**New Findings of Heme Acquisition for Tuberculosis**

Tuberculosis is an infectious disease of the lungs that results from an invasion of the bacteria Mycobacterium Tuberculosis. Dr. Avishek Mitra is a microbiologist at Oklahoma State University who is studying *Mycobacterium tuberculosis* and has published an interesting article that highlighted the resilience of tuberculosis based on all the metabolic pathways that are dedicated for acquiring iron. Before covid-19, Tuberculosis was the highest infectious disease in the world. Dr. Mitra describes why Tuberculosis is so successful at infection.

“What makes Tuberculosis (Tb) such a successful pathogen, is because it has an amazing capability to stay dormant.” - Dr. Mitra. Tuberculosis has several other factors such as having the potential to be extremely resistant to treatment and its ability to bind heme. Hemoglobin is the most abundant source of iron in the human body and blood is rich in hemoglobin, Therefore, the body is a big source of iron for pathogens like *Mycobacterium tuberculosis*. Luckily, the body has developed ways to combat the invasion of pathogens by restricting the iron in the body. This can keep pathogens from becoming infectious, However, this can also result in a more resilient form of Tuberculosis. All the contributing factors described above are clear indications on why Tuberculosis held a title of the most deaths caused by an infectious disease before the pandemic of Covid-19.

The paper titled “Heme and Hemoglobin utilization by *Mycobacterium tuberculosis’* written by Avishek Mitra describes the different ways *Mycobacterium tuberculosis* are able to get iron through heme, a component in the blood that is rich in iron. Tuberculosis more specifically, Drug Resistant Tuberculosis becomes very resilient to the body’s natural response to restrict iron and will begin to use other pathways to acquire iron more freely, some of the ways are using special proteins that are specific to binding heme, along with transporting systems that help with heme uptake. These mechanisms have been known to occur even in latent tuberculosis, which is a dormant form of the mTb.

“. . .it just kind of stays inactive but in respect to the immune system. So there are still all the mechanisms of iron acquisition that we know are present in Tb, are still happening in that latent stage but at a very low level. . .” – Dr.Mitra

Furthermore, it was discovered that mTb can bind to albumin, a very abundant enzyme in the body, especially the liver. Albumin has several important functions such as retaining liquids in the blood, and acting as a carrier for enzymes and important proteins. (Hankins pg 1, p 1)

“. . . . we know that albumin binds heme, it forms a complex. So . . .what we found is that mTb not only uses freely, it can also use heme when it is complex to albumin. . . That is what we found in our study and the reason it is important is because albumin is the most abundant protein in our body. so for mTb to be able to use albumin and complex heme suggest that it has developed many different ways of utilizing heme depending on what part of the body it is in. so that's the relevance.”-Dr.Mitra

With these recent discoveries, it is clear that potential treatment that focus on stopping the binding of heme all together in mTb can be possible and a step closer to fully understanding this infectious pathogen.

References

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