 7f29f2e4 b19	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99144	0	20	0	0	0	0	0	0
d078b5d 8f1eb748 044843f 265a160f 97	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured	0.99369	0	20	0	0	0	0	0	0
e24eea01 ee3a9fea fe8cd157 d09230a a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99999	0	0	0	0	0	0	19	0
9444459 cec4fb64 d9c65cf3 9297b16 d4	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Myroides	1.00000	0	0	0	19	0	0	0	0
6f3f68e5 c8e2a11 b388ddb bea9fa18 2d	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99696	0	0	17	0	0	0	1	1

828a7eb3ac1c808e46f3b328a450b36d	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Limnobacter	0.73310	0	0	0	19	0	0	0	0
6472eb8b1e09f892aca2f23182962903	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae	0.99966	0	0	19	0	0	0	0	0
2f9103a7492f2978e9c17a2c45995b2e	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas;D_6__uncultured Acetobacteraceae bacterium	0.74384	0	0	0	0	0	0	18	0
efbfbff1a182c7d33fbcba0a472b5f8d	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__SBR1031;D_4__A4b;D_5__metagenome;D_6__metagenome	0.71886	0	0	0	0	0	0	18	0
c74e4395341600c8ce2ce630eecdb11c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99781	18	0	0	0	0	0	0	0
4ee621e65d7a91ebd10ac463bf6cd304	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Alicyclobacillaceae;D_5__Tumebacillus	1.00000	18	0	0	0	0	0	0	0
d6efd2da2728fd74ded268	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.96830	7	11	0	0	0	0	0	0

122ee05036										
ec6732c2e0d4cf64b3d0350e7fe3defb	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Lachnospiraceae;D_5__Roseburia	0.98641	0	0	0	0	0	0	0	18
2b22753f23e78e990e39abbdce927abe	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__SC-I-84	0.99999	1	15	2	0	0	0	0	0
7d217addfd80cb5393d81dae5f160367	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Schlegelella	0.99499	0	13	0	0	4	0	0	0
6c5f4f9666d82b1bedf94e99acfe6741	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales	0.99997	0	0	5	0	12	0	0	0
a07d60d655cf8eb02e792c1289853ee4	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Solirubrobacter	0.99996	0	0	17	0	0	0	0	0
7cd840760c5b6b8ac8e732833243a3a9	D_0__Bacteria;D_1__Chloroflexi;D_2__JG30-KF-CM66	0.93910	0	17	0	0	0	0	0	0

b29eb9cf1784665 6f487cd9795c698 ef	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae	1.00000	0	0	16	0	0	0	0	0
435fd03 3e4772a d97cecd 035c9ace ba5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Mycobacteriaceae;D_5__Mycobacterium	1.00000	0	0	16	0	0	0	0	0
6f88f231 034262e d95b234 0538e25 1d8	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__Thermosporothrix;D_6__uncultured bacterium	1.00000	0	16	0	0	0	0	0	0
d2ed5fe0 443294c 72f4a4dd 352e80e 8c	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Bacteroidaceae;D_5__Bacteroides	1.00000	0	0	0	0	0	0	15	0
ab6b7b9 0747341 ce39f82d 0a22a1d 37d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	0.99922	0	0	0	0	0	0	15	0
00bea7a 9ea1a44 98eda6aa 56ac3b9 512	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae	0.99019	0	0	0	0	0	0	15	0
9fef297b c82420d 5b9abea	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99868	5	0	0	0	0	0	10	0

86562b8d27										
09de3dde6c465b74bcb8e6f8a478e4e0	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Nocardiaceae;D_5__Rhodococcus	1.00000	0	0	0	0	12	3	0	0
060cf91cfb472b04d82e15a19461c523	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Ruminococcaceae;D_5__Ruminococcus 1;D_6__Clostridium islandicum	0.98983	0	0	0	15	0	0	0	0
636ed1874cc1df7070c3939d907ccf4e	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99823	0	0	15	0	0	0	0	0
c4b069153ae53489ea1cbfb2de1cfb1d	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Mycobacteriaceae;D_5__Mycobacterium	0.99997	0	15	0	0	0	0	0	0
e6684003dfac37f34b4214f950f43e15	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verrucomicrobiae;D_3__Verrucomicrobiales;D_4__Rubritaleaceae;D_5__Luteolibacter;D_6__uncultured Luteolibacter sp.	0.94054	0	15	0	0	0	0	0	0
8f0bfb05ac0a7e59886704b41047446a	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.89915	0	15	0	0	0	0	0	0

21f95b97dc5e375731a00a6b323a8d35	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae;D_5__Rubellimicrobium;D_6__uncultured bacterium	0.99961	0	0	14	0	0	0	0	0
6db2c97532abe971a75024dfeaf40e9d	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Psychrobacter	0.99997	0	0	0	0	0	9	5	0
61b102e2eb5251c78e6a89fe547f4444	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae	0.99991	14	0	0	0	0	0	0	0
920cf061b073b419fa2cac9ee2baf46b	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup 3);D_5__Bryobacter	0.98451	0	0	0	0	14	0	0	0
c953c6e6e6514cf3f2f81adb6427bbeb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.99919	0	0	0	14	0	0	0	0
ca075f5224b43ed33cc500b25355c0b4	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Saccharopolyspora	0.99097	3	0	11	0	0	0	0	0
9c96d8340d08350b88346	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedo	0.96459	0	0	14	0	0	0	0	0

3fa0d114bf1	nobacteraceae;D_5__1921-3;D_6__uncultured Ktedonobacter sp.									
ad4cba5280fb47cbebea01e7031af61c	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.86679	13	0	0	0	0	0	0	0
679d9c7fd43434a5ab6f9b7f754286c9	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Planctomycetales;D_4__Rubinisphaeraceae;D_5__SH-PL14;D_6__metagenome	0.90947	0	0	0	0	13	0	0	0
a86412b7283dcc5294642e10d1dd47cd	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Ruminococcaceae;D_5__Hydrogenoanaerobacterium;D_6__uncultured bacterium	0.80648	0	0	0	13	0	0	0	0
fcc445dcbc8212d390f6a47a498b9bfe	D_0__Bacteria;D_1__Chloroflexi;D_2__AD3	0.99973	3	1	9	0	0	0	0	0
6e987b822299850f89f9427ca05d2f4e	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae;D_5__uncultured	0.77470	0	0	13	0	0	0	0	0
179c49ef64c244d99c58f7e492ba40e7	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.98477	0	4	9	0	0	0	0	0

d5cc0541da0655f6cef8ffa69b7ff93a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.99808	0	13	0	0	0	0	0	0
36ac36c7074290f1c506f3765b83fdc7	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Solirubrobacter	0.99997	0	13	0	0	0	0	0	0
a7baa09fd673897bdbde41afbed88fde	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Adhaeribacter;D_6__uncultured Bacteroidetes bacterium	0.70791	0	0	0	0	0	0	12	0
711944e123e35994b50e085b07ff2ecc	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas	0.99928	0	0	0	0	0	0	12	0
21fdf08cfe7593993ec0db2a509f64e1	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prolixibacteraceae;D_5__uncultured	0.94502	0	0	0	0	0	0	12	0
3b14d907a9ed7cdb4b2f80c182de8bdd	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10;Ambiguous_taxa;Ambiguous_taxa;Ambiguous_taxa;Ambiguous_taxa	0.90233	12	0	0	0	0	0	0	0
16ae83d44889d55c0a8f6d	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Amycolatopsis	0.89970	5	7	0	0	0	0	0	0

d065920f04										
891ae2f84ec71f312372707a84e506c3	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup 3);D_5__Bryobacter	0.99894	12	0	0	0	0	0	0	0
388def351727a34f89613b006dc475ca	D_0__Bacteria;D_1__Chloroflexi	0.78095	0	0	12	0	0	0	0	0
5d0554628a26b6529365b73ee89d7042	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.96208	0	0	12	0	0	0	0	0
a4cbe987942964b584e95e4efab6a176	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.99966	0	0	0	10	0	0	1	0
516a67156dacfa4341327a7e2a22f877	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Geobacillus;D_6__Geobacillus stearothermophilus	0.77371	0	0	0	0	0	6	5	0
ab1cedc885ae9ac8207f3885daaf2603	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99304	11	0	0	0	0	0	0	0

afaab28f537a72577d22fb00949df1f6	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Polaromonas	0.92984	0	0	0	0	0	11	0	0
07801cdc548aad651e62c058d18e3c60	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99980	0	0	0	8	0	0	3	0
702e821793e8ad73e60a49ee91165118	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Thermoactinomyces;Ambiguous_taxa	0.97274	0	0	0	0	0	3	8	0
16d13ed513218adc8b205a10b716e08c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	2	9	0	0
957df1f4557753cf081921496042e092	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Cohnella	0.99995	0	0	0	0	11	0	0	0
c6319747ad799207563b5aa441e6b693	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Cyclobacteriaceae;D_5__Shivajiella;D_6__uncultured Aquiflexum sp.	0.76156	0	0	0	0	0	0	0	11
7359790b9124fa0457b49a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylorosula	0.72423	0	0	0	0	11	0	0	0

6c8d6cd57c										
ff73c9ca766eebaaec0e548bc574e44d	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured	0.99933	4	0	7	0	0	0	0	0
019c363ca4f4a5cdfae74ddce903e5cb	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Lautropia;D_6__uncultured bacterium	0.73900	0	0	0	0	11	0	0	0
cdf14d2fed157f8032715a22d3bf4573	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella;D_6__Prevotella nigrescens	0.89731	0	0	0	1	0	0	0	10
60ffdff0b284115d9ffad14705e2155f	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__uncultured;D_5__uncultured alpha proteobacterium;D_6__uncultured alpha proteobacterium	0.73787	0	0	11	0	0	0	0	0
b16d364400be99864dc0ceba57973637	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured;D_6__uncultured planctomycete	0.81343	0	11	0	0	0	0	0	0
94fd275739b4e408cf4b3744f604d928	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__Gaiellaceae;D_5__Gaiella;D_6__uncultured Conexibacter sp.	0.73044	0	11	0	0	0	0	0	0

230eb75feb29c3cac3c9c5d344424b59	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Chitinophagales;D_4__Chitinophagaceae;D_5__Flavitalea	0.99962	0	11	0	0	0	0	0	0
0e2e91fba1ca9ed7de2d11ea4786c914	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99959	0	0	0	0	0	0	10	0
ffe3d871aae9f8bca3a7928de5892a07	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99999	0	0	0	0	3	0	4	3
d1f608ca9c0e35248e35bf7fcbea590f	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Polycladomyces;Ambiguous_taxa	0.95487	10	0	0	0	0	0	0	0
13a28c20a882241ecb6ecfd3b4c3d41b	D_0__Bacteria	0.99994	0	0	0	0	0	10	0	0
2ca8d5c62cf788c5a9161c2921b9b993	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Bradymonadales;D_4__Bradymonadaceae;D_5__uncultured proteobacterium;D_6__uncultured proteobacterium	0.99619	10	0	0	0	0	0	0	0
ceb5720003985abc5ab24	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__A	0.99940	10	0	0	0	0	0	0	0

8091ecd d537	cetobacteraceae;D_5__Endobacter;D_6__uncultured bacterium									
526f607 19efbc69 c6a1d39 c7ad78f8 64	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.97286	10	0	0	0	0	0	0	0
ca92bdf2 71282ba 65ab50c 35dd6ca d8b	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Solirubrobacter	0.99999	10	0	0	0	0	0	0	0
68c5689 6f754db 932a51a 88ebad5 bc6a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99989	2	1	7	0	0	0	0	0
536e0d5 0427897 0530d1e 6736fbd 7a1e	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10;D_3__uncultured Chloroflexus sp.;D_4__uncultured Chloroflexus sp.;D_5__uncultured Chloroflexus sp.;D_6__uncultured Chloroflexus sp.	0.94157	0	0	10	0	0	0	0	0
83b94f7 8de4314 ed0d99b 5176aee 2c48	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Spirosomaceae;D_5__Fibrella;D_6__uncultured soil bacterium	0.90381	0	0	0	0	0	0	9	0
13c1b2a 8c491cf3 fba2fa50 e457174 50	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus	1.00000	9	0	0	0	0	0	0	0

cfb9d4f0e2d59181b68cff0a3e3d6271	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Kallotenuales;D_4__AKIW781;D_5__uncultured endolithic bacterium;D_6__uncultured endolithic bacterium	0.85589	0	0	0	0	0	0	9	0
a3834c59a4f683a9039c6373c5f61836	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99244	0	0	0	0	0	0	9	0
7ed8d83d3a6a1ea1730226df01804efb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Kineosporiales;D_4__Kineosporiaceae;D_5__Quadrisphaera;D_6__uncultured bacterium	0.73029	0	0	0	0	0	0	9	0
84bcd6a513b5b5812ee0a5c00a9b2f28	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae;D_5__Sporosarcina;D_6__uncultured bacterium	0.72559	0	0	0	0	0	0	9	0
75a9e262473d4f9a3c948bbf097db62d	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Thermoflavimicrobium;D_6__low G+C Gram-positive bacterium HTA1422	1.00000	9	0	0	0	0	0	0	0
09bdaeab3afb9f6ebbb298f15dc6045c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.99953	9	0	0	0	0	0	0	0
00e60c711977dc98a9bc1	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedo	0.74560	9	0	0	0	0	0	0	0

0e62d6c4409	nobacteraceae;D_5__FCPS473;D_6__uncultured Ktedonobacter sp.									
68831861041b6c9e00142657fc79869c	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group	0.99963	0	0	0	0	0	0	9	0
8804e40d599ff515d0176a3b4036e674	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__Zavarzinella;Ambiguous_taxa	0.71282	9	0	0	0	0	0	0	0
36dc5ea6badbe7ebb63fbf571aac7865	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales	1.00000	9	0	0	0	0	0	0	0
dcf9dc297c2d49e290bd6b2b653dea68	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Nostocales;D_4__Phormidiaceae;D_5__Tychonema CCAP 1459-11B	0.99652	0	0	0	0	0	0	0	9
a5984890029b1f6b1849cd2b3e8aa37a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Acidiphilium;D_6__uncultured soil bacterium	0.86342	0	0	0	0	9	0	0	0
0d67310eafc3e5914eeba73f9a127575	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae	0.99960	0	0	0	0	9	0	0	0

283fbda88937bcb5281d9d201f12780e	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella;D_6__Prevotella pallens	0.97015	0	0	0	9	0	0	0	0
e898620b82d3ae5814a1888c8888639a	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.98991	0	0	0	9	0	0	0	0
8227f0233126022bbd1b2fe5e0806f73	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group;D_5__uncultured bacterium;D_6__uncultured bacterium	0.88290	0	0	9	0	0	0	0	0
30ac7d1de16c84c5982f59bb2fecc2ec	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae	0.99704	0	0	9	0	0	0	0	0
d996608292c1f0fd00a0d82d05ccd107	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas;D_6__uncultured bacterium	0.73086	0	9	0	0	0	0	0	0
e9b70570f6e642a8721db4312e0b2763	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.97689	0	9	0	0	0	0	0	0
be7b34c347d3bd6f69eec0	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	9	0	0	0	0	0	0

523e1d43ed										
dd3a124e0f04306cf546df311a52b727	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Cupriavidus	0.99915	0	2	1	0	0	1	2	2
922d33a2963d3e87a3d4df6b82371235	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99973	7	0	0	1	0	0	0	0
ccfb3b181fdfda0a5444825f0257f3b2	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Sporichthyaceae;D_5__uncultured;D_6__uncultured bacterium	0.92794	0	2	0	0	0	0	6	0
5f0b355a1deb3a9e5cae46692fde9f2d	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Psychrobacter	0.98480	0	0	0	0	0	8	0	0
a58fda69cc4a3a3ceb9d7f6b644d1cdf	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1;D_6__Corynebacterium sp. NML 080024	0.80945	0	0	0	0	0	8	0	0
72b4455586688d0863143a3e0bb71316	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Jeotgalibaca;Ambiguous_taxa	0.84468	0	0	0	0	0	0	8	0

d0bec93708bcaabfe06ac76b4e2a090a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99998	0	0	0	0	0	0	8	0
945184b6386c192c0066e0a98a154780	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99986	0	0	0	2	0	0	5	1
2727f819185a7e8993f13df355a399fa	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.98927	0	0	0	0	8	0	0	0
dec524338263b284b8c6e3647996c4cd	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus	0.99998	8	0	0	0	0	0	0	0
64de809cba16b50a775a2d8961c5c1e5	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473;D_6__uncultured bacterium	0.99999	8	0	0	0	0	0	0	0
89a9e1671d9c89c4f30aec67c06c3637	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__uncultured	0.99927	8	0	0	0	0	0	0	0
27fa10fa9d28d303d1d3b6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Intrasporangiaceae	0.99785	0	0	0	0	0	8	0	0

95f24e90 76										
4e07637 02795e6 afb59e7d 22281a0 099	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli; D_3__Bacillales;D_4__Staphylococcaceae;D_5 __Staphylococcus	0.99996	0	0	0	0	0	8	0	0
dd6549d a7e42e0 3da9992 ef2db62b 1c0	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli; D_3__Bacillales;D_4__Planococcaceae	0.82923	0	0	0	3	4	0	1	0
b3cdae1f 08b43baf e5feedb4 83634d9 a	D_0__Bacteria;D_1__Actinobacteria;D_2__Acti nobacteria;D_3__Corynebacteriales;D_4__Cory nebacteriaceae;D_5__Lawsonella	1.00000	8	0	0	0	0	0	0	0
6e2b6a1 a4180c7 e1a6c2cc ade44bf3 5e	D_0__Bacteria;D_1__Chloroflexi	0.77930	8	0	0	0	0	0	0	0
8ca0b99 17d926b b6241ce 6e23673f ce4	D_0__Bacteria;D_1__Firmicutes;D_2__Clostrid ia;D_3__Clostridiales;D_4__Lachnospiraceae;D _5__Blautia	0.95982	0	0	0	0	8	0	0	0
d7c175c 5b20616 0e3c14ff d3ae201 9d7	D_0__Bacteria;D_1__Proteobacteria;D_2__Ga mmaproteobacteria;D_3__Alteromonadales;D_4 __Pseudoalteromonadaceae;D_5__Pseudoaltero monas	0.99771	0	0	0	0	8	0	0	0

ca9c66d47347c03d0343d6fe03ed8636	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Haemophilus	0.99210	0	0	0	0	0	0	0	8
96e33458e8a180df0ae170b1e16d9e52	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Tepidimonas	0.99204	0	0	0	8	0	0	0	0
1276e36a238d48bea7418f65f3069ea6	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99958	0	0	0	0	8	0	0	0
7ae808cd4ae2caf0e35da0589ee28745	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99994	7	0	0	0	0	1	0	0
63db1192d6cdf1df6cc585055609a492	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99845	0	0	0	8	0	0	0	0
a91108c92f693afd91f04b849e036d52	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	0.74511	0	0	0	6	2	0	0	0
a45028940cd1df2de288ef6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptosporangiales;D_4__The	0.90955	0	0	8	0	0	0	0	0

91f2a3c66	rmomonosporaceae;D_5__Actinoallomurus;Ambiguous_taxa										
8bade6704683f7d463c9815eb9d53d42	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	8	0	0	0	0	0
0091bbe6fbab63428229579bb4d1b31f	D_0__Bacteria;D_1__Gemmatimonadetes;D_2__Gemmatimonadetes;D_3__Gemmatimonadales;D_4__Gemmatimonadaceae;D_5__Gemmatimonas;D_6__uncultured Gemmatimonas sp.	0.77470	0	8	0	0	0	0	0	0
e0aa49e308e34c6e69442514d947224c	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured;D_5__uncultured bacterium;D_6__uncultured bacterium	0.80121	0	8	0	0	0	0	0	0
b69183eae8f0ec5dcb47c505e5e6f7bb	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocatellia (Subgroup 4);D_3__Pyrinomonadales;D_4__Pyrinomonadaceae;D_5__RB41	0.99662	0	8	0	0	0	0	0	0
afdf71cdda45618862699a8b88bc6201	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured	0.99146	0	8	0	0	0	0	0	0
7f85ac088481e3811666998c6ba22231	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Fusobacteriaceae;D_5__Fusobacterium	1.00000	0	8	0	0	0	0	0	0

ec9562edcf3986f9a56ee377d8ff737c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	5	0	2	0
6f2b8b5662ca322965a1babe7d54baab	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Ureibacillus	0.99619	0	0	0	0	0	0	7	0
25e9838ddd33c0994e7d6f6992e39de7	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Cohnella	0.99999	6	0	0	0	1	0	0	0
d11bf612ab3fa56df64dce71117f0fc9	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Blastococcus	0.99913	0	0	0	0	0	0	7	0
a7466907efb4442a0e2d195a22bb18e7	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas	0.99198	0	0	0	0	0	0	7	0
390235a54a9d88482e9fe5b7c0049512	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Alicyclobacillaceae;D_5__Tumebacillus	0.99999	7	0	0	0	0	0	0	0
00ef8cf4ac546b64d460a8	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Pirellulales;D_4__Pirellulaceae;D_5__Pirellula	0.99880	0	0	0	0	0	0	0	7

7eecf029dc										
a0cd4bf7e97c9117ce4e2f865515277f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99997	7	0	0	0	0	0	0	0
fdfae48e729e44a25220e6848b2a9b4e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Diplorickettsiales;D_4__Diplorickettsiaceae;D_5__uncultured;D_6__uncultured bacterium	0.96024	0	0	0	0	0	7	0	0
8b7ed699511c4ce2d3e390b6d3ffab03	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Novosphingobium	0.75755	0	0	0	0	7	0	0	0
a20eb37d50abf4ef13197bd4a0ea8c84	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Arthrobacter	0.78817	0	0	0	7	0	0	0	0
f60b7365df078be0cd032d512e6b67cd	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group;D_5__uncultured bacterium;D_6__uncultured bacterium	0.85000	7	0	0	0	0	0	0	0
41b06fa435f4279693a36ac1c712a8a7	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.86368	7	0	0	0	0	0	0	0

fff06026a9b0bdb4bbba30648af92f93	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus	0.99983	0	0	0	0	7	0	0	0
dcf7709ece9a68d8226f741b011c5690	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Salinicoccus;D_6__Salinicoccus roseus	0.70405	0	0	0	0	0	0	0	7
274def3cad9a8fa985975cd24d244fd3	D_0__Bacteria	0.99189	0	0	0	7	0	0	0	0
8e09caaee61bd482522f087e96e093de	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Geobacillus	0.97540	0	5	0	0	0	0	2	0
1739d8f19c1ac366a2138b64b03047a9	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Rothia	0.99982	0	0	0	0	0	0	0	7
28c177101b1358de0b98066941b9cbf4	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__uncultured;D_6__uncultured Ktedobacteria bacterium	0.95795	0	0	7	0	0	0	0	0
06dfd1d29e9edcdaa110b	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.85285	0	0	7	0	0	0	0	0

a01533fd71b										
7690dbd83820b3ec72fae6f05e630a7b	D_0__Bacteria;D_1__Chloroflexi;D_2__JG30-KF-CM66;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.98023	0	7	0	0	0	0	0	0
1a51fd54a526eadea227fd4cdab17c69	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Azospirillales;D_4__Azospirillaceae;D_5__Skermanella	0.73873	0	7	0	0	0	0	0	0
22b3c70cdfb1714224e1bf8a6314bee9	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Finegoldia	1.00000	2	1	0	3	0	0	0	0
7c378fcb85f1655f2d65e2b2d6094b4a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Aerococcaceae	0.98010	0	0	0	0	0	0	6	0
1c2b8892a0d7f828d72808cd01cfd199	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Devosiaceae;D_5__Devosia	0.86320	0	0	0	0	0	0	6	0
6eb69474b21bd33e7501ca5b7341b763	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99991	0	0	0	0	0	0	6	0

35b20cd95347d74d504247a79528bb69	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Bifidobacteriales;D_4__Bifidobacteriaceae;D_5__Bifidobacterium	0.99996	0	0	0	0	0	0	6	0
4dc73508040792a241e2c6352cd90cee	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.90947	0	0	0	0	0	0	6	0
bcb676e980438f84ac5968bc595ae2d4	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-3;D_6__uncultured Ktedonobacter sp.	0.98680	6	0	0	0	0	0	0	0
a843fc211658b32d18ca8567f97f1a1e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99999	6	0	0	0	0	0	0	0
2fc93e0bb1b8842b0eccc0aee5009d08	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99877	0	0	0	0	0	6	0	0
e0ed1c873727f5f9712d9d879a1b97c2	D_0__Bacteria;D_1__Dependentiae;D_2__Babeliae;D_3__Babeliales;D_4__Vermiphilaceae;Ambiguous_taxa;Ambiguous_taxa	0.99998	0	0	0	0	6	0	0	0
1535c81c2b1af109d7bfe78	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Ammoniphilus	0.99941	0	0	0	0	0	0	6	0

85f783d53										
3ebe761bfb1238c87195d431f41bf976	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99937	0	0	0	3	1	0	0	2
def986eeb3666d56d978db198f028451	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__SB-5;D_5__uncultured bacterium;D_6__uncultured bacterium	0.76701	0	0	0	0	0	0	6	0
d08c66764a93fcdb04e2e1bf5224d546	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XVIII;D_5__Symbiobacterium	0.88533	6	0	0	0	0	0	0	0
4c16494612e4d4a95b79195b883e899f	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__SBR1031;D_4__metagenome;D_5__metagenome;D_6__metagenome	1.00000	0	0	0	0	0	6	0	0
da6a7cba87e0895b9cbe6037b9bd8b3b	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 9	1.00000	1	0	0	0	5	0	0	0
cd74dff9536eba82bac8c6d71a8eea45	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Kribbella	1.00000	6	0	0	0	0	0	0	0

6775d2384a80a0558a46dd8c79c12762	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Sphingobacterium;D_6__Sphingobacterium spiritivorum	1.00000	0	0	0	0	0	0	0	6
8909945f3d540df12980fd8b82497e8b	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Endobacter;D_6__uncultured bacterium	0.99929	6	0	0	0	0	0	0	0
98eb3b3ad861b7d476809a6620253aaf	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__uncultured	0.99630	0	0	6	0	0	0	0	0
cff60bed359051dd65fe850fd0bd07e1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Nocardiaceae;D_5__Rhodococcus;D_6__Rhodococcus corynebacterioides	0.74683	0	0	0	0	6	0	0	0
14bc416e6124338d65168bba150b37f5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Marmoricola	0.74160	0	0	0	6	0	0	0	0
34fbf87eac012541369243c4d278a857	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.97824	0	0	6	0	0	0	0	0
05fe69caa39ee6ec77a0bbd	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__S	0.79314	1	0	5	0	0	0	0	0

01d2f5da f	olirubrobacteraceae;D_5__Solirubrobacter;Ambi guous_taxa									
c830062 0949845 3502bd2 eac28be3 b4c	D_0__Bacteria;D_1__Actinobacteria;D_2__The rmoleophilia;D_3__Gaiellales;D_4__uncultured	0.99509	0	0	6	0	0	0	0	0
d185b16 38d5bdcf b9d8fa4a 7b29142 87	D_0__Bacteria;D_1__Planctomycetes;D_2__Pla nctomycetacia;D_3__Gemmatales;D_4__Gemm ataceae;D_5__uncultured;D_6__uncultured bacterium	0.90855	0	0	6	0	0	0	0	0
b5e1176 2007574 4d857e5 767f367 026c	D_0__Bacteria;D_1__Proteobacteria;D_2__Alp haproteobacteria;D_3__Rhizobiales;D_4__Beije rinckiaceae;D_5__Methylobacterium;D_6__Met hylobacterium sp. LAT_E4	0.99510	0	6	0	0	0	0	0	0
f0140aec 2577562 13c446d 6d7c286 873	D_0__Bacteria;D_1__Firmicutes;D_2__Negativ icutes;D_3__Selenomonadales;D_4__Veillonell aceae;D_5__Selenomonas 3	0.73464	0	6	0	0	0	0	0	0
c46e7d2 8f621cb4 8937cea 4ba78d0 efe	D_0__Bacteria;D_1__Planctomycetes;D_2__Pla nctomycetacia;D_3__Gemmatales;D_4__Gemm ataceae;D_5__uncultured	0.99491	0	6	0	0	0	0	0	0
30b2a1e c8efd17f ac1da04f ec6b5f46 a	D_0__Bacteria;D_1__Actinobacteria;D_2__Aci dimicrobiia;D_3__Microtrichales;D_4__Ilumato bacteraceae;D_5__uncultured;D_6__uncultured bacterium	0.76154	0	6	0	0	0	0	0	0

2209286f7d81fddef78a1157fe683640	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Lactococcus	0.99993	0	0	0	0	0	0	5	0
0dcc33647d18863132854b04d07a609a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Spirosomaceae;D_5__Dyadobacter	0.99996	0	0	0	0	0	0	5	0
f4cc74482db26ac017f4a91a8ec167a0	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group;D_5__uncultured bacterium;D_6__uncultured bacterium	0.77187	5	0	0	0	0	0	0	0
b30de0d09fbbf7573a70496f4e3a4c01	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	0	0	5	0
bdf8a26094624622d68509a87fa75ba7	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.99749	0	0	0	4	1	0	0	0
b38de8a8c802a4845cc9e30cba6615f5	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Ruminococcaceae;D_5__Ruminococcaceae NK4A214 group	0.99989	0	0	0	0	0	0	5	0
8794e5602eabf23b8ae19e	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup	0.71160	5	0	0	0	0	0	0	0

366371a da3	3);D_5__Bryobacter;D_6__uncultured bacterium									
92b9dcd 91c9c39 54f03aa3 81cf492c 4f	D_0__Archaea;D_1__Thaumarchaeota;D_2__Nitrososphaeria;D_3__Nitrososphaerales;D_4__Nitrososphaeraceae	1.00000	5	0	0	0	0	0	0	0
f2b0e3a6 efd1e7d6 fa65e12c 454fa045	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__Aquisphaera	0.99216	5	0	0	0	0	0	0	0
92f1720 367db58 c68a96ec eb9feb41 6a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	0.99995	5	0	0	0	0	0	0	0
ca4a697 7f187a53 514ab5a 0b084be 84f	D_0__Bacteria;D_1__Actinobacteria;D_2__Acidimicrobiia;D_3__Microtrichales;D_4__uncultured	0.86384	5	0	0	0	0	0	0	0
655c4e2 6812b8a 7e6fdf8d 39bacae0 72	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99999	5	0	0	0	0	0	0	0
35fc6513 ac37188 2ddd3f0 68634b6 a4d	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__Anaerolineales;D_4__Anaerolineaceae;D_5__uncultured	0.97828	5	0	0	0	0	0	0	0
3a4756c 3e76d54	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99163	5	0	0	0	0	0	0	0

ef7423db23b113f661										
191fb83796ae38927791b7d1e1f55060	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Alicyclobacillaceae;D_5__Alicyclobacillus	1.00000	5	0	0	0	0	0	0	0
9e9c4270966cf507485654eb33a69880	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Leuconostocaceae;D_5__Weissella	1.00000	0	0	0	5	0	0	0	0
d0d70a8fc48dfa27cfc87b14b02a51da	D_0__Archaea;D_1__Euryarchaeota;D_2__Halobacteria;D_3__Halobacteriales;D_4__Haloferacaceae	0.70727	0	0	0	0	0	0	0	5
dcb780205dff9735d08f1a23c93470cf	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Selenomonas	0.99989	0	0	0	0	0	0	0	5
931ccc3ef22f0a8c33a4cd074f907cc2	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Intrasporangiaceae	0.99857	0	0	0	2	1	0	2	0
61265037f640485a64f826afe5fa3e71	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Noviherbaspirillum	0.93302	0	0	0	0	5	0	0	0

8379ddf122fde1226ef318553bcf092d	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__Gaiellaceae;D_5__Gaiella;D_6__uncultured Rubrobacteria bacterium	0.99349	5	0	0	0	0	0	0	0
9b49bd4c94e0b675023f9b6008561c2a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Myroides	1.00000	0	0	0	5	0	0	0	0
db7f42d2a4ded289e177bb4c00edff61	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Lachnospiraceae;D_5__Lachnospiraceae NK4A136 group	0.94151	0	0	0	5	0	0	0	0
886d3a47f4b9020dc873a9ab3dff589f	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__Gemmata	0.99985	0	0	0	5	0	0	0	0
4f664bf836f12c789abc0fd665d3d7dd	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__Thermosporothrix;D_6__uncultured bacterium	1.00000	0	0	5	0	0	0	0	0
4d3fbe62820ab1c86bf2c1b0100be3a1	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473	0.98875	0	0	5	0	0	0	0	0
8cc0117f474cc9dc7cb054	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10	1.00000	5	0	0	0	0	0	0	0

93c942c9cd										
d7a30327e20600a51e1edc8f9de34264	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup 3);D_5__Bryobacter	0.99632	0	0	5	0	0	0	0	0
d4acf6c3467e230e90fbc2b4f045015d	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99492	0	0	5	0	0	0	0	0
d15bd1dcb9de71d7452648673a59f5b8	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Pedobacter	0.99279	0	0	0	5	0	0	0	0
ca6bc90ea7e155a8984b841445fbc500	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured actinobacterium;D_6__uncultured actinobacterium	0.84208	0	0	5	0	0	0	0	0
c3f64e060dc7fb36e9730bc88f8168dc	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.95848	0	0	5	0	0	0	0	0
9664cae1104ed11cba60a2552c35cae7	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99978	0	0	5	0	0	0	0	0

73555d08d3e11f406fb167af27634818	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Veillonella	1.00000	0	5	0	0	0	0	0	0
205e9006842d47d1a2d1caf6a96e0c88	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Microvirga	0.99987	0	5	0	0	0	0	0	0
2fbc72ed0122cb8c18315f817102f845	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Sporichthyaceae;D_5__uncultured	0.72902	0	5	0	0	0	0	0	0
4fe8e1b20954aedb3ec3b738237457b1	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2	0.96873	0	5	0	0	0	0	0	0
216680403e543df67082df4bca8579eb	D_0__Bacteria;D_1__WPS-2;D_2__uncultured bacterium;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.92309	0	0	5	0	0	0	0	0
e049b9d365eabdadcb5622668321cae0	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.98798	0	5	0	0	0	0	0	0
c5c9af963b1827a7faaf3b9	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	0.99945	0	5	0	0	0	0	0	0

34472d9ea										
077569d02ddef952a1293acbb51a50d2	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup 3);D_5__Bryobacter	0.99774	0	5	0	0	0	0	0	0
dcba105f35d8ebc9e22269c7491ad3a7	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Stenotrophomonas	0.99991	2	0	0	0	0	0	1	1
7d88cb85b80e0024b54a61e7a6da3bf0	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.87738	0	0	0	0	0	1	3	0
8495ba6ecec8d12dae432a82cc654769	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Dietziaceae;D_5__Dietzia	0.99952	0	0	0	0	0	0	4	0
d0204354d788dfb7ff560d7876f3e9a4	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Micromonospora	0.97985	0	0	0	0	0	0	4	0
b1937d4985b612a6e9c822da87bdf76e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae;D_5__Clavibacter	0.77071	3	0	0	0	0	0	1	0

bcba476 20c299fd 34809f1 43e3d26 dff	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.90704	0	0	0	0	0	0	4	0
7755725 060c29a 90f27f53 5a6affe3 9e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae;D_5__Amnibacterium;Ambiguous_taxa	0.76207	0	0	0	0	0	0	4	0
98f5351 9513214 e968c56 9829a14 71bb	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium	0.99657	0	0	0	0	0	0	4	0
b7ae2d9 2c6199a 9e58c97 d0e7586 5d36	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Kocuria	0.99017	0	0	0	3	0	0	0	1
3bae00d 865b43e 800a6f29 7f958ac2 de	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Veillonella	1.00000	4	0	0	0	0	0	0	0
19439cc 990a61fd 03f0210 57c0355 4ad	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus;D_6__Bacillus kokeshiiformis	0.79166	0	0	0	0	0	0	4	0
3c833df6 619f6ac5 81a149d	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473	0.96815	4	0	0	0	0	0	0	0

747e13a4c										
636b004b80fe12ee0ef77c017520f5e3	D_0__Bacteria;D_1__Bacteroidetes;D_2__Ignavibacteria;D_3__Ignavibacteriales;D_4__BSN166;D_5__uncultured bacterium;D_6__uncultured bacterium	1.00000	4	0	0	0	0	0	0	0
bfb6f185952417fb89eeb704513ad226	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus;D_6__Paenibacillus sp. PA231	0.99789	4	0	0	0	0	0	0	0
e57c5df6a9b3b982472e7754ed31f313	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Massilia	0.99308	0	0	0	1	0	0	3	0
88ac7bcd5ccbf53f9e37d749177e7ead	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.95775	4	0	0	0	0	0	0	0
400c53461aabf2fd488d97226e8047a3	D_0__Bacteria;D_1__Gemmatimonadetes;D_2__S0134 terrestrial group;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.99911	0	0	0	0	0	4	0	0
65641452be75528754b5ae258ba661c1	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Aerococcaceae;D_5__Aerococcus	1.00000	0	0	0	1	3	0	0	0

909efc1034e7b2c57778f8f5c8ea3465	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Phytohabitans	0.77563	0	0	0	0	0	0	4	0
1fd1f3fbc0437b678ede5a76465a1326	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__alphaI cluster	0.91650	0	0	0	0	4	0	0	0
d431d19e60929bf4049643e327dfff9f	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured	0.99990	4	0	0	0	0	0	0	0
ba6c32d2cb692cd9e0fdc3693a3996e5	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus	0.99992	0	0	0	0	0	0	4	0
866066cbb4618ee2ee5b2238fd7377f1	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae	0.99380	4	0	0	0	0	0	0	0
4d1ab8e9aef8d4f138d727199f809ac6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99993	4	0	0	0	0	0	0	0
c7fe190a108be5e341e327	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae	0.95068	0	0	0	0	0	0	0	4

3264136 7ea										
b22e7e5 c844dbb 0bd5e7c 912bc07 eacb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99391	4	0	0	0	0	0	0	0
1c1824b 681e845f 20fc3b55 4795bf2 83	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Ectothiorhodospirales;D_4__Ectothiorhodospiraceae;D_5__Thioalkalivibrio;Ambiguous_taxa	0.83452	4	0	0	0	0	0	0	0
b552929 74ddaab c73a9dc 0feda287 854	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae	0.98268	0	0	0	0	0	0	0	4
3934663 248f66c0 f1cad780 db8cb0b 9b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99785	0	0	0	4	0	0	0	0
2e2c268 484df6f7 2476bffb dfeaaa5c 3	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__Anaerolineales;D_4__Anaerolineaceae;D_5__ADurb.Bin120;D_6__uncultured bacterium	0.95912	4	0	0	0	0	0	0	0
862971e b635456 71fb5d7 472a433 97af	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99709	2	0	2	0	0	0	0	0

d5987c3a637e21de6e9fba39da5814a5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Crossiella;D_6__uncultured bacterium	0.74506	4	0	0	0	0	0	0	0
d0b0ea6b995a18830544cbd6ba5fb1f8	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	4	0	0	0
459a6d6adece06214d4d6158bf136271	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__B12-WMSP1;D_4__uncultured Chloroflexi bacterium;D_5__uncultured Chloroflexi bacterium;D_6__uncultured Chloroflexi bacterium	0.99955	4	0	0	0	0	0	0	0
430d480477d450614cc88f3853c6ae7f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99999	0	0	0	4	0	0	0	0
9477d14f8c109bae38f32af89c4c42ee	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.94793	0	0	0	0	0	0	4	0
7f93322b7bbf8067d2f3944c8ffc5919	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Oceanospirillales;D_4__Halomonadaceae;D_5__Halomonas	0.96690	0	0	0	4	0	0	0	0
9c7d8a935b7a78e223a70f	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedo	0.97848	0	0	4	0	0	0	0	0

ecbacad0a9	nobacteraceae;D_5__JG30a-KF-32;D_6__uncultured organism									
e9815b0d2d8b5953fff9db7596503fb1	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.95452	0	0	4	0	0	0	0	0
e86752f8864523356a683a264f62c4e4	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Chryseobacterium;D_6__Bacteroidetes bacterium CH6i	0.83880	0	0	0	0	0	0	0	4
771389df241cb3fda4a869922bc99247	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter	1.00000	0	0	4	0	0	0	0	0
0db7e0cbdc068af88ec3bb6cdecaaa3c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Actinomycetales;D_4__Actinomycetaceae;D_5__Actinomyces;D_6__Actinomyces coleocanis	0.99901	0	0	0	4	0	0	0	0
6bdbd7db1942d234aa16f82567ff21bc	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured Rubrobacteria bacterium;D_6__uncultured Rubrobacteria bacterium	0.96701	0	0	4	0	0	0	0	0
f4e335d35e9b3a7f90d5e0d538a470af	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.99878	0	4	0	0	0	0	0	0

a56c15b953dfa4dc592395667596ee5b	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae	1.00000	0	4	0	0	0	0	0	0
e4bf64e1c0fbb33ab91678ff7b5dd07c	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Microvirga	0.94498	0	4	0	0	0	0	0	0
2b5f7a01d0ed6c857e45dff483108547	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Solirubrobacter;D_6__uncultured bacterium	0.73930	0	4	0	0	0	0	0	0
89455dadc8b592fc9c181079578a2c69	D_0__Bacteria;D_1__Actinobacteria;D_2__Acidimicrobiia;D_3__IMCC26256	0.99983	0	4	0	0	0	0	0	0
e836a387b198e14be1c0ce0c086a0c52	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.99608	0	4	0	0	0	0	0	0
d58508af968236a9adfdc41213dbedb7	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Acidiphilium;D_6__Acetobacteraceae bacterium	0.79353	0	4	0	0	0	0	0	0
f4801b7a68515d9005fa572	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Ralstonia	0.98529	0	0	0	0	0	0	0	3

ee6afdf41										
0c579d21280801f02a641e1608606927	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Micrococcus	0.99948	0	0	1	0	0	1	1	0
0e2d370f860f8262fe2d1fd778dd030f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.99829	0	0	0	2	1	0	0	0
7ddd1a8bfd75292a7e6761daba2045fd	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.87075	0	0	0	0	1	0	0	2
1b51357852b0b814b4d9918c6f0ab762	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99999	0	0	0	2	1	0	0	0
a0b97caf5e95949d7fcc48288836e00a	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__Anaerolineales;D_4__Anaerolineaceae;D_5__uncultured;D_6__uncultured Chloroflexi bacterium	0.76638	0	0	0	0	0	3	0	0
22867e70b6a7405169fba4759c0ff334	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__Zavarzinella;Ambiguous_taxa	0.72801	3	0	0	0	0	0	0	0

2f23ba04e29d4f4fe40a157cc74d49b8	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Acidiphilium	1.00000	2	0	0	0	0	0	1	0
81e04e49c63d3009f3890b229adcaf5a	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__Singulisphaera	0.83667	0	0	0	0	0	0	3	0
0f5f48d793a468de8ec2131049a25f1e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Noviherbaspirillum	0.90925	0	0	0	0	0	0	3	0
1368aca6d12ec4a9bbf16a2ff67104e1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Kocuria	0.95709	0	0	0	0	1	0	1	1
0548b11b6de90319756016a02baab332	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Aggregatibacter	0.76064	0	0	0	0	0	3	0	0
5a476f35b35976422c20e43be58b7d96	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas	0.99959	0	0	0	0	0	0	3	0
8f1a41c736db859a429db3	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 21;D_3__uncultured bacterium;D_4__uncultured	0.91848	3	0	0	0	0	0	0	0

be0d1e1cf0	bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium									
b484195da5a669012008758c2f88fb90	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Dialister	1.00000	0	0	0	0	0	0	0	3
2f3921af250be9d9913e6b0e71347b59	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verrucomicrobiae;D_3__Pedosphaerales;D_4__Pedosphaeraceae;D_5__uncultured bacterium;D_6__uncultured bacterium	0.74152	0	0	0	0	0	0	0	3
8c18c0e6874a495f6c5415a3e9931612	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Capnocytophaga;D_6__Capnocytophaga canimorsus	0.73205	0	0	0	0	0	3	0	0
28452295298195f7785989adde9401b3	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Flavobacterium;D_6__Cytophaga sp. 0401 852	0.99997	0	0	0	0	0	3	0	0
bbae8c19fbfab488eb4a1eba41a56ee8	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__uncultured;D_6__uncultured bacterium	0.87262	0	0	0	0	3	0	0	0
ad38ae96214151fce59ff29618b6b761	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.92417	3	0	0	0	0	0	0	0

93802eb553ef0a76c0bc60e3ea4f98a9	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99283	0	0	0	0	0	0	3	0
dfadfda70792d41172d64893df4a4e0d	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Micrococcus	0.99899	0	0	0	0	0	0	3	0
0bb1a92e85857cf5c4a2e4c0e2154987	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae	0.99967	3	0	0	0	0	0	0	0
1f334210dfebd2da79172b6e128d234f	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae	0.99985	0	0	0	0	3	0	0	0
5697414a50fb9f841bc5469d3b996d99	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Nesterenkonia	0.98889	0	0	0	0	3	0	0	0
62016a3c39bd22e9af1b881b16b16c16	D_0__Bacteria	1.00000	3	0	0	0	0	0	0	0
aa8eeb5225870c7c86dd30	D_0__Bacteria;D_1__Epsilonbacteraeota;D_2__Campylobacteria;D_3__Campylobacterales;D_4	0.96295	0	0	0	0	0	0	0	3

5d47530de4	__Campylobacteraceae;D_5__Campylobacter;D_6__Campylobacter rectus									
9efd783aaf6b496441d3bba9a482e8e8	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Frankiaceae;D_5__Jatrophihabitans;D_6__uncultured bacterium	0.84401	3	0	0	0	0	0	0	0
3b5a0fd2f9476dda98adb14edb281269	D_0__Bacteria;D_1__Chloroflexi;D_2__AD3;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.76055	3	0	0	0	0	0	0	0
b4fbd5766bfac91fcd5a732b0442b78c	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	0	0	0	0	3	0
980fec7ec7384987fdfa2a16ca93bd09	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__Singulisphaera;D_6__uncultured bacterium	0.88283	0	0	0	0	3	0	0	0
99d60d151d66b662a78406dfab5fe1b6	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured;D_5__uncultured alpha proteobacterium;D_6__uncultured alpha proteobacterium	0.98156	3	0	0	0	0	0	0	0
e75351709ccba67b8ae6a18dbd039448	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__JG30-KF-AS9;D_5__uncultured bacterium;D_6__uncultured bacterium	0.96889	3	0	0	0	0	0	0	0

5c0909498baf93f1f49b9d9a489ee90f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Kineosporiales;D_4__Kineosporiaceae	0.99977	0	0	0	0	3	0	0	0
ebd143275f1e9f39c3902d9fef3ad887	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__metagenome;D_6__metagenome	0.74087	3	0	0	0	0	0	0	0
ebe5a53cddb04608fc279c4ec2a00a04	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__uncultured	0.99813	1	2	0	0	0	0	0	0
d3154bd4ff27cb3bed9253e1147732d7	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptomycetales;D_4__Streptomycetaceae;D_5__Streptomyces	0.96232	3	0	0	0	0	0	0	0
dfd42bc974d222dd5ad90c5cb821ea9f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptomycetales;D_4__Streptomycetaceae;D_5__Streptomyces	0.98427	1	0	2	0	0	0	0	0
2306c3e0228fa5e7a762184a6eee1bfd	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria;D_5__Zasmidium cellare;D_6__Zasmidium cellare	0.99748	3	0	0	0	0	0	0	0
e6cd0fa2a53438a45e2569	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__Acidob	0.78739	0	0	3	0	0	0	0	0

bae985b 059	acteriaceae (Subgroup 1);D_5__Acidipila;Ambiguous_taxa									
863c1bce342530c91eec7ab28f51b435	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__URHD0088	0.73200	0	0	3	0	0	0	0	0
bb4b27bff71e8681569504db2c3fcf99	D_0__Bacteria;D_1__Nitrospirae;D_2__Nitrospira;D_3__Nitrospirales;D_4__Nitrospiraceae;D_5__Nitrospira;D_6__uncultured organism	0.99004	3	0	0	0	0	0	0	0
1b3bf25b985cf06161e671f92203fdc4	D_0__Bacteria;D_1__Chlamydiae;D_2__LD1-PA32;D_3__metagenome;D_4__metagenome;D_5__metagenome;D_6__metagenome	0.99138	0	0	0	3	0	0	0	0
8e999e3b06513d3acb048f0640d1b3d3	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Aeromonadales;D_4__Aeromonadaceae;D_5__Aeromonas	0.94917	0	0	0	0	0	0	0	3
ddefadf53f48936c2678e67a992a79c5	D_0__Bacteria;D_1__Actinobacteria;D_2__Rubrobacteria;D_3__Rubrobacterales;D_4__Rubrobacteriaceae;D_5__Rubrobacter;D_6__uncultured bacterium	0.76639	0	0	3	0	0	0	0	0
fdb6bd026e311b67f36a0c5aee3f6a60	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-3;D_6__uncultured bacterium	0.77515	3	0	0	0	0	0	0	0

8206db4b8b8bbd572d04ab96cb720f52	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured bacterium;D_6__uncultured bacterium	0.73484	3	0	0	0	0	0	0	0
b680416871d0b51681c0cfb82dae1ec7	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Actinocatenispora	1.00000	0	0	3	0	0	0	0	0
a1472466e4672ded3639c057e46abad1	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__uncultured	0.99961	0	0	3	0	0	0	0	0
c47ba0fb3144501e661bc5769ff047ff	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Puniceispirillales;D_4__uncultured	0.76655	3	0	0	0	0	0	0	0
4a00de380bd5803c6f3f522d5ea7a931	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Pseudoglutamicibacter;Ambiguous_taxa	0.82268	0	0	0	3	0	0	0	0
df9f4aad85aa6c5b3549d8c2cb552056	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae	1.00000	0	0	0	0	3	0	0	0
2fff29fc59ea380e866a9e7	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Saccharopolyspora	0.89688	0	2	1	0	0	0	0	0

e9f1e8ff6										
c0c651025cc7a08b9de4ae32552eb88a	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Haliangiaceae;D_5__Haliangium;D_6__uncultured Myxococcales bacterium	0.96794	0	0	3	0	0	0	0	0
0dbf3aec3a34b218a94919344c9110ad	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptomycetales;D_4__Streptomycetaceae;D_5__Streptomyces	0.99754	1	2	0	0	0	0	0	0
9196fcf84991d694d95998ddf760770c	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.77479	0	0	3	0	0	0	0	0
9ae326cda0c7be2d14b592ddc9c056fb	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter;D_6__uncultured bacterium	0.97222	0	3	0	0	0	0	0	0
6670328c63516f131c4ea8193cd763e2	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.91117	0	3	0	0	0	0	0	0
1f26b446f585fc166ce1c5a61270af6a	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__B12-WMSP1;D_4__uncultured Chloroflexi bacterium;D_5__uncultured Chloroflexi bacterium;D_6__uncultured Chloroflexi bacterium	0.99996	0	0	3	0	0	0	0	0

947d2ff3bd02438ee7ec043c4c0a3ae9	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__JCM 18997;D_6__uncultured bacterium	0.98062	0	3	0	0	0	0	0	0
03c26b4b88eb9ec058c1d9382971443c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptosporangiales;D_4__Streptosporangiaceae;D_5__Microbispora	0.70382	0	0	3	0	0	0	0	0
9dd05f18619d26f1a1b04a98dfa32472	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	0.99989	0	0	3	0	0	0	0	0
48135e277428b03192385eefe48e3b6a	D_0__Bacteria;D_1__Chloroflexi	0.84340	0	3	0	0	0	0	0	0
594ecfb1a61f3430a2b35bd78a583db0	D_0__Bacteria;D_1__Armatimonadetes;D_2__uncultured	0.99966	0	3	0	0	0	0	0	0
33318abaa63e8ba008680c9515fcca2b	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__RCP2-54	0.99999	0	0	3	0	0	0	0	0
6a3e8c8e64e1da4d9fdeefb	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured	0.99468	0	3	0	0	0	0	0	0

2ef8cc456										
bfb49704e413366a872bc2261e8faf3b	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__Aquisphaera	0.97631	0	3	0	0	0	0	0	0
f29ac999fff477732527e3a3db6072cd	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	1.00000	0	3	0	0	0	0	0	0
7377e34c100bce1c76a3ba9ebf4aab2c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99979	0	3	0	0	0	0	0	0
2604fe2423d67c7c9b2c28115ec57121	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.99861	0	3	0	0	0	0	0	0
729c165a4444e22f14f697fa8a7f52a1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptomycetales;D_4__Streptomycetaceae;D_5__Streptomyces	0.99825	0	3	0	0	0	0	0	0
4d6cfb44cae22fcb20a4cd82f98ddd20	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__uncultured;D_5__uncultured Acidobacteria bacterium;D_6__uncultured Acidobacteria bacterium	0.73159	0	3	0	0	0	0	0	0

ff9d93d7b7e46787568f2d241caeaf3b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99923	0	0	0	2	0	0	0	0
958d54f6c2724fdc04ad01d39d59aaca	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella;D_6__Chlamydia trachomatis	0.99996	0	0	0	0	2	0	0	0
87ace68671b521fa779b33d5fcf2b782	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Enterococcaceae;D_5__Enterococcus	0.99214	0	0	0	0	0	0	2	0
e8386d3a307c208c4b9f0a756259cd6b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99961	0	0	0	0	0	0	2	0
7d135dfbf857c62673695ef24332b100	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Rothia;D_6__uncultured organism	0.75228	0	0	0	0	0	0	0	2
99e433a3ce4d5290445f668df2c9147e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99999	2	0	0	0	0	0	0	0
b33ad18b61a4434ed227a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99492	0	0	0	0	0	2	0	0

b0ff772d83a										
bd26ca1a6bbfb898f25028603bafe8b8	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae;D_5__Sporosarcina;D_6__uncultured bacterium	0.83558	0	0	0	0	0	0	2	0
f4b1ae26f685a24a4351ac294f468a0b	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__Anaerolineales;D_4__Anaerolineaceae;D_5__Anaerolineaceae UCG-001;D_6__uncultured bacterium	0.75173	0	0	0	0	0	2	0	0
2f3da68606254b35e1d68615524c6815	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Capnocytophaga;D_6__Capnocytophaga gingivalis	0.98763	0	0	0	0	0	0	2	0
2bb9b07deaa20d1a5a58b4015eed56da	D_0__Bacteria;D_1__Chloroflexi;D_2__Gitt-GS-136;D_3__uncultured bacterium;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.72307	0	0	0	0	0	0	2	0
cc59b9739479b7d225baaa171125e3ba	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99093	0	0	0	0	2	0	0	0
3073690a8233475dcf5f6d739def1bb5	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae;D_5__Savagea;Ambiguous_taxa	0.99988	0	0	0	0	0	0	2	0

81b14a06fe51fed6aaa311ff4e370125	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella;D_6__Prevotella intermedia	0.90961	0	0	0	0	0	0	2	0
25fe23e989514e818f4bc1f680ad6da1	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Family XII;D_5__Exiguobacterium	0.99950	1	0	0	0	0	0	0	1
b8c4ed03d7d91546b9f6ad80b80135a3	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Blastococcus	0.99939	1	0	0	0	0	0	0	1
1df2faad7a87c53286100df3198877cb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Bogoriellaceae	0.99662	0	0	0	0	0	0	2	0
034c785d16cb7fc53f07a64589338102	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	1.00000	0	0	0	0	0	0	2	0
41da1f67db882e54aa2020701805031e	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae;D_5__Rhodopseudomonas	0.93924	0	0	0	0	0	0	2	0
9e53163d950f3c52128c8a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Chitinophagales;D_4__Chitinopha	0.70910	0	0	0	0	0	0	2	0

057d6fbcca	gaceae;D_5__Segetibacter;D_6__uncultured bacterium									
f3962e2c466db18ac248b96d983a5d9e	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 9	0.99999	0	0	0	0	0	0	2	0
04ffc791c286aec952f7b8a82e00a678	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Solirubrobacter	0.99991	2	0	0	0	0	0	0	0
e61a7bc42a30f0ca4f170b5e3f6cad0c	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Chryseobacterium	0.99958	0	0	0	0	2	0	0	0
b05195de0a59d1cb93f25ccfba9eb202	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473;D_6__uncultured Ktedonobacter sp.	0.76355	2	0	0	0	0	0	0	0
f29037d23b3abc55a86ac6f17dbaa038	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Spirosomaceae;D_5__Dyadobacter	0.99998	0	0	0	0	0	0	2	0
4caf0971a7a8efe3d88b65115f4d144d	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Noviherbaspirillum	0.92179	0	0	0	0	2	0	0	0

aaf720cb05ddb528efa9bacbd90f7c58	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.93569	2	0	0	0	0	0	0	0
d5a426d4bbfe218586c580ad63d7ad88	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae	0.76841	2	0	0	0	0	0	0	0
68762ad4d433e0f995e034b113365973	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured bacterium;D_6__uncultured bacterium	0.78548	2	0	0	0	0	0	0	0
8eeacf92460641ca1420ffae36647e17	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter;D_6__uncultured bacterium	0.74853	2	0	0	0	0	0	0	0
44aa6712f78f0bbad38485da0d6ddf19	D_0__Bacteria;D_1__Deinococcus-Thermus;D_2__Deinococci;D_3__Deinococcales;D_4__Deinococcaceae;D_5__Deinococcus	1.00000	0	0	0	2	0	0	0	0
686d2286de927e96590bbb338a0191f2	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XVIII;D_5__uncultured;D_6__bacterium T33.8	0.99994	2	0	0	0	0	0	0	0
51a4c18fb615375aae712e6	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	2	0	0	0	0	0	0	0

3e0885b11										
f4e78e2e397dc8bd3ca2f87c245a8773	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Fusobacteriaceae;D_5__Fusobacterium	1.00000	0	0	0	0	0	2	0	0
dda78e69e3c7656f37ae43b76cbe5af9	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.92749	0	0	0	0	0	0	0	2
26005dfb7ad2e8cdbb139846af329663	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.86222	0	0	0	2	0	0	0	0
4b99a3b6905d4492ca733c7a59cdd201	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Actinomycetospora	0.96962	2	0	0	0	0	0	0	0
e3a49ff0ab31485981d1d134c332c051	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Micropepsales;D_4__Micropepsaceae;D_5__uncultured	0.97428	2	0	0	0	0	0	0	0
e6b3d814f5a5a5addaec1b51d8253842	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Marmoricola	0.81356	2	0	0	0	0	0	0	0

76039e2a6c7cbf3d77a9d337d38d3d6c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Mycobacteriaceae;D_5__Mycobacterium	1.00000	2	0	0	0	0	0	0	0
ae52afddd6fa5fb9e036e65ebfdaea4e	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__SBR1031;D_4__A4b;D_5__metagenome;D_6__metagenome	0.96847	0	0	0	0	2	0	0	0
32e35cc8a10dc12bb73acf0c612784a8	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.98979	2	0	0	0	0	0	0	0
b7c0c8cfb4c0693d000a4f3255dda87e	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.98057	2	0	0	0	0	0	0	0
dcd45aebbb6d51904272fdefe6c0dc5c	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae	1.00000	0	0	0	0	2	0	0	0
a26c0e21cf23f74ec2224597a8623a7a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingorhabdus	0.98025	0	0	0	0	0	0	2	0
f6a769266e710ccd95a0bb	D_0__Bacteria;D_1__Gemmatimonadetes;D_2__Gemmatimonadetes;D_3__Gemmatimonadales	0.71581	2	0	0	0	0	0	0	0

3bd7168b9e	;D_4__Gemmatimonadaceae;D_5__Gemmatirosa;D_6__uncultured bacterium									
56beab795d7c892be143abd1d3addb91	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Arenimonas	0.85174	0	0	0	0	2	0	0	0
921cc68c9d615a6da46217a64437c2fb	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.99855	2	0	0	0	0	0	0	0
65e92d5fc37d7caa832c77123674aa5f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria	1.00000	2	0	0	0	0	0	0	0
4c3ebd8ecd3278a7e5e454bca5d3502b	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus;D_6__uncultured Firmicutes bacterium	0.96199	2	0	0	0	0	0	0	0
dba682409a748b26ce327b1b112550e9	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	0	0	0	2	0	0
f86555851df7176f71a40ea7e3ec92ae	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter;D_6__metagenome	0.99959	0	0	0	0	2	0	0	0

e46eb653ee429c74ca335b002a34e085	D_0__Bacteria;D_1__Patescibacteria;D_2__Gracilibacteria;D_3__Gracilibacteria bacterium canine oral taxon 394;D_4__Gracilibacteria bacterium canine oral taxon 394;D_5__Gracilibacteria bacterium canine oral taxon 394;D_6__Gracilibacteria bacterium canine oral taxon 394	0.99480	0	0	0	0	2	0	0	0
1975f0f2b6531e29f1c84e99f1b51ef8	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99982	0	0	2	0	0	0	0	0
52983c820a524697c3f9d39ad5f5addf	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Myroides;Ambiguous_taxa	0.70226	0	0	0	2	0	0	0	0
c67ba62f34a05261ea7a810ff643a52c	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus;D_6__uncultured bacterium	0.99156	0	0	0	2	0	0	0	0
3833fb89680e0c1b788c137cde4ef3af	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Pedobacter;D_6__Pedobacter sp. WF1	0.72658	0	0	0	0	0	0	0	2
04a5a0c6fd17c464444689514dd60a91	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Thermoactinomyces;Ambiguous_taxa	0.92541	0	0	0	0	0	0	2	0

e7d93f06dc902fa97b0df9b02c8bcd0f	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__uncultured	0.84000	0	0	2	0	0	0	0	0
1644bac83434fbff42aee3b9328d91b0	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Actinophytocola	0.74580	2	0	0	0	0	0	0	0
193d109524a91adf6657723067b407d1	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Cardiobacteriales;D_4__Cardiobacteriaceae;D_5__uncultured;D_6__Cardiobacterium sp. feline oral taxon 092	0.91758	0	0	0	0	2	0	0	0
4a6794e426e464d18beb9d0cbd20686b	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptomycetales;D_4__Streptomycetaceae;D_5__Streptomyces	0.99945	2	0	0	0	0	0	0	0
ddfd49f939f92958b1ec816741055348	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Ralstonia	0.99971	2	0	0	0	0	0	0	0
f2dc706b397f4878d063404ba8e28293	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Myroides	1.00000	0	0	0	2	0	0	0	0
f6415459ab6f19e0ff3d2c7	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Devosiaceae;D_5__Devosia	0.98403	2	0	0	0	0	0	0	0

90227a5c1										
5932adb8eab0a2b254165744e04ed827	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Cardiobacteriales;D_4__Wohlfahrtiimonadaceae;D_5__Ignatzschineria;Ambiguous_taxa	0.99683	0	0	0	2	0	0	0	0
988b12a1fa764fe014e34d5ab9044597	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__Acidobacteriaceae (Subgroup 1);D_5__Acidipila	0.88863	2	0	0	0	0	0	0	0
14fc6d2fe5fdbd7420cd26f5893b987d	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.99999	2	0	0	0	0	0	0	0
f433df029d919f2dd9b1d0640d1a8c49	D_0__Bacteria;D_1__Spirochaetes;D_2__Spirochaetia;D_3__Spirochaetales;D_4__Spirochaetaceae;D_5__Sediminispirochaeta;D_6__uncultured organism	0.99283	0	0	2	0	0	0	0	0
96a16f29d6ad72133d698fd6f99a9a41	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.98942	0	0	2	0	0	0	0	0
f2f791d3ab0caed2a7a77e88c9692fe3	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Mitsuokella	0.99277	0	0	0	2	0	0	0	0

a449fa7f00650d7eeafd9edbbf97af5a	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Methylophilaceae;D_5__Methylotenera	0.97618	0	0	0	2	0	0	0	0
8cdc78b75e780e8bc4369dd3836c2558	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__CPla-3 termite group;D_5__metagenome;D_6__metagenome	0.80414	0	0	2	0	0	0	0	0
8e5309395572fb0951e88e0f20c75f2f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99997	0	0	2	0	0	0	0	0
9ab31c9eaf9842ad0d65c524a57933dc	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Frankiaceae;D_5__Jatrophihabitans	0.99894	2	0	0	0	0	0	0	0
504b45f0ef800caf40629640bbbbddac	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__uncultured	0.99925	0	0	2	0	0	0	0	0
6287056ab2ea3ad11d1502614a484b8b	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Elev-1554;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.99987	2	0	0	0	0	0	0	0
496ecde24f9ab698992413	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_	0.99892	0	0	0	0	2	0	0	0

d3d4f04 b5f	4__Xanthomonadaceae;D_5__Stenotrophomonas									
5eecb2c064ddeb3bbbad8d2065078dab	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria	1.00000	0	0	0	2	0	0	0	0
99df8285d8df1e5557fc7e75caa19449	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-3;D_6__uncultured Ktedonobacter sp.	0.94026	0	0	2	0	0	0	0	0
ca9908d85d0b07ee9df4d0d839c2b0fa	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus;D_6__Paenibacillus sp. PA231	0.95234	0	0	0	0	2	0	0	0
9d86c23f9de6b1d00630a36feb35358f	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.99142	2	0	0	0	0	0	0	0
3ca0986d1aa692fc230c7f9154533ed4	D_0__Bacteria;D_1__Actinobacteria;D_2__Acidimicrobiia;D_3__Microtrichales;D_4__Iamiaceae;D_5__Iamia	0.99996	0	0	0	0	0	0	0	2
b5e3d5c7c92c328e5c8b1d55511df81a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99270	0	0	0	0	0	2	0	0

d48e7d5e8887a59e8d64f3572e2febd5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptomycetales;D_4__Streptomycetaceae;D_5__Streptomyces	0.99883	0	0	2	0	0	0	0	0
693657ecd702d2437ad3f83061127dc6	D_0__Bacteria;D_1__Actinobacteria;D_2__Acidimicrobiia;D_3__Acidimicrobiales;D_4__Acidimicrobiaceae;D_5__uncultured;D_6__uncultured bacterium	0.70080	0	2	0	0	0	0	0	0
5e74baf520114a32cd4a8e7fd5014c9d	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup 3);D_5__Bryobacter	0.99613	2	0	0	0	0	0	0	0
89395719470f3d95de20ca4a267c7af5	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured;D_6__uncultured planctomycete	0.72719	0	0	2	0	0	0	0	0
e7b2dea799ec7d376d2a8c7e20ef6dc3	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Geodermatophilus	0.75320	0	2	0	0	0	0	0	0
90aca794c7e30b8a77e87f13ffc9a5cc	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae;D_5__uncultured	0.71713	0	0	2	0	0	0	0	0
902c53fa91f7ca9fb42b6a3	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Isosphaerales;D_4__Isosphaeraceae;D_5__Singulisphaera	0.99390	0	0	2	0	0	0	0	0

41412bd5b										
fa4f7bdf5efa5c17160e0c2e8bad8af2	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus	0.81625	2	0	0	0	0	0	0	0
beddf9f278516231913feb8aa98b2367	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured actinobacterium;D_6__uncultured actinobacterium	0.84023	0	2	0	0	0	0	0	0
354378bc86c8b27ffdc1309614536d11	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99998	0	0	2	0	0	0	0	0
214cc30ccf4468dbf4abce1d2bfc658a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__uncultured;D_6__uncultured Paracraurococcus sp.	0.99869	0	2	0	0	0	0	0	0
c938c4ceac4c09d1270d8be976a6ccde	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter;D_6__uncultured Conexibacteraceae bacterium	0.96892	0	2	0	0	0	0	0	0
6bc519d119a3731e5b16b94c84f31960	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473;D_6__uncultured Ktedonobacter sp.	0.79061	0	2	0	0	0	0	0	0

cf4918f75f2cc93ada62cfed20cb6a95	D_0__Bacteria	0.89139	0	2	0	0	0	0	0	0
f1be300df01babcf1897e610350717 9f	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;D_5__uncultured soil bacterium;D_6__uncultured soil bacterium	0.99085	0	2	0	0	0	0	0	0
5b57f5fa91dc4ba08ae9af2e6147d7aa	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Turicella;D_6__uncultured bacterium	0.80500	0	2	0	0	0	0	0	0
fb076f55d6022d05f45d4de6b861e309	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473;D_6__uncultured Ktedonobacterales bacterium	0.99612	0	2	0	0	0	0	0	0
6e4858896e3fb9aec9e247247491d05b	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Haliangiaceae;D_5__Haliangium	0.99952	0	2	0	0	0	0	0	0
f950374850cdf52d792db296de1a41d2	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Desulfobacterales;D_4__Desulfobacteraceae;D_5__Desulfotignum	0.99983	0	0	2	0	0	0	0	0
c8d2c85953b7cccd0f23ab	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__uncultured;D_5__uncultured alpha	0.98306	0	2	0	0	0	0	0	0

1a6644d 703	proteobacterium;D_6__uncultured alpha proteobacterium									
87461b5 f2af4769 574e5c3 af8b7a3d 03	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Capnocytophaga;D_6__Capnocytophaga granulosa	0.88923	0	2	0	0	0	0	0	0
3d5baff4 5729bf2 214074c 2e9f77ad 10	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	0	0	0	1	0	0	0	0
7fb08fa9 b7b2eef6 a3db57d 0de7692 27	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Peptoniphilus	1.00000	0	0	0	0	0	0	1	0
e335f740 33bc634 af43ee6b aa84fa24 7	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Peptostreptococcaceae;D_5__Romboutsia	0.79503	0	0	0	0	0	0	1	0
6a4c0e5 943a7eb 8c9f0b5b 5e69171 828	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.85610	1	0	0	0	0	0	0	0
db1d8e2 a3ec12b df03df47 b1aab59 bcd	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.79362	0	0	0	0	0	1	0	0

7911816f5e81f650f769aba0d5c708cb	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	0	0	0	1
6186715aaa798c9043cf0dbfa27a2c71	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae	0.99999	0	0	0	0	0	0	1	0
453cf07d3e96e304f23fbde7b355fe70	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99908	0	0	0	0	0	0	1	0
cb0db18277323b1f0db8a57fef080696	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Desemzia	0.99982	0	0	0	0	0	0	1	0
b7b4ecb07e1719860260746a5443092a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 7	0.99999	1	0	0	0	0	0	0	0
12de18c4fa878cd169c12b5de7cbec69	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Thermoflavimicrobium;D_6__low G+C Gram-positive bacterium HTA1422	1.00000	0	0	0	0	0	0	1	0
75a3e20e916ee5ec7dceae3	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Actinomycetales;D_4__Actinomycetaceae;D_5__Actinomyces	1.00000	0	0	0	0	0	0	1	0

4a1bc0209										
53903158801eb4b694d25e3427a7f6fd	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptosporangiales;D_4__Nocardiopsaceae;D_5__Nocardiopsis	0.99969	0	0	0	0	0	0	1	0
445887bdb851ba2f846b0d8138beecff	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured actinobacterium;D_6__uncultured actinobacterium	0.91451	1	0	0	0	0	0	0	0
9f98eb7ef8579538a567f94e34e6de80	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verrucomicrobiae;D_3__Pedosphaerales;D_4__Pedosphaeraceae	1.00000	0	0	0	0	0	1	0	0
d133e13a625bef788ab70ec678b72b1e	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Shimazuella;D_6__uncultured bacterium	0.94557	0	0	0	0	0	0	1	0
7ffeca597d6944bc2ce127831c942786	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99807	1	0	0	0	0	0	0	0
ef826df0a908924baf376bbd7160bfb2	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__FCPS473;D_6__uncultured bacterium	0.99978	1	0	0	0	0	0	0	0

1b252fd446d25647aa2db66ac34342b0	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Jeotgalibaca	0.83238	0	0	0	0	0	0	1	0
ea41d641ce257e55a9695ebf73d983b9	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured bacterium	0.95050	1	0	0	0	0	0	0	0
9bf089e8a835c4b7d64a6ca8cef1a3c1	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Heliobacteriaceae;D_5__Hydrogenispora;D_6__uncultured bacterium	0.99955	0	0	0	0	0	0	1	0
097dcdc3c91b5b334c58a38beddfe215	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria;D_5__Amaranthus tricolor;D_6__Amaranthus tricolor	0.82600	0	0	0	0	1	0	0	0
4452a5a630af331baca958ef04d0082c	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verrucomicrobiae;D_3__Chthoniobacterales;D_4__Chthoniobacteraceae;D_5__Chthoniobacter;D_6__uncultured soil bacterium	0.94208	0	0	0	0	0	0	1	0
c01d9de257272c62a5b133e734d057bd	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales	1.00000	0	0	1	0	0	0	0	0
00aeece91df332b73cb477	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Aerococcaceae;D_5__uncultured;D_6__uncultured bacterium	0.97052	0	0	0	0	0	0	1	0

905e212392										
427dd47be087cef32b2f9c27b5fb38dc	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.98790	1	0	0	0	0	0	0	0
33deb57a51743c338407d5c7e9b6f5fd	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Peptostreptococcaceae;D_5__Terrisporobacter	0.99950	0	0	0	0	0	0	1	0
646f6ca56d422273df4c7186aab7b7d1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides;D_6__Nocardioides sp. HSD06	0.99565	1	0	0	0	0	0	0	0
fec7ac615e0c8441736abb6e502a67e4	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae	0.98921	1	0	0	0	0	0	0	0
74a26e97b02fcab82b0d346de4920f75	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Mycobacteriaceae;D_5__Mycobacterium	1.00000	1	0	0	0	0	0	0	0
c9f3a7e4e896e056af322d9b663490b2	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Micromonospora	0.98110	0	0	0	0	0	0	1	0

4d616046b394d8f14e9f84283bb5ba79	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__ML635J-40 aquatic group;D_5__uncultured Bacteroidetes bacterium;D_6__uncultured Bacteroidetes bacterium	1.00000	1	0	0	0	0	0	0	0
c66ea3d804ab0d5346b5d0a31b4562ae	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Stenotrophomonas	0.99998	0	0	0	0	0	0	1	0
701da47a92f65f64945ec79cd0072b36	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptosporangiales;D_4__Thermomonosporaceae;D_5__Actinoallomurus	0.99997	1	0	0	0	0	0	0	0
450f9b0cfa998591710b045c8940bc9f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99996	1	0	0	0	0	0	0	0
ef9ba508c09b7c1e1d7359c16e48a737	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured	0.99740	1	0	0	0	0	0	0	0
2a39f0b75d31d00b3136b2edbe82962e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Actinomycetospora	0.99862	0	0	0	0	1	0	0	0
c093b140b6c38a6bdb3dd	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-	0.85534	0	0	0	0	1	0	0	0

d4b5e773a3e	KF-CM45;D_5__Paraburkholderia tropica;D_6__Paraburkholderia tropica									
8909517e082a1f7da2ebdddcacf58dab	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Intrasporangiaceae;D_5__Ornithinimicrobium	0.70725	0	0	0	0	0	0	1	0
b022b5312f30be684bdd2cc66030dea5	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Veillonella;D_6__unidentified	0.76502	0	0	0	0	0	1	0	0
497a26126c9e726c768bdec79e8c4e9b	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae;D_5__Curtobacterium	0.81206	0	0	0	0	0	0	1	0
84f5f756839efc33ac4bf6a5d8c5bcd0	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.93101	0	0	0	0	0	0	0	1
4132d2bd10d57650e8585e5c14d735de	D_0__Bacteria	0.99926	0	0	0	0	0	1	0	0
c3fe6ae58bb1e240a989dac6b2708532	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Aureimonas	0.97604	1	0	0	0	0	0	0	0

bc2e929954e781759c0730da46614a6f	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Psychroglaciecola;D_6__uncultured bacterium	0.85136	1	0	0	0	0	0	0	0
1b057b5f1c048af522447b5cda8c6be9	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.72249	1	0	0	0	0	0	0	0
5473c224f739cb4b6ff3265bbc140a4c	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae;D_5__Cronobacter	0.77349	0	0	0	0	0	0	1	0
7777f45f8f06f6991869492a15e75f25	D_0__Bacteria;D_1__Actinobacteria;D_2__Coriobacteriia;D_3__OPB41;D_4__uncultured Coriobacteriia bacterium;D_5__uncultured Coriobacteriia bacterium;D_6__uncultured Coriobacteriia bacterium	0.80108	0	0	0	0	0	1	0	0
53a9e4df60a4068241f449d16de63f80	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae	0.99983	1	0	0	0	0	0	0	0
cf050fc71436490022f8f6d433a3224f	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae	0.99987	0	0	0	0	1	0	0	0
0a165844daf38d8ce2008c	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99858	0	0	0	0	0	0	1	0

94a5b4565e										
263b0e8696de7048420c9d4bea7a573d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Elsterales;D_4__uncultured;D_5__uncultured bacterium;D_6__uncultured bacterium	0.76884	1	0	0	0	0	0	0	0
a90adcfd1731c59c52f71e8b3b6f8771	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae	0.99984	1	0	0	0	0	0	0	0
735cb9abbbc8ff2b5b354be608a3a869	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	1.00000	0	0	0	0	0	0	1	0
76a943445b8e3e794dab9432fab69baa	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Rufibacter;D_6__uncultured bacterium	0.72971	1	0	0	0	0	0	0	0
5d418b89cf14c9a0c2865848a51ecfd8	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae	0.94348	0	0	0	0	0	0	1	0
b3027f0f587aaf736693f04f567c41ee	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae	0.99350	0	0	0	1	0	0	0	0

b83e79d1012693079478 84b88c103d38	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Haliangiaceae;D_5__Haliangium;D_6__uncultured bacterium	0.76643	1	0	0	0	0	0	0	0
3062b09c6e8943086701e00a561bc900	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus;D_6__uncultured bacterium	0.86370	1	0	0	0	0	0	0	0
5c4096734813b85d0313e557eff46db3	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Amycolatopsis	0.98012	1	0	0	0	0	0	0	0
9f04d4582c00cc1372a4a536aaa64d65	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae	0.98042	0	0	0	0	1	0	0	0
a18c57c9b518b57af3f6e877796dd9ec	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99720	0	0	1	0	0	0	0	0
35370c2ebd38ff85c4067417a90776fa	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Micrococcus	0.99940	0	0	0	0	0	0	1	0
ea403646ed22d679fa4586	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99825	0	0	0	0	1	0	0	0

263d8fc32f										
5438e75153393c2dda98fe3d99c26da1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99993	0	0	0	0	0	0	1	0
48811ba63b0a3dcc4db20ab15f20c603	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus	0.96439	1	0	0	0	0	0	0	0
bc0797a2dc37999299a076d56a60dfdb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Nocardiaceae;D_5__Nocardia	0.99999	1	0	0	0	0	0	0	0
7ce227c0eb2c227bd2c489d64e140a8c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae	0.99335	1	0	0	0	0	0	0	0
9286426dcbe8ed669942f26a6c8b4b1f	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Solirubrobacter	0.99959	1	0	0	0	0	0	0	0
a84ea701ff88d8dbc6c288aa3ee686ea	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Acidothermaceae;D_5__Acidothermus	0.99960	0	0	1	0	0	0	0	0

ed89598c59ee717abc7cb7c34ee6d46e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	1.00000	0	0	0	0	0	1	0	0
7d78ed99b08bd1723065fdd795d17e9c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.97538	0	0	0	0	0	0	1	0
8562afaf3955423d4eda6d71b8b277d8	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocatellia (Subgroup 4);D_3__Pyrinomonadales;D_4__Pyrinomonadaceae;D_5__RB41	0.99718	1	0	0	0	0	0	0	0
4e5bba08a4dd6b379f4c06cb857bc1da	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10	1.00000	1	0	0	0	0	0	0	0
50e5c97ca46d1b2cd105f7e13bb076fc	D_0__Bacteria;D_1__Chloroflexi;D_2__KD4-96	1.00000	0	0	0	0	0	0	0	1
675c847bccbc53942ebb7b8cbb4efc4d	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 9	0.99999	0	0	0	1	0	0	0	0
d892d40bc79d0c356bd28	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Cellulomonadaceae;D_5__Cellulomonas	0.99080	1	0	0	0	0	0	0	0

86ce8d1 20ee										
8391421 bf18e410 739b170 d88347e 8bd	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae	0.98351	1	0	0	0	0	0	0	0
3ac7012 c538693 bcf363c9 d4b6d5e 9d5	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Lactobacillaceae;D_5__Lactobacillus	0.99999	0	0	0	0	0	1	0	0
427ae0a 31574f8 9e592eb 8e53906 20fa	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas;D_6__Pseudomonas luteola	0.70832	0	0	0	0	0	0	1	0
8f6bd73f f858f125 f501dc14 911fd44 4	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus;D_6__Paenibacillus glycanilyticus	0.76636	0	0	0	0	1	0	0	0
b9e6521 dcc5d9d 9f43c505 40ecff66 d8	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99974	0	0	0	0	0	0	1	0
f44404ea 806c18f6 b05b7cb b4f3e5fd 2	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Peptostreptococcaceae;D_5__Romboutsia	0.87498	0	0	0	0	0	0	1	0

075936c88dd53d53c1045ddc73565741	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Gracilibacillus;D_6__Gracilibacillus halotolerans	0.84163	1	0	0	0	0	0	0	0
61f94809e37751a82c1ad80d9561f9b0	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae	0.99981	0	0	0	0	0	0	1	0
5a0b78658b49317d33fa64d2b973d170	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99991	0	0	0	0	0	0	1	0
723ddf4bb05efd61148920eb16f5cfdc	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Archangiaceae;D_5__Anaeromyxobacter	0.99962	1	0	0	0	0	0	0	0
a51f0742b05cb98a6ef788cba968ce41	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Methylobacterium	0.99991	0	0	0	0	0	0	1	0
366d4a9dfe4002f3a8b08dd938b63d65	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Atopococcus;D_6__Atopococcus tabaci	0.72497	0	0	0	1	0	0	0	0
6d5d85961765d59b54a5a	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.73752	1	0	0	0	0	0	0	0

c75143a9baa										
cbc7e1ded30d9a5a5921eb022daf9060	D_0__Bacteria;D_1__Firmicutes;D_2__Erysipelotrichia;D_3__Erysipelotrichales;D_4__Erysipelotrichaceae;D_5__Catenibacterium	0.99998	0	0	0	0	1	0	0	0
da8ec37be9b823e3777bcd96381ffd5e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Frankiaceae;D_5__Jatrophihabitans;D_6__uncultured bacterium	0.80046	0	0	0	0	1	0	0	0
e354f6bafca9d5c7d618b7c8c1fe1abc	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Psychrobacter	0.98236	0	0	0	0	0	1	0	0
4c305959c7c57db6959c5ef15533f5a3	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	0	1	0	0
1a883863725eead9924f1c1ae4f7f3da	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Altererythrobacter;D_6__Porphyrobacter sp. SX2RGS8	0.99984	1	0	0	0	0	0	0	0
abb69608fceb477017506aa60afa8394	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.99768	1	0	0	0	0	0	0	0

70742388b793fe05ea7ca716a8ee7f4d	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Nocardiaceae;D_5__Rhodococcus	0.98162	1	0	0	0	0	0	0	0
928eba1773e8efa70fcec086333c8f94	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__uncultured;D_6__uncultured soil bacterium	0.73181	1	0	0	0	0	0	0	0
4a66de031541faf4d71d443cc7701e3c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Intrasporangiaceae;D_5__Arsenicicoccus;Ambiguous_taxa	0.93615	0	0	0	0	0	0	1	0
7108ce103947b0166e0cd211dfa3a29b	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99995	0	0	0	0	1	0	0	0
3ab144ab96d21207d87440ff1a12b07f	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;D_5__bacterium Ellin6537;D_6__bacterium Ellin6537	0.99024	1	0	0	0	0	0	0	0
a994002c99e6a2c8ef3cb7be12d51ac4	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Pseudoxanthomonas	0.88331	0	0	0	0	0	0	0	1
c8db2b48c3d18d511d24d	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Sporolactobacillaceae;D	0.92961	0	0	0	0	1	0	0	0

111d27b 0616	_5__Pullulanibacillus;D_6__uncultured bacterium									
dd86d96 9d72983 857480c 394c50ef c1d	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Brevibacteriaceae;D_5__Brevibacterium	1.00000	0	0	0	0	1	0	0	0
c32b52df 9d8ecd7 7914865 8674453 e66	D_0__Archaea;D_1__Thaumarchaeota;D_2__Nitrososphaeria;D_3__Nitrososphaerales;D_4__Nitrososphaeraceae	0.99992	1	0	0	0	0	0	0	0
f492caee 1affb095 532cdf08 315e34d b	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 9	0.99998	0	0	0	1	0	0	0	0
1605ecf2 1446c70f 0f4af4b5 0172e87 d	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10;D_3__uncultured Chloroflexi bacterium;D_4__uncultured Chloroflexi bacterium;D_5__uncultured Chloroflexi bacterium;D_6__uncultured Chloroflexi bacterium	0.99984	1	0	0	0	0	0	0	0
5a813b7 89edbc3 1e3e60aa 41c3621 8fd	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Intrasporangiaceae	0.99791	0	0	0	0	0	0	1	0
79676a8 76f0ca2d 602daf25 1c78665 d8	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Thermoactinomycetaceae;D_5__Thermoflavimicrobium;D_6__low G+C Gram-positive bacterium HTA1422	1.00000	1	0	0	0	0	0	0	0

9877255bb29ba6e28ab9b01172334f0f	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae	1.00000	0	0	1	0	0	0	0	0
337b14e1938677e488fda429b20b7e54	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	0	0	0	1	0	0
bc83f59ec4472c250266229a55c9ba30	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Clostridiaceae 1;D_5__Clostridium sensu stricto 1	0.99452	0	0	0	0	0	0	1	0
e5aa5d51078fb003395ba2e09194f7c8	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;D_5__uncultured bacterium;D_6__uncultured bacterium	0.99913	0	0	0	0	0	1	0	0
fe5b867a508c1fe71eac03b2d7d41488	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.77156	0	0	0	1	0	0	0	0
fe0ee07c8a03dcc118f7d3ceb7ae8f47	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Crossiella;D_6__uncultured bacterium	0.79228	1	0	0	0	0	0	0	0
5b745a9d79ce4eea87704b	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__Anaerolineales;D_4__Anaerolineac	0.90295	0	0	0	1	0	0	0	0

3c645a7aa7	eae;D_5__uncultured;D_6__uncultured marine bacterium									
b4ebe9b5dbff34071160942a083f02dd	D_0__Bacteria;D_1__Patescibacteria;D_2__Gracilibacteria;D_3__Gracilibacteria bacterium canine oral taxon 394;D_4__Gracilibacteria bacterium canine oral taxon 394;D_5__Gracilibacteria bacterium canine oral taxon 394;D_6__Gracilibacteria bacterium canine oral taxon 394	0.99999	0	0	0	0	1	0	0	0
83e948f389f9d97b0c975afc880989e8	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.99953	1	0	0	0	0	0	0	0
283f86ea159740988703987f669bcee3	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae	0.73633	0	0	1	0	0	0	0	0
68262884f1021c896f8e1bf7348d773c	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Flavobacterium	0.99984	0	0	0	0	0	1	0	0
e3a773dd9722f4c2e23c848a293952ad	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Family XII;D_5__Exiguobacterium	0.99922	1	0	0	0	0	0	0	0
f8a0f81a9c727efd3cdf8c8ee1af699a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 9	0.99999	0	0	0	0	1	0	0	0

3d0fdaba5562129fdce740dd2c09f772	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Cellulomonadaceae;D_5__Cellulomonas	0.97744	0	0	0	1	0	0	0	0
a55990b64a885b064a75c159d4086dd9	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99673	1	0	0	0	0	0	0	0
d38070238cb6b305050fe80cd2140075	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales	1.00000	0	0	0	0	1	0	0	0
5cab1b081ed8247bdac11c64213270a1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.99829	0	0	0	0	0	0	1	0
21a1c17897b5b63a14525608d78920e8	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.97973	0	0	0	0	0	0	0	1
2fbee9aadbcf17eb2e4d61ea7049c1f6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.90522	1	0	0	0	0	0	0	0
ef77428035e431c59e2f3c3	D_0__Archaea;D_1__Euryarchaeota;D_2__Halobacteria;D_3__Halobacteriales	1.00000	0	0	0	0	0	0	0	1

f7117e220										
faf54496ca58062db4f4ae5be7153bab	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Frankiaceae;D_5__Jatrophihabitans	0.88306	0	1	0	0	0	0	0	0
0faa04a878a046507c35eee274562b31	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99945	0	0	1	0	0	0	0	0
9abfd92a3a066eac8ed8f167a121e689	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae	0.99996	0	0	1	0	0	0	0	0
13898d5879aba3f049db3a69664c9934	D_0__Bacteria;D_1__Actinobacteria;D_2__Rubrobacteria;D_3__Rubrobacterales;D_4__Rubrobacteriaceae;D_5__Rubrobacter;D_6__uncultured bacterium	0.96387	1	0	0	0	0	0	0	0
c41352ec9dd9bd9cf859fa5a9092010f	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99178	0	0	1	0	0	0	0	0
95da071fb3cd4567b09e95ef22b77859	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verrucomicrobiae;D_3__Chthoniobacterales;D_4__Chthoniobacteraceae;D_5__Candidatus Udaeobacter	0.99999	0	0	1	0	0	0	0	0

79e0bff2b05a8b24ed0812726ab6683f	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__1921-2;D_6__uncultured Ktedobacteria bacterium	0.96385	0	0	1	0	0	0	0	0
d8598bd4995349ea6ea88e1a59cbe211	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;Ambiguous_taxa;Ambiguous_taxa	0.73907	0	0	0	0	1	0	0	0
4ab8d8282ce57d9388753684b41de01f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Gammaproteobacteria Incertae Sedis;D_4__Unknown Family;D_5__Acidibacter;D_6__bacterium Ellin5264	0.98435	1	0	0	0	0	0	0	0
3e5e7d3cf2d2b11a8c62d72fdd79de42	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Gemmatales;D_4__Gemmataceae;D_5__uncultured;D_6__uncultured bacterium	0.74084	1	0	0	0	0	0	0	0
b0894cbeebdd3115d898b41b94131113	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__uncultured;D_6__uncultured Ktedobacteria bacterium	0.99867	1	0	0	0	0	0	0	0
58a737429655104c69ab1a500332e9bb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Streptosporangiales;D_4__Thermomonosporaceae;D_5__Actinoallomurus	0.99997	1	0	0	0	0	0	0	0
3563cb3ebcb497c13d4cc	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae	0.99999	0	0	1	0	0	0	0	0

89e5e31 0106										
6a7a6fed 3a850c6 bab631c 438c055 6c4	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Glutamicibacter	0.99003	0	0	0	1	0	0	0	0
0df420d 7610bf0 5d4304f 777214c 2adb	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.96880	0	0	0	0	1	0	0	0
0b482fa6 04092d5 b5a8114 a4da6bc d96	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter;D_6__Hymenobacter qilianensis	0.72761	0	0	0	1	0	0	0	0
86ff0efd 7fd88b8 2809500 c90c4a7 832	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Ruminococcaceae;D_5__Faecalibacterium;D_6__metagenome	0.75352	0	0	0	1	0	0	0	0
8086b94 6da9013f 2fe760e9 15f0176 56	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6;D_3__uncultured beta proteobacterium;D_4__uncultured beta proteobacterium;D_5__uncultured beta proteobacterium;D_6__uncultured beta proteobacterium	0.83882	0	0	0	1	0	0	0	0
146011b 4b3b1ac 5bd7d82 24c5d93 209d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99524	0	1	0	0	0	0	0	0

71a6d8ff0b743989da17462de36917d1	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Fusobacteriaceae;D_5__Fusobacterium	0.99999	0	0	0	1	0	0	0	0
73c9a3991a3d17179495bf59a59b79ef	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.73347	0	0	1	0	0	0	0	0
b18b6befa4984850974771c4e3bc594e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Actinocatenispora;D_6__Actinocatenispora rupis	0.90447	0	0	1	0	0	0	0	0
b9e4efe84b0f0ce254695b87484c9a8e	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__uncultured;D_5__uncultured Bacteroidales bacterium;D_6__uncultured Bacteroidales bacterium	0.99985	0	0	0	0	0	0	1	0
3ee2f30e70c2ec005a999d3e1ef5e83e	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Alloprevotella	1.00000	0	0	0	1	0	0	0	0
219743d3746c780e91b55e5e074dd4ed	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group;D_5__uncultured bacterium;D_6__uncultured bacterium	0.83580	0	0	1	0	0	0	0	0
d76d59ec71de0e3b22da0	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Lachnospiraceae;D_5__Fusicatenibacter	0.99988	0	0	0	0	1	0	0	0

c9cd564 d41a										
2cbc6b1 3bc415a 53a5712 47d8071 6fa4	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli; D_3__Bacillales;D_4__Paenibacillaceae;D_5__ Paenibacillus;D_6__Paenibacillus sepulcri	0.93295	1	0	0	0	0	0	0	0
271aba4f beac0b7 68a7292 041a924 7fd	D_0__Bacteria;D_1__Actinobacteria;D_2__Nitr iliruptoria;D_3__Nitriliruptorales;D_4__Nitriliru ptoraceae;D_5__uncultured actinobacterium;D_6__uncultured actinobacterium	0.89525	1	0	0	0	0	0	0	0
753d40b 2460d44 8d60fcab 7f427d2 70d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alp haproteobacteria;D_3__Rhizobiales;D_4__Xant hobacteraceae;D_5__Rhodoplanes	0.88472	0	1	0	0	0	0	0	0
515343d e69d532 9ff5e6bb 9d5cf4dc be	D_0__Bacteria;D_1__Actinobacteria;D_2__Acti nobacteria;D_3__Corynebacteriales;D_4__Noca rdiaceae;D_5__Nocardia	0.99999	0	0	1	0	0	0	0	0
cd37bed e28eb00 b726f8e2 56b4a8d 459	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bact eroidia;D_3__Cytophagales;D_4__Hymenobact eraceae;D_5__Hymenobacter	1.00000	0	0	0	1	0	0	0	0
fd49e69f 94c6e1d 27fa06bf a3ee945 91	D_0__Bacteria;D_1__Proteobacteria;D_2__Ga mmaproteobacteria;D_3__Xanthomonadales;D_ 4__Xanthomonadaceae;D_5__Stenotrophomona s	0.99991	0	0	0	1	0	0	0	0

8ff5cf9d564c7f53638c77384a931326	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Devosiaceae;D_5__Devosia	0.98445	0	0	0	0	0	1	0	0
56706e878bbf127a79b764d7a1bed9bd	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99799	1	0	0	0	0	0	0	0
8e73ea982a30bf1536a1e38981619707	D_0__Bacteria;D_1__Actinobacteria;D_2__Acidimicrobiia;D_3__Microtrichales	0.99856	1	0	0	0	0	0	0	0
938c438c74c91e6689a429f1700e8bf8	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae;D_5__Micromonospora	0.78074	1	0	0	0	0	0	0	0
bf65f5b650980048e374167ba9104f1b	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Actinomycetospora	0.99884	0	1	0	0	0	0	0	0
17b8ba8c9f6813730e1428cff21f4aba	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured;D_5__uncultured Conexibacter sp.;D_6__uncultured Conexibacter sp.	0.71291	0	0	1	0	0	0	0	0
6ddb6ca13d5e22fb780859	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__Acidobacteriaceae (Subgroup 1);D_5__Acidipila	0.95582	1	0	0	0	0	0	0	0

5926eceaec										
c7a09f6c7a5f17d1b5d47fd138a42bbb	D_0__Bacteria;D_1__Chloroflexi;D_2__TK10; Ambiguous_taxa;Ambiguous_taxa;Ambiguous_taxa;Ambiguous_taxa	0.99711	0	0	1	0	0	0	0	0
040fcbb0be05a6f0d588f0fc48af9514	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Solibacterales;D_4__Solibacteraceae (Subgroup 3);D_5__Bryobacter	0.99468	0	0	1	0	0	0	0	0
84e1f74b7363f0321d0df8986283c5fa	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Nannocystaceae;D_5__Nannocystis;Ambiguous_taxa	0.92488	0	0	1	0	0	0	0	0
210103819517329a90f0656fbf1639ec	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured Solirubrobacter sp.;D_6__uncultured Solirubrobacter sp.	0.85798	0	0	1	0	0	0	0	0
bcdcb4395296c326861839472b4eb5fd	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	1.00000	0	0	1	0	0	0	0	0
a5a1e306802d036a6f3878340b1a69e8	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__Thermosporothrix;D_6__uncultured bacterium	1.00000	0	0	1	0	0	0	0	0

61c6e3af25d21de6de9050acb567a7b9	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter	0.95241	0	0	1	0	0	0	0	0
1047a174ecc9fc9835007ad39319a751	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__Solirubrobacteraceae;D_5__Conexibacter;D_6__uncultured bacterium	0.80892	0	0	1	0	0	0	0	0
486795c6ddfbccdbd570b951adde1aa1	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Oligoflexales;D_4__0319-6G20	1.00000	0	1	0	0	0	0	0	0
d9875087f8e1729d025b0182f84f1d4f	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured;D_5__bacterium Ellin6517;D_6__bacterium Ellin6517	0.92171	0	1	0	0	0	0	0	0
3108b6b941a4b3d61547809b7d6a9084	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria	1.00000	0	0	1	0	0	0	0	0
9691e0505fa6c7004d032dbe79909998	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocatellia (Subgroup 4);D_3__Blastocatellales;D_4__Blastocatellaceae;D_5__Blastocatella	0.98485	0	0	0	0	1	0	0	0
a5167ba4f4e8c8116cdbb6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micromonosporales;D_4__Micromonosporaceae	0.99773	0	1	0	0	0	0	0	0

056be12265										
fe03c675c55ff041fdb5a5661754df0b	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.88202	0	1	0	0	0	0	0	0
8df8539a9a3dbbae4eb0bbcbfc6417f1	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter;D_6__Hymenobacter sp. MIMBbqt21	0.95948	0	0	1	0	0	0	0	0
148b2e802dd6ae4c6214b3a7d07f4648	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Oceanospirillales;D_4__Halomonadaceae;D_5__Halomonas	0.99837	0	1	0	0	0	0	0	0
b32c256597551d6ca04688ac5b0b7082	D_0__Bacteria;D_1__Chloroflexi;D_2__Ktedonobacteria;D_3__Ktedonobacterales;D_4__Ktedonobacteraceae;D_5__JG30a-KF-32	0.97395	0	0	1	0	0	0	0	0
0551bb63d550ae8c8f89dacebda76822	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Pseudoxanthomonas	0.99993	0	0	0	0	1	0	0	0
e5b6c669a504f0fe88dee38f6dc98c49	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Gaiellales;D_4__uncultured	0.99794	0	1	0	0	0	0	0	0

279f375792b57be5129aa7a5b347e48f	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Bergeyella;Ambiguous_taxa	0.75136	0	1	0	0	0	0	0	0
39fec41753c744ead70a63753dd9cf79	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__AKAU3644;D_5__uncultured bacterium;D_6__uncultured bacterium	0.98964	0	0	0	0	0	0	1	0

Table D2. QIIME2 output summary of the laboratory DNA extractions prior to any data manipulation. Next Generation Sequencing was executed at NASA Johnson Space Center and all ASV's reported are best matches from the SILVA v132 database.

OTU ID	Taxon	Confidence	Cleanroom drawer handles (QIAamp)	Cleanroom cabinet handles (QIAamp)	Volara foam (QIAamp)	Freezer door handle (QIAamp)	Glovebox gloves interior (QIAamp)	Glovebox gloves exterior (QIAamp)	Bruderheim capsule
8ae518dbb29595b3f7	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99930	426	152	503	296	102	96	634

9214be0b589066									
c22b16cc6108c04f29fea3b6d4c81571	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	10	4	3	260	34	160	0
ff9d93d7b7e46787568f2d241caeaf3b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99923	4	3	1	0	0	0	250
e8386d3a307c208c4b9f0a756259cd6b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99961	6	1	0	8	0	137	0
be7131483e8a0d470670c485cb72af49	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	50	0	0	0	100	0	0
ec9562edcf3986f9a56ee377d8ff737c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	50	81	0	6	0	0
f1860fe716257bd5fd5c4c6a16cf3b95	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__Neisseria	0.99951	0	113	0	0	13	0	0
65d43491988bfe557da4d86a5ba25dae	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99999	7	10	4	19	34	44	0
820f6693f569e339f1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Lawsonella	1.00000	40	5	2	26	13	25	0

83638cd7 3a7fe6									
0920dcf0f 62fb2b3ab 9e32f1c4e dec37	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99831	0	100	0	0	0	0	0
06f825b51 2d903b92 30e1a55d8 7359ee	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99907	15	15	0	11	59	0	0
ffa37dc5d e1dfb59cd 8f7270b4a a78fb	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	82	16	0	0	0
63403aa05 15deb003 9fbfb793b 870272	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas;D_6__Pseudomonas caeni	0.99288	0	0	90	0	0	0	0
6f690e421 affa47234 5a987c7bf e10d5	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Planctomycetales;D_4__Rubinisphaeraceae;D_5__SH-PL14;D_6__uncultured Planctomycetaceae bacterium	0.87292	0	0	0	0	0	81	0
99e433a3c e4d52904 45f668df2 c9147e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99999	0	0	76	0	0	0	0
21f95b97d c5e375731 a00a6b323 a8d35	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae;D_5__Rubellimicrobium;D_6__uncultured bacterium	0.99961	5	0	0	0	0	70	0
d3dfafdb1 f265e063e	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Nannocystac	0.78040	0	0	0	0	69	0	0

2d7990ac8 24be7	eae;D_5__Nannocystis;D_6__uncultured bacterium mle1-22								
436736dd e2bcafb6b 17fa53813 29e9ca	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Steroidobacterales;D_4__Steroidobacteraceae;D_5__uncultured	1.00000	0	0	0	0	0	63	0
49c38774e 7c641195 17025720 9321f60	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99864	9	4	18	9	3	2	12
0e2e91fba 1ca9ed7de 2d11ea478 6c914	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99959	0	5	0	52	0	0	0
827992b2 2906f7a8b 7f7a87580 b21cfa	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	1	55	0
a537d8bab 85c83b0e7 4c73c5579 0324b	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Caulobacterales;D_4__Caulobacteraceae;D_5__Brevundimonas	0.99996	55	0	0	0	0	0	0
0c11526dc c7b80980 d4996816 efb55e3	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__uncultured;D_6__uncultured organism	0.99949	0	0	0	0	0	54	0
be80fe6e8 4c2bae973 7bd5ee5b9 ca751	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Arthrobacter	0.78584	21	29	0	0	2	0	0
0ed82bed8 4de7c7374	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99992	0	0	0	0	0	52	0

39d26588 91e5e2									
d114fb4c3 35125128 be284015 22dd41a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Lactococcus	1.00000	32	2	0	8	3	0	0
516a6715 6dacfa434 1327a7e2a 22f877	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Geobacillus;D_6__Geobacillus stearothermophilus	0.77371	0	4	0	0	36	0	0
cc6031235 7314937af 544b9333 c06feb	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Pseudonocardia	0.99654	0	34	0	0	0	0	0
e5c19d780 0b18015f3 a917fc015 fc42f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Enhydrobacter	1.00000	2	29	0	1	0	0	0
3d5baff45 729bf2214 074c2e9f7 7ad10	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	0	0	0	31	0	0	0
18916ff01 c5cc30f13 e73cab657 abe0e	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Lactobacillaceae;D_5__Lactobacillus;D_6__Lactobacillus jensenii	0.97328	0	15	0	3	13	0	0
d8a05ea8a ecfcf5910 db345be8 8e712a	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella;D_6__Prevotella sp. oral taxon 299 str. F0039	0.99719	0	0	30	1	0	0	0
a032ff45a 707ad658	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99890	0	0	0	0	0	30	0

dce11fdc7f6c537									
31d2ff1b3248b4254fb7801aaddcb2a8	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Pedobacter	0.98064	0	0	0	0	29	0	0
4608fae4bbc9964cdd17af8782f2155e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Massilia	0.99815	0	26	0	0	3	0	0
c2f18b27ec6d3c302b7edba8b7dcea35	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Azospirillales;D_4__Azospirillaceae;D_5__Skermanella	0.99981	0	29	0	0	0	0	0
3481fa43fe5fba6aecdc7f9aae6ed9c0	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99686	29	0	0	0	0	0	0
5c60f84b3d868e8544e0b7805e20ae77	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99978	0	0	0	0	1	0	26
ff968887a9f82bd9eced385761e0e716	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Veillonella	1.00000	0	0	0	0	26	0	0
8fc402cff8598bb90aab5493fe4c7828	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae	0.99998	0	0	0	0	0	0	26
0929a42add0959ca86	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	26	0	0	0	0	0	0

dcdc1ef25f3f56									
a68db5de3b0821d9af3f09d43d0bde45	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Methylophilaceae;D_5__Methylotenera	0.99988	0	26	0	0	0	0	0
87ace68671b521fa779b33d5fcf2b782	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Enterococcaceae;D_5__Enterococcus	0.99214	0	0	0	5	16	4	0
853bd2693c33f924be87a3affad3d497	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria	0.98719	0	0	1	23	0	0	0
1b51357852b0b814b4d9918c6f0ab762	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99999	0	21	0	0	3	0	0
7ddd1a8bfd75292a7e6761daba2045fd	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.87075	0	3	2	18	0	0	0
1e1178f3163cc9169597e95ff04f6ec6	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Aquabacterium	0.74421	0	23	0	0	0	0	0
d3c2b1c15d26e5fdcab77b372a987628	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1;D_6__Corynebacterium kroppenstedtii	0.98566	0	23	0	0	0	0	0
100e6b6cd413f4739c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.85162	0	0	0	0	22	0	0

c41b6340 d2648f									
000b8167 9cc9b9cc0 5b351aab6 f46617	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae	1.00000	0	0	0	0	22	0	0
4245fe74d 6dc62e222 f933d3dc8 502f5	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus	1.00000	0	0	1	0	21	0	0
77a920bd 965da12d 31f93c1ad f2c5ea1	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium	0.81943	0	22	0	0	0	0	0
1c388722e 483ec71d1 0b90536e 24b028	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	22	0	0	0	0	0	0
fd496fd32 dc8c08ade 2e8b6c9d8 ee13d	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	1.00000	0	0	0	0	21	0	0
c001a20b9 2388b91a 5c510bf83 2dfb01	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae;D_5__Psychrobacillus	0.97673	0	0	0	0	0	21	0
d75e7ba5f 4eaa7d475 c6c5ab246 ac6f2	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Actinomycetales;D_4__Actinomycetaceae;D_5__Actinomyces	1.00000	0	0	0	0	20	0	0
43731abad 5250502b	D_0__Archaea;D_1__Euryarchaeota;D_2__Methanobacteria;D_3__Methanobacteriales;D_4__Methanobacteriaceae;D_5__Methanobacterium	0.99998	0	0	0	0	20	0	0

a4fc74439 834a87									
25fe23e98 9514e818f 4bc1f680a d6da1	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Family XII;D_5__Exiguobacterium	0.99950	0	0	20	0	0	0	0
d865968b b6ff3f9f0c b9ad2636 b33101	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Chitinophagales;D_4__Chitinophagaceae;D_5__Ferruginibacter	0.99790	0	0	0	19	0	0	0
22c08c300 6abdc0bc2 f5839b7bb aa5d5	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__Neisseria	0.79990	0	0	0	0	0	19	0
7d135dfbf 857c6267 3695ef243 32b100	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Rothia;D_6__uncultured organism	0.75228	0	0	0	19	0	0	0
b33ad18b 61a4434ed 227ab0ff7 72d83a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99492	0	19	0	0	0	0	0
8f23b4eb0 28e97da67 3b11e79ed 271f9	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae	0.99999	19	0	0	0	0	0	0
33295f184 6cff2bf9c8 8e15798fb c91d	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Anoxybacillus	0.94602	0	8	0	0	10	0	0
156b77a4 5f0fb6ea1	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus	1.00000	0	0	0	0	17	0	0

37b6f8104 513e99									
49b9484d a82784fbf dafb70511 e93bcb	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphapr oteobacteria;D_3__Rhodobacterales;D_4__Rhodoba cteraceae;D_5__Paracoccus	0.93066	0	17	0	0	0	0	0
2bd9309f2 f97cae51d 18d06ea1c a519a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3_ _Lactobacillales;D_4__Carnobacteriaceae;D_5__Gra nulicatella	0.91367	0	16	0	0	0	0	0
4fcfbf9e4c 52e5e6be4 1b748633 7763c	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaeroline ae;D_3__Caldilineales;D_4__Caldilineaceae;D_5__u ncultured	1.00000	0	0	0	0	16	0	0
0cd986d3f a41118a4d 3ae6468ea 21980	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocat ellia (Subgroup 4);D_3__Blastocatellales;D_4__Blastocatellaceae	1.00000	0	0	0	0	0	0	16
d37da0a77 d2df2acf8 e870687b d519c0	D_0__Bacteria;D_1__Synergistetes;D_2__Synergisti a;D_3__Synergistales;D_4__Synergistaceae;D_5__F retibacterium;Ambiguous_taxa	0.77332	0	0	0	0	16	0	0
db66071d 30f1e311d 4458035a 349d027	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphapr oteobacteria;D_3__Sphingomonadales;D_4__Sphing omonadaceae;D_5__Sphingomonas	0.97272	0	0	0	0	15	0	0
db1d8e2a3 ec12bdf03 df47b1aab 59bcd	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinob acteria;D_3__Corynebacteriales;D_4__Corynebacter iaceae;D_5__Corynebacterium 1	0.79362	0	0	0	0	15	0	0
5623774a 2fae35fa1	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroid ia;D_3__Bacteroidales;D_4__Bacteroidetes BD2-2	0.91124	0	0	0	0	0	0	15

43ed45aec22a61b									
65f5ef12101d9e10b7a5286bb45e5b7c	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.96198	0	15	0	0	0	0	0
7fb08fa9b7b2eef6a3db57d0de769227	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Peptoniphilus	1.00000	0	0	0	0	10	4	0
41f3f39a0335a7392afa80327caf0f77	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus;D_6__uncultured organism	0.79001	0	0	0	0	14	0	0
6e6f306a337ba255a7f4a7f8469ff691	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Cellvibrionales;D_4__Cellvibrionaceae;D_5__Cellvibrio;D_6__uncultured Cellvibrio sp.	0.77458	14	0	0	0	0	0	0
b03d2e5ac94c7a0d115e5c542e9315e8	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__Dolosigranulum;D_6__uncultured bacterium	0.90592	0	0	14	0	0	0	0
4a0b292ba716582f9af46694458c0b9b	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	9	0	3	1	0	0
64a7728654e8082b9ae4117afa279542	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Sandaracinaceae;D_5__uncultured	0.99996	13	0	0	0	0	0	0
22b3c70cdfb1714224	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Finegoldia	1.00000	1	0	0	0	0	11	0

e1bf8a631 4bee9									
aa9b3a141 8d146c26 2ec633052 92065a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.92550	1	1	0	5	5	0	0
31703dc0 1afca1eba 26335fcab 7b4981	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Phycisphaerales;D_4__Phycisphaeraceae;D_5__CL500-3;D_6__uncultured bacterium	0.99716	0	0	0	0	12	0	0
171cef17d 3a509350f 828d7902 bd2969	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Intrasporangiaceae	0.99986	0	12	0	0	0	0	0
cc761daf5 1f27c423d a57f3f1f0f f5cc	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae;D_5__Pantoea	0.74696	11	1	0	0	0	0	0
7e2445dae 10d34b6f8 ce426e072 b2c6e	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	12	0	0	0	0
5296abbfe 7997c706 bac0d50bf fc8eec	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Chryseobacterium	0.99999	0	0	0	0	11	0	0
7d500200 dff3c719a b930148aa deb189	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Bosea	1.00000	0	0	0	0	11	0	0
e16fdc5f5 a29efc0bd	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocatellia (Subgroup 4);D_3__Blastocatellales;D_4__Blastocatellaceae;D	0.87060	0	0	0	11	0	0	0

f38be939f 1fd66	_5__uncultured;D_6__uncultured Pietermaritzburg bacterium Y14-5								
17aae5582 d0548330 ecf4838b2 3cb0f6	D_0__Archaea;D_1__Euryarchaeota;D_2__Halobacteria;D_3__Halobacteriales;D_4__Haloadaptaceae;D_5__Haladaptatus;D_6__uncultured archaeon	0.93708	11	0	0	0	0	0	0
a4cbe9879 42964b58 4e95e4efa b6a176	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.99966	8	0	0	0	0	0	2
a1e8fa809 b56df2763 7499c27b 93fc46	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Modestobacter	0.99622	0	10	0	0	0	0	0
de3366ad9 fd02e5721 3a7e4cc7a 3cd99	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Chromatiales;D_4__Chromatiaceae;D_5__Halochromatium	0.94712	0	0	0	10	0	0	0
5b061dcc5 f062037f7 c582d377 3afb46	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus	1.00000	0	0	0	10	0	0	0
09330304 94ce0f98f 70fa4ddca b921eb	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Lactococcus	1.00000	0	0	0	10	0	0	0
d0615dd5 5815c532 2e9a76fb2 28dcc6a	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99783	0	0	0	0	10	0	0
dcece32e6 721f47a5d	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__uncultured	0.99973	0	0	0	10	0	0	0

0849ec92f 722a4									
a20eb37d5 0abf4ef13 197bd4a0e a8c84	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Arthrobacter	0.78817	0	0	10	0	0	0	0
21422456 ed7737a4b db709d26 6804892	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Paenibacillaceae;D_5__Paenibacillus	0.99997	10	0	0	0	0	0	0
5aec9bd35 889489e4a 05c78a823 58060	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99933	9	0	0	0	0	0	0
4d4158f11 1abb8fcce 65b0b0c2c 00bee	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae;D_5__Rubellimicrobium;Ambiguous_taxa	0.76580	0	0	0	9	0	0	0
9ac3bb1d7 dedb08a01 2692a6f53 6b5af	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	1.00000	2	0	7	0	0	0	0
59bf7993e 12b93dc2 6182de70 b3ed5b8	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Nakamurellaceae;D_5__Nakamurella	0.99522	0	9	0	0	0	0	0
28fc5b4c9 8e618c2d8 b58303c7 77ae23	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99875	0	9	0	0	0	0	0
4a4bfd2e9 555ca374c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Nostocales;D_4__Chroococcidiopsa	0.88920	9	0	0	0	0	0	0

15fd29a71 c36d6	ceae;D_5__Aliterella CENA595;D_6__Aliterella antarctica CENA408								
d49783e7 800974b5f 2bcce554e 26072e	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D _3__Clostridiales;D_4__Lachnospiraceae;D_5__Bla utia	0.99823	0	0	0	0	0	9	0
2740cf241 7c92847cc 298cbd71 dd1fcd	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicute s;D_3__Selenomonadales;D_4__Veillonellaceae;D_ 5__Veillonella	1.00000	4	0	0	0	4	0	0
32932253 bfdfac825 bfe75ec75 3f3996	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisp haerae;D_3__Tepidisphaerales;D_4__Tepidisphaerac eae;D_5__uncultured bacterium;D_6__uncultured bacterium	0.99968	0	0	0	8	0	0	0
57a3bfc0d 5164b0db bb027b1d bcae99d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphapr oteobacteria;D_3__Rickettsiales;D_4__Mitochondria	0.99996	0	0	0	0	8	0	0
2727f8191 85a7e8993 f13df355a 399fa	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphapr oteobacteria;D_3__Sphingomonadales;D_4__Sphing omonadaceae;D_5__Sphingomonas	0.98927	0	8	0	0	0	0	0
0fa9b44d5 2836d2f17 3f4ac532f 8a013	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphapr oteobacteria;D_3__Azospirillales;D_4__Azospirillac eae;D_5__Skermanella	0.99988	1	7	0	0	0	0	0
29fbc7e50 21229480 248fa7466 a499a2	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3_ _Lactobacillales;D_4__Aerococcaceae;D_5__Abiotr ophia;D_6__uncultured bacterium	0.91448	0	0	0	0	0	8	0
f08d5b87a eb5d43f19	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D _3__Clostridiales;D_4__Lachnospiraceae	0.99999	0	0	0	0	0	8	0

da05f1715 cdcb4									
cdf2b7893 a7c66be24 75defd929 d7c02	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphapr oteobacteria;D_3__Rhodobacterales;D_4__Rhodoba cteraceae;D_5__Amaricoccus	0.89345	0	0	0	0	0	8	0
12e5ea96b 2b4f0557a bcb459f18 1397a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3_ _Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.75196	0	0	0	7	0	0	0
dad8ce33d 8c40fd504 4d5f1b55b caded	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinob acteria;D_3__Micrococcales;D_4__Micrococcaceae; D_5__Micrococcus	0.99907	0	0	0	0	7	0	0
544f78d92 9b679d82 ebcd53c09 29cccd	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexi a;D_3__Thermomicrobiales;D_4__JG30-KF-CM45;D_5__Paraburkholderia tropica;D_6__Paraburkholderia tropica	0.91136	0	0	0	0	7	0	0
1926880b 82ebdbed3 f994a5cab 4598ef	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3_ _Bacillales;D_4__Staphylococcaceae;D_5__Staphyl ococcus	0.99998	0	0	0	0	7	0	0
4a5b5b81 d9281362 0ba80abcf 755d6d1	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammap roteobacteria;D_3__Xanthomonadales;D_4__Rhoda nobacteraceae;D_5__Dokdonella	0.93647	0	0	7	0	0	0	0
9cca219ac 7e1d9722a b63545dc 219ecd	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammap roteobacteria;D_3__Pseudomonadales;D_4__Pseudo monadaceae;D_5__Pseudomonas	1.00000	0	4	0	0	0	3	0
4632b50d ccb7ed5e4	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroid ia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5 __Chryseobacterium	0.99911	7	0	0	0	0	0	0

ab080ca5b575f12									
113e5cb2dbb0b2086e230fc9d845310f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99635	7	0	0	0	0	0	0
6beafd441dc17f1692deac41680e3287	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Myxococcales;D_4__Sandaracinaceae;D_5__uncultured	1.00000	7	0	0	0	0	0	0
318a2dc4bf9117dd3a03ab8c2a4b16cc	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__PB19	0.99903	0	0	0	0	0	7	0
dd3a124e0f04306cf546df311a52b727	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Cupriavidus	0.99915	1	0	0	1	1	3	0
5a7b179b1b45f0fe2282f260bf073f60	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Propionibacteriaceae;D_5__Cutibacterium	0.99945	0	3	0	0	1	2	0
ffe3d871aae9f8bca3a7928de5892a07	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99999	0	0	0	0	5	1	0
2b74166aeaeff68914505e3eaf0f74be	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Lautropia	0.99991	0	0	0	0	6	0	0
a285136eb52ed8870	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocatellia (Subgroup	0.98901	0	0	0	0	0	0	6

13aaa7917 ce5051	4);D_3__Pyrinomonadales;D_4__Pyrinomonadaceae ;D_5__RB41;D_6__Acidobacterium sp. Ac_12_G8								
c6c441fe1 134725b4 a5bb2627 5ae1f89	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinob acteria;D_3__Corynebacteriales;D_4__Corynebacter iaceae;D_5__Lawsonella	1.00000	0	0	0	6	0	0	0
6f3f68e5c 8e2a11b38 8ddbbea9f a182d	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammap roteobacteria;D_3__Pseudomonadales;D_4__Pseudo monadaceae;D_5__Pseudomonas	0.99696	0	0	6	0	0	0	0
fa75e4a8d 77483c82a 344c520c1 9f153	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Carnobacteriaceae;D_5__All oiococcus;D_6__uncultured bacterium	0.88887	5	0	0	0	1	0	0
5d21d8b8 8a8cd0ca0 ecfdd1d93 f0b910	D_0__Bacteria;D_1__Verrucomicrobia;D_2__Verru comicrobiae;D_3__Chthoniobacterales;D_4__Chtho niobacteraceae;D_5__Chthoniobacter	0.99995	6	0	0	0	0	0	0
261b9324 b7018cbaa 9abf6fced 7803a9	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammap roteobacteria;D_3__Pseudomonadales;D_4__Pseudo monadaceae;D_5__Pseudomonas	0.99624	0	6	0	0	0	0	0
da9353c99 ad9f76a88 7d4c7751 de88cc	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Stre ptococcus	0.98020	6	0	0	0	0	0	0
7f5077847 85563d43 5af9af74d 6368df	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinob acteria;D_3__Micrococcales;D_4__Microbacteriacea e	0.99987	6	0	0	0	0	0	0
7dfdb3636 ffe9e062c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphot obacteria;D_3__Chloroplast	0.99980	0	0	0	5	0	0	0

e4251ac5f188bd									
7911816f5e81f650f769aba0d5c708cb	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	4	0	0	1	0	0	0
75a3e20e916ee5ec7dceae34a1bc0209	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Actinomycetales;D_4__Actinomycetaceae;D_5__Actinomyces	1.00000	0	5	0	0	0	0	0
989fcd371191f82c9dbe36c2513d2055	D_0__Bacteria	0.96996	0	5	0	0	0	0	0
7117984c22f21c4c62eadf27cf65ab16	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Massilia	0.99868	5	0	0	0	0	0	0
443fd1bc1c58f2a456ae6c391dbd3c4a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99983	5	0	0	0	0	0	0
9d8efe7918b08458d6bd2c277fa2c6e7	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99840	0	5	0	0	0	0	0
1e261831700d5565ba8b54f3124145c3	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas	0.99854	0	5	0	0	0	0	0
414d5a577ea97dae1	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Pigmentiphaga	0.75161	5	0	0	0	0	0	0

692e0511 6fa9a17									
864267f12 bedace192 72af56224 498c7	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__uncultured;D_6__uncultured bacterium	0.99997	5	0	0	0	0	0	0
8ef6cec72 8e5f8f19b 049f3b799 31e70	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas;D_6__Sphingomonas humi	0.70018	0	0	5	0	0	0	0
12322f15c 5dcca422f 121c2e90e b3566	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Caulobacterales;D_4__Caulobacteraceae;D_5__Brevundimonas;D_6__Brevundimonas diminuta	0.75265	0	0	0	4	0	0	0
dcba105f3 5d8ebc9e2 2269c749 1ad3a7	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Stenotrophomonas	0.99991	2	0	0	0	0	2	0
2caf2453f 7c312610 926a8f735 e90a07	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Leptotrichiaceae;D_5__Leptotrichia	1.00000	0	0	0	4	0	0	0
21d681c0 53e463a9d b7171f44e 7a4a39	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	4	0	0	0
8495ba6ec ec8d12dae 432a82cc6 54769	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Dietziaceae;D_5__Dietzia	0.99952	0	0	0	4	0	0	0
c845eda99 662b5a88a	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Lautropia	0.99999	0	0	0	0	4	0	0

8c8e979ec07dd0									
bdf8a26094624622d68509a87fa75ba7	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.99749	3	0	0	1	0	0	0
88227a14a9a0e01aaabfc6d792e83e96	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Kineosporiales;D_4__Kineosporiaceae;D_5__Quadrisphaera	0.74102	0	0	0	4	0	0	0
b8c4ed03d7d91546b9f6ad80b80135a3	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Blastococcus	0.99939	4	0	0	0	0	0	0
ce6e97c4fef04c8977b87226f290f123	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Planctomycetales;D_4__Rubinisphaeraceae;D_5__SH-PL14	1.00000	0	0	0	4	0	0	0
ec6665f4d7bda38bfb9ebcac845d2067	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1;D_6__Corynebacterium pseudodiphtheriticum	0.96554	0	0	0	0	0	0	4
892a0fc53b26d6a2c193d145b2464da7	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Chryseobacterium	0.99996	0	0	0	0	4	0	0
86748e6e46eddb955f6918863b3cf191	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus;D_6__Bacillus coagulans	0.91897	0	0	0	0	4	0	0
101982ee6204355a5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Kineosporiales;D_4__Kineosporiaceae	0.99950	0	0	0	0	4	0	0

4d11d127 824a796									
435fd033e 4772ad97c ecd035c9a ceba5	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Mycobacteriaceae;D_5__Mycobacterium	1.00000	0	0	0	0	0	4	0
ef082017c 0bfefb9dcf 9ac41e878 ea1c	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter;D_6__Hymenobacter sp. Xue4	0.93172	0	4	0	0	0	0	0
4856e07a2 1f6a60b63 9fa9c6946 87d95	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingobium	0.99762	0	4	0	0	0	0	0
fccd274e7 18e26b32c 71f188d97 d9e59	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae	0.99999	0	4	0	0	0	0	0
86954a26a 0afe6e80f 7c706e1e7 f7693	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99999	0	0	0	4	0	0	0
34e07216e af862049a edd21b8f2 84b28	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Pasteurella	0.98146	0	0	0	0	4	0	0
8a8895d1 60b2fda42 4ad5446e9 bf8f4e	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Peptococcaceae;D_5__Desulfosporosinus	0.99986	0	4	0	0	0	0	0
2e0101d0 89374b80	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Flavobacterium;D_6__uncultured organism	0.98433	4	0	0	0	0	0	0

79e22cddb f18426f									
eae880eaa 9c99650e3 99d9b4eb 5dd3b0	D_0__Bacteria;D_1__Firmicutes;D_2__Negativicutes;D_3__Selenomonadales;D_4__Veillonellaceae;D_5__Veillonella	1.00000	2	0	0	0	0	2	0
02d64234 59a11125 777ff49d9 d112ba5	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99999	0	0	4	0	0	0	0
44245871 134a7a84a c8e3049b9 769980	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Cytophagaceae;D_5__Rhodocytophaga;D_6__uncultured Bacteroidetes bacterium	0.83122	4	0	0	0	0	0	0
922d33a2 963d3e87a 3d4df6b82 371235	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99973	0	0	0	0	3	0	0
80829037 d7f87fc1a d2f17d13c 2d916b	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	3	0	0
16d13ed5 13218adc8 b205a10b 716e08c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	3	0	0	0	0	0
2f7123d5d 25c1743ce afc86cced 90157	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1	0.99996	0	0	0	3	0	0	0
85c44c83e ddc5d302	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Family XI;D_5__Gemella	1.00000	0	1	0	0	2	0	0

8261a100 0b7d0e1									
cc59b9739 479b7d22 5baaa1711 25e3ba	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99093	0	0	0	2	1	0	0
1a56ad3ec 2b87cfbea ba8976be0 8b4b9	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Xanthobacteraceae;D_5__uncultured	0.95411	0	0	0	0	3	0	0
2d2625f2c 2302caa7a 5270d7e5c 6c6d3	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__SAR324 clade(Marine group B);D_4__uncultured soil bacterium;D_5__uncultured soil bacterium;D_6__uncultured soil bacterium	0.84150	0	0	0	0	3	0	0
a18151bd 97caef55a acf0aab86 354a8d	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Pedobacter	0.76254	0	0	0	0	3	0	0
12c4cf4a9 b6a4541ef 111f02191 bae96	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Oceanospirillales;D_4__Halomonadaceae;D_5__Halomonas	0.99971	0	0	0	0	3	0	0
ce765bd74 2f18e161a b9a3cd2a7 88849	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Spirosomaceae;D_5__Pseudarcicella;D_6__uncultured bacterium	0.84247	0	0	0	3	0	0	0
7ac6bd9de e5ec9fc4c cd70a40fd 514fb	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae;D_5__Paracoccus	0.98397	0	0	0	0	3	0	0
195a5447 6a1802d7	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacter	0.76377	0	0	0	3	0	0	0

5e0e77360 1fe964b	iaceae;D_5__Corynebacterium;D_6__Corynebacterium diphtheriae								
15e87797e 329f7af17 0725c172 2c3b37	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	1.00000	0	0	0	3	0	0	0
146195f72 933e590d 98b89c38 d6eda33	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Frankiales;D_4__Geodermatophilaceae;D_5__Geodermatophilus;Ambiguous_taxa	0.81546	0	3	0	0	0	0	0
44aa6712f 78f0bbad3 8485da0d 6ddf19	D_0__Bacteria;D_1__Deinococcus-Thermus;D_2__Deinococci;D_3__Deinococcales;D_4__Deinococcaceae;D_5__Deinococcus	1.00000	3	0	0	0	0	0	0
46e9544e9 c5e7ed6d9 0a7b50a8a 9c990	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus	1.00000	0	0	0	0	3	0	0
35c1c246a 11186908 e19e98727 6ec8ae	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Moraxella	0.99867	0	0	0	0	2	1	0
363fcb92a 60309d17 1c005584 b21c9ab	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter	1.00000	0	0	0	3	0	0	0
36ecd054f 5309a965 8926a092 6d7ee82	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Shinella	0.95535	0	3	0	0	0	0	0
fd8c9d2ad 5c9503a2a	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__SBR1031;D_4__A4b;D_5__uncultured organism;D_6__uncultured organism	0.98274	0	0	0	3	0	0	0

771a3e959cf903									
8c302173c3119eb5653313dd244872c3	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter;D_6__Parahymenobacter ocellatus	0.79549	0	0	0	3	0	0	0
25612c10b9c5b70c9a92eb24e2fced5a	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	3	0	0	0	0
4a1e5e44473fcf41f308288148927289	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__uncultured	1.00000	0	2	0	0	1	0	0
8d8e2d43cbf7a1a15ecd9e22172878e9	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Fusobacteriaceae;D_5__Fusobacterium	0.99999	0	3	0	0	0	0	0
df12ba968d58f548e1f6e3c7fa2dd47b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Gammaproteobacteria Incertae Sedis;D_4__Unknown Family;D_5__Acidibacter	0.98489	0	3	0	0	0	0	0
9ab3263b93867d691a5014b2ddab6649	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1;D_6__Corynebacterium kroppenstedtii	0.98185	3	0	0	0	0	0	0
251fb9e771085e0267a4f87cf841ce2f	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast;D_4__metagenome;D_5__metagenome;D_6__metagenome	0.92714	3	0	0	0	0	0	0
912f795ef3617aeb65	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Xanthomonadales;D_4__Xanthomonadaceae;D_5__Stenotrophomonas	0.99995	0	0	3	0	0	0	0

ff9ad69b9567a8									
15f4f5d8f280521ef2d0303a55207810	D_0__Bacteria	0.99867	3	0	0	0	0	0	0
2d16d001e21717f960cf771ae879b1dd	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99992	3	0	0	0	0	0	0
b549aa463191ec4f8dc2803101d8b469	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium 1;D_6__Corynebacterium kroppenstedtii	0.98152	0	3	0	0	0	0	0
9214c8ae1d39f7b6cd90d07cde2582f6	D_0__Bacteria;D_1__Acidobacteria;D_2__Acidobacteriia;D_3__Acidobacteriales;D_4__uncultured	0.99046	0	0	3	0	0	0	0
de96ec639611e50e9e3f6318317650c4	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	3	0	0	0	0
d0dad971506647d25b7ec3c857964526	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99588	0	3	0	0	0	0	0
706141143cfb0f684436d98e4bb5a288	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14	0.90320	0	3	0	0	0	0	0
3b94c19ef326eea091	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99986	0	0	0	0	0	3	0

8e1c3d244 c999c									
2ddb2659 87d9e155 64c88ea52 33e9fc4	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Porphyromonadaceae;D_5__Porphyromonas;D_6__uncultured bacterium	0.76097	0	3	0	0	0	0	0
ee4405c37 3c9342d3f 2653bb55 6d0107	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Pirellulales;D_4__Pirellulaceae;D_5__Pirellula	0.99997	0	0	0	0	0	3	0
101c41f32 e591dec8f 76fd70a69 a817b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99950	0	3	0	0	0	0	0
13c1b2a8c 491cf3fba 2fa50e457 17450	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Anaerococcus	1.00000	0	0	0	2	0	0	0
d504e53cc ce7a7a7a4 28bc855ad 3380b	D_0__Bacteria;D_1__Deinococcus-Thermus;D_2__Deinococci;D_3__Thermales;D_4__Thermaceae;D_5__Meiothermus;Ambiguous_taxa	0.71323	0	0	0	2	0	0	0
946d0c87 4c0395a7d a247b201e fc5228	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Acetobacterales;D_4__Acetobacteraceae;D_5__Roseomonas;D_6__uncultured Acetobacteraceae bacterium	0.91204	2	0	0	0	0	0	0
ad4cba528 0fb47cbeb ea01e7031 af61c	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.86679	0	0	0	0	2	0	0
7d88cb85 b80e0024	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.87738	0	0	0	1	1	0	0

b54a61e7a6da3bf0									
a843fc211658b32d18ca8567f97f1a1e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99999	0	0	0	0	2	0	0
60ebb4e6b032f25eca3143ac20f5ccf7	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Chryseobacterium	0.99882	0	0	0	0	2	0	0
9b95fc89431007a12bd9403423405aaa	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria	0.99999	0	0	0	2	0	0	0
0f5f48d793a468de8ec2131049a25f1e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Noviherbaspirillum	0.90925	0	0	0	2	0	0	0
5db9a3f87f3fd3fa547e88e4a765d2c3	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Mesorhizobium	0.94422	0	0	0	0	2	0	0
6fd430b55ccfa3d06028840419621cab	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	1.00000	0	0	0	2	0	0	0
00e629d85f9026b8883c0b8b04ab7f48	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Schlegelella;D_6__uncultured bacterium	0.86920	0	0	0	0	2	0	0
3ebe761bfb1238c87	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99937	0	0	0	0	0	0	2

195d431f4 1bf976									
c45afba84 3c16b878 7a317a875 a41674	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium	0.73690	0	0	0	0	2	0	0
5244ae04b b85cf5316 ff65a4613 350fd	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Flavobacteriaceae;D_5__Flavobacterium	1.00000	0	0	0	0	0	0	2
1f8120413 8e65cc756 d489af22d 3cd9e	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Massilia	0.99705	0	0	0	0	2	0	0
a4630989 6efce1cce 3eb882adf 16f307	D_0__Bacteria;D_1__Chloroflexi;D_2__Chloroflexia;D_3__Chloroflexales;D_4__Chloroflexaceae;D_5__FFCH7168;D_6__uncultured bacterium	1.00000	0	0	0	0	2	0	0
00f7793b9 e96c3365f 6a3a097c5 6805d	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Brochothrix	0.99549	2	0	0	0	0	0	0
efe704e3b 0eb8985c6 57b2211ea 988be	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Orbales;D_4__Orbaceae;D_5__Gilliamella;Ambiguous_taxa	0.94047	0	0	0	2	0	0	0
8c6d41b1f 64e1b869 b52890e2 4979e63	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter;D_6__Hymenobacter algoricola	0.98370	0	0	0	0	2	0	0
dda78e69e 3c7656f37	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.92749	0	0	2	0	0	0	0

ae43b76cb e5af9									
35a094adc baabf934f bcf2eb11c f6d4a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99851	0	0	0	0	2	0	0
0758c3f3b a306d67c9 0f1a305c1 ecc50	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Planococcaceae	0.92735	0	0	0	0	0	0	2
88dcbc6fc fe5227131 7be3534e9 2481a	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Moraxella;Ambiguous_taxa	0.99322	0	0	0	0	2	0	0
e5a40afd3 aaf4416c1 639c117b 20138f	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.81584	0	2	0	0	0	0	0
510f20fab 394834bf2 187b5f570 b569b	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Micrococcus	0.99828	0	0	0	2	0	0	0
7485078a 61b2dc0b 27162fc57 d24aedd	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter	1.00000	0	2	0	0	0	0	0
71f9394a6 c9c5eda0d 8df14bc54 39abd	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Chryseobacterium	0.99992	0	2	0	0	0	0	0
4502a4ac5 d1ae6823f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Aquabacterium	0.79117	0	2	0	0	0	0	0

8455809d eb32ac									
0a60184eb 11318c87e 1a2328f8c 95582	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	0	0	0	2	0
1be97800 4eacb1134 25e88922 d4f1181	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99724	2	0	0	0	0	0	0
86e4497c0 54a30a69e 80832fa1d fd876	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 7	0.99999	0	2	0	0	0	0	0
d7bb7988 074c5903 406f61877 dd697c0	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhodobacterales;D_4__Rhodobacteraceae;D_5__Rubellimicrobium;D_6__uncultured bacterium	0.99839	2	0	0	0	0	0	0
7a6d4a1bf c7606e2b2 8d1aec9ab e8368	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Comamonas	0.83808	0	0	2	0	0	0	0
5c6946f2d 2689526a b15f5cd5f 766ca2	D_0__Bacteria;D_1__Proteobacteria;D_2__Deltaproteobacteria;D_3__Syntrophobacterales;D_4__Syntrophobacteraceae;D_5__Desulforhabdus;D_6__Candidatus Desulfonatronobulbus propionicus	0.81787	2	0	0	0	0	0	0
a529f9aad 50a01737 dee8c03bb bd43f5	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99858	0	2	0	0	0	0	0
7adfae942 9d46a2b7e	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.87467	2	0	0	0	0	0	0

3e100634 6aeaa9									
bac36161c a2e5a921c 07b6be89 772fc2	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__Microvirga	0.97976	0	2	0	0	0	0	0
d450dc55 02decd0b0 dc621a963 ee2d9a	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae	0.99948	0	0	0	0	0	2	0
7ff346973 a282aa55d e296afdb5 d74af	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae	0.99991	0	0	0	0	0	0	1
0c579d21 280801f02 a641e1608 606927	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Micrococcus	0.99948	0	0	0	0	0	1	0
0df6c8029 66e86702 79671824 da4f10a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Lactobacillaceae;D_5__Lactobacillus;D_6__Lactobacillus gasseri	0.79120	1	0	0	0	0	0	0
394eda29c 886632f51 4dd94b58 381186	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Haemophilus	0.90589	0	0	0	0	1	0	0
eed4445c6 828c17a10 169e46afa 6fa5c	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Pedobacter	0.95711	0	0	0	0	1	0	0
8df2b2e6c 1cb64bd1	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Massilia	0.99960	0	0	0	1	0	0	0

8b81d5bae7f0898									
d8ae863af0a62dab9d559a2de77d3d07	D_0__Bacteria;D_1__Acidobacteria;D_2__Subgroup 6	1.00000	0	0	0	1	0	0	0
26f173c04574871aba8876838e2d9e61	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Novosphingobium	0.97930	0	0	0	1	0	0	0
cdf14d2fed157f8032715a22d3bf4573	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella;D_6__Prevotella nigrescens	0.89731	0	1	0	0	0	0	0
c0d5395792eadbf5f62e8ffb14fa0262	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria	0.96366	0	0	0	0	1	0	0
ec1dbf34759352b3f524e626315af15b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Cardiobacteriales;D_4__Cardiobacteriaceae;D_5__Cardiobacterium	0.78713	0	0	0	1	0	0	0
d15bc449222795a9ff230013aa633686	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.98161	0	0	0	1	0	0	0
3a02f11000fbcb8cb977f1a95d8bc340	D_0__Archaea;D_1__Euryarchaeota;D_2__Methanobacteria;D_3__Methanobacteriales;D_4__Methanobacteriaceae;D_5__Methanobacterium;D_6__uncultured archaeon	0.71187	0	0	0	0	1	0	0
70745fa69950bfb64d	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Lachnospiraceae;D_5__uncultured	0.75995	0	0	0	0	1	0	0

b28e3afff2b1e5									
b8f4b792a7569c5f07c33e036d449dc4	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.98758	0	0	0	0	1	0	0
45beee42b973bb0cec1072fc4e65cdea	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria;D_5__Zasmidium cellare;D_6__Zasmidium cellare	0.99895	0	0	0	0	1	0	0
05b2cb29d088f6a3316dcd5721fb732a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99997	0	0	0	0	1	0	0
16d0bd6022f7303c06695fcbe2e68c6e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Actinomycetales;D_4__Actinomycetaceae;D_5__Actinomyces	1.00000	0	0	0	0	1	0	0
b8c545c99dea06d010eb0bf2c6572d1c	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.93788	0	0	0	1	0	0	0
b0ff799403acc14f773a302a305c81a8	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	0.99973	0	0	0	1	0	0	0
f06ebfccbca879dcdabeb85a6b9cf3d0	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99932	0	0	0	0	1	0	0
22a226f73eda5b4e34	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Pirellulales;D_4__Pirellulaceae;D_5__uncultured	1.00000	0	0	0	0	1	0	0

3a7218aa8dfc08									
9e668f7174dad676c985b09a0aa0fbb8	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	0	0	0	1	0	0	0
4786ec1cd1f0a55eeca25c69ae08ae09	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99993	0	0	0	0	1	0	0
bd5d02cf1509c352b7eede2cdcebba40	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Lautropia	0.83620	0	1	0	0	0	0	0
6938ee83d3bb3e95f1d2fb7037bdd573	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__Neisseria	0.99947	0	0	0	0	1	0	0
bee0912158e6b8c6aa19fe0edb3eb250	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__Caldilineales;D_4__Caldilineaceae;D_5__uncultured;D_6__uncultured bacterium	0.93566	0	0	0	0	1	0	0
b0bed773ed6d97b252451292e92f296f	D_0__Archaea;D_1__Euryarchaeota;D_2__Methanobacteria;D_3__Methanobacteriales;D_4__Methanobacteriaceae;D_5__Methanobacterium	0.99991	0	0	0	0	1	0	0
814d36cce47414beccceb7665900831e6	D_0__Bacteria;D_1__Fusobacteria;D_2__Fusobacteriia;D_3__Fusobacteriales;D_4__Leptotrichiaceae;D_5__Leptotrichia;D_6__uncultured bacterium	0.70317	0	0	0	0	1	0	0
217282f1c9a90df7cb	Unassigned	0.94604	0	0	0	1	0	0	0

0aa79722d69cfc									
d76d6003ee959b0bdf1f9de282467004	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99969	0	0	0	0	1	0	0
d892d40bc79d0c356bd2886ce8d120ee	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Cellulomonadaceae;D_5__Cellulomonas	0.99080	1	0	0	0	0	0	0
0a3cf58d4ca062c13d42c9db4ebcbc53	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	1	0	0	0	0	0
62727dc7f1b9c5878de3da94b2977f05	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Ochrobactrum	0.79682	0	0	0	0	1	0	0
68fd3ae559594bf383fa6ca8e452c3b6	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99998	0	1	0	0	0	0	0
33228eb9da870754e63e4296d391cbc9	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae;D_5__Buchnera	1.00000	0	0	0	1	0	0	0
2d7d46ce838715be16f49e2b9e25beea	D_0__Bacteria;D_1__Acidobacteria;D_2__Blastocatellia (Subgroup 4);D_3__Blastocatellales;D_4__Blastocatellaceae	1.00000	0	1	0	0	0	0	0
65bce1b11ca9d92567	D_0__Bacteria;D_1__Deinococcus-Thermus;D_2__Deinococci;D_3__Deinococcales;D_4__Deinococcaceae;D_5__Deinococcus	1.00000	1	0	0	0	0	0	0

69fc74814 13574									
9c23f2bb0 52a648f46 4afd47a6b 45305	Unassigned	0.93044	0	0	0	1	0	0	0
b87fd90b9 bba462fd7 76de42adf d2dd5	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Neisseriaceae;D_5__Neisseria	0.99913	0	0	0	0	1	0	0
3d6da485 3055ccfc8 0db03cefe e88f5a	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99123	0	0	0	0	0	1	0
7cc89e9ce 3813867b 377f62a64 bf5311	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	0.99970	0	0	0	1	0	0	0
abf22e4d0 6624c53a8 e4a69c054 2300d	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Tistrellales;D_4__Geminicoccaceae;D_5__Geminicoccus;Ambiguous_taxa	0.73390	0	1	0	0	0	0	0
ca446a2b7 de0365d9 ba663bcfe e59f25	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Syntrophomonadaceae;D_5__Candidatus Contubernalis	0.99999	0	0	0	0	0	0	1
de3a10adb bd3362a5 5983ea276 ce55d0	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales	0.99683	1	0	0	0	0	0	0
9d30df1c0 9b60bb79	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99915	0	1	0	0	0	0	0

1f16b9f769c6335									
5271b01a0a9c7bd4575092999db6580d	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group	1.00000	0	1	0	0	0	0	0
356f92b8a9023179f9722432b9f1bd21	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Methylococcales;D_4__Methylomonaceae;D_5__Methylomicrobium	0.99985	0	0	0	0	0	0	1
0a68ec564e278b0246c920ad7de41880	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Lachnospiraceae;D_5__Blautia	0.98848	1	0	0	0	0	0	0
0f8ac0d81dd6449a43b34fcb184efd8f	D_0__Archaea;D_1__Thaumarchaeota;D_2__Nitrososphaeria;D_3__Nitrososphaerales;D_4__Nitrososphaeraceae	1.00000	1	0	0	0	0	0	0
a099b394e1c5bf8da4ea283c5f27fd68	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae	1.00000	0	1	0	0	0	0	0
9fec7bdd6bd88e710bd69b15692e54a0	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	1.00000	0	0	1	0	0	0	0
952c32b137e45825fa13735649f232b7	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Kineosporiales;D_4__Kineosporiaceae;D_5__Quadrisphaera	0.71822	0	0	0	0	1	0	0
6ba43acb03ae795b3e	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Leuconostocaceae;D_5__Leuconostoc	1.00000	0	1	0	0	0	0	0

7e31f2be9 46006									
326a2feeb 5d4ddbe4 de49644f7 00aa81	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Bifidobacteriales;D_4__Bifidobacteriaceae;D_5__Bifidobacterium;D_6__Bifidobacterium minimum	0.79650	0	0	0	0	1	0	0
e1b2b6ae4 af6686429 c21926cc0 314a0	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	1	0	0	0	0
6faf025d6 1e54fb3be 2f52bd61a d7d78	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Hydrogenophilaceae;D_5__Tepidiphilus	1.00000	0	1	0	0	0	0	0
3e26116c7 03ecc7af9 6ed28b0a8 a2973	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingomonas	0.99730	0	1	0	0	0	0	0
db14260fc 5277a628 88232450 b62d889	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Gammaproteobacteria Incertae Sedis;D_4__Unknown Family	0.72245	1	0	0	0	0	0	0
8553bd0d bb73c5fa6 fe8f4481fa 62bbb	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Pedobacter	0.99844	0	1	0	0	0	0	0
4e4f1228d edebaa402 708cd896 82f15e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Nocardioidaceae;D_5__Nocardioides	0.99946	1	0	0	0	0	0	0
9e3e61ab8 f8501e49d	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family	0.76351	0	1	0	0	0	0	0

fd6f9a0af9 1d14	XI;D_5__Anaerococcus;D_6__uncultured Anaerococcus sp.								
9b87264a 5bfe77363 5326db0f7 73bdc4	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Hymenobacteraceae;D_5__Hymenobacter	1.00000	0	0	1	0	0	0	0
0b0c88efe 8fd1d1490 989b63c8 b28bc0	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Rhizobiaceae;D_5__Aminobacter	0.90110	0	1	0	0	0	0	0
480e77a52 be7bf11d1 e96e7a3f0 a0a13	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Sphingobacteriales;D_4__Sphingobacteriaceae;D_5__Sphingobacterium;D_6__bacterium YY1	0.99742	0	0	0	0	1	0	0
925b699c 39eb1696e c45138da5 3a9a76	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rickettsiales;D_4__Mitochondria	0.97345	0	0	0	0	1	0	0
16875650 7bec9c3de 8c23cb084 df3498	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae;D_5__Sphingobium	0.99613	1	0	0	0	0	0	0
3c34b774 5df764d5c e6226b37a 22c4c5	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Cytophagales;D_4__Spirosomaceae;D_5__Persicitalea;D_6__uncultured bacterium	0.99720	1	0	0	0	0	0	0
a47f1d9b1 66707448 add5c1c11 3eb511	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99997	0	0	1	0	0	0	0
909cafdb1 7471fda5c	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil	0.94585	1	0	0	0	0	0	0

a6253139dd1af1	group;D_5__uncultured bacterium;D_6__uncultured bacterium								
9df60a5f37d3d62dc59afd327cbbdf28	D_0__Bacteria;D_1__Planctomycetes;D_2__Phycisphaerae;D_3__Tepidisphaerales;D_4__WD2101 soil group;D_5__uncultured bacterium;D_6__uncultured bacterium	0.85375	1	0	0	0	0	0	0
621fde95b8e76ead33fe8f7740d03fb8	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99956	1	0	0	0	0	0	0
cfabc1d084705c38096261ba7212b235	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella 7;D_6__uncultured Bacteroidetes bacterium	0.99991	0	0	0	0	1	0	0
90f44084459949dd4fd965e1fc355026	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Rhizobiales;D_4__Beijerinckiaceae;D_5__1174-901-12;Ambiguous_taxa	0.72341	0	0	0	0	1	0	0
c4977e8914634ccb2f5ebefba92e9a2e	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99996	0	0	0	0	0	1	0
9059dcce2e5cbe791c710c24b188a4b0	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Noviherbaspirillum;D_6__Oxalicibacterium sp. MIC3045	0.72849	0	0	1	0	0	0	0
c1d2e35608d3749dfb0bdfc1662c4873	D_0__Bacteria;D_1__Chloroflexi;D_2__Anaerolineae;D_3__SBR1031;D_4__uncultured bacterium;D_5__uncultured bacterium;D_6__uncultured bacterium	0.94237	0	0	0	0	0	1	0

Table D3. QIIME2 output summary of the kit blank and microbial standard DNA extractions prior to any data manipulation. Next Generation Sequencing was executed at NASA Johnson Space Center and all ASV's reported are best matches from the SILVA v132 database.

OTU ID	Taxon	Confidence	Mock Community #1 (PowerSoil)	Mock Community #2 (PowerSoil)	Mock Community #3 (PowerSoil)	PowerSoil Kit Blank	Mock Community #1 (QIAamp)	Mock Community #2 (QIAamp)	Mock Community #3 (QIAamp)	QIAamp Kit Blank	PCR Blank
8ae518dbb29595b3f79214be0b589066	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99930	691	743	748	90	875	777	763	136	0
d46e2205f0c6ecf67b51f83d111c509c	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae;D_5__Escherichia-Shigella	0.98399	9	19	13	0	5	4	5	0	832
ff9d93d7b7e46787568f2d241caeaf3b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99923	215	153	159	0	41	37	44	3	0

a4cbe987942964b584e95e4efab6a176	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus	0.99966	47	50	51	0	41	150	161	1	3
65d43491988bfe557da4d86a5ba25dae	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99999	0	0	0	350	0	0	0	128	0
f4801b7a68515d9005fa572ee6afdf41	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Ralstonia	0.98529	0	0	0	2	0	0	0	310	0
ec9562edcf3986f9a56ee377d8ff737c	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	0	0	0	182	0
0920dcf0f62fb2b3ab9e32f1c4edec37	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae	0.99831	0	0	0	0	0	0	0	1	162
49c38774e7c641195170257209321f60	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.99864	18	19	11	0	33	26	24	3	0
c22b16cc6108c04f29fea3b6d4c81571	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	1.00000	0	0	0	4	0	0	0	123	0
87ace68671b521fa779b33d5fcf2b782	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Enterococcaceae;D_5__Enterococcus	0.99214	0	0	0	109	0	0	0	0	0

05c2d2963f606b1530be56ab8ce2e427	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Bifidobacteriales;D_4__Bifidobacteriaceae;D_5__Bifidobacterium	1.00000	0	0	0	58	0	0	0	0	0
4cbfff144d4e7a4e0f4619ed505be070	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99993	17	15	18	0	1	2	3	0	0
fdc88b7e2191fa6e2a58afd5bb95bc3b	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Chitinophagales;D_4__Chitinophagaceae;D_5__Taibaiella;D_6__uncultured bacterium	0.79952	0	0	0	44	0	0	0	0	0
0f18144d308ada95632ab5193d92073f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.99875	0	0	0	42	0	0	0	0	0
a537d8bab85c83b0e74c73c55790324b	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Caulobacterales;D_4__Caulobacteraceae;D_5__Brevundimonas	0.99996	0	0	0	36	0	0	0	0	0
82dece6e35540738ba450a0c3a90b5a0	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae;D_5__Serratia	0.79885	0	0	0	34	0	0	0	0	0
6e6f306a337ba255a7f4a7f8469ff691	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Cellvibrionales;D_4__Cellvibrionaceae;D_5__Cellvibrio;D_6__uncultured Cellvibrio sp.	0.77458	0	0	0	31	0	0	0	0	0
820f6693f569e339f183638cd73a7fe6	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Lawsonella	1.00000	0	0	0	15	0	0	0	12	0

9a3281f7bae5756d168fff9d203c3203	D_0__Bacteria;D_1__Actinobacteria;D_2__Thermoleophilia;D_3__Solirubrobacterales;D_4__67-14;D_5__uncultured bacterium;D_6__uncultured bacterium	0.98286	0	0	0	0	0	0	0	27	0
d5e94b36ce9cd48d3998cac0bd4784e5	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacteriales;D_4__Weeksellaceae;D_5__Moheibacter	1.00000	0	0	0	27	0	0	0	0	0
28fc5b4c98e618c2d8b58303c777ae23	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Microbacteriaceae	0.99875	0	0	0	22	0	0	0	0	0
cca9da3e03bac557ccba323df253ea41	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Dysgonomonadaceae;D_5__Proteiniphilum;D_6__Inostemma sp. AD-2014	0.91305	0	0	0	21	0	0	0	0	0
70af55dfcef9c183e27503a40c7731a1	D_0__Bacteria;D_1__Proteobacteria;D_2__Alphaproteobacteria;D_3__Sphingomonadales;D_4__Sphingomonadaceae	0.99995	0	0	0	21	0	0	0	0	0
ca9c66d47347c03d0343d6fe03ed8636	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Haemophilus	0.99210	0	0	0	19	0	0	0	0	0
a046fc0d35c7a862e362b39a364c64eb	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Bacillus;D_6__Bacillus thermoamylovorans	0.74268	0	0	0	19	0	0	0	0	0
d8a05ea8aecfcf5910db	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella	0.99719	0	0	0	0	0	0	0	17	0

345be88e712a	;D_6__Prevotella sp. oral taxon 299 str. F0039										
06f825b512d903b9230e1a55d87359ee	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99907	0	0	0	0	0	0	0	15	0
ffe3d871aae9f8bca3a7928de5892a07	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Staphylococcaceae;D_5__Staphylococcus	0.99999	0	0	0	10	0	0	0	1	0
195a54476a1802d75e0e773601fe964b	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Corynebacteriales;D_4__Corynebacteriaceae;D_5__Corynebacterium;D_6__Corynebacterium diphtheriae	0.76377	0	0	0	11	0	0	0	0	0
1945c4b91b36f7b4ceaa63bfbc9857cd	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Bacillaceae;D_5__Geobacillus	0.98341	0	0	0	11	0	0	0	0	0
ee4155701748347fc6175f2e27a3c6e2	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Ralstonia	0.98187	0	0	0	0	0	0	0	10	0
0df6c802966e8670279671824da4f10a	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Lactobacillaceae;D_5__Lactobacillus;D_6__Lactobacillus gasseri	0.79120	0	0	0	0	0	0	0	8	0
f4725bd63f4160a3cbdf8d8d5f3fc2ea	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Pseudonocardiales;D_4__Pseudonocardiaceae;D_5__Actinomycetospora	0.98549	0	0	0	0	0	0	0	7	0
72157e01d951b144c7e9	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Flavobacterial	0.74287	0	0	0	7	0	0	0	0	0

174c09766338	es;D_4__Weeksellaceae;D_5__uncultured;D_6__uncultured bacterium										
3e86e9620a4aceb493a34d5c47723513	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Enterobacteriales;D_4__Enterobacteriaceae	0.99988	3	1	0	0	1	1	0	0	0
e5c19d7800b18015f3a917fc015fc42f	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Enhydrobacter	1.00000	0	0	0	6	0	0	0	0	0
5304985dfc663733868a02280bb35ffb	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Ralstonia	0.98399	0	0	0	0	0	0	0	5	0
dd3a124e0f04306cf546df311a52b727	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Betaproteobacteriales;D_4__Burkholderiaceae;D_5__Cupriavidus	0.99915	0	0	0	0	1	2	0	1	0
0562e97bf8665edd5ae85899297a44a8	D_0__Bacteria;D_1__Deinococcus-Thermus;D_2__Deinococci;D_3__Thermales;D_4__Thermaceae;D_5__Thermus	1.00000	0	0	0	0	0	0	0	0	3
7ddd1a8bfd75292a7e6761daba2045fd	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Pseudomonadaceae;D_5__Pseudomonas	0.87075	0	0	0	0	0	0	0	3	0
c5fc98e6091fa87614b63d42e1d8d8a8	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Streptococcaceae;D_5__Streptococcus	0.99994	0	0	0	3	0	0	0	0	0
4a0b292ba716582f9af4	D_0__Bacteria;D_1__Cyanobacteria;D_2__Oxyphotobacteria;D_3__Chloroplast	1.00000	0	0	0	0	2	0	0	0	0

6694458c0b9b											
b7ae2d92c6199a9e58c97d0e75865d36	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Micrococcales;D_4__Micrococcaceae;D_5__Kocuria	0.99017	0	0	0	0	0	0	0	2	0
6ea8228cb56f8a62f932f0e613bca40e	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Family X;D_5__Thermicanus;D_6__uncultured bacterium	0.94515	0	0	0	2	0	0	0	0	0
fac54fffc3590462dcdb5d93230fbb44	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Propionibacteriales;D_4__Propionibacteriaceae;D_5__Cutibacterium;D_6__Propionibacterium sp. KPL1844	0.76699	0	0	0	2	0	0	0	0	0
3ac9e6ff080f31d2df4d714cd54428c3	D_0__Bacteria;D_1__Planctomycetes;D_2__Planctomycetacia;D_3__Planctomycetales;D_4__Rubinisphaeraceae;D_5__Planctomicrobium	1.00000	0	0	0	2	0	0	0	0	0
22b3c70cdfb1714224e1bf8a6314bee9	D_0__Bacteria;D_1__Firmicutes;D_2__Clostridia;D_3__Clostridiales;D_4__Family XI;D_5__Finegoldia	1.00000	0	0	0	0	0	0	0	1	0
e8386d3a307c208c4b9f0a756259cd6b	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pseudomonadales;D_4__Moraxellaceae;D_5__Acinetobacter	0.99961	0	0	0	0	0	0	0	1	0
0548b11b6de90319756016a02baab332	D_0__Bacteria;D_1__Proteobacteria;D_2__Gammaproteobacteria;D_3__Pasteurellales;D_4__Pasteurellaceae;D_5__Aggregatibacter	0.76064	0	0	0	1	0	0	0	0	0

94852fb419632cfdf82afcef13edc5f6	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Bacillales;D_4__Listeriaceae;D_5__Listeria	0.98897	0	0	0	0	0	1	0	0	0
0e18a6bc90dceab51ae4e0dc0e0ff6d5	D_0__Bacteria;D_1__Gemmatimonadetes;D_2__Longimicrobia;D_3__Longimicrobiales;D_4__Longimicrobiaceae	1.00000	0	0	0	0	0	0	0	1	0
9e75d15ba3717ca20d8aa45e3c4a6bab	D_0__Bacteria;D_1__Firmicutes;D_2__Bacilli;D_3__Lactobacillales;D_4__Leuconostocaceae;D_5__Leuconostoc	1.00000	0	0	0	0	0	0	0	1	0
4c6808ed34aed567fd2ed5ff92d8523e	D_0__Bacteria;D_1__Bacteroidetes;D_2__Bacteroidia;D_3__Bacteroidales;D_4__Prevotellaceae;D_5__Prevotella7;D_6__metagenome	0.99197	0	0	0	1	0	0	0	0	0
ee5a27046acb0f3b757d7c5764384d2c	D_0__Bacteria;D_1__Actinobacteria;D_2__Actinobacteria;D_3__Kineosporiales;D_4__Kineosporiaceae	0.99984	0	0	0	0	0	0	0	1	0