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Smallpox Infectious Disease

By: Miranda Allbee and Brandon Smith

Smallpox Infection

Immune Response: When viruses enter the bloodstream, the immune system usually produces a substance called interferon-gamma. The interferon-gamma helps the body fight off disease and stops viral replication. However, when the smallpox virus enters the bloodstream, it contains a “weapon” to invade the immune system. This weapon is called an interferon-gamma binding protein. This protein binds with the interferon-gamma and immobilizes it, making the substance no longer able to activate the immune defenses. The smallpox virus then replicates and can cause extensive damage. The smallpox virus is also known to have a complementary regulatory protein. This protein inactivates the complementary system, so the host cell is not targeted by the mediated attack of the immune system. The virus enters through the mouth and the throat and successfully evades the first line of defense. The second line of defense sends white blood cells to find the virus and destroy it; however, the virus is already in a cell, hidden from b-cells. The third line of defense is activated, but smallpox has a specialized protein that binds with the interferon-gamma, making the body think that everything is going properly (Saint Louis University, 2008).

Progression: After the initial symptoms an early rash begins to form (lasts about 4 days) and smallpox sometimes contagious during this phase. A pustular rash is next (lasts about 5 days) and is contagious. During the third stage/phase pustules and scabs forms (lasts about 5 days) and is very contagious. Finally resolving scabs (last about 6 days) and is not contagious. There is no treatment option that kills the smallpox virus, but there are some treatments to relieve the symptoms. Intravenous (IV) fluids, medications to control fever, or pain antibiotics to prevent secondary infections from bacteria (CDC, 2007).

Prognosis: Smallpox has a fatality rate of 30%. Normally smallpox is chronic; people who do get smallpox do not die. After a couple of weeks, the smallpox virus should be out of the body completely and symptoms and rashes will no longer be evident. There is no recurrence, because memory cells remember the virus to stop it immediately next time (CDC, 2004).

Smallpox Treatment

Options: There is no treatment for the smallpox virus, only a vaccine to prevent it. There are also ways to help manage the symptoms of this virus. The Intravenous (IV) fluids, pain antibiotics to relieve pain and to prevent secondary infections from bacteria, and medications to control fever, are the ways to help treat the symptoms of this virus (Donaldson, Kramer, and Lim, 2004).

Mechanism: The smallpox vaccine (vaccinia virus) is the only known way to prevent this disease. This vaccine contains the live smallpox virus to help the body become immune to this disease. Four or five days after receiving the vaccine, a red and itchy bump appears at the vaccination site. At this point, the rash is contagious. A week after the vaccination, the bump becomes a blister and fills with pus. In the second week, the blister develops into a scab. In the third week, the scab eventually falls off, making the disease no longer contagious. The live virus injected to help the B memory and killer T cells help remember this virus the next time it appears (Donaldson, Kramer and Lim, 2004).

Emerging: Scientists and doctors are trying to develop a new drug or treatment for the smallpox disease. The smallpox virus contains a harmful interferon-gamma binding protein. The interferon-gamma binding protein binds with the interferon-gamma, stopping the good protein form binding with the substance, and eventually helps spread the smallpox disease. Since the interferon-gamma binding protein is harmful, scientists are developing a drug to help stop the binding between the good interferon-gamma and the harmful protein (Donaldson, Kramer and Lim, 2004).

References available upon request.