

[3,4]. In both cases, the infection was acquired abroad, through an animal bite.

Transmission of the rabies virus to humans usually occurs through the bite of an infected animal, but can also occur through direct contact of mucous membranes or fresh breaks in the skin with infectious material (e.g. saliva, neural tissue, cerebrospinal fluid). Person-to-person transmission has been observed only in rare isolated cases after transplantation. Rabies in transplant recipients was last reported in 2004 in the United States [5,6]. Based on a risk analysis ([http://www.cdc.gov/ncidod/dvrd/rabies/organ\\_update\\_070204.htm](http://www.cdc.gov/ncidod/dvrd/rabies/organ_update_070204.htm)), 174 contacts associated with these cases received post-exposure prophylaxis with simultaneous passive immunisation with rabies immunoglobulin and active immunisation with rabies vaccine.

As a result of this situation, in consultation with the Konsiliarlabor for Rabies and the Bernhard-Nocht-Institute, the Robert Koch-Institut has defined indications for immunisation after contact with a person suspected of or confirmed as having rabies. These are available at <http://www.rki.de>.

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## LARGE ONGOING RUBELLA OUTBREAK IN RELIGIOUS COMMUNITY IN THE NETHERLANDS SINCE SEPTEMBER 2004

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As of 25 February 2005, 128 serologically confirmed cases of rubella were notified in the Netherlands (since 1 September 2004). This is a large increase compared with the annual average of five cases notified from 2000 to 2003. Forty six cases were in males and 82 in females. The median age was 11 years. None of the patients had been vaccinated against rubella, most frequently for religious reasons (118 cases). Nine of the 128 reported cases are known to be in women who were pregnant at the time of infection. Of these, five were infected in their first trimester.

Postnatally acquired rubella is generally mild, and in many cases infection is asymptomatic. However, rubella infection acquired during early pregnancy can lead to severe birth defects known as congenital rubella syndrome (CRS). This syndrome occurs in up to 90% of infants born to mothers who were infected in the first trimester [1].

Since 1999, only laboratory confirmed cases of rubella have been notifiable in the Netherlands. Surveillance based on this has meant that the true number of infections has been largely underestimated. Age and

sex distribution may be also biased if based on notified cases only. Case finding has been enhanced by offering non-invasive diagnostic methods (using saliva, finger prick blood, urine and throat swabs). These non-invasive methods are being used in a pilot surveillance project for rash diseases, and will be introduced nationally later in 2005 [2].

Vaccination strategies against rubella aim primarily to prevent CRS. In the Netherlands rubella vaccination of 11 year old girls began in 1974. However, mathematical models predicted that more CRS cases might be prevented by universal vaccination [3]. Therefore, since 1987, rubella vaccination has been offered to all children aged 14 months and 9 years as part of the combined vaccination against measles, mumps and rubella (MMR).

The uptake of MMR is generally high in the Netherlands (96%, MMR (first dose) in 2004). However, this conceals areas of lower vaccination coverage which are sociogeographically linked [4]. The spread of the current outbreak closely matches these areas of lower coverage (see [http://www.rivm.nl/vtv/object\\_map/o1219n21466.html](http://www.rivm.nl/vtv/object_map/o1219n21466.html)). These areas are characterised by a high proportion of religious inhabitants, some of whom refuse vaccination because they feel prevention of disease interferes with divine providence. In these areas, GGDs (Municipal Health Services) continue to offer vaccination to individuals up to 18 years of age.

The risk of outbreaks in this specific community increases when a critical number of susceptible children are born after an epidemic. Periodic epidemics occurred in the last decade: poliomyelitis (1992/93), rubella (1996) and measles (1999/2000). The current rubella epidemic could be expected: a large seroprevalence study in 1995/6 estimated that the seroprevalence in unvaccinated individuals in the age group 1-9 years was low [5]. The prevalence of immunity in females >10 years of age was >97%, both overall as well as in areas of lower vaccination coverage. The latter can be explained by natural rubella infection in the past. Based on this, it is estimated that the current prevalence (8 years after the sample) of immunity in women of childbearing age is >97%, irrespective of vaccination status.

Experience in countries with MMR programmes has shown that immigrants may be a risk group for rubella infection and CRS [6,7]. Limited information available suggests that immunity in some immigrant groups in the Netherlands may be low compared to the indigenous population [8]. However, there is no indication yet that the current rubella outbreak in the Netherlands has spread beyond the unvaccinated religious community to immigrants.

In the past, outbreaks in the Dutch orthodox religious groups have spread abroad. In the 1992/3 poliomyelitis outbreak, spread of infection to Canada was documented [9]. In the 1999/2000 measles outbreak, Canada was again affected [10].

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