Dr. Wozniak and a Discussion about Cryptococcus Neoformans

Dr. Karen Wozniak, professor at Oklahoma State University, has a PhD in Microbiology, Immunology, and Parasitology. Dr. Wozniak does research in immunology and affecting fungi, specifically examining Cryptococcus neoformans. Dr. Wozniak chose this specific field of research as it pertains to her interests in regards to infections.

Recent research in Dr. Wozniak’s lab includes formulating an immunization which is destined to produce innate memory to combat infection by Cryptococcus neoformans through epigenetic changes. Dr. Wozniak states that, although Cryptococcus neoformans is formally considered a fungi, it is actually similar in some ways to pathogens. This is evident in its very small structure and certain characteristics.

A new discovery made through this experiment was that dendritic cells are actually capable of making memory. This is surprising, as T cells and B cells (important immune cells involved with defensive mechanisms) were initially believed to be the cells which were capable of storing memory, not dendritic cells. Dendritic cells are star-fished shaped defense mechanisms of the immune system which interact with outside invaders (viruses/bacteria/fungi) by phagocytoses (engulfing and consuming), presentation to T cells (which act to degrade or acidify harmful particles), or release of cytokines to attack and kill these unwelcome substances.

Cryptococcus neoformans infection, which generally acts as a secondary infection, can cause serious pulmonary disease, which can potentially lead to meningitis in compromised individuals. Meningitis is when pulmonary infection in the lungs has spread to the brain, causing confusion, mental instability, and eventual death. When asked if there is any way to avoid infection by this fungi, Dr. Wozniak responded that is a very common pathogen, found in a multitude of environments. The best way to avoid infection is to maintain a healthy microflora, which is the normal commensal bacteria that covers each individual. These healthy bacteria minimize risk of infection and over-population by other harmful bacteria or, in this case, fungi. A microflora rich in healthy bacteria provides a means of competition to other invaders by competing for nutrients.

Populations most at risk for infection are those who are immune-compromised. Immune-compromised individuals includes those with a poor quantity of autoimmune helper cells or patients on antibiotics. Antibiotics, although helpful in many instances, can actually kill the natural flora of bacteria on an individual, allowing harmful fungi to proliferate and cause infection.

Dr. Wozniak successfully designed a dendritic-cell specific vaccination which will induce dendrites to retain memory for Cryptococcus neoformans, and degrade fungus cells via phagocytosis. Dr. Wozniak states that, although research has yet to be done on humans, this means of vaccination has been successful when tested on lab rats with no negative side effects.

References

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