

MIGHT AS WELL TAKE SOMETHING ENJOYABLE

9. RHINOVIRUSES AND CORONAVIRUSES

Lat. *rhinus* = nose; Ger. *Erkältung*; Fr. *rhûme* = common cold.

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Rhinoviruses are the most frequent cause of common colds. All age groups are affected. Infections are endemic with higher frequencies during autumn and spring in temperate climates.

TRANSMISSION/INCUBATION PERIOD/CLINICAL FEATURES

The common cold is spread by close contact and by inhalation of virus-containing droplets. The incubation period is 2–4 days, and a person is probably infectious from 1 day postinfection and as long as there are clinical symptoms.

SYMPTOMS AND SIGNS

Systemic:	None or Low-Grade Fever, Headache
Local:	Coryza, Sneezing, Sore Throat, Cough, Hoarseness

In uncomplicated cases the illness usually lasts for 1 week, with maximal symptoms on days 2 and 3.

COMPLICATIONS

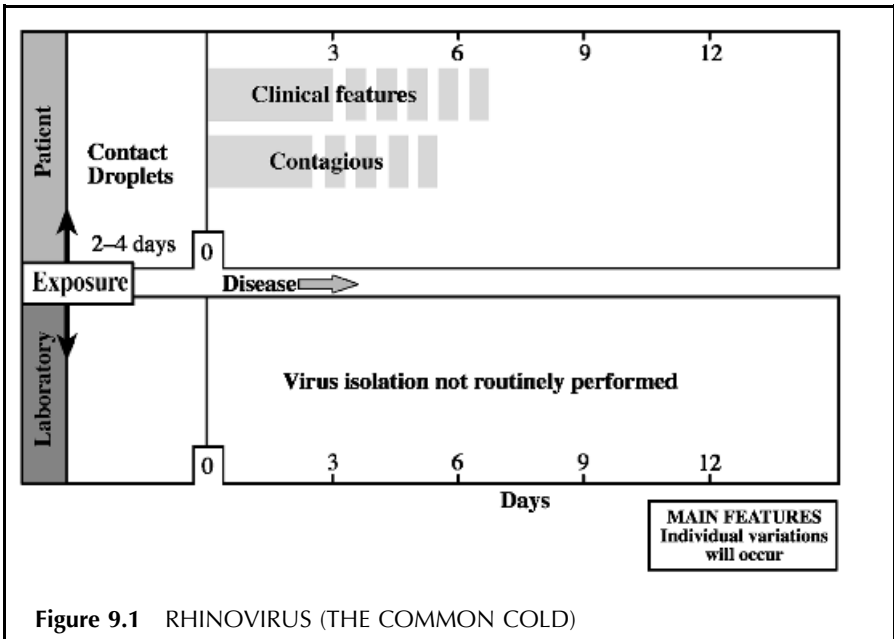
Secondary bacterial infections may occur (sinusitis, otitis media). Rhinovirus infections may precipitate acute asthma in predisposed children, and may aggravate chronic bronchitis in adults.

THERAPY AND PROPHYLAXIS

No specific therapy or prophylaxis is available.

LABORATORY DIAGNOSIS

During acute illness the virus can be isolated from the nose, the throat and sputum. Special cell culture techniques are needed for virus isolation and these are performed in very few virus laboratories. Serological diagnosis is not routinely used either, because of the many serotypes.



CLINICAL FEATURES

SYMPTOMS AND SIGNS

After an incubation period of 2–4 days, the illness starts with symptoms of nasal congestion/blockage and irritation, sneezing and a sore throat. Excess nasal secretion follows which is serous at first and later becomes purulent if secondary bacterial infection ensues. Cough is a frequent symptom, as is headache during the first days of illness. Fever occurs seldom, and if so, it is moderate. Rhinovirus infection causes the same symptoms in all age groups. The infection is limited to the respiratory tract. It has been suggested that rhinoviruses may cause a more serious infection of the lower respiratory tract in small children. Rhinovirus infection has also been shown to precipitate attacks of asthma in children and aggravate chronic bronchitis in adults. Asymptomatic infections are reported to occur in about 25% of individuals infected with rhinovirus.

Differential diagnosis. Symptoms of common cold, particularly in children, may be due to other virus infections, e.g. influenza virus, parainfluenza virus, adenovirus, RSV and coronaviruses. Coronaviruses are now considered to be second to rhinoviruses as a cause of common cold, but the symptoms are usually milder in coronavirus infections. Influenza virus infections occur in epidemics, and general symptoms such as fever and malaise are more severe. In parainfluenza and adenovirus infections pharyngitis is more pronounced. During epidemics of RSV some of the patients, children as well as adults, may have the same symptoms as in rhinovirus infections. Pharyngitis and tonsillitis will dominate infections with *Streptococcus pyogenes*. However, it is usually not possible to determine the aetiology on the basis of the clinical findings alone in upper respiratory infections.

CLINICAL COURSE

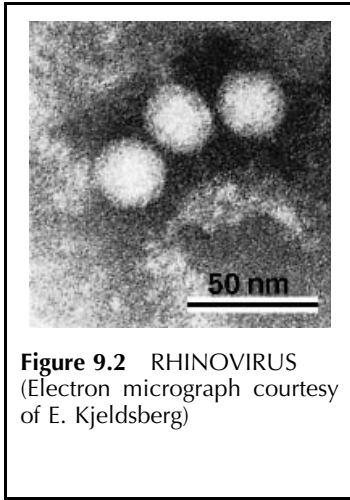
As a rule, the illness will last for 1 week, but 25% of the patients will need 2 weeks to recover completely. The illness tends to last longer in smokers than in non-smokers.

COMPLICATIONS

Bacterial sinusitis and otitis media are the most common complications. Occasionally a bacterial bronchopneumonia is seen.

THE VIRUS

Rhinovirus and *Enterovirus* are two genera in the family *Picornaviridae*. They are small (28–32 nm) single-stranded RNA viruses (Figure 9.2).



Rhinovirus now comprises more than 100 different serotypes, and new types are still being identified. As with other picornaviruses the virion capsid consists of a naked icosahedron of 60 capsomers, each made up of four proteins. Depressions in the virus capsid represent the sites on the virus where the cellular receptors bind. These depressions ('sockets') are the targets for experimental studies of synthetic anti-rhinoviral agents. A fifth protein is associated with the single-stranded RNA. Due to the lack of a lipid envelope, the virus is resistant to inactivation by organic solvents. Rhinoviruses are more acid-labile than enteroviruses.

EPIDEMIOLOGY

The rhinoviruses probably cause about half of all cases of common cold and are considered to be one of the most frequent causes of infections in man. Studies in the USA have revealed an infection rate of at least 0.6 per individual per year. The rate is highest among infants and decreases with age. Schoolchildren are considered to be important transmitters of rhinovirus infections. Parents with children in kindergarten or in primary school may have more common cold episodes than single adults. Rhinovirus infections are endemic, but occur most frequently during autumn and spring in temperate climates. Several serotypes can circulate simultaneously in the same population, and it is possible that new serotypes emerge over the years. There is no evidence that some serotypes cause more serious illness or occur more frequently than others.

THERAPY AND PROPHYLAXIS

Specific chemotherapy is not available, and treatment with immunoglobulin is without effect. Experiments in volunteers have found α - and β -interferon given intranasally to be effective in preventing rhinovirus infection, whereas studies using γ -interferon have been unsuccessful. The suggestion that large quantities of vitamin C (ascorbic acid) taken prophylactically or during illness influences the course of the disease, has not been proven. Symptomatic treatment includes mild analgesics and nasal drops. Prophylactic use of antibiotics against bacterial superinfections is not recommended in otherwise healthy individuals.

No **vaccine** is available. The high and uncertain number of serotypes and their relative importance and distribution during various outbreaks are

obstacles to vaccine development. In addition to inhalation of droplets, spread of infection by contact is considered to play a significant role. Measures should be taken to avoid infection from virus-contaminated hands. Persons suffering from asthma and from chronic bronchitis should avoid close contact with common cold patients.

LABORATORY DIAGNOSIS

Cultivation of rhinoviruses requires special cell cultures which are incubated at 33°C (the temperature in the nasal mucosa). Also, since many serotypes are difficult to cultivate, rhinovirus isolation is performed only by very few virus laboratories. Serological diagnosis is complicated by the large number of serotypes and is therefore not routinely performed.

CORONAVIRUS

Coronaviruses are the second most frequent cause of the common cold (15–20%). They are single-stranded RNA viruses belonging to the *Coronaviridae* family. The virions vary in diameter from 80 to 160 nm. They have club-shaped spikes on the surface which give a crown (corona)-like picture by electron microscopy (Figure 9.3). At least four different proteins are known, and the S (spike)-protein induces virus-neutralizing antibodies contributing to immunity. The coronaviruses are divided into three serological groups, the human coronaviruses have been allocated to two of these serological groups, and the two human prototypes are OC43 and 229E. The coronaviruses are believed to spread as the rhinoviruses, and the incubation period is about 2 days. The symptoms are similar to those following rhinovirus infections, lasting for about 1 week. As many as 50% of coronavirus infections may be asymptomatic. Serological studies suggest that the infection occurs in all age

groups. Reinfection viruses have been observed, suggesting that protective immunity is not long-lasting. Coronavirus infections occur most frequently in late winter/early spring. Coronavirus may be isolated from the nose and throat during the acute phase of illness if organ cultures of human fetal trachea are used. Only a small number of coronavirus strains have been identified, and most knowledge about this virus infection has been obtained by serological studies on paired sera from patients. Very few laboratories diagnose coronavirus infections as part of their routine work.

