



CHAPTER

12

*Screening and
Vaccinating Adolescents
and Adults to Prevent
Congenital Rubella
Syndrome*

By Marie-Dominique Beaulieu

Screening and Vaccinating Adolescents and Adults to Prevent Congenital Rubella Syndrome

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Screening for rubella immunization status by obtaining proof of vaccination or by serology should be part of the periodic health examination of women of child-bearing age (B Recommendation). Susceptible non-pregnant women should be offered vaccination; susceptible pregnant women should be vaccinated immediately after delivery. An equally acceptable alternative for non-pregnant women of child-bearing age is to offer vaccination against rubella without screening (B Recommendation). There is insufficient evidence to recommend for or against screening or routine vaccination of young men in settings where large numbers of susceptible young adults of both sexes congregate, such as military bases and colleges (C Recommendation). Routine screening or vaccination of young men other than in such settings, or of older men or post-menopausal women, is not recommended.

Burden of Suffering

Rubella is generally a mild illness but when contracted by pregnant women, especially in the first 16 weeks of pregnancy, it frequently causes serious complications including miscarriage, abortion, stillbirth, and congenital rubella syndrome (CRS). The most common manifestations of CRS are hearing loss, developmental delay, growth retardation, and cardiac and ocular defects. The lifetime cost of treating a patient with CRS was estimated in 1985 to exceed 220,000 U.S. dollars.<1>

Universal childhood immunization was initiated in every province of Canada in the early 1970s. (For current recommendations see Chapter 33). By 1990, reported rubella infection had declined from 30 to 1.5 cases per 100,000 population, and CRS incidence had decreased from 1.7 to 0.01 cases per 100,000 live births.<2> In 1983, however, rubella infection peaked at a rate of 29.8 per 100,000 population. No increase in the rate of CRS was observed.



In 1991, 61.7% of reported cases of rubella infection occurred in adolescent and young adults

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There was also an outbreak of rubella in 1989 in British Columbia. The total number of cases of rubella infection estimated to have occurred in Canada in 1992 was 2,142; a three-fold increase compared to 1991. Males were affected in 72% of the cases. Adolescents and young adults (ages 15-29 years) accounted for 61.7% of the new cases of rubella infection.<2> In 1991, 5 cases of CRS were reported.

Maneuver

Two strategies to prevent CRS are available. One is based on screening for the immunization status of women of child-bearing age, and immunization only of susceptible ones. The other relies on universal vaccination of adolescents and young women.

Screening for rubella susceptibility can be done by serologic tests for antibodies or by obtaining proof of vaccination history. Vaccine trials and cohort studies have shown that most patients with hemagglutination inhibition (HI) antibody are protected from clinical disease.<3,4> However, HI is a labor-intensive test and can be associated with both false positive and false negative results. Enzyme immunoassay and latex agglutination have now replaced HI in most laboratories. Using HI as the comparison standard, these tests have sensitivities of 92-100% and specificities of 71-100%.<5> The apparently low specificities of some newer methods are due to their ability to detect low levels of rubella antibody that are undetectable by HI methods and are therefore reported as false positives. There have been no controlled trials to determine if these low levels confer immunity against wild virus, but other clinical and in vitro evidence suggests that they are protective.<6> These tests therefore appear to be both more accurate and more convenient than HI when performed in laboratories with demonstrated proficiency.

A history of rubella vaccination can identify many individuals who may be protected. Despite a variety of design flaws in some of the available studies, most demonstrate that individuals with a positive history of having received rubella vaccine are significantly more likely to be seropositive (range 82% to 97%) than those without such a history (range 62% to 83%).<7> A positive rubella vaccination history documented by vaccination card, school record, or medical record is more likely to be associated with seropositivity than is an undocumented history. A positive history of rubella infection is substantially less likely to correctly predict rubella immunity than is a positive history of vaccination;<8> therefore, a history of infection should not be used to determine susceptibility.



Screening for immunization status by obtaining proof of vaccination history or serologic testing has a sensitivity between 80% to 100%

Effectiveness of Screening and Treatment

Rubella vaccine, once administered, is efficacious and seropositivity is long lasting.<9> Adverse reactions from the

RA27/3 live attenuated rubella vaccine are generally mild in children. Joint symptoms are common in adults but rarely persist; the incidence of joint symptoms is higher in women than in men and increases with increasing age at vaccination.<4> Vaccination of individuals who are already immune rarely induces the joint symptoms seen upon primary immunization of susceptible individuals.

It is estimated that 6-12% of the young adult population is seronegative.<10> It has been recommended by some authorities that clinicians also direct efforts toward vaccinating susceptible adolescents and young adults, particularly women of childbearing age.<11> Two strategies have been considered: screening for immunization status and vaccination of susceptible women or universal vaccination of adolescent and young adult women.

The new immunization schedule recently approved in Canada (see Chapter 33 on Childhood Immunizations) will result in the systematic vaccination of young women against rubella, since the MMR confers immunity against both conditions. However, it can be expected that full herd immunity will not be conferred to childbearing women before about 15 years.

Screening Followed by Vaccination

Several factors may reduce the effectiveness of this strategy in preventing CRS. First, the screening test may falsely identify some susceptible individuals as immune. For example, of the 21 CRS cases reported in the U.S. in 1990, 71% of the mothers had a positive serologic test, while 43% gave a history of vaccination.<12> Secondly, people correctly identified as susceptible may not be offered or may not accept the vaccine.

No population studies have evaluated the effectiveness of screening and vaccinating susceptible individuals in reducing the incidence of CRS. Evidence that screening and vaccination can reduce the likelihood of rubella infection was seen in a severe rubella outbreak in Iceland, where identical rates of protection from infection occurred in screened and immunized (98.5%) and in naturally immune (99%) schoolgirls.<13> Evidence for the effectiveness of screening and follow-up vaccination in reducing rubella susceptibility is supplied also by a cohort study from Scotland. Six to seven years after a screening program for schoolgirls took place, 98.7% of girls who had originally been naturally immune had circulating antibodies, compared to 95.1% of those who had been vaccinated as susceptibles and 42.8% of a small group of susceptibles who had refused vaccination.<14> There is thus fair evidence that screening and immunizing susceptible females of child-bearing age reduces both rubella susceptibility and infection, and by inference, CRS.



Screening followed by immunization of susceptible women or systematic immunization reduces the risk of congenital rubella syndrome

Universal Vaccination

In addition to protecting those who have not been previously vaccinated, universal vaccination would also potentially eliminate most susceptibility due to primary vaccine failure and waning immunity. In Sweden and Finland, vaccine programs in which all adolescent girls are routinely immunized, as well as all children aged 14-18 months, have been associated with substantially reduced occurrence of both seronegativity and of rubella infection in female compared to male adolescents and adults.^{<15,16>} These data provide fair evidence for routine vaccination of all non-pregnant women of child-bearing age to reduce rubella susceptibility and infection, and therefore CRS.

Pregnancy and Rubella Vaccination

The rubella vaccine is contraindicated during pregnancy because of the theoretical possibility of teratogenicity, although there have been no reported cases of rubella vaccine-related birth defects in the United States after inadvertent vaccination of 321 susceptible pregnant women within 3 months of conception.^{<3>} Because a measurable iatrogenic risk cannot be excluded, vaccination of susceptible women known to be pregnant should be postponed until the postpartum period. Women who are vaccinated should be advised not to become pregnant in the subsequent month. The virus has been isolated in breast milk and in breast fed infants after postpartum vaccination, but no adverse consequences from such exposure have been reported.

Screening and Vaccination in Young Men

In settings where large numbers of young adults are gathered (e.g., military bases and colleges), outbreaks of rubella are not uncommon and males and females are infected at similar rates.^{<2>} Rubella screening or routine vaccination of young men in such settings might reduce the risk of spreading rubella to susceptible pregnant women. There is weak evidence from before-after studies that universal rubella screening and follow-up vaccination of military recruits is effective in preventing rubella infection and eliminating epidemic rubella.^{<17>} There is no direct evidence that either screening or routine vaccination of males in these settings reduces CRS. For young men not living in such settings, no evidence at all was found supporting either screening or routine vaccination in reducing susceptibility infection or CRS.

Recommendations of Others

The Canadian Immunization Guide ^{<18>} recommends that rubella vaccine should be given to all female adolescents and women of child-bearing age unless they have either laboratory evidence of detectable

antibody or documented evidence of having received vaccine. Susceptibility should be determined by serological testing whenever possible. The Guide also considers that serologic testing for rubella antibody should be a routine procedure during prenatal care. Recommendations from a January, 1994 meeting sponsored by the Laboratory Center for Disease Control on rubella and mumps should become available in 1994.

In 1989, the U.S. Preventive Services Task Force recommended that serologic testing for rubella antibodies should be performed at the first clinical encounter with all pregnant and non-pregnant women of child-bearing age lacking evidence of immunity. They also recommended that susceptible non-pregnant women who agree not to become pregnant for three months should be vaccinated and that susceptible pregnant women should not be vaccinated until immediately after delivery. These recommendations are currently under review.<19>

Conclusions and Recommendations

When administered to children, the current rubella vaccine is efficacious in the induction of rubella immunity and in the prevention of rubella infection and CRS. The added coverage provided by the two MMR vaccinations many will receive during childhood to meet current recommendations for measles immunization (see Chapter 33) should eliminate most primary vaccine failures and increase the rate of primary immunization among women of child-bearing age. Therefore, the incidence of CRS will probably decline as the current cohort of highly immunized female children and adolescents enters its child-bearing years.

In the intervening years, however, many women of child-bearing age will remain susceptible to rubella infection. Universal screening and follow-up vaccination of susceptible females would reduce rubella susceptibility, infections, and CRS; however, the effectiveness of this strategy in the clinical setting may be limited by incomplete screening, imperfect screening tests and failure to vaccinate susceptibles. Routine vaccination of all women of child-bearing age, without screening, also appears to be effective in reducing rubella infections, and avoids the problem of noncompliance with return visits, but results in vaccination of many women who are already immune. Because the adverse effects of vaccinating immune individuals appears to be minimal, cost and convenience are likely to be the determining factors in deciding which strategy should be used.

There is fair evidence to support screening for rubella immunity in the periodic health examination of women of child-bearing age, either by serologic testing or by eliciting a history of vaccination. A documented history of vaccination is more accurate than an undocumented history. All susceptible non-pregnant women of

child-bearing age should be offered vaccination (B Recommendation). Susceptible pregnant women should be vaccinated in the immediate postpartum period (B Recommendation). There is also fair evidence to support offering routine vaccination to all women of child-bearing age, without screening by history or serology (B Recommendation). The decision of which strategy to use should be tailored to the individual clinician's practice population, depending on the availability of vaccination records, the reliability of the vaccination history, the rate of immunity, the cost of serologic testing, and the cost and likelihood of follow-up vaccination for susceptible individuals identified by serologic testing. There is insufficient evidence to recommend for or against routine vaccination of young men in settings where large numbers of susceptible young adults of both sexes congregate, such as military bases and colleges, in order to prevent CRS (C Recommendation).

Unanswered Questions (Research Agenda)

There is a need to study the costs and the benefits of alternative primary prevention strategies in various Canadian settings.

Evidence

The literature was identified with a MEDLINE search in the English language for the years of 1989 to 1993, using the following key words: rubella vaccine, adverse effects and rubella. This review was initiated in October 1993 and the recommendations finalized by the Task Force in January 1994.

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MANEUVER	EFFECTIVENESS	LEVEL OF EVIDENCE <REF>	RECOMMENDATION
Screening for immunization status followed by vaccination*			
Screening for immunization status (serology or proof of vaccination) and immunization of women at risk	Screening for immunization status and vaccination of women at risk can increase seropositivity rates to 95%.	Cohort studies <12-14> (II)	Fair evidence to include in the periodic health examination of women of child-bearing age (B)
Screening for serologic proof of immunization in pregnant women and counselling of seronegative women	No studies have evaluated the effectiveness of this strategy. Knowledge of the serologic status of pregnant women is considered important to counsel/document new infection.	Expert opinion <3> (III)	Fair evidence to include in the periodic health examination of pregnant women (B)
Universal vaccination*			
Universal vaccination of adolescent and young women independently of prior knowledge of immunization	Confers immunity without significant adverse effects. Universal immunization of adolescent and young women is an effective alternative to screening followed by immunization and may be less expensive.	Cohort studies <15,16> (II)	Fair evidence to include in the periodic health examination of women of child-bearing age (B)
Universal vaccination of young men in settings where large number of people gathered	The only cohort study used a less immunogenic vaccine than the one used in women's studies.	Cohort study (methodologic problems) <17> (II)	Lack of evidence to include or exclude in the periodic health examination of young men gathered in large settings (C)

* The decision of which strategy to use should be tailored to the individual clinician's practice population, depending on the availability of vaccination records, the rate of immunity, the cost of serologic testing and of follow-up vaccination for susceptible people.