

Evaluating the Auto-MODS: An Emerging Tool for TB Diagnosis

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Does Patient X have tuberculosis (TB)?



Mycobacterium Tuberculosis (MTB) detection

Rough (quick) Exact (slower)

Acid-Fast Bacilli (AFB) Smear

AFB Culture

No growth

Non-TB

Distinguish Mycobacteria

TB

Other Mycobacteria

Drug Susceptibility Testing (DST)

Multidrug Resistant TB (MDR-TB)

TB

Background

- TB is still a prevalent threat especially in developing countries despite being curable and preventable
- MDR-TB prevalence is on the rise
- There is an urgent need for quick, easy, safe and inexpensive techniques for TB diagnosis in resource-limited settings

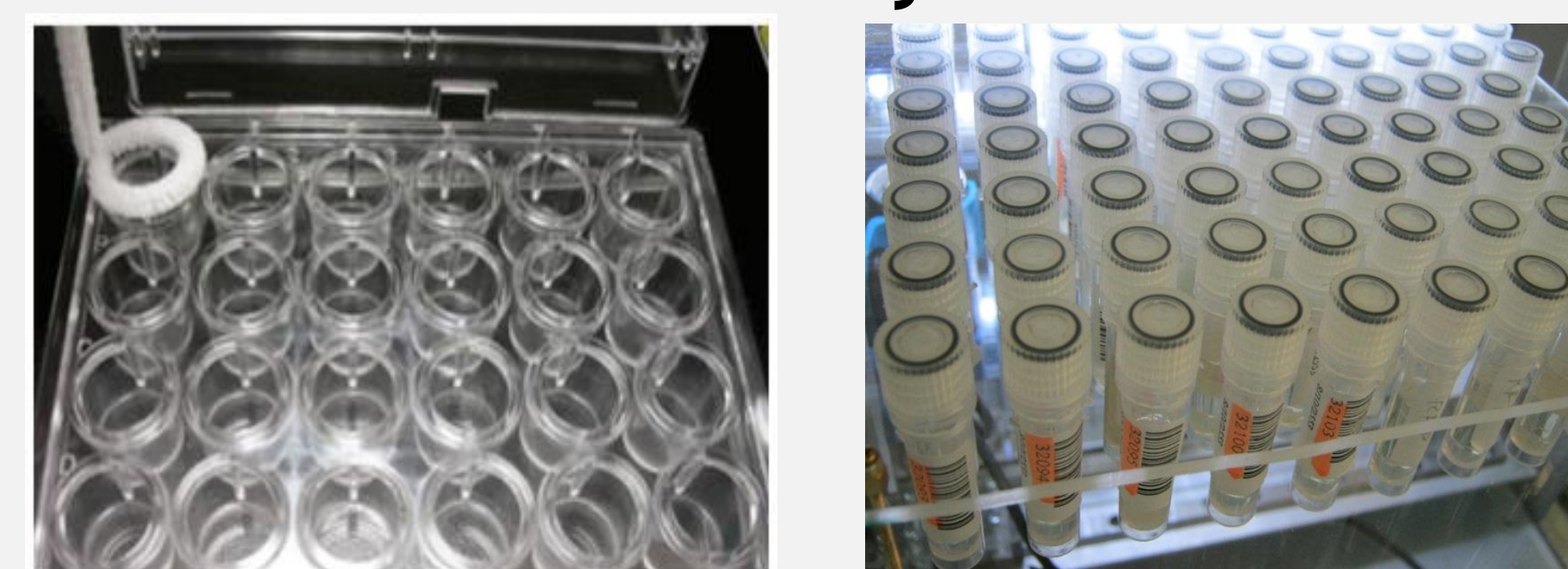
Table 1 - Comparison of current AFB Culture Methods

	Ogawa	MGIT	MODS
Feature	solid	liquid	liquid
Time	slow	quick	quick
Cost	low	high	low
Contamination	less	prone	prone
Biosafety	great	good	concern

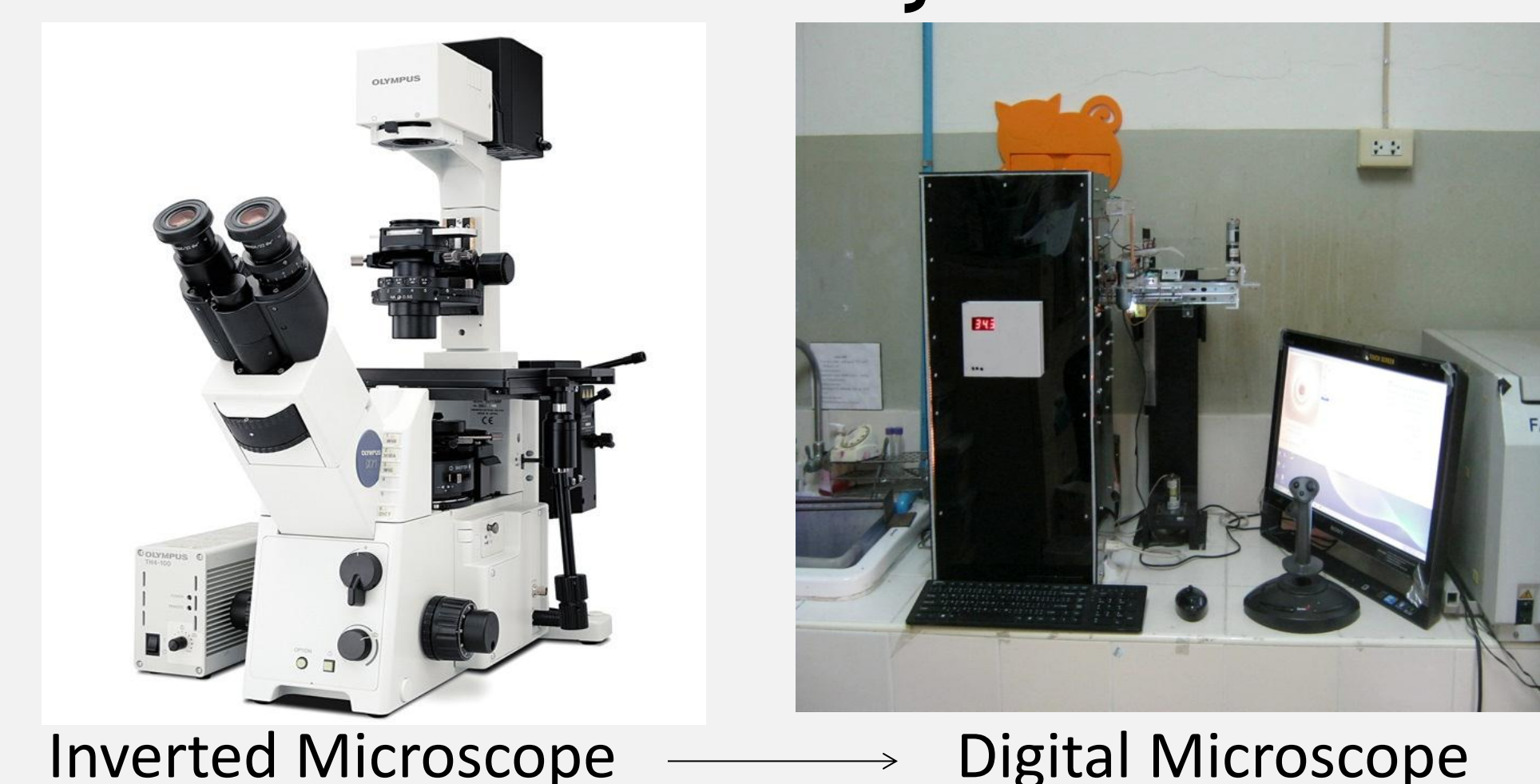
MODS vs. Auto-MODS

- Microscopic Observation Drug-Susceptibility Assay (MODS) is an alternative TB-diagnosis tool for resource-limited settings
- Auto-MODS is a modified version of MODS developed by TB/HIV Research Foundation (THRF), Thailand

Modification 1: Biosafety



Modification 2: Efficiency



Other Modifications:

- Centrifuge samples at a low speed to enhance image quality
- P-Nitrobenzoic Acid (PNB) to differentiate TB and other Mycobacteria (NTM)

Table 2 - Reading results from Auto-MODS' 5 tubes

Culture 1	Culture 2	Culture Result	PNB	INH	RFP	Result
			+			NTM
				+	+	MDR
Positive in either	Positive		-	+	-	Non-MDR
				-	+	Non-MDR
				-	-	Non-MDR
N/N or N/C or C/N	Negative					Non-TB
C/C	Contaminated					Unknown

Objectives & Methods

Objectives:

- Evaluating the reliability of Auto-MODS in detecting TB and MDR-TB
- Evaluate the speed of Auto-MODS in detecting TB

Methods:

- Samples are collected in 17 Hospitals in Chiang Rai, Thailand
- Samples collected prior to or less than 2 weeks after treatment
- Inclusion criteria: New/Relapse TB Patients

279 Eligible Samples

17 Contaminated 6 Data missing

245 Sputum Samples

AFB Culture & DST

TB Non-TB NTM MDR-TB

- Performance of Auto-MODS and MGIT is compared in reference to the truth

Truth: results of MGIT supplemented by Ogawa

Results

Median culture positive time of Auto-MODS:

- 10 days (IQR:8-13)
- > MGIT 6 days (IQR:5-8), P<0.0001
- < Ogawa 30 days (IQR:23-35), P<0.0001

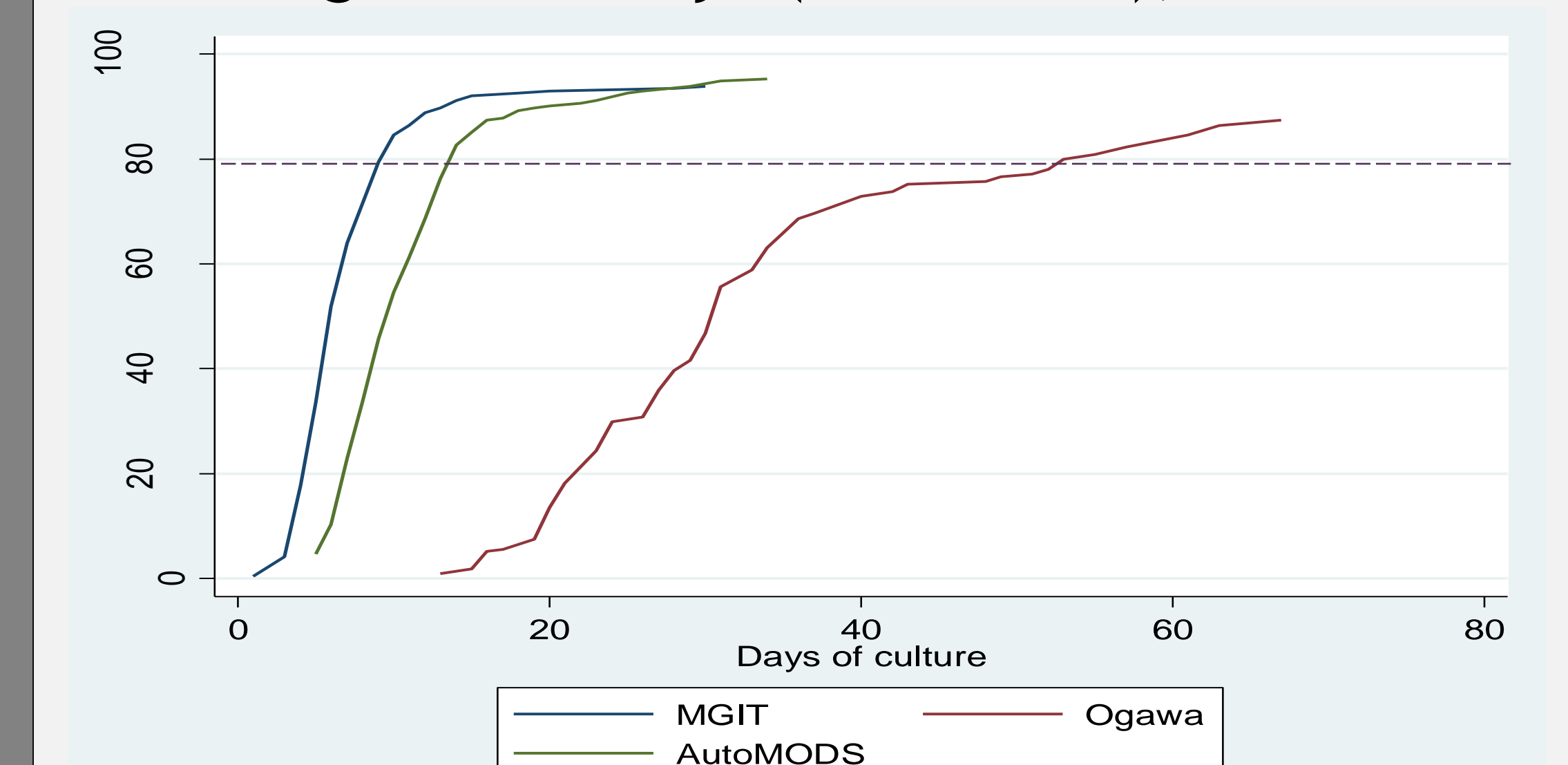


Figure 1 - Cumulative culture positive percentage by time

Reliability of Auto-MODS compared to MGIT:

	Reference (Truth)			
	TB	Non-TB	NTM	MDR-TB
Auto-MODS				
TB	194	3	0	0
Non-TB	3	24	0	0
NTM	0	0	4	0
MDR-TB	0	0	0	2
Unknown	10	4	1	0
Total	207	31	5	2
MGIT				
TB	198	0	0	0
Non-TB	2	29	0	0
NTM	0	0	5	0
MDR-TB	0	0	0	2
Unknown	7	2	0	0
Total	207	31	5	2

	Auto-MODS	MGIT
Agreement	91.4% (87.2, 94.6)	95.5% (92.1, 97.7)
Sensitivity (TB + MDR-TB)	93.8% (89.6, 96.6)	95.7% (92.0, 98.0)
Specificity (NTM + Non-TB)	77.8% (60.8, 89.9)	94.4% (81.3, 99.3)

Conclusion

- Auto-MODS is an efficient and safe tool for TB diagnosis in resource-limited settings
- Limitations: Low number of NTM and MDR-TB samples and contamination concerns