Rhinovirus

Rhinovirus (from the Greek "rhin"- which means "nose") are the most common viral infective agents in humans and are the predominant cause of the common cold

Rhinovirus infection proliferates in temperatures between 33–35 °C (91–95 °F), and this may be why it occurs primarily in the nose.

Rhinovirus is a species in the genus *Enterovirus* of the *Picornaviridae* family of viruses.It has been now merged into Enteroviruses, a group of Picornaviridae that includes Poliovirus, Coxsackie A virus, and Hepatitis A.

There are over a 100 recognized types of rhinovira that differ based on their varying surface proteins.

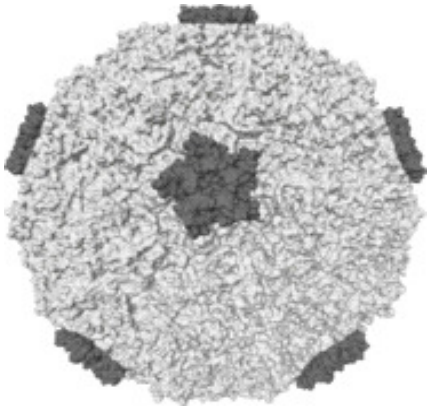
Structure

Rhinovira are among the smallest vira, with diameters of about only 30 nanometers. Rhinoviruses have single-stranded positive sense RNA genomes of between 7.2 and 8.5 kb in length. At the 5' end of the genome is a virus-encoded protein, and like mammalian mRNA, there is a 3' poly-A tail. Structural proteins are encoded in the 5' region of the genome and non structural at the 3' end. This is the same for all picornaviruses. The viral particles themselves are not enveloped and are icosahedral in structure.

The viral proteins are transcribed as a single, long polypeptide, which is cleaved into the structural and nonstructural viral proteins.

Rhinoviruses are composed of a capsid, that contains four viral proteins VP1, VP2, VP3 and VP4. VP1, VP2, and VP3 form the major part of the protein capsid. The much smaller VP4 protein has a more extended structure, and lies at the interface between the capsid and the RNA genome. There are 60 copies of each of these proteins assembled as an icosahedron. Antibodies are a major defense against infection with the epitopes lying on the exterior regions of VP1-VP3.

The rhinovirus also grows best in the temperatures between 33–35 °C, and this may be why reproduction occurs in the nose. It is sensitive to acidic environments.



Molecular surface of a Human rhinovirus, showing protein spikes

Rhinovirus Transmission

There are two modes of transmission:

1. Via aerosols of respiratory droplets and

2. From contaminated surfaces, including direct person-to-person contact.

A high majority of colds are transmitted by autoinoculation by contact with contaminated surfaces.

Rhinovira occur worldwide and are the primary cause of common colds. Symptoms include sore throat, runny nose, nasal congestion, sneezing and cough; sometimes accompanied by muscle aches, fatigue, malaise, headache, muscle weakness, or loss of appetite. Children may have six to twelve colds a year

Pathogenesis

The primary route of entry for Human rhinoviruses is the upper respiratory tract. Afterward, the virus binds to ICAM-1 (Inter-Cellular Adhesion Molecule 1) also known as CD54 (Cluster of Differentiation 54) receptors on respiratory epithelial cells. As the virus replicates and spreads, infected cells release distress signals known as chemokines and cytokines.

Human rhinoviruses preferentially grow at 32°C (89°F) as opposed to 37°C (98°F), hence infect the upper respiratory tract.

Novel antiviral drugs

Pleconaril is an orally bioavailable antiviral drug being developed for the treatment of infections caused by picornaviruses.[6] This drug acts by binding to a hydrophobic pocket in VP1, and stabilizes the protein capsid to such an extent that the virus cannot release its RNA genome into the target cell. When tested in volunteers, during the clinical trials, this drug caused a significant decrease in mucus secretions and illness-associated symptoms. Pleconaril is not currently available for treatment of Human rhinoviral infections, as its efficacy in treating these infections is under further evaluation.

DRACO, a broad-spectrum antiretroviral therapy being developed at the Massachusetts Institute of Technology, has shown preliminary effectiveness in treating rhinovirus, as well as a number of other infectious viruses.

There are potentially other substances such as Iota-Carrageenan that may lead to the creation of drugs to combat the Human rhinovirus.

Vaccine

There are no vaccines against these viruses as there is little-to-no cross-protection between serotypes. At least 99 serotypes of Human rhinoviruses affecting humans have been sequenced However, recent study of the VP4 protein has shown it to be highly conserved amongst many serotypes of Human rhinovirus, opening up the potential for a future pan-serotype Human rhinovirus vaccine.