Too Much of a Good Thing: High T Cell Count Can Kill Newborns

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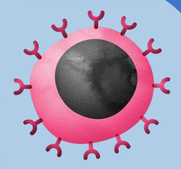
Introduction



- T cells are a type of leukocyte (white blood cell), generated in the thymus, that form the majority of the body's adaptive immune response to pathogens and tumors.
- Helper T cells assist other immune cells and have the CD4 marker.
- Killer T cells can act to destroy pathogens and cancer cells. They have the CD8 marker.
- T cells become activated in the presence of foreign particles in the body called antigens.
- Infants are especially susceptible to infectious diseases.
- Common belief is that they have a naïve immune system and have not yet been exposed to many pathogens and therefore cannot defend against them.
- This immune deficiency can be beneficial for newborns because it prevents too strong of an immune response that otherwise would be detrimental to the health of the newborn.

Purpose

- To find preliminary data in order to further investigate why the immune systems of infants are deficient.
- This can then help us to better understand the neonatal immune system for potential therapeutic interventions to protect infants from disease, while still protecting them from a robust immune response.

Methods

- The spleens of BALB/c strain mice were harvested at different age points from neonates to adults.
- The spleens were processed and stained for different markers and analyzed using flow cytometry.
- In some studies BALB/c mice were infected with *Bordetella pertussis* (whooping cough) at D6 and then euthanized at D9.
- In some studies, adult BALB/c were infected with *Listeria* and euthanized 2 days after.

Results

Fig. 1: A greater amount of T cells was observed in older mice.

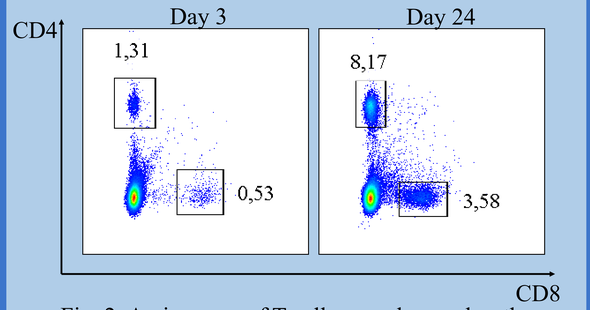
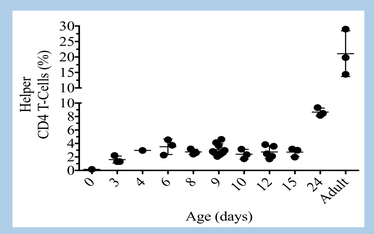


Fig. 2: An increase of T cells was observed as the mice age.



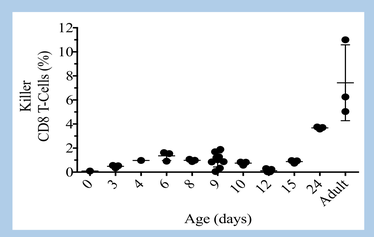
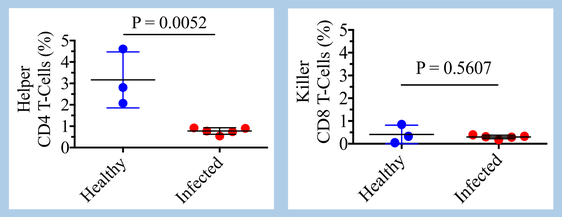
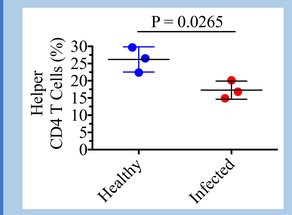


Fig. 3: A decreased amount of Helper CD4 T cells was found in the mice infected with *Bordetella pertussis.* No significant change was observed in the Killer CD8 T cell count.



Results

Fig. 4: A decreased amount of Helper CD4 and Killer CD8 T cells was found in the mice infected with *Listeria.*



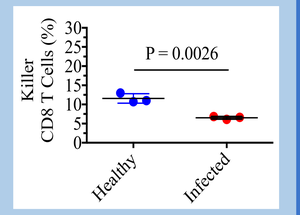


Fig. 5: Cultured *Bordetella pertussis* colonies.

Fig. 6: Cultured *Listeria* colonies.

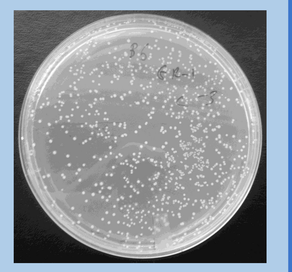
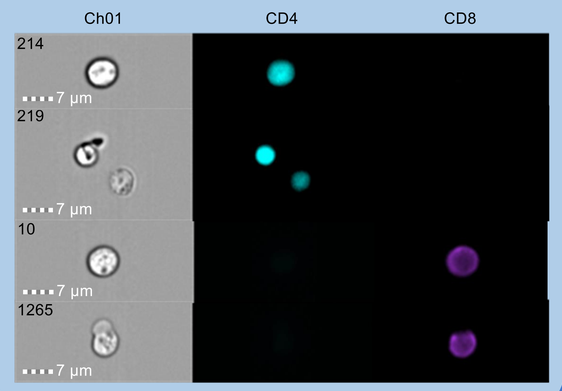


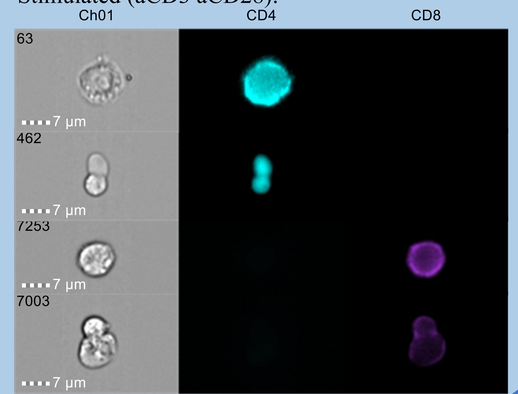
Fig. 7: In the cell imaging stream, cyan fluorescence indicates Helper CD4 markers and purple fluorescence indicates Killer CD8 markers. Larger cells are observed in the activated stream.

Unstimulated:



Results

Stimulated (aCD3 aCD28):



Conclusions

- The helper and killer T cell count increases as a baby ages, which could be accounted to increased exposure to antigens and pathogens that build up the baby's adaptive immunity.
- The helper and killer T cell count in healthy mice was greater than in infected mice, which could be a result of cell death after infection or too short of a time period post infection.
- That babies have a weaker immune system as compared to adults. Fewer T cells can indicate less ability to fight infections.
- This weaker immune response to pathogens can be beneficial for the survival of the newborn.
- The next step would be to investigate other factors that uniquely affect a baby's immune system, to then better understand why it is deficient and to find ways of protecting babies from disease while still protecting them from a powerful immune response.
- From here and onwards, new medicines, methods of care and treatments could stem that would help prevent unnecessary infant death.

Acknowledgments

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