Adenovirus

Conjunctivitis, Pinkeye, these are names that make mothers and grade school teachers shudder. The cause of this illness is a virus called Adenovirus. The adenovirus is well known for its relationship with pinkeye, but many may not know that the adenovirus is one of many viruses that cause the common cold. In this paper we will look at the form and structure of the adenovirus, we will discuss how the adenovirus is spread, we will look at the pathogenesis of the adenoviruses, and finally we will discuss the treatment as well as the preventing the spread of adenovirus.

Virus Structure

Adenovirus is a member of the *Adenoviridae* family, which contains viruses with double stranded DNA. (Stetzenbach & Yates, 2003). The first time the adenovirus was isolated was in 1953. The virus its self was found in adenoid gland tissues that had been grown in a culture, hence the name ADENOvirus. (Lyles, 1969). The structure of the virus has special features that allow the virus to attach and replicate. The adenovirus is a naked icosahedral capsid that has spikes extending off of the capsid. Being that adenovirus is a virus its size is relatively small, around 60-90 nm (Bauman, 2007). When an adenovirus infects a cell, the adenovirus-infected cells make soluble virus specific antigens; these antigens can help in the identification of the virus when it is in humans. All of the antigens can be separated by the methods of column chromatography. (Lyles, 1969).

Replication

We the adenovirus infects a cell the replication process can be split into two specific phases, the early phase and the late phase. In the early phase, the virus will enter the host cell and pass its genome into the nucleus of the infected cell. The virus then begins selective transcription and translation of the first line of genes. (Russell, 2000). The transcription of the viral genes is broken up into several events where genes are involved in complex splicing events. In adenovirus transcription, the four early events are termed E1, E2, E3, and E4. The events o through a complex step-by-step process of gene sharing and protein adding and taking processes which blends the viral genome into the DNA of the host cell. (Lederberg, 200). In the early phase the infected cell continues to function as it would which allows the virus to replicate and grow unnoticed. The final step in the early phase is the assembly of the viruses and maturation in the nucleus. The early phase of adenovirus replication takes 6 to 8 hours. (Russell, 2000). The late phase of the adenovirus infection

involves the process of the assembled adenoviruses leaving the infected cell. The adenoviruses being assembled in the nucleus of the infected cell cause the membrane to become permeable with allows a gathering of viruses in the infected cells cytoplasm. The final step of the late phase is when the viruses disintegrate the plasma membrane of their host and are released from the cell. The late phase takes less time then the early phase producing more viruses in 4 to 6 hours. (Russell, 200).

Respiratory Disease

The most common form of disease that shows up in humans is an acute respiratory response. In this respiratory response, the symptoms are similar to those of the common cold; there are at least 30 different types of respiratory adenoviruses. (Bauman, 2007). The illness itself is usually mild and will begin 5 to 7 days after exposure. The infected individual will notice headache, fever, mild sore throat, slight cough, stuffy nose, and loss of appetite. The acute respiratory response occurs most often during the winter months and will behave like and be confused with influenza. The acute respiratory response is most commonly seen in new military recruits, 20 to 40% of new military personal will contact the disorder, which has earned it the name "acute respiratory disease of recruits." (Lyles 1969).

Conjunctivitis

Conjunctivitis, more commonly known as pink eye, is an inflammation or infection of the conjunctiva membrane that lines your eyelid. The adenovirus will cause the viral conjunctivitis found commonly in school aged children and newborns (Mayoclinic, 2006). The specific strain of conjunctivitis caused by adenovirus single type 8 is Keratoconjunctivitis. (Lyles, 1969). In pinkeye, some signs and symptoms are redness and itchiness in one or both eyes, blurred vision and sensitivity to light, a discharge in one or both eyes as well as a gritty feeling. Conjunctivitis causes buy adenovirus will usually have a watery, mucous discharge where as bacterial pinkeye will have a thick yellow discharge. Both strain of either viral or bacterial are highly contagious. (Mayoclinic, 2006).

Transmission

The adenovirus is highly contagious and easy transmitted. The illnesses associated with the adenovirus family are spread by direct contact, the fecal-oral route of transmission, and waterborne transition. The adenovirus is unusually stable at extreme pH conditions and has been found to be very resistant to chemical and physical agents. (Yates, 2003). These factors allow the adenovirus to survive in many areas. Children are the most common

spreaders of the conjunctivitis disease, when children are presenting a population infection rates may be as high as 70%, and conjunctivitis will spread more during summer months (Lyles, 1969).

Treatment and Prevention

The treatment and prevention of adenovirus is very mild. The virus itself is hard to combat, destruction methods such as ultraviolet lights, floor oiling, aerosols, and isolation have been relatively ineffective. (Lyles, 1969). In the early stages of the respiratory infection, a live attenuated vaccine is available, but is most used only in military personnel (Bauman, 2006). When infected with conjunctivitis a doctor may test the illness by using antibiotics, but if the infection is caused by a virus the treatment is isolation and rest. The smartest thing to do is wait out the viral infection of the eye and not expose other in the population to it due to its highly contagious nature. There may be a worsening of symptoms in the first three to five days, but symptoms will begin to clear shortly after that. The use of "fake tears" can help relieve the itching of the illness. (Mayoclinic, 2006). Prevention of the spread of adenovirus is a simple concept that many people do not do, simply washing your hands regularly, especially after using the bathroom can significantly cut down on the spread of adenovirus. By washing your hands you can prevent contact with the adenovirus, which is vary stable outside the body surviving via respiratory droplets, on fomites, and improperly chlorinated drinking water. (Bauman, 2006). Also, if there is an individual who has become infected with the acute respiratory illness or conjunctivitis avoid contact with that person. Children who have pinkeye will often spread it to other children after rubbing there eyes and contacting the other children. Simply take those children out of the environment that holds all of the other children. Simple prevention measures allow for an adenovirus free environment.

Adenovirus Research Past and Present

Research in adenovirus replication has made many breakthroughs in the recent pass. Earlier we discussed the splicing in the gene process, but the adenovirus is very special in how it transcribes its DNA. When the adenovirus tries to replicate it was found that the mRNA used to translate was much shorter that the adenovirus. At the time of this research this was confusing because it was thought that the viral DNA and the mRNA needed to be the same size. What was found is that the Adenovirus used a specific splicing technique. After an mRNA molecule was transcribed from DNA, section called intros were removed from the mRNA, all of the remaining sections were splicing together the fit the correct DNA size. The cells ribosomes then translate only

the cut and spliced sections. This research was thought to only be specific to adenovirus, but was later found that most eukaryotic cells use the splicing technique. (Bauman, 2006) In medicine today adenoviruses have been used to infect and kill cells. One mutation of the adenovirus is called Onyx-015, this mutation only replicates and destroys rapidly dividing cells. Cancer cells fit the category of rapidly dividing cells perfectly. In clinical trails patients who had adenovirus used to destroy cells cause 63% of head and neck tumors to shrink or disappear. (Bauman, 2006).

Conclusion

The adenovirus, which was originally found in the adenoid gland, has been a cause of problems and lead to breaks in microbiology research. This double-stranded DNA virus leads to the common could as well as pinkeye, every grade school teacher's nightmare. The virus help scientists discover the deletion and splicing process in mRNA transcription, and have begun to open doors on destroying rapidly dividing cells. The prevention of adenoviral infection can be as easy as washing your hands after using the rest room or avoiding those who are showing signs of conjunctivitis. In the future we may see the adenovirus play a role in gene therapy and fighting cystic fibrosis. (Bauman, 2006). Finally the focus needs to be placed on prevention of the spread of acute respiratory disorder and conjunctivitis through educating the public on simple prevention measures. If the population knows how the can protect themselves we will see a lowering in the number of outbreaks of illness and disease cause by the Adenoviridae.