



Rubella vaccination strategy

Alan R. Hinman*

When rubella vaccines were introduced in 1969 they were initially used only in industrialized countries. Two major strategies were used to prevent the occurrence of congenital rubella syndrome (CRS). In the United States, the strategy aimed to interrupt rubella virus circulation among young children, thereby reducing the possibility of exposure of a susceptible pregnant woman. This was accomplished by mass vaccination of children aged 1-12 (over the course of 1-3 years) followed by universal vaccination of children as they reached 1 year of age. In the United Kingdom (UK), the approach was to provide individual protection to girls as they entered the childbearing age and this involved vaccinating girls (only) at 12-14 years of age.

The U.S. approach greatly reduced the overall incidence of rubella and CRS and eliminated the prior 6-9 year epidemic cycle of the disease, but sporadic cases of CRS continued with transmission among young adults. In the UK, there was little change in the secular trend of rubella occurrence and there were sizeable epidemics with substantial increases in the number of cases of CRS, although fewer than in the pre-vaccine era. Thus, both approaches had some success, but neither had optimum impact. Reviewing the experience, in 1983, we concluded that the first priority of rubella vaccination programs should be to vaccinate women of childbearing age. The second priority should be to interrupt transmission of rubella (by vaccinating children). This "complete" strategy should lead to maximal prevention of CRS.¹

The UK added rubella vaccine to its routine childhood immunization schedule in 1988 (as measles-mumps-rubella [MMR] vaccine) and conducted a large-scale campaign using measles-rubella (MR) vaccine in 1994.² There has been a significant reduction in both rubella and CRS. In the United States, greater emphasis has been placed on immunizing

women of childbearing age. Rubella is no longer an endemic disease in the United States.³

There was a rapid evolution of rubella vaccination strategies in the Americas in the late 1980s and early 1990s. The lead was taken by the countries of the English-speaking Caribbean. As part of their measles elimination activities, many countries included rubella vaccine. There were two major components to the strategy: mass vaccination of males and females 1-40 years of age with MR or MMR and addition of rubella vaccine into the routine childhood immunization schedule. The result was that both measles and rubella were eliminated as indigenous diseases in the English-speaking Caribbean.⁴

Notwithstanding the progress in the Caribbean, in 1998, we concluded that it was premature to establish a hemispheric goal of rubella elimination while acknowledging it could be a logical development as progress continued with elimination of measles. We did recommend initiation of surveillance of CRS (and rubella) throughout the Americas and incorporation of rubella vaccine (as MR or MMR) into childhood vaccination programs, both as part of routine childhood immunization at 12-15 months and as part of the follow-up measles campaigns reaching all children 1-4 years of age every 4 years. Over the course of several years this would prevent epidemic rubella among children, although it would not have an immediate effect on transmission of rubella among adults or on the occurrence of CRS. We also recommended that all countries should adopt one of three additional steps: mass vaccination of females 5-39 years of age, mass vaccination of both males and females 5-39 years of age, or vaccination of women of childbearing age. When a hemispheric goal of elimination was established, countries would need to fill in any of the steps that were not previously carried out.⁵ Rubella surveillance was integrated with measles surveillance.

**See related article on page
415**

* MD, MPH. Task Force for Child Survival and Development, Decatur, Georgia, USA.

Suggested citation: Alan R. Hinman. Rubella vaccination strategy. *J Pediatr (Rio J)*. 2007;83(5):389-391.

doi 10.2223/JPED.1700

A 2000 meeting at the World Health Organization recommended two approaches for CRS prevention – prevention of CRS only (through immunization of adolescent girls and/or women of childbearing age), and elimination of rubella as well as CRS (through universal vaccination of infants with or without mass campaigns, surveillance, and assuring immunity in women of childbearing age). The meeting also recommended that countries which currently included rubella in their childhood immunization program should ensure that women of childbearing age are immune and should move toward rubella elimination.⁶

The Pan American Health Organization (PAHO) recommended that "countries ready to accelerate rubella control and/or CRS prevention should rapidly introduce a rubella-containing vaccine into the adult population in addition to routine childhood vaccination. In order to accelerate CRS prevention, countries are advised to conduct a one-time mass vaccination campaign that targets all females aged 5-39 years with rubella-containing vaccines. With this strategy, the number of CRS cases drops significantly, but as men remain susceptible, the virus continues to circulate. However, for countries that seek an accelerated rubella control strategy, a one-time mass campaign (with a measles and rubella-containing vaccine) is recommended for both males and females aged 5-39 years. This strategy will interrupt rubella virus transmission."⁷ Brazil and Chile targeted their campaigns to women only, while campaigns in Costa Rica and Honduras included men and women.⁸

Reflecting continuing progress in Western Hemisphere measles elimination and growing interest in the use of rubella vaccine, in September 2003, PAHO's Directing Council approved a resolution calling for Member States to eliminate rubella and CRS by the year 2010.⁹

The magnitude of rubella as a public health problem in Brazil became apparent as Brazil implemented its measles elimination plan. Between 1993 and 1996, nearly 50% of suspected cases in which measles was ruled out were subsequently diagnosed as rubella. As part of measles elimination activities, children aged 1-11 years were vaccinated with the MR vaccine. Nonetheless, outbreaks of rubella were reported in several states between 1998 and 2000 and in many of them the highest proportion of cases occurred in adolescents and young adults. In response, a two-phase program of mass vaccination of women was carried out. Each state established the target group and the date. The most common target was women 12-39 years of age. Thirteen states carried out campaigns in adult women in November 2001 and the other 11 states carried out campaigns between June and July, 2002. In total, 27 million women were targeted.¹⁰

The article by Lanzieri et al. in this issue describes the progressive control of rubella and CRS in the state of Paraíba, Brazil.¹¹ It also reflects the need to take a comprehensive

approach in order to assure interruption of rubella transmission and elimination of CRS. Vaccination of all children aged 1-11 years in a mass campaign in 1998 followed by the introduction of the MMR vaccine into the routine childhood immunization schedule had a significant impact on transmission of rubella among children but did not prevent the occurrence of outbreaks of rubella in adolescents and young adults, as seen in 2000 in Paraíba. Had it been feasible to carry out mass vaccination of women at the time of the childhood campaign, the outbreak probably could have been prevented. However, in a country the size of Brazil, that would have presented enormous challenges in financing, planning and implementation. Vaccinating adult men as well as women (as done in most other countries in Latin America) would have virtually ensured there would be no continuing transmission of rubella among adults but also would have added another 25 million persons (or more) to be vaccinated, with concomitant additional cost and complexity.

There are two other items of note in Lanzieri's investigation. The first is the high proportion of suspected cases of CRS who had laboratory investigation (167/171 = 97.7%). This was the result of active surveillance that was implemented in the referral maternity hospital in the state capital in Paraíba and is to be contrasted with a lower proportion in a neighboring state that did not have active surveillance (2/45 = 4.4%).¹² Effective surveillance is critical to assess interruption of rubella transmission. The second item of note is the fact that only half of the CRS cases had hearing impairment identified, lower than typically reported. This may reflect the often subtle manifestations of CRS.

I believe the main message to take from the experience in Paraíba (and Brazil) is that in a five-year period rubella and CRS have been nearly eliminated from a large and populous country. This is an important achievement and, with the experience in the rest of the Americas, should serve as a stimulus to the rest of the world to take action to prevent and eliminate congenital rubella infection.

Acknowledgements

I am grateful for the useful comments of Tatiana Lanzieri, Rebecca Prevots, and Susan Reef on drafts of this manuscript.

References

1. Hinman AR, Bart KJ, Orenstein WA, Preblud SR. [Rational strategy for rubella vaccination](#). *Lancet*. 1983;1: 39-40.
2. Plotkin SA, Reef S. [Rubella vaccine](#). In: Plotkin SA, Orenstein WA, editors. *Vaccines*. 4th ed. Philadelphia; Saunders; 2004. p. 707-43.

3. Centers for Disease Control and Prevention (CDC). [Elimination of rubella and congenital rubella syndrome - United States, 1969-2004](#). MMWR Morb Mortal Wkly Rep. 2005;54:279-82.
4. Hinman AR. [Rubella and the Americas](#). Pan Am J Public Health. 2003;14:298-9.
5. Hinman AR, Hersh BS, de Quadros CA. [Rational use of rubella vaccine for prevention of congenital rubella syndrome in the Americas](#). Pan Am J Public Health 1998;4:156-60.
6. World Health Organization (WHO). Report of a meeting on preventing congenital rubella syndrome: immunization strategies, surveillance needs. Document WHO/V&B/00.10. Geneva, 12-14 January 2000. Geneva: WHO; 2000.
7. Castillo-Solórzano C, Carrasco P, Tambini G, Reef S, Brana M, de Quadros CA. [New horizons in the control of rubella and prevention of congenital rubella syndrome in the Americas](#). J Infect Dis. 2003;187 Suppl 1:S146-52.
8. [Accelerated control of rubella and prevention of congenital rubella syndrome, WHO Region of the Americas](#). Wkly Epidemiol Rec. 2003;78:50-4.
9. PAHO Directing Council resolution CD44.R1. Sustaining immunization programs – elimination of rubella and congenital rubella syndrome (CRS). <http://www.paho.org/English/GOV/CD/cd44-fr-e.pdf>. Access: July 22, 2007.
10. [Accelerated control of rubella and prevention of congenital syndrome, Brazil](#). Wkly Epidemiol Rec. 2002;77:169-75.
11. Lanzieri TM, Pinto D, Prevots DR. Impact of rubella vaccination strategy on the occurrence of congenital rubella syndrome. J Pediatr (Rio J). 2007;83:415-21.
12. Lanzieri TM, Parise MS, Siqueira MM, Fortaleza BM, Segatto TC, Prevots DR. [Incidence, clinical features and estimated costs of congenital rubella syndrome following a large rubella outbreak in Recife, Brazil, 1999-2000](#). Pediatr Infect Dis J 2004;23:1116-22.

The beginning of a new era: systematic testing for pathogens causing acute respiratory tract infections (ARI) in children

Heinz-J. Schmitt¹, Britta Gröndahl², Franziska Schaaff¹, Wolfram Puppe²

The problem

On average, humans get sick ten times per year. About six times, the illness is due to an acute respiratory tract infection (ARI). Morbidity is especially high in children, since

- they usually encounter the offending organism for the first time in their life;
- the lack of immunity results in shedding of the offending organisms in high numbers of prolonged time as compared to adults;
- their airways are smaller than those of adults and thus the inflammatory response leads to a more significant narrowing of the airways resulting in more severe disease;
- on average, they have a high number of social contacts and also a more intimate contact with peers and caregivers alike resulting in a higher attack rate;

- they display an age-dependent lack of appropriate hygiene measures.

In poor countries, ARI are one of the leading causes of death (Table 1).¹ Optimal medical management of ARI is, therefore, of the highest importance everywhere in the world. The utmost importance of ARI in children is in sharp contrast to the little knowledge we have about the etiology, epidemiology, and clinical consequences such as development of asthma following respiratory infections. While ARI are comparatively simple to diagnose clinically

by investigating the history of the patient and by physical examination, clinical findings alone do not allow to identify the offending microorganism in an individual case. We regularly encounter the peak of the RSV season in the middle of the influenza season; and often – based on only partial knowledge of the epidemiological situation

and the spectrum of diseases caused by both organisms –

***See related article on page
422***

1. MD. Infectious Diseases Service, Department of Pediatrics. Johannes Gutenberg-Universität, Mainz, Germany.

2. PhD. Infectious Diseases Service, Department of Pediatrics. Johannes Gutenberg-Universität, Mainz, Germany.

Suggested citation: Schmitt H-J, Gröndahl B, Schaaff F, Puppe W. The beginning of a new era: systematic testing for pathogens causing acute respiratory tract infections (ARI) in children. J Pediatr (Rio J). 2007;83(5):391-396.

doi 10.2223/JPED.1701