

Editorial on Rhinovirus (Common Cold)

Manu Mitra*

Alumnus with Electrical Engineering Department, University of Bridgeport, USA

***Corresponding Author:** Manu Mitra, Alumnus with Electrical Engineering Department, University of Bridgeport, USA.

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Introduction

The rhinovirus, which is the primary cause of the common cold, is the most prevalent viral infection in humans. It thrives in temperatures ranging from 33 to 35 °C (91 to 95 °F), commonly found in the nasal region. Belonging to the Enterovirus genus in the Picornaviridae family, rhinoviruses consist of three species (A, B, and C) with approximately 165 recognized types characterized by variations in surface antigens or genetics. These viruses, exhibiting lytic behavior, are among the smallest viruses, measuring about 30 nanometers in diameter. To provide context, they are significantly smaller than other viruses like smallpox and vaccinia, which are approximately ten times larger at around 300 nanometers, and influenza viruses, which range from 80 to 120 nm in size.

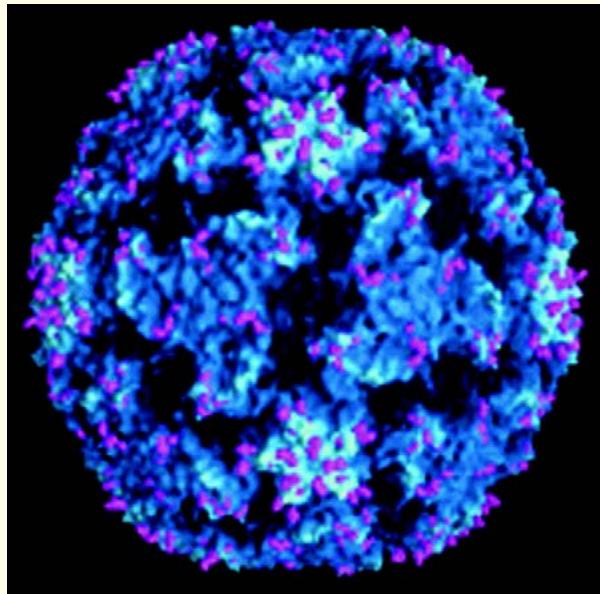


Figure 1: Illustrates the structure of a rhinovirus A [1].

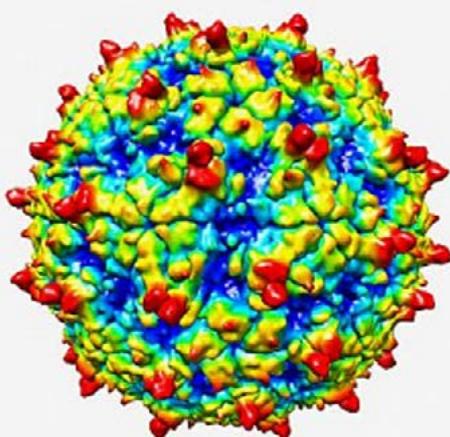


Figure 2: Illustrates the structure of a rhinovirus C, showing the spike-like fingers in red [2].

Structure of Rhinovirus

Human rhinoviruses consist of a capsid comprising four viral proteins: VP1, VP2, VP3, and VP4. The primary components of the protein capsid are VP1, VP2, and VP3, with VP4 being considerably smaller and possessing an elongated structure. VP4 is situated at the interface between the capsid and the RNA genome. These proteins are organized as 60 copies of each, forming an icosahedron. In the defense against infection, antibodies play a crucial role by targeting epitopes located on the external regions of VP1-VP3 [3].

Asthma Can Increase Tenfold In Children

Infants who undergo viral respiratory illnesses accompanied by wheezing face an elevated risk of developing asthma later in childhood. While it was unclear if all respiratory viruses leading to wheezing posed similar risks, recent molecular techniques have led researchers to identify rhinovirus as a potential culprit.

At the age of six, 28 percent of the children had asthma, and those who had experienced wheezing with rhinovirus were disproportionately represented among them. Children who wheezed with rhinovirus in their first year were nearly three times more likely to develop asthma by age six. In contrast, children who wheezed with respiratory syncytial virus (RSV), another common respiratory ailment linked to asthma risk in children, did not show an increased risk of asthma.

As children grew older, the impact became more pronounced. Those who wheezed with rhinovirus in their second year were over six times more likely to develop asthma, and wheezing with rhinovirus at three years old increased the odds of asthma by more than 30-fold [4].

Common Cold Vaccines

The pursuit of a vaccine for rhinoviruses may have seemed ambitious, given the presence of over 100 circulating varieties worldwide. However, the immune system proves capable of meeting this challenge. Vaccines that encompass numerous rhinovirus varieties have demonstrated effectiveness in inducing antiviral antibodies in both mice and monkeys.

Rhinoviruses stand as the primary culprits behind the common cold, though other viruses like respiratory syncytial virus, parainfluenza virus, and adenoviruses can also contribute. Furthermore, rhinoviruses can worsen asthma attacks. Despite their diverse array, rhinoviruses don't undergo the same degree of genetic variation as influenza viruses.

In the 1960s, researchers demonstrated the feasibility of vaccinating individuals against one rhinovirus variety, preventing illness upon exposure to the same virus. The challenge then lay in the extensive diversity of rhinoviruses—or so it seemed at the time [5, 6].



Figure 3: Challenges making a vaccine that protects from the common cold is that common viruses often mutate—this can mean that vaccines could be ineffective against new variants [7].

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