

Transmission has been documented in medical settings. Several young adult health care workers have been confirmed with measles. Transmission has occurred from health care workers to patients and from patients to health care workers.

Measles virus has been isolated from clinical specimens collected from several measles cases by the Instituto Adolfo Lutz. Genetic analysis of these isolates will be performed at the measles laboratory of the Centers for Disease Control and Prevention in Atlanta, Georgia, USA. This information may provide important clues as to the source of the virus which is causing the São Paulo outbreak.

After reviewing available data, an advisory panel organized by the Secretariat of Health has recommended that a "selective" measles vaccination campaign be conducted among children 9 months through 4 years of age to stop the outbreak. This campaign was scheduled to begin on 21 June 1997.

*Source:* São Paulo State Secretariat of Health, Division of Epidemiology; Instituto Adolfo Lutz, Department of Virology.

**Editorial Note:** After a virtual absence of about 6 years, measles virus is again circulating in São Paulo. This is among the largest outbreaks in recent years in the Americas. Although difficult to predict, this outbreak may approach or surpass the 1989 measles outbreak, when nearly 2,000 cases were reported in São Paulo state.

Contributing factors for this outbreak include: insufficient population immunity in children 1-4 years of age due to an inappropriate vaccination schedule, the presence of large numbers of susceptible young adults, high population density and introduction of measles virus.

As discussed previously, a two-dose vaccination strategy is not sufficient to eradicate measles, especially when the vaccination coverage is less than 100% for both doses and population density is high. Moreover, the reported vaccination coverage data in São Paulo appear to have grossly overestimated true coverage, due to an underestimation of the population size.

There are approximately 400,000 measles susceptible children 1-4 years of age in Greater São Paulo. Transmission in this age-group may be fueling measles transmission among infants < 1 year of age and susceptible young adults.

According to the PAHO measles eradication strategy, a *follow-up* measles vaccination campaign should be conducted when the number of susceptible preschool-aged children approaches one birth cohort. Therefore, a *follow-up* campaign should have been conducted among children 9 months through 4 years of age in 1995. This was not done in São Paulo.

Such a campaign could have prevented this outbreak, or at the least, would have greatly reduced the number of susceptible preschool-aged children and would likely have reduced the probability of experiencing so large an outbreak.

In addition to susceptible, preschool-aged children, there is apparently a large number of susceptible young adults living in São Paulo. These are persons who are both unvaccinated and have never experienced measles infection. Many of these persons are in the age-group which was targeted for vaccination during the 1987 mass vaccination campaign. A working hypothesis is that the outbreak is occurring primarily among unvaccinated young adults who have recently migrated to São Paulo from other parts of the country. This hypothesis is currently being investigated.

Outbreak prevention is always preferable to outbreak response. Measles outbreak control is very difficult, if not impossible, especially when measles virus is circulating widely. Measles virus spreads far faster than outbreak response vaccination activities. Therefore, the planned selective vaccination campaign is unlikely to have any major impact on measles virus circulation in São Paulo. A *follow-up* campaign targeting all children 6 months to 15 years of age would seem more appropriate under the present circumstances. Further updates of this important outbreak will be included in future issues of the *EPI Newsletter*.

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## Rubella and Congenital Rubella Syndrome in the USA

Indigenous rubella and congenital rubella syndrome (CRS) have been targeted for elimination in the United States by the year 2000. From 1969 through 1989, the numbers of annual reported cases decreased 99.6% for rubella and 97.4% for CRS. Following a slight resurgence during 1990-1991, the number of reported rubella cases reached record lows during 1992-1996 (annual average: 183 reported cases). Findings indicate sustained low incidence of rubella and CRS since 1992 and possible interruption of transmission of rubella virus in late 1996.

**Rubella:** During 1994-1996, a total of 32 states, the District of Columbia and New York City reported 567 rubella cases. Based on provisional data as of 18 April 1997, symptom onset for the last case in 1996 was 6 November and

for the first case in 1997 was 5 January, representing approximately three incubation periods with no reported rubella cases. Of the 561 (98.9%) patients for whom age was known, 171 (30.5%) were women of childbearing age (15-44 years); of these, five were pregnant at the time of rash onset.

Of the 505 (89.1%) cases with known importation status, 471 (93.3%) were indigenously acquired, 32 (6.3%) were internationally imported, and two (0.4%) were imported from another state. Of the internationally imported cases, country of exposure was reported for 15 (46.9%): Mexico (five cases); Japan (three); Kenya (two); and Colombia, England, Germany, Korea and Switzerland (one each).

**Congenital Rubella Syndrome:** A total of 12 infants with laboratory-confirmed CRS were born during 1994-1996. Nine states reported seven indigenously acquired cases, four imported cases, and one case with unknown importation status. The maternal exposures for the four imported cases occurred in Mexico (two cases), Sri Lanka (one) and Dominican Republic (one)—countries that do not routinely provide rubella vaccination. Of the seven infants with indigenously acquired cases, four were born to women of Hispanic ethnicity. Of the 10 mothers for whom vaccination status was available, seven had one or more missed opportunities for vaccination.

In recent years, outbreaks of rubella have occurred primarily in settings where young adults congregate, and the risk has been the highest among persons who often are unvaccinated and who may be exposed to persons traveling from areas where rubella vaccination is not routine.

The increasing proportion of cases accounted for by persons of Hispanic ethnicity suggests a potentially susceptible group to whom vaccination efforts should be directed. Hispanics and those who are native of countries without rubella vaccination programs should be considered susceptible to rubella unless they have documentation of vaccination or serologic evidence of immunity.

The changing epidemiologic pattern of rubella underscores the importance of ongoing collection and analysis of information on reported rubella and CRS cases, including demographics, vaccination history, source of exposure (i.e., indigenous or imported), relation to outbreaks, and mode of transmission. Such analysis is important for effectively targeting vaccination activities, evaluating the effectiveness of rubella and CRS prevention programs, and designing more efficient prevention strategies.

The effectiveness of efforts to control and prevent rubella in the United States is reflected by the possible interruption of transmission of rubella during November-December 1996, the dramatic decline in reported cases when compared with the prevaccine era, and the low annual average number of cases since 1991. Elimination of rubella will further require:

- maintenance of high vaccination levels in preschool and school-aged children and young adults,
- intensification of diagnosis of and surveillance for rubella and CRS,
- prompt control of outbreaks.

The shift in the increasing proportion of cases accounted for by persons aged 15-44 years indicates that vaccination programs targeting school-aged children have been successful in preventing rubella in that age group, but that vaccination activities also should include adolescents and adults. Because more than half of CRS cases in recent years have resulted from missed opportunities for vaccination, health care providers should screen reproductive-aged women for rubella immunity (e.g. during prenatal screenings and premarital health care visits) and vaccinate when appropriate (e.g., postpartum). Elimination of indigenous transmission of rubella in the United States also will require

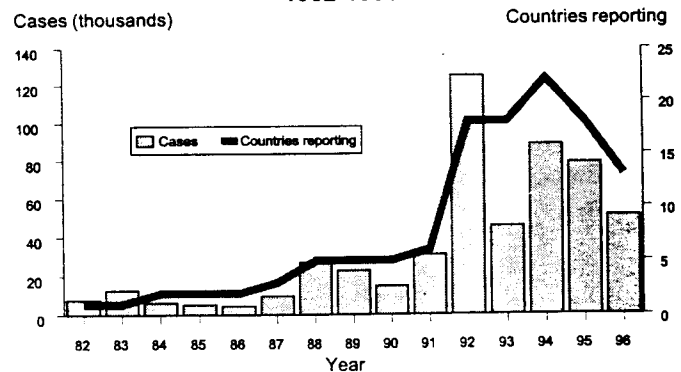
collaboration with other countries to develop and implement national rubella vaccination policies.

*Reported by: State and territorial epidemiologists. Child Vaccine Preventable Diseases Br, Epidemiology and Surveillance Div, National Immunization Program, CDC.*

Source: MMWR 46(16); 350-354; April 25, 1997.

**Editorial Note:** *Situation in the Americas* - The United States' surveillance system for rubella suggests that the virus is circulating in Latin America and the Caribbean (see Figure 1). Moreover, the cases detected in the United States may only be the tip of the iceberg. Unfortunately, relatively little data are available concerning the epidemiology of rubella in the Americas.

**Figure 1**  
**Reported cases of rubella**  
**Latin American and Caribbean Countries**  
**1982-1996**



Source: PAHO/EPI Information Systems

In 1995 and 1996, the Caribbean Epidemiological Center (CAREC) confirmed the circulation of rubella virus in seven countries, including among pregnant women. Regarding CRS, most of the available experience in surveillance comes from the Caribbean, where countries have started notification and follow-up of cases. Four countries in that region selected as pilots for CRS surveillance in 1996, have found eight confirmed cases (6 in Jamaica and 1 in Barbados and Trinidad).

In Barbados, 20 suspected cases of CRS were identified through an active search in 1996, and eight additional cases were being investigated. In the same country, 17 of 52 pregnant women (33%) with fever and rash illnesses tested positive for rubella. In Guyana, six suspected cases of CRS have been identified in children born between 1992 and 1996.

The Regional Measles Surveillance System has highlighted rubella as a health problem. Of the total suspected measles cases investigated by laboratory in 1996, 17% had rubella as a final diagnosis. The countries presenting the highest percentage of positive cases for rubella through the surveillance system include: Nicaragua with 38%, El Salvador with 33%, Costa Rica with 32% and Peru with 20%.

CAREC has proposed a set of case definitions for CRS, a CRS case reporting form, and guidelines for CRS surveillance. The guidelines include the creation of a registry of pregnant women with laboratory-confirmed rubella whose infants need to be followed through the neonatal and post-

natal periods. Countries in the English-speaking Caribbean have been encouraged to strengthen their measles surveillance system, in order to improve rubella surveillance.

In Mexico, there were 26,286 cases of rubella reported in 1996 and 51,157 cases during 1995. However, the Mexican Ministry of Health has estimated that there may be as many as two million cases annually in children under the age of 15. In Colombia, an average of 7,000 rubella cases have been reported annually since 1985. The most affected populations are children under the age of five, followed by those between the ages of 5 and 14 years of age. In Colombia congenital malformations are among the leading five causes of deaths in the 0-4 age range; and within these, the congenital cardiopathies compatible with CRS represent between 59 and 62% of all the congenital anomalies which occurred during those three years. In Canada, in 1996 there were five clinically-confirmed cases of CRS, two of these were from children born in Central America and subsequently adopted by Canadian parents.

**Current Control Strategies** - Several countries in the Americas are developing strategies for the control of rubella aimed at groups identified as a priority and based on the availability of financial resources. In the Andean region, only Colombia has introduced the measles, mumps and rubella vaccine in the national vaccination schedule for children between the ages of 1 and 3. Ecuador is planning to include this vaccine in 1998, as part of its regular schedule. In Central America, Costa Rica, El Salvador and Honduras

are using MMR. In the English-speaking Caribbean and Suriname, MMR vaccine is part of the routine vaccination schedule.

**Future Activities** - Taken together, rubella and CRS surveillance data from the United States and the limited data from other countries of the Region strongly suggest that rubella is a significant public health problem in the most of the Hemisphere.

The first step to developing appropriate interventions against rubella in Latin America and the Caribbean is to better define the burden of disease in these countries. Once the magnitude of the rubella and CRS problem is known and persons at risk of disease are identified, targeted vaccination strategies can be developed. Therefore, the immediate PAHO goal is to develop CRS surveillance throughout the Region.

Many countries are adopting MMR vaccine for routine infant immunization and for use in the measles *follow-up* campaigns. While this will surely reduce the circulation of rubella virus, it will not prevent CRS. In order to prevent CRS, we must assure that women of childbearing age are protected against rubella infection. Infant and childhood immunization are necessary, but not sufficient to eliminate CRS. New vaccination strategies are needed to effectively eliminate rubella and CRS. The availability of quality surveillance data will help greatly in developing targeted and effective rubella vaccination strategies.

## Viral Hepatitis

*This is the third article dealing with the subject of viral hepatitis. The previous two articles described general diagnostic aspects of viral hepatitis (February 1997 issue of the EPI Newsletter) and details of hepatitis B and D (April 1997 issue of the EPI Newsletter). This final segment covers hepatitis A, C and E.*

### Hepatitis A

Anti-HAV antibodies appear early, together with biochemical changes and symptoms of infections (Table 1). Although there are four genotypes of HAV, these comprise only 1 serotype and thus do not interfere in the serological diagnosis.

#### Serological Markers of Hepatitis A

- Anti-HAV IgM:** An acute phase marker, its titer rises rapidly, reaching maximum serum levels in 1 to 3 weeks after the appearance of symptoms. Their average duration is 3 months.<sup>1</sup>
- Anti-HAV IgG:** Detected soon after IgM, it is an antibody with a long life, whose presence is indicative of previous infection and immunity.<sup>1</sup> A decrease in the levels of these antibodies is possible, making them undetectable using conventional tests, although the individual retains his immunity to this viral infection.<sup>2</sup>
- HAVAg:** Although viremia in HAV infection is quite transient, the viral antigen can be detected in the blood

and feces of infected individuals at the end of the incubation period and later after the appearance of the first symptoms.<sup>1</sup>

**Table 1**  
**Serological profile of HAV infections**

| Interpretation of serological profile | Anti-HAV IgM | Anti-HAV IgG |
|---------------------------------------|--------------|--------------|
| Susceptible                           | -            | -            |
| Recent infection                      | +            | +            |
| Past infection, immunity              | -            | +            |

### Hepatitis C

Anti-HCV tests are currently grouped based on their antigenic composition, in the first, second and third generation. The first generation tests were made up of recombinant proteins corresponding to the NS4 region and part of the NS3 region of the viral genome. Recombinant proteins or synthetic peptides were added to subsequent tests, corresponding to the structural (core) and non-structural (NS3) regions (second generation) and the NS5 region (third generation).<sup>4-5</sup>

Serological diagnosis of Hepatitis C is based on ELISA screening. However, specimens that are reactive in this first stage are later subjected to confirmation or supplementary