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## SMALLPOX AND SMALLPOX VACCINATION

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Smallpox is caused by infection with variola virus. In 1980 the WHO declared that smallpox had been eliminated from all parts of the world.

### Occurrence

Smallpox is infectious irrespective of climate or season and was previously found all over the world. Before vaccination was introduced, practically everyone was infected. In 1796 the English physician Edward Jenner showed that inoculation into the skin of material from cowpox pustules could protect against smallpox. This technique spread rapidly around the world, and the first vaccinations were performed in Denmark as early as 1801. A programme for the worldwide elimination of smallpox was initiated in 1967, and the last smallpox patient in Denmark was diagnosed in 1970. The last naturally infected patient in the world was seen in Africa in 1977, and since then the disease has ceased to exist.

### Transmission

Man is the only host, and smallpox virus spreads directly from person to person, chiefly in droplets from an infected person or by direct contact. The infective dose is very small. The patient is infectious from about one day before the rash appears until the last scab has fallen off. The patient is most infectious during the first week after the appearance of the rash, when large amounts of virus are liberated into the saliva from the oral mucosa. At present, variola virus could be used as a terror weapon, spread as an aerosol, as the virus has been shown to be stable in this form.

### Symptoms

After an incubation period of 8-16 days, the patient starts to feel very ill, with high fever and severe headache. Two to four days later a red-dish maculopapular rash appears, spreading from the mouth and face to the rest of the body, especially the arms and legs, and may appear both on the palms of the hands and on the soles of the feet. Within one or two days vesicles containing a clear fluid appear, developing into pustules after a further one or two days. During the second week of illness the pustules dry out, forming scabs which fall off after three or four weeks. In contrast with chickenpox, the lesions of

smallpox all show the same stage of development in the same area of skin. The smallpox rash typically appears peripherally and spreads to central parts of the body, the opposite of the pattern for chickenpox, in which, moreover, no lesions occur on the palms or soles. At least 90% of smallpox patients display the characteristic symptoms and rash.

### Course

Smallpox may appear either as variola major or as variola minor. The skin lesions are identical in the two forms, leaving small pitted scars, but variola minor takes a milder course in respect of both fever and rash. A mild course of illness may also be seen in persons with immunity from prior vaccination. Apart from the skin and mucosal lesions, other organs are seldom affected. Secondary bacterial infection is rare. The mortality is less than 1% in patients with variola minor, as against about 30% in those with variola major. Deaths are most frequent during the second week of illness. Two rare forms of smallpox, haemorrhagic and malignant smallpox, carry a high mortality. There is only sparse knowledge of the course of the disease in persons with immune deficiencies, e.g. HIV infection.

### Diagnosis

Variola virus can be rapidly identified by electron microscopic examination of vesicular or pustular fluid. The diagnosis can also be made by PCR on the same material, as well as from oropharyngeal secretions at an early stage of illness.

### Prevention

In 1980 the WHO recommended all countries to stop smallpox vaccination. Obligatory smallpox vaccination was discontinued in Denmark in 1976, and smallpox vaccine ceased to be issued in Denmark from June 1981. As the disease has ceased to exist, vaccination of the civilian population is regarded as irrelevant and is not currently being performed anywhere in the world. Smallpox can also be controlled by provisions for quarantine and isolation, as the morbidity is close to 100% and the disease has very characteristic clinical features. Contacts of smallpox patients must be vaccinated, as vacci-

nation within the first few days after exposure may moderate the course of illness.

### Vaccination

The vaccines are preparations of vaccinia virus, which is closely related to smallpox virus. Epidermal inoculation produces a local infection (a pustule) which results in protection against smallpox. Protection is almost complete for the first five years after vaccination and then declines; after 20 years, protection is probably minimal. Existing vaccines may produce a relatively high incidence of side effects such as fever or malaise. Depending on the type of vaccine, the frequency of encephalitis may be 1 per 50,000 to 300,000 vaccinations; about a quarter of the cases are fatal or associated with long-term neurological complication. Persons with eczema may develop serious complications from infection with vaccinia virus, and the condition can be serious or even fatal. A less serious side effect is vaccinia generalisata, producing pustules on the head, trunk and limbs. (See the Weekly epidemiological record no. 44, 2001, at [www.who.int/wer](http://www.who.int/wer)) Statens Serum Institut has stocks of prepared vaccines and raw material for vaccine production, which have been stored in liquid nitrogen since the 1970's. The vaccine is still active. (S. Glismann, Dept. of Epidemiology, B. F. Vestergaard, Dept. of Virology)

### FREE VACCINATION OF CHILDREN BORN TO WOMEN WITH CHRONIC HEPATITIS B

From 1 November 2001, children born to women with chronic hepatitis B can be vaccinated free of charge against hepatitis B, at birth and the age of 1, 2 and 12 months, as recommended by the National Board of Health. The provision applies only to children under 2 years of age born or resident in Denmark. This change in provisions for vaccinations that are free of charge has been made to ensure that babies exposed to perinatal infection receive the three follow-up vaccinations, which are normally given by the child's general practitioner. (Department of Epidemiology)

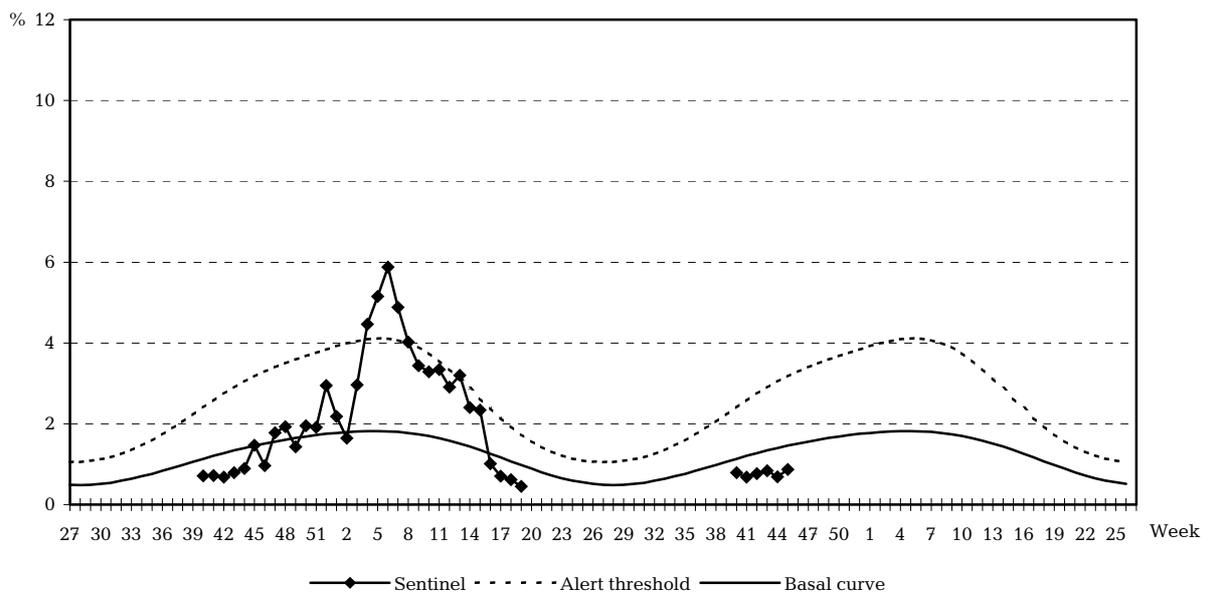
## Patients with laboratory-diagnosed RSV or rotavirus infections, 3rd quarter 2001

July		August		September	
RSV	Rota	RSV	Rota	RSV	Rota
0	18	0	9	2	10

Reported from the following Clinical Microbiology Departments:  
 Aalborg Hospital (South), Aarhus Municipal Hospital, Herning Central Hospital,  
 Hvidovre Hospital, Odense University Hospital, Slagelse Central Hospital,  
 Viborg Hospital and the Dept. of Virology, Statens Serum Institut.

## Sentinel surveillance of influenza activity

Weekly percentage of consultations, 2000/2001/2002



**Sentinel:** Influenza consultations as % of total consultations  
**Basal curve:** Expected frequency of influenza consultations under non-epidemic conditions  
**Alert threshold:** Possible incipient epidemic

(Dept. of Epidemiology)