

asked to report aggregate rubella cases by vaccine status and age group. Countries with a comprehensive rubella vaccination programme and countries approaching measles elimination should report case-based data.

The number of congenital rubella syndrome (CRS) cases reported from countries in the WHO European Region is very low and most likely due to weak surveillance programmes for this condition. The number of CRS cases reported over the last three years were: 2000, 53 cases; 2001, 19 cases; and 2002, 8 cases; 38% of these cases were reported from Romania. Effective surveillance for CRS requires inclusion of, and participation by paediatricians, obstetricians, cardiologists and ophthalmologists.

The WHO Regional Office for Europe held a technical consultation on measles and rubella surveillance issues in March 2003. Participants identified the following needs for applied research with regard to surveillance for CRS:

1. Frequency, aetiology and sensitivity of methods for detection of rash fever in pregnancy need to be assessed over time in areas with moderate to high rubella control
2. Optimal methods (sensitivity and cost) need to be defined for identification of cases of CRS
3. Optimal definitions to identify circulation of rubella virus in the community are needed, i.e. what is the size of a cluster that would suggest a rubella outbreak in a community, supporting further public health interventions
4. Ethical and legal implications of serologic testing for susceptibility to rubella in antenatal care and after diagnosis of rash-fever

need to be assessed regarding possible errors of a misclassification and their potential impact on the integration of surveillance activities into routine antenatal services.

Reporting of outbreaks of both measles and rubella is being introduced within the WHO European Region. An outbreak reporting form has been developed [3]. Member states are strongly encouraged to use the online entry tool developed for this purpose and available at the Regional Office website <http://www.euro.who.int/vaccine>.

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ORIGINAL ARTICLES

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SEROLOGICAL SURVEILLANCE OF RUBELLA IN EUROPE: EUROPEAN SERO-EPIDEMIOLOGY NETWORK (ESEN2)

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Serological surveillance is an important resource to evaluate vaccine programmes, especially for diseases such as rubella, where a suboptimal programme can lead to an increase in morbidity. A coordinated vaccine policy in Europe is needed and the aim of the European Sero-Epidemiology Network (ESEN2) is to standardise serological surveillance in 22 countries for eight diseases, including rubella.

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Key words : Rubella, Europe, surveillance, European network

Rubella vaccines were first licensed in the late 1960s [1], since when immunisation programmes have been implemented in many European countries. The chief strategies for rubella immunisation are universal vaccination of children, selective vaccination of adolescent females, or a combination of these [2]. The universal vaccination of children with a two-dose measles, mumps and rubella (MMR) vaccine has been adopted in all countries of western Europe. However, a universal MMR immunisation programme has been implemented in only some of the other countries of the World Health Organization (WHO) European Region, and in many there is no rubella immunisation programme [3].

Serological surveillance is an important tool for the evaluation of vaccination programmes as it monitors immunity in the population, thus providing information with which to identify further control measures [4, 5]. Serological surveillance data are an important supplement to coverage data and avoid many of the limitations of pas-

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sive disease reporting systems for rubella, which can be unreliable due to under-notification of clinical disease and under-diagnosis, as up to 50% of cases are estimated to be subclinical.

Serological surveillance data provides age-specific profiles that enable the identification of susceptible cohorts that can emerge following the implementation of vaccination programmes [6]. Furthermore, serological data are employed in mathematical models to simulate disease transmission within a population, thereby predicting the impact of public health interventions on future disease incidence [7, 8]. In particular, for vaccination programmes, mathematical models can provide important estimates of the proportion of the population needed to be immunised to attain herd immunity, the impact on disease incidence of not achieving these targets and the future emergence of susceptible cohorts. Such modelling estimates provide policy makers with important evidence with which to review the impact of possible options on disease incidence and burden [9].

The mathematical modelling of the impact of rubella immunisation programmes has demonstrated that if vaccine coverage falls below a threshold of approximately 80%, then there is an increase in congenital rubella syndrome (CRS), due to decreased circulation of the virus resulting in accumulation of adult female susceptibles [7]. The consequences of the introduction of a suboptimum rubella vaccination programmes have been observed in a number of European countries, where important numbers of CRS have been reported following outbreaks of rubella [10,11].

A coordinated vaccine policy within Europe is increasingly important as migration, especially within the European Union, means that outbreaks of diseases in one country can be exported to others. For example, an epidemic of rubella in Greece in the late 1990's was linked to a case of CRS in the United Kingdom [12]. Therefore, although individual vaccine schedules remain the responsibility of individual countries, there is a need that all populations in Europe have adequate levels of protection to prevent the occurrence of epidemics that could then be exported to other countries.

The European Sero-Epidemiology Network (ESEN2), based on the original ESEN project [13], was established in 2001 with funding from the Research Directorate of the European Commission. The aim of ESEN2 is to standardise the serological surveillance of eight vaccine preventable diseases (measles, mumps, rubella, diphtheria, pertussis, varicella zoster virus, hepatitis A and B virus), of which rubella is one, in twenty two European countries. By standardising both laboratory and epidemiological methodology, international comparisons can be made to allow the effectiveness of different immunisation programmes to be evaluated and to coordinate vaccine policy to ensure that adequate levels of immunity exist throughout Europe.

The ESEN2 project will achieve its objective by the following three main methods:

1. Standardisation of rubella assay results. A panel consisting of 150 samples including negative, equivocal and positive specimens was prepared and distributed to participant laboratories by the reference centre (Robert Koch-Institut, Berlin, Germany). Each participating national laboratory tests the reference panel and its results are regressed against those of the reference laboratory to obtain an equation for the line of best fit. The standardisation equation will convert each country's results to common ESEN2 units and the application of common cut-offs will control inter-assay variability, allowing comparison to be made.

2. Collection of national serum banks. These are both geographically representative and of an adequate size with a minimum total of 3500 specimens stratified by age and in equal numbers of males and females.

3. An organisational analysis questionnaire collects information on current and past rubella immunisation programmes in each of the participating countries. This provides valuable information with which to interpret the sero-profiles, but also a catalogue of different interventions. For rubella, of particular interest is the use of universal as opposed to selective vaccination programmes targeted at adolescent females.

The standardised rubella sero-profiles of twenty one European countries will be available this year, with a similar analysis as undertaken for the seven countries in the original ESEN project [14]. For some countries this will be the first time such a large scale serological surveillance will have been conducted in their own country and will provide invaluable data for each country to evaluate its own rubella immunisation programme. At a regional level, this will allow a mapping of each country's progress towards WHO targets for CRS control and their susceptibility to further rubella outbreaks. As part of a further EC Research Directorate funded project (POLY-MOD), serological data will be used to model the epidemiological impact of different immunisation policies, thereby providing policy makers with an evaluation of the most cost-effective options.

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ORIGINAL ARTICLES

Outbreak report

A LARGE RUBELLA OUTBREAK, ROMANIA - 2003

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Romania experienced a large rubella outbreak in 2002-03, with more than 115 000 reported cases nationwide, and an incidence of 531 reported cases per 100 000 population. The incidence was highest in children of school age. The cohorts of adolescent girls vaccinated in 1998 and 2002 (when a rubella-containing vaccine was available) had significantly lower incidence rates ($p < 0.001$) compared with those in boys in the same age groups who were not vaccinated. In 2003, of the 150 suspected congenital rubella syndrome (CRS) cases reported, seven (4.6%) were confirmed by positive rubella IgM antibodies. In the absence of available rubella containing vaccine for outbreak control, an outbreak response plan to improve the detection of cases and to limit rubella virus transmission was developed. The following activities were conducted: surveillance of pregnant women with suspected rubella or history of exposure to rubella virus was implemented, with follow up of pregnancy outcomes; surveillance for CRS was strengthened; existing infection control guidelines to prevent disease transmission within healthcare facilities were reinforced; and a communication plan was developed. In May 2004, Romania is introducing measles, mumps and rubella (MMR) vaccine for routine vaccination of children aged 12 to 15 months, while continuing vaccination of girls in the 8th grade of school (13-14 years of age) with rubella-only vaccine.

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Key words : Rubella, outbreak, Romania, congenital rubella syndrome, measles vaccine

Introduction

Rubella is usually a mild rash illness in children and adults. However, its seriousness and public health importance stem from the ability of rubella virus to cross the placental barrier and infect fetal tissue, which may result in congenital rubella syndrome (CRS). Recognising that measles and rubella remain important causes of vaccine preventable morbidity and mortality in Europe, the World Health Organization (WHO) Regional Office for Europe has developed a Strategic Plan for Measles and Congenital Rubella Infection. The overall objectives are to interrupt the indigenous transmission of measles and reduce to very low levels the risk of congenital rubella infection (< 1 case of CRS per 100 000 live births annually) by 2010. The strategy includes strengthening routine immunisation and surveillance programs throughout the Region [1].

The Romanian ministry of health (MoH) currently has no national childhood rubella vaccination program. However, rubella vaccine, in the form of measles-rubella vaccine, was first offered to girls aged 15-18 years (those born 1980-83) in 1998 as part of a measles vaccination campaign following a nationwide measles outbreak. In 2002, in Bucharest only, girls aged 14-18 years (born 1983-87) received rubella vaccine. In 2003, nationwide, all girls in the 8th grade (born 1987-1988) received rubella vaccine. In addition, in Bucharest only, 10% of girls in the 7th grade also received the vaccine in 2003.

Before the 2003 outbreak reported here, the last widespread rubella outbreak in Romania occurred in 1997, coincident with the measles outbreak, and had an incidence of 192 reported cases per 100 000 population. The average incidence in 1999-2001 was 26 reported cases per 100 000 population/year.

Methods

Case definitions

The following case definitions are used for surveillance:

- suspected rubella: any patient with fever and maculopapular rash and one of the following: cervical, suboccipital, or post-auricular adenopathy or arthralgia/arthritis.
- suspected CRS: any infant less than one year of age born to a mother with suspected or confirmed rubella during pregnancy or

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