

# Rubella Vaccine and Vaccination Strategies

One of the consequences of the devastating rubella pandemic in Western Europe and the United States in 1964-1965 was extended research and progress towards the development of an effective vaccine. Following isolation of the rubella virus in 1962 by Parkman, Beuscher, and Arenstein in Washington D.C., and Weller and Neva in Boston, three rubella vaccine strains were initially licensed in the United States in 1969. These were soon replaced by the vaccine now used throughout the world; the RA 27/3 rubella vaccine. This vaccine was developed by Dr. Stanley A. Plotkin between 1965 and 1967 at the Wistar Institute in the United States. The RA 27/3 vaccine was licensed in the United States in January 1979.

The vaccine is a weakened live rubella virus and produces immunity by mimicking natural rubella infection. It is attenuated by 25-30 passages in tissue culture. The resulting viremia and pharyngeal excretion, however, are of a much lower magnitude than natural infection, and are noncommunicable. Rubella vaccination induces IgM and IgG antibody responses. The long-term presence of IgG antibody eliminates the possibility of viremia following subsequent exposure to the circulating rubella virus. By generating secretory IgA responses to block replication in the nasopharyngeal mucosa, vaccination protects the body against re-infection.

The rubella vaccine is very safe. It is generally non-communicable. However, a mother may transmit the vaccine virus to her infant via breastfeeding. Infection in the infant, however, remains subclinical. Adverse reactions to the vaccine are rarely severe and are generally self-limiting. RA 27/3 is administered mostly in a combination with measles and mumps vaccines (MMR). The most common adverse reactions of the rubella component of vaccination are joint symptoms. Arthralgia may occur in approximately 25% of susceptible women. Moreover, approximately 10% of susceptible women may have acute arthritis-like symptoms.

Due to its safety, as well as consistent immunogenicity, the RA 27/3 vaccine strain is preferred over previously licensed rubella vaccines. Seroconversion occurs in over 95% of those vaccinated. The vaccine induces higher antibody titers and produces an immune response that more closely resembles natural infection. It is highly effective, with immunity thought to be lifelong.

The preferred form of rubella vaccine administration is through the MMR or MR (measles and rubella) vaccination. Children should receive MMR vaccine at 12-15 months of age. In addition, MMR vaccine may be used for the measles *follow-up* campaign. Indications for vaccine use in adults include: international travelers, persons in post-high school educational institutions, health care workers, and women of childbearing age who lack acceptable evidence of immunity.

The main contraindication to rubella vaccination is pregnancy. Although there is no evidence to suggest that rubella vaccination causes Congenital Rubella Syndrome (CRS), it is prudent to avoid rubella vaccination, as well as

other live virus vaccines, during pregnancy. Another contraindication is persons with impaired immunity. Therefore, persons infected with HIV and exhibiting signs of severe immunosuppression should not be vaccinated. Other contraindications include moderate to severe febrile illnesses and persons who have recently received injections of immune globulins.

## Rubella Control Strategies

In the past 30 years, two major rubella control strategies have been implemented; however, both vaccination strategies have been only moderately successful. In the United Kingdom, a national rubella immunization program was implemented in 1970. The initial target population of this strategy was prepubescent girls 11-14 years of age. The objective was to attain high levels of rubella immunity among women. In 1976, the strategy was expanded to vaccinate all susceptible women of childbearing age. This strategy proved partially successful. While the number of CRS cases dropped significantly there were still quite a few persons who remained susceptible and the virus continued to circulate.

The strategy initially adopted in the United States in 1969 was to target the primary transmission group--young school children of both sexes. This strategy assumed that decreased rubella virus transmission among children would protect susceptible women of childbearing age. Routine vaccination of all children aged 12-15 months was later implemented. Studies showed, however, that although a decline in rubella transmission in children had occurred, the number of susceptible childbearing aged women had remained relatively unchanged.

Recently in the United States, outbreaks of rubella have occurred in South Carolina, New York, California, and Texas. Young adults of Hispanic ethnicity have accounted for the majority of the cases in recent-year outbreaks. In fact, over 80% of the rubella cases reported to the Centers for Disease Control and Prevention (CDC) during 1997 occurred in persons of Hispanic ethnicity. These data suggest that rubella virus is being imported to the United States from Latin America.

Rubella vaccination has only been recently introduced into Latin America. While rubella incidence has greatly decreased in the United States, rubella remains endemic in the countries of Latin America and the Caribbean. Thus, persons born in countries without rubella vaccination programs are at an increased risk.

Although a goal to eliminate rubella and CRS in the Americas has yet to be established, there are steps to be taken to improve rubella control and decrease CRS incidence. From the above, it is apparent that much work is needed to control and eventually eliminate rubella. A vaccination strategy combining the strategies used by the United Kingdom and the United States would likely be successful in interrupting rubella virus circulation. The vaccination program would integrate individual protection for women of childbearing age, with the vaccination of all children to

interrupt transmission.

At the Technical Advisory Group (TAG) Meeting on Vaccine-Preventable Diseases in 1997, the following recommendations for the countries of the Americas were made:

- Rubella vaccine (as MR or MMR) should be incorporated into routine childhood vaccination programs of all countries in the Region.
- CRS surveillance should be established before or concurrent with rubella vaccination program implementation.
- Because each country is in a different situation and

moving at a different pace towards improved rubella and CRS control, there are recommendations that apply to certain countries:

- Countries wishing to prevent and control CRS promptly should carry out a mass campaign to vaccinate all females ages 5-39.
- Countries wishing to prevent and control both rubella and CRS promptly should carry out a mass campaign to vaccinate persons of both sexes ages 5-39.
- Countries that are unable to do either of the above, in addition to routine infant vaccination, should target women of childbearing age for rubella vaccination.

## Polio Surveillance

Seven years following the last case of poliomyelitis in the Americas and four years after the certification of eradication of wild poliovirus transmission in the Americas, the rate of acute flaccid paralysis (AFP) continues to decline (0.70 of AFP cases per 100,000 in children under 15 years of age). The projected year end goal is to reach the rate of 1 case of AFP per 100,000 in children under 15 years of age. Based on this, a calculation was done of the AFP cases needed to be reported by countries. Table 1 below shows countries, that at week 40 had failed to report cases of AFP expected to occur during this period.

Table 1

Country	Cases reported 1997	Cases reported up to week 40/1998	Cases expected to be reported up to week 40/1998
Argentina	49	0	141
Brazil	430	195	637
CAREC	14	10	26
Costa Rica	11	0	14
Dominican Republic	22	11	31
Haiti	0	2	26
Paraguay	10	7	21

Table 2  
AFP Surveillance Indicators

Country	80% weekly reporting units	80% of cases investigated within 48 hours	80% of cases with 1 adequate stool sample taken	AFP Rate $\geq$ 1:100,000 in children < 15 years
Chile				
Colombia				
Cuba				
Honduras				
Mexico				
Nicaragua				
Bolivia				
Ecuador				
El Salvador				
Panama				
Peru				
Venezuela				
Dominican Republic				
Paraguay				
Brazil				
Guatemala				
Haiti				
Uruguay				
Argentina				
Costa Rica				

\* Data as of week 40, ending 10 October 1998  
Source: SVI/PAHO (PESS).

## Regional Notes

**VII Meeting of Wives of Heads of State and Government, 28-29 September, Chile:** The First Ladies of the Americas included the following statement in their final Declaration: "We reiterate the need to guarantee the continuity in the efforts towards eradicating measles in our Hemisphere by the year 2000. Moreover, we support other initiatives that implement innovative strategies to promote mental and physical health."

**Yellow Fever:** As of 20 October 1998, a provisional total of 254 cases of yellow fever and 103 deaths have been reported in countries endemic for the disease: Bolivia (52 cases and 35 deaths), Brazil (32 cases and 14 deaths), Ecuador (3 cases and 1 death), French Guyana (1 case and 1 death), Peru (153 cases and 48 deaths), and Venezuela (14 cases and 3 deaths.)

In Brazil, the two states most affected are Pará and Roraima. In Pará, (population of 3.1 million), mass vaccination against yellow fever is underway. In the State of Roraima, the threat of urbanization of yellow fever led national and local authorities to immediately start vaccinating the State's entire population (260,000 inhabitants). Since 1996, Brazil has included vaccination against yellow fever in children's routine immunization programs in endemic areas. In 1999, the Ministry of Health plans to immunize 110 million people living in enzootic areas and contiguous regions infested by *Ae. aegypti*.

Another outbreak in the Amazon region of Venezuela, along the eastern border with Brazil is under investigation.

PAHO is collaborating with countries in the Region where yellow fever is endemic, to implement a strategy that prevents the re-urbanization of the disease. The strategy, presented at the 8th Meeting of EPI Managers of the Andean Region (May 1998), and at the meeting of experts on Yellow Fever Prevention and Control Strategies-Risk of Urbanization in the Americas (May 1998), recommends that countries: 1) achieve as soon as possible vaccination of the entire population against yellow fever, at least in endemic areas; 2) incorporate the vaccine in the basic immunization schedule for children under 1 year of age, and administer it jointly with measles vaccine.