Tetanus

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Overview:
Tetanus is caused by the bacterium Clostridium tetani which usually enters the body through a wound in the skin. The toxin produced by C. tetani interferes with the release of neurotransmitters and blocks inhibitor impulses. This causes the muscles to become stiff and can also cause spasms. It can be prevented with proper vaccination but it can possibly be fatal.

Name and history:
Tetanus was first discovered in 1884 by Carle and Rattone, when it was isolated in soil. In 1897, the usefulness of an antitoxin and passive immunization was utilized in humans. There is evidence that tetanus has been around since the 5th century BC. Tetanus is also commonly referred to, as “lockjaw” because that is one of the first common signs is muscle stiffness of the neck muscles. It is caused by the bacterium Clostridium tetani and vaccines became common by World War II.

Transmission:
Tetanus is not transmitted from individual to individual; it is passed from an object to a break in the skin. Common methods to obtain tetanus are through dirt, spit, burns or objects puncturing the skin. Tetanus can also be obtained from surgical procedures, insect bites, compound fractures or IV drug use. Once C. tetani is inside the individual the bacterium will produce spores that will be toxic to the human’s nervous system.

Reservoir:
C. tetani is found everywhere in the environment, but primarily in the soil and dust. Occasionally the bacterium will be found the intestines and manure of animals. The bacterium can also possibly be found in contaminated heroin.

General Characteristics:
C. tetani is a gram-positive, anaerobic bacterium that is rod shaped, it can develop a terminal spore and consequently can have a drumstick appearance. The spores of the C. tetani are resistant to heat as well as many antiseptics but the actual bacterium is very sensitive to heat and will not survive in the presence of oxygen. The spores are found in soil as well as animal feces and will progress to bacterium once they are in a favorable environment. Many individuals can be harboring the spores to the bacterium. The taxonomy of the bacterium from kingdom to species is Bacteria, Firmicutes, Clostridia, Clostridiales, Clostridiaceae, Clostridium and Clostridium tetani.

Signs and Symptoms:
There are three different types of tetanus: generalized, localized, and cephalic. The most common type is generalized and the common symptoms include headache, jaw cramping, involuntary muscle tightening, muscle stiffness, trouble swallowing, body jerks, seizures,
fever, sweating, high blood pressure and a fast heart rate. Localized tetanus is uncommon but occurs when the individual has constant contraction of the muscles in an area right around the wound. Cephalic tetanus is very rare but usually stems from an ear infection. If tetanus progresses then it can include complications such as laryngospasm, which is spasms of the vocal cords, bone fractures because of muscle contractions. Pulmonary embolism, pneumonia and death can also be symptoms of progressed tetanus. Tetanus is considered a medical emergency and approximately 10-15% of tetanus cases are fatal.

Virulence Mechanisms:
Once the spores are exposed to an anaerobic environment and germinate to the bacterium. The toxins are produced from the bacteria and then are sent to the body through the circulatory and lymphatic systems. Two toxins are produced, one is tetanospasmin which is a neurotoxin that causes the tetanus symptoms to manifest. This toxin binds to several sites in the nervous system including the spinal cord, the brain and the ends of peripheral motor nerves. This toxin binds and prevents the release of neurotransmitters, which then blocks inhibitor impulses from firing. When the impulses are prevented it causes the muscle stiffness. C. tetani has an incubation range of 3-21 days but averages 10 days, shorter incubation periods are associated with a higher chance of death. There is not a laboratory test for the tetanus bacteria and it is diagnosed solely on clinical symptoms.

Prevention:
The best method of prevention is to get the tetanus vaccination (requires three doses) as a child and then to get subsequent booster shots as an adult. It is recommended to get tetanus boosters every 10 years as an adult. The vaccine includes a tetanus toxoid and the most common ones are Td and DTaP. Adults are recommended to replace one dose of Td with a dose of Tdap in booster shots. In addition, thoroughly cleaning wounds and dressing them appropriately helps prevent the spread of tetanus.

Control/Treatment:
Tetanus is normally treated with tetanus immune globulin (TIG), which removes the toxin produced that has not yet bound to the nerve endings. In addition, tetanus toxoid booster, agents to control the muscle spasms and antibiotics are given to the individual. Depending on the progression of the disease the individual might be given assistance breathing or maintaining an open airway. Having the illness will not make the individual immune to subsequent infections.

Current Information:
There are an average of 29 cases reported each year in the USA from 1996 to 2009 and it mostly consists of individuals that have not received the tetanus infection. In 1989 neonatal tetanus was recognized as a public health problem and an initiative was launched to eliminate neonatal tetanus. There are still thirty-four countries who have yet to eliminate maternal and neonatal tetanus.
Works Cited


