Rubella vaccines

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Rubella is an acute, viral disease traditionally affecting children and young adults. The virus is transmitted by the respiratory route, replicates in the nasopharyngeal mucosa and local lymph nodes and spreads by viremia to different organs. The incubation period ranges from 12–23 days.

Although usually a mild self-limited illness, rubella during early pregnancy may result in miscarriage, fetal death or congenital ophthalmic, auditory and/or cardiac defects known as congenital rubella syndrome (CRS). The period of highest risk of CRS (up to 90% of cases) is from just before conception and during the first 8–10 weeks of gestation. Serious manifestations of CRS include meningoencephalitis, hepatosplenomegaly, hepatitis, and thrombocytopenia. Surviving infants may face developmental disabilities. Maternal rubella is rarely associated with fetal defects after the 16th week of pregnancy.

Before the introduction of rubella vaccine, the incidence of CRS varied from 0.1–0.2 per 1000 live births during endemic periods, and from 0.8–4 per 1000 live births during rubella epidemics. Large-scale rubella vaccination during the past decade has drastically reduced or practically eliminated rubella and CRS in many countries.

Most rubella vaccines are based on the live, attenuated RA 27/3 strain. Other live, attenuated rubella-vaccines include the Takahashi, Matsuura, TO-336, or BRD-2 strains. Rubella-containing vaccines (RCVs) are available either as monovalent formulations or, more commonly, in combinations with vaccines against measles (MR), measles and mumps (MMR), or measles, mumps and varicella (MMRV). The immune response to rubella antigens is not affected by the other vaccine components.

RCVs are administered subcutaneously or intramuscularly, usually at age 12–15 months, but may be administered to children aged 9–11 months and to older children, adolescents and adults. Although one dose of rubella vaccine probably induces life-long protection, in most countries using the MR or MMR vaccines a second dose is offered at 15–18 months or 4–6 years, as indicated for protection against measles and mumps.

In clinical trials, 95–100% of susceptible persons aged ≥12 months develop rubella antibodies after a single dose of the vaccine. In outbreak situations the effectiveness of different rubella vaccines has been estimated at 90–100%. RA 27/3-containing vaccines have eliminated rubella and CRS from the western hemisphere and in European countries with high vaccination coverage.

Adverse reactions following vaccination with RA27/3-containing rubella vaccine are mild, particularly in children. However, in susceptible adult women, transient arthralgias and arthritis are relatively common. No causal link has been demonstrated between RCVs and chronic joint disease, Crohn's disease, ulcerative colitis, or autism. Furthermore, no cases of CRS have been reported in more than 1000 susceptible women who unknowingly were vaccinated in early stages of pregnancy. However, because of a theoretical, but never demonstrated teratogenic risk, rubella vaccination of pregnant women should be avoided, and those planning a pregnancy are advised to avoid pregnancy for 1 month following rubella vaccination.

Rubella vaccination is contraindicated for people with a history of an anaphylactic reaction to components of the vaccine and for persons suffering from severe immunodeficiency.

There are two general approaches to the use of rubella vaccine: The first focuses exclusively on reducing CRS by immunizing adolescent girls and/or women of childbearing age; the second approach aims at interrupting viral transmission and thereby eliminating rubella as well as CRS.

For CRS reduction alone, adolescent and adult females should be vaccinated through either routine services or supplementary immunization activities (SIAs). This option will provide direct protection to women of childbearing age; however, the impact of this strategy is limited by the coverage achieved and the age groups targeted. In the absence of a programme that ensures vaccination of infants and young children, rubella will continue to circulate, resulting in ongoing exposure of pregnant women and the associated risk of CRS.

For the elimination of rubella and CRS, the preferred approach is to begin with MR vaccine or MMR vaccine in a campaign targeting a wide range of ages, immediately followed by the introduction of MR or MMR vaccine into the routine programme. All subsequent follow-up campaigns should use MR vaccine or MMR vaccine. In addition, countries should make efforts to reach women of childbearing age by immunizing adolescent girls or women of childbearing age, or both, either through routine services or mass campaigns.

Measles-vaccine delivery strategies provide an opportunity for synergy and a platform for advancing rubella and CRS elimination. All countries that are providing 2 doses of measles vaccine using routine immunization or SIAs, or both, should consider including RCVs in their immunization programme.

Sustained low coverage of rubella immunization in infants and young children can result in increased susceptibility among women that may increase the risk of CRS above levels during the prevaccine era (“paradoxical effect”). Therefore, countries should achieve and maintain immunization coverage of ≥80% with at least one dose of an RCV delivered through routine services or regular SIAs.

The need to document the impact of rubella vaccination requires laboratory-supported surveillance for rubella and CRS, and molecular epidemiology. Immunization coverage should be monitored by age and locality and supplemented by seroprevalence surveys where necessary to determine age-specific susceptibility to rubella and direct vaccination activities. Antenatal serological screening is a practical tool in this context.