
Can Norway be kept free from rubella and measles?

PERSPECTIVES

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We have eliminated measles and rubella in Norway, but are still exposed to infection from abroad. The high vaccination coverage for children must be maintained, and non-immune adults should also be offered vaccination. In cases of clinical suspicion, doctors should test more patients for measles and rubella so that outbreaks can be halted rapidly. This will help provide a good surveillance of disease prevalence.

Measles is a highly infectious disease. It can lead to pneumonia, encephalitis and death. Rubella, on the other hand, is usually a mild disease, but may result in severe malformations in the child if a pregnant, non-immune woman is infected before gestational week 20 (1).

Measles and rubella are notifiable to the Norwegian Surveillance System for Communicable Diseases (MSIS). In all suspected cases, serological examination for antibodies should be performed, and a saliva test taken for genotyping of the virus (Box 1).

Tabell

Box 1

Measles and rubella – practical information
The municipal medical officer or, if relevant, the Norwegian Institute of Public Health's 24-hour Infectious Disease Control shall immediately be notified of any case that is suspected or detected (1)
Saliva samples are taken in a container with Oracol mouth swab or as nasopharyngeal/oral secretion on a swab that is sent on a virus transport medium. Saliva can alternatively be sent in a sterilised container
Positive antibody tests and tests for virus genotyping should be sent to the Norwegian Institute of Public Health, which is the national reference laboratory accredited by WHO
MMR vaccine ordered from the Norwegian Institute of Public Health is free of charge, but is subject to a handling fee
Information on disease and prevention of infection is available on the website of the Norwegian Institute of Public Health, www.fhi.no/nettpub/smittevernveilederen/ . The Institute also offers advice to healthcare personnel by telephone and email

The European region of the World Health Organization (WHO) has as an aim to eliminate measles and rubella [\(2\)](#). Elimination is defined as the absence of continuous disease transmission (endemic cases) with local or imported virus in the population for at least 12 months under a well-functioning surveillance system and with use of virus genotyping. One elimination indicator that is used is that there shall be less than one case of disease per 1 000 000 inhabitants per year (imported cases are not included in the calculation) [\(2\)](#).

Several factors make it possible to eliminate these diseases. Humans are the sole reservoir, the vaccines are safe and effective and good diagnostic tests are available. In the WHO's Region of the Americas rubella was eliminated in 2015 and measles in 2016. If the other five WHO regions also achieve elimination, the diseases can be declared eradicated. The annual status for Norway has been reported to the WHO since 2010.

Measles and rubella in Norway

The last nationwide measles epidemic in Norway was in 1983 – 84 [\(3\)](#). In 2010 and 2012 – 15 the reported incidence rate in MSIS was consistent with the WHO's elimination indicator. However, a relatively large outbreak took place in 2011, with slightly more than six cases per 1 000 000 [\(4\)](#).

The last reported major rubella outbreak in Norway was in 1978 – 79. A smaller local outbreak occurred in 1995 – 96. Since 1999, the incidence rate for rubella has corresponded to the elimination indicator, and the last reported case of congenital rubella syndrome following rubella infection in Norway was in 1990 [\(1\)](#).

However, the Norwegian Institute of Public Health has data indicating that general practitioners use diagnostic codes for measles and rubella more frequently than is suggested by the number of cases notified to MSIS. Only around half of the reimbursement codes recorded are followed by a code for laboratory tests (Inger Cappelen, Norwegian Institute of Public Health, personal communication). This may indicate that Norwegian doctors do not follow the recommendation in the Guidelines for infectious disease control to follow up suspicion of measles or rubella with microbiological testing.

The Norwegian surveillance system for measles and rubella is a passive case finding that depends on healthcare personnel and laboratories reporting cases. Compared to an active system in which the public authority contacts all actors possessing information, this may have contributed to underreporting and delayed notifications of these diseases in Norway.

When few cases are reported, it is difficult to know whether there are in fact few cases of disease, whether there are cases that have not been reported, or whether there are patients who have not been tested. The reports sent to WHO should therefore provide information on the number of suspected cases tested (at least two per 100 000 inhabitants). For the years 2014 and 2015, the test rate for measles in Norway was lower than recommended – 0.78 and 1.18 per 100 000 for measles and 1.0 and 0.76 per 100 000 for rubella, respectively.

Nevertheless, most reported cases in Norway are confirmed by laboratories, and all samples sent to the Norwegian Institute of Public Health are examined in a WHO-accredited laboratory. The proportion of suspected cases of disease in which retrieval of relevant information is initiated within 48 hours from the time of notification is, however, unknown (WHO indicator for disease investigation, target at least 80 % of cases). Examples of relevant information are date of onset of the rash, date of microbiological sample collection and information on previous vaccinations.

The Norwegian Institute of Public Health assumes that few clinicians notify the diseases before the diagnosis has been verified virologically and this target is therefore not achieved. Very few cases are notified by telephone to MSIS. In Norway, an unknown place of infection is only exceptionally reported, and no known cases are attributed to the virus being endemic within the country. This indicates that we have a good overview of the sources and spread of infection.

Vaccination coverage in Norway

The WHO's strategy for elimination of measles and rubella is to achieve and maintain high vaccination coverage ($\geq 95\%$) with two doses of measles vaccine and at least one dose of rubella vaccine.

The MMR vaccine against measles, mumps and rubella has been part of the Norwegian childhood immunisation programme since 1983, with two doses of vaccine (at 15 months and 11 – 12 years). Two doses of vaccine provide almost 100 % protection against measles and rubella [\(2\)](#).

Since 1995, child vaccination coverage in Norway has been monitored by the immunisation registry SYSVAK [\(5\)](#). The SYSVAK registry is for the time being not well suited to assess vaccination coverage for adults, since the notification to the registry was only introduced for this group in 2011. The number of registered childhood immunisations is presumably also lower than actual immunisations, partly because of a lack of reporting. Risk groups and reasons for low vaccination coverage must be assessed locally, as in the case of the measles outbreak in Oslo in 2011 where there were several cases within a Somali community in one district [\(4\)](#).

In the period 2010 – 11, the registered vaccination coverage for one dose of MMR vaccine in Norway was 93 – 95 % and 87 – 91 % for two doses (unpublished data). In 2013, six counties reported only 87 – 89 % vaccination coverage for two doses of MMR vaccine in 16-year-olds (unpublished data). As a result, the WHO expressed concern that the infection could again become endemic in these areas [\(6\)](#). The Norwegian Ministry of Health and Care Services therefore asked the Directorate of Health and the Institute of Public Health to join forces to ensure high coverage of the childhood immunisation programme.

Feedback from municipalities and counties via the County Medical Officers indicated that the low coverage was attributable to inadequate routines for follow-up when children fall outside of the regular immunisation programme, as well as technical challenges related to the use of the electronic patient record

system and its communication with the SYSVAK registry. Furthermore, the Population Registry was not fully updated with regard to children who lived in the municipality, and there was insufficient retrospective registration of previous vaccinations.

Since autumn 2015, SYSVAK has provided feedback to the public health nurse if 15-year-olds lack registration of two valid doses of MMR vaccine. The vaccines can thereby be offered or missing registration in SYSVAK corrected.

In 2015, only two counties had a vaccination coverage of less than 90 % for two doses of MMR vaccine (unpublished data), although 97 % of these 16-year-olds had received at least one dose. This indicates high immunity to measles for this birth cohort. The improved vaccination coverage for the second dose of MMR vaccine may be due to better information from the Norwegian Institute of Public Health and the active use of the feedback from SYSVAK in the municipalities.

Imported infection, outbreaks and immunity

The Norwegian Institute of Public Health introduced genotyping of the measles virus in 2003. This is recommended in order to identify endemic and imported strains. When an outbreak is evaluated genotyping can provide knowledge of the source of the infection and distinguish between different outbreaks. We have no evidence to suggest that particular genotypes are dominant in Norway, but genotyping was only possible in one of two outbreaks in recent years. This was associated with lack of testing and/ or a long delay between onset of symptoms and testing. Only sporadic cases of imported rubella were registered in the period 2010 – 15.

Immunity testing of military recruits has shown that more than 97 % of Norwegians born before the introduction of measles vaccination in 1969 have had measles (7). Some individuals born after 1969 may both have avoided infection and remained unvaccinated. Older persons from countries in which measles is still endemic will have natural immunity. Globally almost 85 % of all children now receive the measles vaccine (8). The disease is therefore becoming less common, so that young adults who move to Norway may have escaped both the disease and vaccination. Young adults arriving from Western Europe may also lack protection, as low vaccination coverage has been, and continues to be, a problem in several countries (9).

Blood testing of pregnant women, followed by an offer of rubella vaccination after pregnancy for seronegative women, became common from the mid-1980s, but was first established by a circular letter in 1993 (10). This offered free rubella vaccination for all proven seronegative women of fertile age. We can assume that up to 10 % of women who grew up in other countries may lack immunity to rubella (11). This is therefore an important group to reach when they immigrate to Norway and are in their fertile age.

Since 2016, screening for rubella antibodies is only recommended for pregnant women who have not been vaccinated with two doses of vaccine or who have not had rubella (12). If no protective antibody level against rubella is found by

testing, vaccination of the woman is recommended shortly after delivery when pregnancy is excluded (maternity wards, public health clinics) (1).

The way ahead

According to the European Regional Verification Commission for Measles and Rubella Elimination, Norway is among 24 of 53 member countries who fulfil the criteria for elimination of measles and rubella (9). However, as long as these viruses are endemic in Europe and the rest of the world, infection will regularly occur in our country. It is essential that healthcare personnel and the general population are aware of measles and rubella and how the diseases can be prevented through vaccination – and vaccination coverage must be maintained at a high level.

A national plan for elimination of measles and rubella was concluded in the autumn 2016 (not yet published). All children in Norway will continue to be offered two doses of MMR vaccine through the childhood immunisation programme, and two doses will also be offered when the first dose has been delayed. Low vaccination coverage in a city district or municipality requires local interventions to increase it.

All adults who have not undergone these diseases or know that they have not been vaccinated should also be offered the MMR vaccine. Prior antibody testing is not necessary. This is especially important for those who have moved to Norway or are temporarily resident, for women of fertile age (preferably before the first pregnancy), young men, healthcare personnel and day-care employees. Health services for immigrants and asylum seekers, municipal outreach activity for itinerant groups, public health clinics, general practitioners, occupational health services and outpatient vaccination clinics are important providers of vaccination to different target groups.

Laboratory confirmation is essential for rare infectious diseases, both to provide a correct diagnosis and given our responsibility to notify the WHO. It is crucial that healthcare personnel test for both measles and rubella where a clinical suspicion exists. Effective management of outbreaks and collection of relevant data for MSIS is important to limit transmission of infection and to document that Norway remains free from measles and rubella, also in the future.

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Publisert: 29 May 2017. Tidsskr Nor Legeforen. DOI: 10.4045/tidsskr.17.0047

Received 13.1.2017, first revision submitted 16.3.2017, accepted 24.4.2017.

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