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Rhinovirus Physiognomies

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Abstract

Rhinovirus is one of the contagious viral agents in humans and is the principal cause of common cold. Rhinovirus belongs to the genus Enterovrirus in the family Picornaviridae. Rhinovirus are alienated as three standard classes (A, B and C) that includes 160 recognized types of human rhinovirus that differ according to their surface proteins (serotypes). They are lytic in nature and are one of the among the smallest viruses with diameter of about 30 nanometers. Comparatively with other viruses like smallpox and vaccinia are around ten times larger i.e. around 300 nanometers, while flu viruses are around 80 to 120 nanometers. Rhinoviruses are single stranded positive sense RNA genomes structure that varies 7200 and 8500 nt in length. At 5' end of the genome is a virus -encoded protein and there is 3' poly-A tail. Structural proteins are encoded in the 5' region of the genome and non- structural at 3' end. The viral particles are not enveloped and are dodecahedral in structure.

Keywords: Rhinovirus; Virus; Common cold; RNA

Virus Replication is better at Cool Temperatures

As per new study, scientists and experts confirms that common cold virus can replicate itself more efficiently in cool temperatures that is found inside the nose than in the main body temperature. Scientists have studied that most frequent cause of common cold – the rhinovirus replicates faster in slightly cooler environment of the nasal cavity than in warmer lungs. Although, prior investigation was found that body temperature influenced the virus as opposed to the immune system.

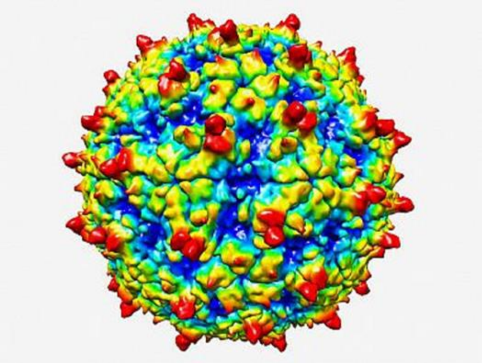

Figure 1: *Illustrates the structure of a rhinovirus C, showing the spike-like fingers in red [1].*

Studies also strongly recommends that variable temperatures inclined the immune system rather than virus itself. They also found that replication of virus in airway cells with genetic deficiencies in immune system sensors that detect virus and in the antiviral response. With these immune deficiencies, virus was able to replicate at higher temperature. Scientist and experts also plan to apply this observation into how temperatures affect immune system to other conditions for instance childhood asthma. It may cause serious breathing problems for children with asthma [2,3] (Figures 1,2).

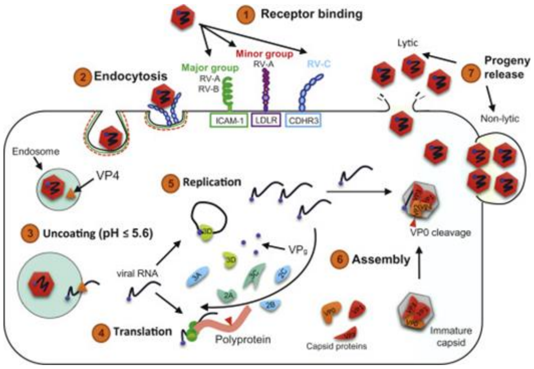

Figure 2: *Illustrates replication cycle of Rhinovirus [4].*

Asymptomatic Rhinovirus Infection

Common cold virus may be more common than previously thought not reporting any symptoms. Studies confirm that virus responsible for common cold was found at some point in eight-week study period in an estimated 60% were asymptomatic. Rhinovirus is known for causing common cold can also trigger asthma attacks and bronchitis. Scientists conducted an experiment that when cold activity peaks and requested candidates to collect nasal swab once weekly regardless of symptom occurrence. If cold like signs were reported, then they were requested to provide daily nasal swabs for a time of seven days. Using DNA based poly-merase chain reaction (PCR) they detected rhinovirus in 54% of candidates reported symptoms. Based on these conclusions, scientists estimate that as many as 60.5% of asymptomatic candidate population was infected at some time with rhinovirus over an eight-week time study period. Scientists also used PCR to determine viral load in symptomatic and symptomatic candidates. Candidates with asymptomatic rhinovirus infections had significantly less virus than symptomatic infections [5] (Figure 3).

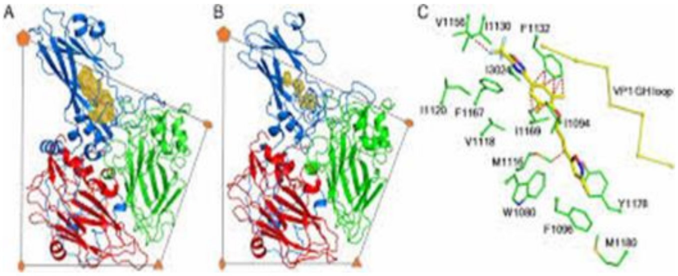

Figure 3: *Illustrates RV-C15a has a collapsed VP1 hydrophobic pocket. RV-A16 (A) and RV-C15a (B) are colored by polypeptides: VP1 (blue), VP2 (green), and VP3 (red). The volume of the VP1 hydrophobic pocket, calculated using PyMOL, is colored gold. (C) Residues lining the VP1 pocket of RV-C15a clash with pleconaril (a capsid-binding inhibitor against many EV but not RV-C) when superimposing the structures of RV-C15a and RV-B14 complexed with pleconaril. The VP1 GH loop (yellow) of RV-B14 is shown as Cα backbones, which adopts a conformation that can accommodate pleconaril. Red dashed lines indicate a distance of closer than 2.5 Å between a given atom of a RV-C15 residue (green) and a given atom of pleconaril (yellow). Oxygen, nitrogen, and sulfur atoms are colored red, dark blue, and dark yellow, respectively [1].*

Cold Caused By Rhinovirus

Scientists confirms that when Rhinovirus infects the host; how our immune system responds that causes cold symptoms. There are more than hundred different viruses that cause common cold, human rhinoviruses are the major cause. While common colds are typically considered to be minor infections for nose and throat, they have much more serious health repercussions. It is also an important pathogen in more serious conditions for instance asthma and chronic obstructive pulmonary disease. For instance, children who gets recurrent rhinovirus-induced wheezing in early life are ten times more likely to get asthma. Rhinovirus infections are major cause of acute attacks of Chronic Obstructive Pulmonary Disease (COPD) and hence exert huge impact on health care costs. Results of the study opens new lines of examination into how rhinovirus impacts asthma and COPD [6,7] (Figure 4).

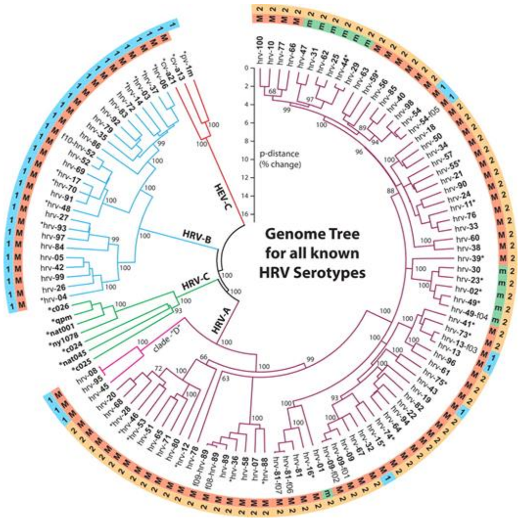

Figure 4: *Illustrates Genome structure of Rhinovirus [9].*

Rhinovirus Virus Found to Manipulate Genes

Human Rhinovirus that causes thirty to fifty percent of common cold. But in truth, human rhinovirus has the ability to manipulate the genes that is accurate of some of the coldest symptoms. Scientists demonstrated that human Rhinovirus hijacks many of the genes which causes an overblown immune response that ends up nose being overblown. Scientist conducted experiment on volunteers who were inoculated with sham inoculation and attained cell scrapings from nasal passages 8 and 48 hours after inoculation and evaluated the genetic changes by microarray also known as gene chip technology. After 8 hours virtually there was no changes between the control and the human rhinovirus-group but by the 48 hour mark more than 6500 genes has been significantly up and down planned in human rhinovirus subjects – many of them were up-regulated genes fell into two categories: genes making antiviral proteins, including viperin or genes making pro-inflammatory cytokines [8].

Vulnerability Found in Major Human Viruses

Experts and academicians found that new discovery and new features of large class of pathogenic viruses may allow expansion of new antiviral medications for the cold, polio and other illness. Picornaviruses include rhinoviruses and enteroviruses. Rhinoviruses causes millions of cases of upper respiratory

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infections (common cold) yearly and contribute to asthma and enter viruses are responsible for millions of infections including cases encephalitis, meningitis and polio. To replicate, viruses interact with host cells and often change shape; stabilizing the virus particle is the thought to be a promising strategy for preventing replication. In search for potential antiviral, scientist found a compound that stabilized a model picornavirus then they performed cryo-electron microscopy (cryo-EM) of the drug-virus complex to evaluate how the drug exerted its effect. Major task for academics and researchers is in developing antiviral medications that viruses mutate very quickly changing in ways that makes a useful drug ineffective [10,11].

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