

Mastery Series: Tuberculosis

1. Is *Mycobacterium* oxidative or oxidative and fermentative?
2. How might being "slow-growing" a possible advantage for *Mycobacterium*?
3. How is living within macrophages a possible advantage for *Mycobacterium*?
4. What percent of the world estimated to be infected with *Mycobacterium*?
5. What percent of those infected will go on to develop active infection?
6. Describe the Pathogenesis of *Mycobacterium*.
 - a. How might either extreme of immunosuppression or excessive immune response lead to the spread of *Mycobacterium*?
7. What are the symptoms of active TB?
8. How is TB transmitted?
9. What is the PPD skin test?
 - a. Give an example of a false positive and a false negative result on the skin test.
10. How can a chest X-Ray be used to help diagnose TB?
 - a. Can a chest X-Ray determine active versus latent TB?
11. What is the standard treatment for latent TB?
12. How does isoniazid work?

Mastery Series ANSWERS: Tuberculosis

1. Is *Mycobacterium* oxidative or oxidative and fermentative? **oxidative**
2. How might being “slow-growing” a possible advantage for *Mycobacterium*? **It may not spread easily or quickly, but it is less susceptible to antibiotics since it does not have a rapid division rate or metabolism!**
3. How is living within macrophages a possible advantage for *Mycobacterium*? **It hides from the host immune system.**
4. What percent of the world estimated to be infected with *Mycobacterium*? **1/3**
5. What percent of those infected will go on to develop active infection? **10% of the those**
6. Describe the Pathogenesis of *Mycobacterium*. **Waxy coat allows *Mycobacterium* to survive in aerosol droplets. WBCs in the lungs engulf the bacterium, but are unable to destroy it, due to its waxy coat. The bacteria may continue to slowly divide and live inside of alveolar WBCs for many years. Fibroblasts and lymphocytes “wall” off areas of the lungs that are infected with collagen fibers that are visible on an X-Ray. This type of “quarantine” is called a granuloma.**
 - a. How might either extreme of immunosuppression or excessive immune response lead to the spread of *Mycobacterium*? **Immunosuppression may allow the bacteria to spread further in the lungs, or to other organs. Excessive immune response may actually kill off many macrophages and allow the spread of *Mycobacterium*.**
7. What are the symptoms of active TB? **Productive cough, fever/chills, weight loss (consumption)**
8. How is TB transmitted? **Droplet aerosols**
9. What is the PPD skin test? **A small amount of purified *Mycobacterium* proteins are injected into the skin. If a person makes antibodies to *Mycobacterium*, they will have a raised bump on their skin. The diameter of the reaction is measured to determine if the person has had a “positive” TB skin test**

False Positive Example: Patient has been vaccinated with BCG (TB vaccine) –evidently a blood titre is a better way to check for TB in vaccinated individuals. Doesn’t that make you wonder how effective the vaccine is?

False Negative Example: Patient’s immune system is not able to make antibodies to *Mycobacterium*, but it is present in the body.
10. How can a chest X-Ray be used to help diagnose TB? **Granulomas can be seen.**
 - a. Can a chest X-Ray determine active versus latent TB? **NO!**
11. What is the standard treatment for latent TB? **Isoniazid for 9 months (needed to be this long because *Mycobacterium* divides VERY slowly)**
12. How does isoniazid work? **Inhibits *Mycobacterium* from forming its waxy wall**