

Infectious Disease: Chicken Pox & Shingles

Name of Student

Institution

Course

Professor

Date

Introduction

Varicella-zoster virus (VZV) is a member of herpes family that causes Chickenpox (varicella) and shingles (herpes zoster). It is highly contagious and common childhood illness. The disease is more severe if it develops in an adult than it is in children. Varicella-zoster virus remains inactive in the body for many years after the first attack by chickenpox. Herpes zoster (shingles) occurs when the inactive virus becomes active again. The virus leads in causing human viral disease because it is second to influenza virus. The virus can invade the host immune response by avoiding complete activation. An infected person develops extremely itchy blisters. The virus is not dangerous, but for people with compromised immune system it can become complicated. The disease is becoming less common due to the introduction of the chickenpox vaccine.

Structure and Morphology of Infectious Agent

Herpes viruses are enveloped and they bud from the inner nuclear membrane. The virus has a round or polygonal shape and a visible central dot. Its size varies between 120 to 300 nm. An average of 30-35 polypeptides is involved in the assembly of the virion. The virion has four distinct components, which include envelope, capsid, tegument and core with genome.¹

The virus DNA is double-stranded with two envelopes. The outer envelope has a trilaminar appearance and surrounds the core of the virus that contains proteins and lipids. The core has a dumbbell shape and contains double-stranded DNA. The particles in the envelope have a diameter of 180-200 nm. Underneath the envelope lies the tegument layer and it does not have distinct properties. Tegument has encoded proteins and enzymes that are

¹ Bionity.com. (2014). *Herpes_zoster*. [online] Retrieved from: http://www.bionity.com/en/encyclopedia/Herpes_zoster.html [Accessed: 2 Mar 2014].

responsible for the initiation of replication. The genome is located inside the nucleocapsid. The core is composed of the DNA coiled on a protein axis. The size of the genome differs, but cytomegalovirus has the largest genome. Capsid has a doughnut shape with a diameter that varies between 100-200 nm.²

Effects on Human Physiology

The initial step of infection occurs when the virus is attached to the host cell. Varicella-zoster virus enters the host through the respiratory track, penetrates the cell and move to the mucous membrane. The virus reaches the cell membrane and releases the core protein in the host cell. The virus replicates in the cytoplasm. The virus starts DNA replication and transcription without relying on the host enzyme to initiate the process. Chickenpox first affects the tongue and mouth by forming small red spots. The spots advance to form sores, which burst and release virions into the mouth and throat. Within 24 hours, the rash start appearing on the face and later spreads throughout the body surface. As it spreads throughout the body, it infect the lymphatic system and later presents lesions, pustules and scabs causing scarring all over the body.

Symptoms

Varicella-zoster virus has an incubation period of up to 20 days for the first symptoms to appear. The initial symptoms include a sudden fever of about 105 degrees Fahrenheit, headache, loss of appetite and swollen glands. This is followed by very itchy rash that progress from red bumps to fluid-filled blisters. The blisters initially occur on the face, chest and abdomen. The symptoms reduce once the rash breaks out. New blisters

²Oxman, M., Levin, M., Johnson, G., Schmader, K., Straus, S., Gelb, L., Arbeit, R., Simberkoff, M., Gershon, A., Davis, L. & Others (2005). A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults. *New England Journal Of Medicine*, 352 (22), pp. 2271--2284.

forms as the old ones scab and dry until after two weeks all the sores have healed. Each blister may take about four days to dry from the scrub. The number of blisters varies in number from one patient to another because some may have few while others have hundreds.

Shingles occur in adults and two to three symptoms stages occur. The first phase is the prodrome, in this phase warning symptoms appear 3 days before the outbreak of the infection. Some of the symptoms include nausea, chills, fever, itching, burning sensation and muscular aches. The second phase is active infection, in the phase a rash appears on the trunk, legs, arms, face or neck. The rash starts as small red clear spots and within 24 hours spread to other parts of the body just as with chickenpox. If the blisters do not heal within 7 to 10 days, the shingles go the next phase that is the postherpetic Neuralgia. In this phase, the pain persists for more than a month and typical symptoms include extreme sensitivity to temperature change, persistent pain that come and goes, aching and burning sensation. Unlike chickenpox, shingle is never transmitted from one person to another, but occurs when the inactive virus becomes active again.

Epidemiology

The virus can only infect humans it is spread through person-to-person interaction by inhalation of droplet nuclei. Most of the transmission occurs through close face-to-face contact with an infected person. Other forms of transmission include airborne and fomite transmission. Objects such as clothes and blankets, which are contaminated with the Varicella, may serve as a route to spread the virus. In addition, physical contact with a chickenpox pustule may also transmit the virus. The virions are found in the mouth and nose secretions and when an infected person coughs or sneezes the air droplets can infect a health person. Ventilation systems in a building may be another source of encountering virion.

There is no relationship between the virus and seasons, but it is strongly related to increasing age.

The virus mostly affects children less than 10 years of age with, about 75-90% of chickenpox cases occurring in children. Each year about 4 million cases of chickenpox were reported in the U.S before the varicella vaccine became available in 1995. The aging process increases the risk of attack by the herpes zoster virus with the risk of postherpetic neuralgia increasing after age 60. People with immune deficiency are at a higher risk of attack by the varicella-zoster virus because the virus attacks the lymphatic system. Other than age, psychological stress, exposure to immunotoxins and mechanical trauma are possible risk factors.

History

The name chickenpox was derived from the way the virus makes infected skin look like a freshly plucked chicken. There was affliction similar to chickenpox 2,000 years ago in ancient Babylonia. The first description of chickenpox was given between 1510-1580 by Giovanni Filippo. In 1767, William Herberden showed that chickenpox was a mild disease and insisted that victims remained immune.

In 1875, an infectious causal agent of chickenpox was discovered, Rudolf Stainer demonstrated this by taking fluid from the blister of an infected individual, rubbed it to health volunteers, and they were infected with an itchy rash. Chickenpox was confused with smallpox until 1953 when Thomas Huckler established a way of differentiating the two. In 1940, the virus was not thought to be contagious until 1942 when it was recognized that risk of herpes zoster infection increased in frequency with advancing age. In the 1920s, it was confirmed that chickenpox and shingles were related infections. Takahashi developed the first chickenpox vaccine in 1972.

Treatment and Recovery

It is easy for health care provider to diagnose a patient who is suffering from chickenpox or shingles by observing the symptoms although it is easy to confuse it with smallpox. In some cases, the doctor the doctor can do other tests to distinguish between varicella-zoster and herpes simplex viruses. Three tests can be done to identify the virus they include virus culture, Immunofluorescence assay and polymer chain reaction. Chickenpox patients can relieve discomfort by taking acetaminophen. Soothing baths refer to frequent baths that help to relieve itching. Patients can apply over the counter lotions to the blisters to soothe the skin.

There is no cure for the Varicella-zoster virus, only repeated vaccination program can help to eradicate the virus. There are two varicella vaccines, chickenpox and shingle vaccines. The chickenpox vaccine is administered to children, adolescents and adults while shingle vaccine is for adults over 60 years. The chickenpox vaccine provides an individual with immunity up to 5 years and provides immunity protection to more than 95% of vaccinated individuals. In addition, patients can use antibiotics to reduce chances of secondary infection due to bacterial infections associated with the virus. Majority of chickenpox patients recovers though 30 percent die from the disease.³

Chickenpox can lead to serious complication under certain circumstances. Cases of complication occur in infants, pregnant women and individuals with weakened immune system. Pregnant women who receive the vaccine usually result in stillbirth. Serious complications from chickenpox include pneumonia, sepsis, skin infection and inflammation

³ennstatehershey.adam.com. (2014). *Shingles and chickenpox (varicella-zoster virus) - penn state hershey medical center*. [online] Retrieved from: <http://pennstatehershey.adam.com/content.aspx?productId=112&pid=10&gid=000082> [Accessed: 2 Mar 2014].

of the brain. Finally, survivors of chickenpox and shingles are left with disfiguring scars on the body.

References

1. Bionity.com. (2014). *Herpes_zoster*. [online] Retrieved from: http://www.bionity.com/en/encyclopedia/Herpes_zoster.html [Accessed: 2 Mar 2014].

2.Oxman, M., Levin, M., Johnson, G., Schmader, K., Straus, S., Gelb, L., Arbeit, R., Simberkoff, M., Gershon, A., Davis, L. & Others (2005). A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults. *New England Journal Of Medicine*, 352 (22), pp. 2271--2284.

3.Pennstatehershey.adam.com. (2014). *Shingles and chickenpox (varicella-zoster virus) - penn state hershey medical center*. [online] Retrieved from:

<http://pennstatehershey.adam.com/content.aspx?productId=112&pid=10&gid=000082>

[Accessed: 2 Mar 2014].