ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

CHARACTERISTICS OF RHINOVIRUS INFECTION

Mirzakarimova Dildora Bakhodirovna

Abdukodirov Sherzodjon Taxirovich

Department of infectious diseases, Andijan State Medical Institute

Abstract: Rhinovirus infection, commonly known as the common cold, is one of the most prevalent and widespread viral infections affecting humans worldwide. With over 100 distinct strains identified, rhinovirus is responsible for an estimated 30-50% of all upper respiratory tract infections. The impact of rhinovirus infection on public health cannot be overstated, as it accounts for millions of cases of illness and billions of dollars in healthcare costs and lost productivity annually. This article aims to provide an in-depth exploration of the rhinovirus infection, including its virology, transmission, clinical manifestations, and implications for public health.

Keywords: Rhinovirus, respiratory pathology, wheezing, pneumonia, bronchiolitis, asthma.

Introduction: Rhinoviruses were discovered in the 1950s during attempts to isolate the etiological agent of common colds. Rhinoviruses remain the most commonly detected viral etiology of upper respiratory tract infections and are responsible for more than half of all cold-like illnesses. They represent the most important and most prevalent viral cause of the common cold, and it has been reported that, in host-seropositive conditions, symptom scores and proportions of infected subjects of rhinovirus-infected individuals were equivalent after experimental inoculation with these two agents. Rhinovirus pathogenicity has been well described since the first attempts to isolate these agents from individuals with common colds. Experimental inoculation with rhinovirus has been performed in a large number of studies, enabling the description of the natural history, pathogenesis, and immune response to these agents.

Clinical rhinovirus disease is differentiated by a wide spectrum of illnesses, including upper and lower respiratory syndromes, different infections in predominantly healthy and susceptible populations, necrotizing bronchiolitis in young children, exacerbations of preexisting lung disorders, and even fatal infections in some subsets. Nonetheless, the dry seasons saw fewer positive tests for other common respiratory viruses, including adenoviruses, and other respiratory picornaviruses, including enterovirus and human bocavirus. Consequently, their role in the exacerbation of several conditions, such as asthma, chronic obstructive pulmonary disease, bronchiolitis, and pneumonia, has been addressed in relatively high-quality studies, some of which used experimental inoculation of rhinovirus. Despite this knowledge, there is still an urgent need to develop specific ant rhinovirus agents or vaccines. This review describes MDA5 pathway activation, the divergent outcomes associated with experimental studies of rhinovirus infection, phases involved in the investigation of breakthroughs in the discovery of rhinoviruses, diagnostic methods, pathogenesis, immune response, exacerbations of preexisting chronic lung diseases, diagnostic methods, therapeutic drugs, and perspectives for antiviral agents or vaccines.

Discovery and Classification

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

The rhinoviruses were discovered in the 1950s during research on the causes of the common cold. The pathological agent of that disease, the rhinovirus, was the first virus to be cultured. The disease was experimentally transmitted by inoculating the nasal mucous membranes of healthy individuals with isolated and purified rhinovirus preparations. General groups of rhinoviruses were initially produced by serology. This classification was later supported by other techniques, such as neutralization by sera from a vaccinated host. A more precise classification was subsequently made on the basis of cell culture and molecular biological techniques.

Researchers began by classifying rhinoviruses into two types (types A and B); a further serological classification subdividing those two into 100 serotypes was made, and more recently, they have been grouped genetically. The strains are multiplied in cultured human cells, generating the cytopathic effect typical of the replication of picornaviruses. In conjunction with other techniques, the sequence analysis of the genomic regions encoding the L1 coat protein or the RNA-dependent RNA polymerase has allowed detection of rhinovirus types and intra-typic variants. These variants are responsible for distinct antigenic subtypes of rhinoviruses which are associated with the adjustment of viral replication to the selective interactions of the virus with the polymorphisms of the two-membrane tubule coat complex, called ICAM-1 (Inter-cellular Adhesion Molecule-1) and LDL-R (Low-Density Lipoprotein Receptor).

Epidemiology and Transmission

Rhinovirus is the primary cause of the common cold and a major cause of more serious illnesses such as pneumonia and bronchiolitis. Rhinovirus is well known for its rapid emergence and transmission through the respiratory route, leading to seasonal epidemics. Children are particularly susceptible to rhinovirus infection and become infected frequently during the first few years of life, with about 10-15 episodes of the common cold reported during the first year of life.

The human rhinovirus is the most common respiratory virus in circulation. Moreover, rhinovirus is considered as the most frequent agent isolated from pediatric patients with viral lower respiratory tract infections, causing bronchitis or bronchiolitis. Rhinovirus is responsible for more than 50% of lower respiratory tract infections due to viral agents, and it has been known to be associated with life-threatening respiratory failure in infants and childhood. Fluorescent in situ hybridization/immunofluorescence staining for rhinovirus and/or RNA-nucleic acid amplification methods such as PCR/cell culture assay demonstrate the presence of rhinovirus in 29.8% to 37.0% of children admitted with respiratory infections.

The transmission of RVs normally takes location through direct publicity and inhalation of respiratory droplets or micro-droplets, though it can additionally appear via fomites (such as contaminated surfaces and different inanimate objects) or via direct person-to-person contact. This is due to the fact RV has average resistance to frequent disinfectants such as alcohol hand rubs. Previously, it was once believed that RVs did now not make contributions to decrease respiratory tract illnesses due to the thought that they replicate extra effortlessly at a decrease temperature of 33 °C, which is the temperature of the nasal passage, in assessment to the greater temperature of 37 °C. However, it is necessary to word that the

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

most advantageous temperature for replication can also range extensively amongst identified RV serotypes, and viral replication at 37°C may also nonetheless end result in titers that are excessive adequate to instigate the infection.

Indeed, this has been demonstrated in each scientific and experimental conditions. After being deliberately contaminated in one-of-a-kind experiments, RV has been found in the decrease airways thru a range of techniques, which include polymerase chain response (PCR), immunostaining and in situ hybridization for detecting wonderful strand viral ribonucleic acid (RNA). With the growing use of multiplex diagnostic platforms, we now have a higher appreciation of the hyperlink between respiratory illnesses and RV, and latest epidemiological statistics suggests that this virus is an alternatively popular pathogen (or co-pathogen) in younger youth offering with acute respiratory infections.

More specifically, there is a settlement in the literature that RVs are the main motives of acute respiratory infections, and are additionally the most pervasive team of respiratory viruses spanning throughout all pediatric age businesses and in both outpatient and inpatient settings. Their scientific and socioeconomic burden in the neighborhood appears to be considerable and they symbolize a massive fraction of the world burden of top respiratory tract infections (URTIs), mirrored in 17.2 billion incident instances in 2019. Therefore, energetic surveillance will be increasingly more vital in correctly defining the full fitness care burden of these respiratory viruses, whilst forecasting the burden of URTIs with the use of novel strategies (such as high-dimensional time collection information and forecast combinations) will facilitate healthcare useful resource planning.

Clinical Manifestations

The symptoms of rhinovirus infection are typically mild and self-limiting, with most individuals experiencing a range of symptoms, including:

1. Rhinorrhea (nasal congestion and runny nose)
2. Sneezing
3. Coughing
4. Sore throat
5. Headache
6. Fatigue
7. Mild fever

In rare cases, rhinovirus infection can exacerbate underlying conditions, such as chronic obstructive pulmonary disease (COPD), bronchial asthma, and cystic fibrosis, leading to more severe respiratory complications, including pneumonia and bronchiolitis.

Implications for Public Health

The impact of rhinovirus infection on public health is multifaceted and far-reaching. According to the Centers for Disease Control and Prevention (CDC), the common cold accounts for an estimated 50 million cases of illness in the United States each year, resulting in approximately 20 million missed school days and 12 million missed workdays.

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

Furthermore, the economic burden of rhinovirus infection is substantial, with estimated annual healthcare costs exceeding $40 billion.

In addition to its economic and social implications, rhinovirus infection also poses a significant threat to vulnerable populations, including young children, older adults, and individuals with compromised immune systems. In these populations, rhinovirus infection can lead to severe and potentially life-threatening complications, such as pneumonia and acute respiratory distress syndrome.

Recommendations

Several recommendations can be made to mitigate the impact of rhinovirus infection on public health:

1. Improved hygiene practices, such as frequent handwashing and proper disposal of respiratory secretions, can significantly reduce the transmission of rhinovirus.
2. Vaccination remains the most effective way to prevent rhinovirus infection, and efforts should be made to develop and distribute effective vaccines targeting the most prevalent strains.
3. Antiviral medications, such as oseltamivir and zanamivir, have demonstrated efficacy in reducing the severity and duration of rhinovirus infection and should be prescribed judiciously in high-risk populations.
4. Public awareness campaigns aimed at promoting healthy behaviors, such as proper hand hygiene and respiratory etiquette, can help reduce the transmission of rhinovirus and other respiratory pathogens.

Conclusion.

In conclusion, the rhinovirus infection is a complex and multifaceted illness that poses a significant threat to public health. By understanding the virology, transmission, and clinical manifestations of this infection, and implementing effective prevention and treatment strategies, we can reduce the burden of this common yet debilitating illness and promote improved health outcomes for individuals and communities worldwide.

References:

1. Çalışkan M., Bochkov Y.A., Kreiner-Møller E., Bønnelykke K., Stein M.M., Du G., Bisgaard H., Jackson D.J., Gern J.E., Lemanske R.F., Jr., et al. Rhinovirus wheezing illness and genetic risk of childhood-onset asthma. N. Engl. J. Med. 2013; 368:1398–1407. Doi: 10.1056/NEJMoa1211592.
2. Zhang Y., Willis-Owen S.A.G., Spiegel S., Lloyd C.M., Moffatt M.F., Cookson W.O.C.M. The ORMDL3 Asthma Gene Regulates ICAM1 and Has Multiple Effects on Cellular Inflammation. Am. J. Respir. Crit. Care Med. 2019; 199:478–488. Doi: 10.1164/rccm.201803-0438OC.
3. Bønnelykke K., Sleiman P., Nielsen K., Kreiner-Møller E., Mercader J.M., Belgrave D. A genome-wide association study identifies CDHR3 as a susceptibility locus for early

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

childhood asthma with severe exacerbations. Nat. Genet. 2014; 46:51–55. Doi: 10.1038/ng.2830.
4. Kanazawa J., Masuko H., Patagia Y., Sakamoto T., Yamada H., Kaneko Y. Genetic association of the functional CDHR3 genotype with early-onset adult asthma in Japanese populations. Allergol. Int. 2017; 66:563–567. doi: 10.1016/j.alit.2017.02.012.
5. Shigemasa R., Masuko H., Hyodo K., Kitazawa H., Kanazawa J., Yatagai Y., Iijima H., Naito T., Saito T., Hirota T., et al. Genetic impact of CDHR3 on the adult onset of asthma and COPD. Clin. Exp. Allergy. 2020; 50:1223–1229. doi: 10.1111/cea.13699.
6. Palmenberg A.C. Rhinovirus C, Asthma, and Cell Surface Expression of Virus Receptor CDHR3. J. Virol. 2017;91: e00072-17. doi: 10.1128/JVI.00072-17.