


[Back to Table of Contents](#)
[en](#) [es](#) [fr](#) [it](#) [pt](#)
[Previous](#)
[Next](#)

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EPIDEMIOLOGY OF RUBELLA IN FINLAND

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Before rubella vaccination programmes began, rubella infection was prevalent in Finnish children. The disease occurred as epidemics at intervals of a few years. Rubella infection was most often contracted between the ages of 2 and 12 years. Vaccinations specifically aimed at eradicating rubella were begun with monocomponent vaccine in the mid-1970s, and the measles, mumps and rubella (MMR) vaccination programme with two injections got underway in 1982. A clear reduction in rubella cases was evident a few years after the launch of the MMR programme. Owing to a sufficiently high vaccination coverage (>95% since 1987), circulation of the indigenous rubella virus in the Finnish population ceased in the late 1990s. Some rubella cases have been imported to Finland since elimination, but they have not caused any secondary cases. This shows unambiguously that protection against rubella continues to be effective, although our cohort studies imply that the vaccine induced antibody levels do decrease with time. The MMR programme has also eliminated congenital rubella syndrome (CRS) from the country. The last CRS case was recorded in 1986. As a result of the high coverage two dose MMR vaccination programme, rubella was successfully eliminated from Finland. How long the acquired protection will last remains to be seen.

Rubella has been a notifiable disease in Finland for several decades. Before 1987, the notifications were based on the clinical picture, but since 1987, all cases reported to the National Infectious Disease Register have been laboratory confirmed before notification. In the pre-vaccination era, rubella was endemic in Finland, with large epidemics occurring every few years. The yearly incidence of notified rubella cases ranged from 33 to 249 per 100 000, with the majority of cases occurring in two to twelve year old children.

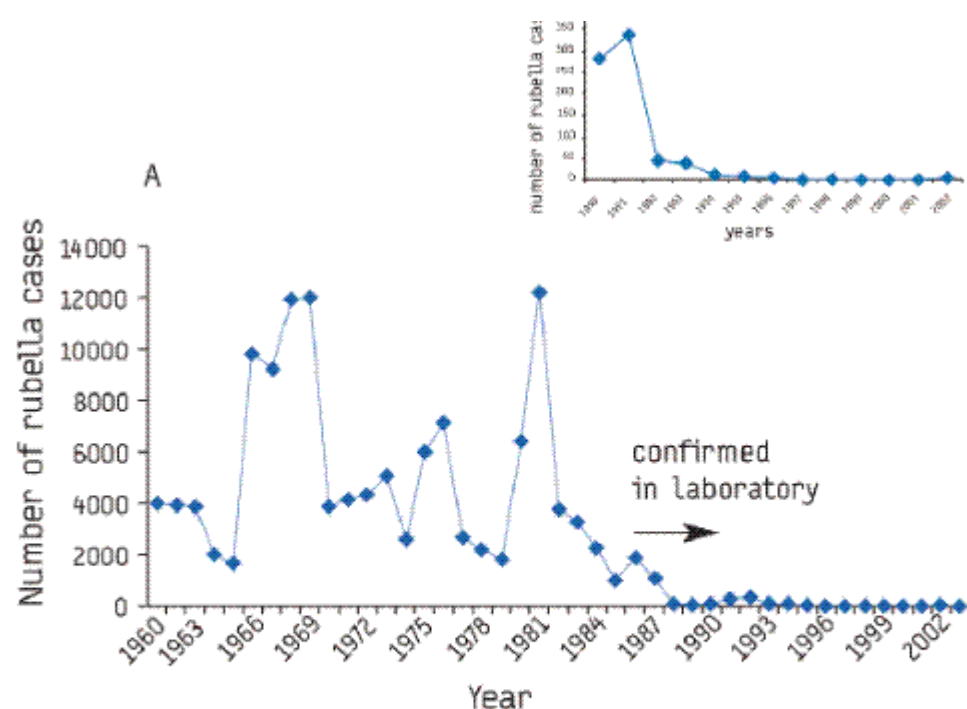
The elimination of rubella in Finland was achieved over twenty years through two different vaccination strategies (Figure 1). Selective rubella vaccination with monocomponent vaccine was started in 1975. The programme targeted 11-13 year old girls and seronegative mothers after delivery. The vaccination coverage was 60-70%, which was not sufficient to eliminate rubella during pregnancy [1]. The rubella vaccine used in this programme until 1983 was Cendevax (SmithKline-RIT, Belgium) containing Cendehill rubella strain). Thereafter, Rubeaten vaccine (Berna, Swiss Serum and Vaccine Institut, Switzerland) containing RA 27/3 rubella strain was used until 1988 for adolescent girls and seronegative women in the postpartum period.

FIGURE

Number of notified rubella cases in Finland*.

A: 1960-2002, B: 1990-2002.

B



* The cases have been confirmed in laboratory since 1987

Monocomponent rubella vaccination had a very limited influence on the number of rubella cases between 1975-1982, probably because of low coverage and because it targeted only girls and seronegative mothers. Rubella cases continued to occur; for instance, the peak number of rubella cases since 1960 (245 per 100 000) was observed in 1980.

Consequently, a two dose nationwide measles, mumps and rubella (MMR) vaccination programme was launched in 1982, the 2 doses being given at the ages of 14-18 months and 6 years [2]. Catch up MMR vaccinations were given between 1983-1986 to children between 14-18 months and 6 years of age. The MMR vaccine was also used in the vaccination of military conscripts from 1986 to 1999. The vaccine was MMRII (Merck Co., United States) throughout the programme.

The vaccination coverage of the MMR was <90% during the first four years of the programme. By 1987, coverage of 97% was attained by means of a specific campaign [3]. Since then the coverage has remained >95% throughout the MMR programme, which is high enough to stop the circulation of rubella virus in population [4].

Concurrent with the MMR vaccination campaign, several specific studies were begun to evaluate the effectiveness of the programme. One was a study of suspected vaccine failures, which revealed that less than 1% of clinically suspected rubella cases could be laboratory confirmed between 1983-1995 [5], indicating the low positive predictive value of clinical diagnosis at this stage of control.

Soon after the start of the MMR programme, a large decline was seen, with the annual number of cases dropping from 3250 to 99 in five years [6], and a simultaneous transient increase in the age of acquisition to older and unvaccinated age groups [7].

The last two rubella outbreaks involved 200-300 cases each and occurred in 1990-1991. Any person having fever and maculopapular rash with rubella-specific IgM antibodies was considered as a rubella case. The cases appeared mostly at vocational schools in two cities in southwest Finland. Those infected were unvaccinated boys and young men aged between 15 and 21 years [8]. The girls of the same age at the same schools had apparently been protected because of vaccination with the monocomponent rubella vaccine. This epidemic rubella strain was found to belong to genotype 1, the most prevalent strain worldwide (unpublished data).

After this outbreak the number of cases continued to decline steadily. Since 1996 no indigenous rubella cases have occurred in Finland. Some imported cases are still diagnosed each year, with cases being imported from Russia, Estonia, Thailand and France over the past 5 years. No secondary cases have been observed in the Finnish population, indicating high herd immunity.

Rubella antibody screening of pregnant mothers during 1982-83 showed the prevalence of seronegative parturient women was 3.7% which was a half of that before selective vaccination [9]. A seroprevalence study performed as part

of the ESEN (European Sero-Epidemiology Network) project from specimens collected from 0 to >65 year olds in 1997-98 revealed that the percentage of the population that was seronegative for rubella was less than 5% in all studied age groups for both sexes [10].

In spite of monocomponent rubella vaccinations, the number of congenital rubella syndrome (CRS) cases was high prior to the MMR vaccination programme. During a four year period (1979-1982) before the MMR campaign 22 cases of CRS were diagnosed. However, since 1983, the start of the MMR vaccination programme, CRS has been serologically confirmed in only five cases, the last of which occurred in 1986 [11].

A twenty year cohort study of MMR induced immunity suggests that serum antibody levels have waned substantially over time, even after two doses of rubella vaccine [12], so that a relatively large proportion of vaccinees had an antirubella antibody level of <15 IU/ml, a putative protective level (unpublished data). However, the decreased antibody levels still remain at a measurable level, i.e., all were seropositive.

Finland has now been free of indigenous rubella for eight years. Very high vaccination coverage has been the cornerstone for this state of affairs, and will be essential if it is to continue. It will be interesting to see how long the protection against rubella provided by our two dose MMR vaccination programme will last.

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