

# Mumps

## What is mumps?

Mumps is an acute viral disease characterised by swelling and tenderness of one or more of the salivary glands, usually the parotid glands. Symptoms also include fever, headache, muscle ache and sore throat. Swelling of the testicles occurs in 15-25 per cent of infected males. Approximately one-third of infected people do not exhibit symptoms. Hippocrates was the first to describe the classical clinical form of mumps in the 5<sup>th</sup> century BC.

The mumps virus is a paramyxovirus. There is only one serological type. Man is the only known natural host for mumps virus. It is spread by direct contact with saliva and discharges from the nose or through airborne droplets from the upper respiratory tract of infected individuals. Mumps may be contagious seven days before and nine days after the onset of the disease. A person is most contagious 48 hours prior to the appearance of symptoms.

The incubation period lasts two to three weeks. The virus multiplies in the mucous membranes of the nose and throat and then in regional lymph nodes. Twelve to 25 days after infection, viraemia occurs and the virus spreads into the tissues including the glands, such as the salivary gland, the pancreas, the testes and ovaries, and the central nervous system. Inflammation of infected tissue produces the characteristic symptoms of swelling of the salivary glands or aseptic encephalitis and meningitis.

Further complications of the disease include arthritis (inflammatory reaction of the joints), kidney problems, inflammation of the thyroid gland or breasts, and permanent deafness, which occurs in one out of 20,000 cases. Approximately one week after onset, the fever and swelling subside and if there are no complications, cure is complete. In general, the natural infection confers life-long protection against the virus, although a few cases of relapse have been reported.

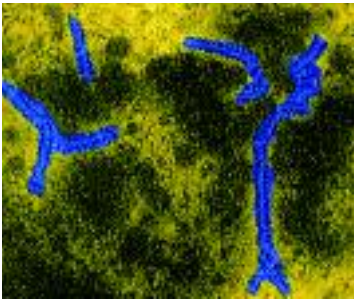
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**Mumps is a viral infection causing tender, swollen salivary glands. Vaccines have protected children from the misery of mumps. Research is continuing to develop vaccines that are even more effective and better tolerated.**



### Who does mumps affect?

Mumps usually occurs in children and adolescents between the ages of five and 19 years. The greatest risk of infection occurs among older children. Mumps is more common during winter and spring.



Electron-microscopic picture of mumps virus

Although it is chiefly a benign childhood disease, mumps virus may also infect adults in whom uni- or bilateral infection of the testicles (orchitis) and meningitis are relatively common complications. In rare cases, mumps-related orchitis is associated with irreversible sterility. Symptomatic mumps-related meningitis (headache, stiff neck) is reported in 15 per cent of cases, but the outcome is generally favourable within three to ten days.

In most regions throughout the world, the annual incidence of mumps is between 100 and 1,000 per 100,000 inhabitants, with epidemic peaks every two to five years. The mortality associated with mumps is estimated at one to three cases per 10,000.

### Present treatments

There is no specific treatment for mumps. Pain-relieving medicines are given to combat head and muscle aches. To soothe the swollen parotid glands, either warm or cold packs are applied.

For prevention, effective vaccines are available and where high vaccinal cover has been maintained, the incidence of mumps has fallen considerably. The viral origin of mumps was recognised in 1934. The first attenuated live vaccines were developed during the 1960s. Currently, more than ten vaccinal strains are used throughout the world to produce mumps vaccines. The strains differ both in terms of origin and number of steps resulting in attenuation, as well as the cellular substrates used.

According to the WHO, introduction of routine mumps vaccination should be a high priority, as with other prophylactic options. Mumps vaccine is given at the age of 12-15 months in combination with measles and rubella (MMR) vaccine. A second dose of MMR is generally given at four to six years of age, but should be given no later than 11 to 12 years of age. Today, some 120 countries have introduced vaccination against mumps in their national prophylaxis programmes, and in most cases the vaccine is given as MMR combination.

There are nevertheless disparities between regions. Countries such as Finland or Sweden have completely eradicated mumps from their national territory. In England and Wales, the incidence of mumps fell after MMR vaccination was introduced in 1988. In 2004, an outbreak of 8,104 cases of mumps was confirmed, compared with a total of 3,907 cases in the previous five years; and during the first four months of 2005, the Health Protection Agency (HPA) reported 28,470 cases. The outbreak occurred in older teenagers and young adults, who would not have been offered MMR vaccination before 1988.

Ironically, the more advances in vaccination have successfully limited outbreaks, the more the impact that these infectious agents once had on society becomes marginalised. Public confidence in vaccination erodes because of perceived risks associated with immunisation, and this in turn leads to lower vaccination coverage and loss of herd immunity.

### What's in the development pipeline?

Research groups are studying new tissue culture techniques which will lead to live attenuated MMR vaccines with even higher immunogenicity and better tolerance.

Two clinical phase 3 trials are underway to assess the immunogenicity and safety of a live attenuated MMR-varicella (chicken pox) candidate vaccine when given to healthy children in their second year of life. Another clinical phase 3 study is being

conducted to demonstrate that a combined MMR-varicella vaccine may be administered concomitantly with pneumococcal conjugate vaccine without impairing the safety or immunogenicity of measles, mumps, rubella, varicella, or the seven serotypes of *Streptococcus pneumoniae*.

There is a further phase 1/2 clinical trial underway to explore the immunogenicity and safety of live-attenuated varicella, MMR, or combination varicella/MMR vaccines administered to healthy children at 12 and 18 months of age. The objective is to determine the immunogenicity and safety of live attenuated varicella vaccine, with and without concomitant administration of MMR vaccine.



Research groups are also evaluating immunisation schemes with MMR vaccine, either given by traditional injection or by an aerosol delivered to the respiratory tract. An aerosol could be of advantage in patients with contraindication for subcutaneous injections.

### **The longer-term future**

Paramyxoviruses such as the mumps virus enter cells by fusion of their lipid envelope with the target cell plasma membrane. Fusion of the viral membrane with the plasma membrane allows entry of the viral genome into the cytoplasm of the host cell. The trigger mechanism that controls the viral entry machinery remains to be elucidated. Two viral proteins are key to the infectious process: an attachment protein and the fusion protein. For mumps virus, the attachment protein is the haemagglutinin/neuraminidase protein. In the last five years, atomic structures of fusion and attachment proteins of several paramyxoviruses have been reported. The knowledge gained from these structures towards understanding the mechanism of viral membrane fusion may lead to new therapeutic approaches to treat the acute disease.

Immunisation against mumps has not yet been included in the routine vaccination programme in some regions of the world, and for this reason, mumps is still common in these countries. Furthermore, as nearly one-third of world-wide infections with mumps virus go unnoticed, WHO has stated that it will not be possible to eradicate mumps totally.

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