Tuberculosis

Natalie Giangiulio, Joshua Giles, Olivia Garcia, Neunghun Heo, Alexis Gilreath, Maddy Gavin
**History**

Tuberculosis, or commonly referred to as TB, made its presence known by claiming its victims since the early 18th century. This disease has followed humanity for the last 4,000 years. Scientists know this from studying the remains of Egyptian mummies where there was evidence of boney tuberculosis. During that time period, Tuberculosis was known as consumption, white death, or the white plague. Overseas deployment and close living quarters among the poorer classes put people at risk for this disease because it was a transmissible disease and spread in close quarters. TB targeted poor classed due to close quarters and overseas deployment. What is classified as TB is made up of a bacterium called Mycobacterium Tuberculosis. This bacterium was first discovered back in March 24th, 1882 by a man with the name of Dr. Robert Koch. Dr. Koch was known as a German physician and scientist that had an interest in discovering what caused anthrax, cholera, tuberculosis. After the discovery of the bacterium, his experiments led him to develop 4 postulates that he used as a guideline for isolation of the organism and its growing pure cultures. What helped Dr. Koch isolate the causative agent was the work of another scientist named Jean Antoine Villemin who previously discovered TB to be a transmissible disease. Prior to Dr. Koch, Hippocrates estimated that the death toll this disease was one billion people. However, after Koch made his discovery of mycobacterium tuberculosis, the annual death rate was reaching nearly seven million people.

**Type Of Organism**

Tuberculosis is a bacterial disease caused by a certain bacteria called, mycobacterium tuberculosis. This bacterium is a gram-positive bacterium that requires oxygen to grow. For this reason, Tuberculosis typically attacks the lungs; however, tuberculosis can attack any part of the
TUBERCULOSIS

body as well such as the brain and spine since they require oxygen to function as well. This microorganism differs from other types of bacteria because of the coding that makes up the bacteria. Tuberculous is found to be a slow-growing pathogen that holds about four thousand genes, mainly consisting of the nitrogenous bases guanine and cytosine. This large portion of coding houses blueprints for the creation of enzymes that specifically attack lipids. Mycobacterium tuberculosis is classified as an actinobacteria (acid fast bacteria). Another interesting fact of the disease is the way it works while viewing the bacteria on a microscopic level. The bacteria has shown that it can sometimes remain dormant in a body for that whole person's life. This inherently aids the survival of the bacteria because the immune system is more easily worked around when the bacteria remains dormant, eventually developing a tolerance for the antibodies that would otherwise eliminate the invading agent. However, this hinders the spread of the disease because, while dormant, tuberculosis cannot be transmitted, remaining in the same body sometimes without showing any symptoms. As stated, while it remains dormant, it results in something called bacilli which flows into the bloodstream and spreads throughout one’s body which causes the serious complications in humans.

**Disease**

Depending on where mycobacterium grow in the body, tuberculosis symptoms vary. When the infection exists in the lungs (pulmonary tuberculosis), victims have been shown to have a persistent cough that may last up to three weeks, accompanied by chest pains, fever, and coughing up blood. In some cases, the disease can be in the kidneys (renal tuberculosis) or spine (Pott’s disease). When it’s in the kidneys, patients have noticed the presence of blood in the urine, and when it infects the spine, they document having persistent back pains. Tuberculosis is
TUBERCULOSIS

a an airborne disease, meaning that it is highly contagious and easily spread through the air through coughing, speaking, sneezing, and even singing. The contraction of tuberculosis is dependent on several factors. Susceptibility is one of these, with the elderly and the young or immunosuppressed being prime target for infection. Another factor is how much of the droplet nuclei are in the air at the time of contact, or how long these particles remain in an area. If the disease is contracted, it has been shown to have an incubation period anywhere from three to ten weeks before any signs or symptoms are even made apparent. Although blood and skin tests can be performed to detect tuberculosis, the most common way of detecting and diagnosing the disease is through a full physical examination and a skin test. Skin tests involve having small amounts of PPD tuberculin injected below the skin on the forearm and checked for swelling within 48-72 hours.

**Prevention**

The primary prevention method for Tuberculosis is to first identify those with the disease as early as possible. There are a few other methods in limiting the exposure among humanity such as a education of the general public, a vaccine, TB test, and/or a personal respiratory protective device. As far as education goes, people need to be aware of who is at a high risk. These individuals who classify under high risk would be those infected with HIV, the elderly, infants and adolescents, and those who partake in injecting illegal drugs. Education cannot prevent TB all together, so the Bacillus Calmette-Guerin (BCG) vaccine, which was developed back in 1920. In children, this vaccine acts as a very reliable protection option; however, successful protection against pulmonary TB in adults can be questionable. A TB test is not necessarily a prevention, but it allows the first step in identifying those infected in efforts to start
treatment and prevent others from others coming in contact. With the TB, if one tests positive
their next step would be a chest x-ray, where they will determine if it is TB disease or Latent TB
infection. For those diagnosed with Latent TB infection, chemoprophylaxis exists as a treatment
in order to keep the bacterium from becoming active. If an individual starts having symptoms of
those related to TB, they may think otherwise due to the symptoms being related to other
illnesses. If this is the case, a personal respiratory protective device, or in other words a “mask”,
may be beneficial in reducing the risk of it spreading. Mycobacterium Tuberculosis can live in
the air for up to 4 hours so a mask protects the droplets form dispersing in the air acting as a
secondary prevention method.

**Treatment**

Tuberculosis (TB) can be treatable with a combination of different drugs, as well as, an
abundance of time to allow these drugs to break down the bacteria. A person who is infected
with the Tuberculosis Disease may undergo different stages of the treatment process depending
on the level of severity and the progression of the disease. For example, there are first line drugs
used to treat newly infected patients and second line drugs to treat patients that show drug
resistant Tuberculosis. Typically the first line drugs are labeled as “intense” within a 2 month
period, whereas, the second line drugs are more of a “continuous” type of treatment due to
bacteria being more drug resistant. Mycobacterium Tuberculosis contains two bacterial
subpopulations. The first subpopulation tends to be more reactive to the drug. The second
subpopulation, on the other hand, shows more resistance to the medication. Those with drug
resistant TB, the resentence to one or multiple TB drugs, suffer from life-threatening results. In
efforts to treat those with drug resistant TB, two new medications have been created called
bedaquiline and delamanid. Some of the TB drugs used may hold benefits, but can cause side effects as well. Some patients might experience fever, nausea or vomiting, dark urine, and/or in some cases color blindness.

References


Historical Perspectives Centennial: Koch's Discovery of the Tubercle Bacillus. (n.d.). Retrieved February 04, 2018, from https://www.cdc.gov/mmwr/preview/mmwrhtml/00000222.htm


