

# 14

## Rubella

Introduced in 1971/ MMR introduced in 1988

NOTIFIABLE

### Introduction

Rubella is a mild disease caused by a toga virus whose only host is humans. Up to 50% of infections are asymptomatic. Its most serious effects are on the foetus, and prevention of the congenital rubella syndrome is the main aim of rubella vaccination.

### Epidemiology

The incubation period is 14-21 days, with most individuals developing a rash 14-17 days after exposure. Respiratory transmission occurs by direct or droplet spread. It may be transmitted by asymptomatic cases. Most infections occur in winter or early spring. Individuals with rubella are most infectious from 1 week before to 1 week after onset of the rash. Infants with congenital rubella may shed high titres of virus from their nasopharynx or in the urine for over 1 year.

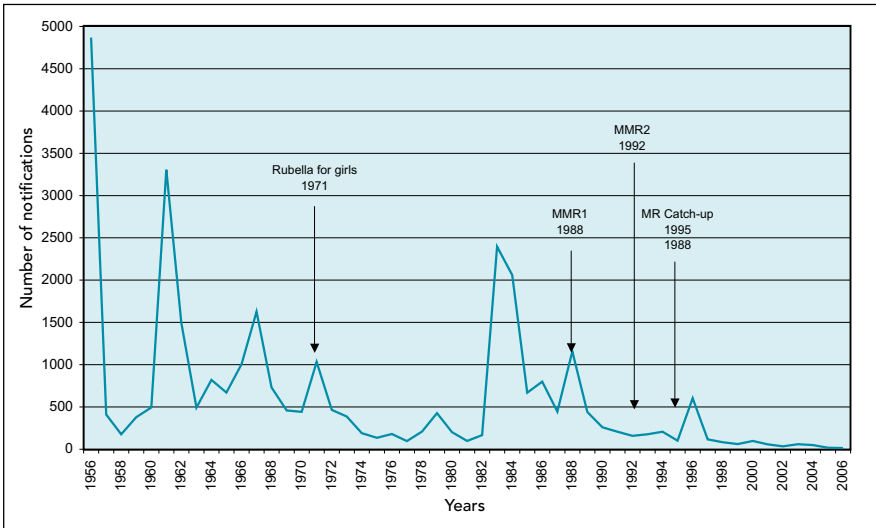
Since the introduction of Rubella vaccine in 1971, notifications of rubella have decreased (Figure 14.1). There is a longer interval between outbreaks and the numbers infected are smaller. In order to prevent outbreaks 95% uptake of 2 doses of MMR vaccine is required.

### Effects of rubella

#### ***Acquired rubella***

When symptoms occur they are generally mild. In children, rash is usually the first manifestation and a prodrome is rare. In older children and adults there is often a prodromal illness with low-grade fever, malaise, coryza and mild conjunctivitis. Lymphadenopathy involving post-auricular and sub-occipital glands may precede the rash. The rash is an erythematous maculo-papular rash which initially occurs on the face and

**Figure 14.1** Number of rubella notifications in Ireland, 1956-2006.  
Source: HPSC



neck. The rash is short-lived and is not specific to rubella and therefore laboratory confirmation is recommended.

Arthralgia and arthritis, which may last for up to 1 month, occur frequently in adult females (up to 70%) but are rare in adult males and children. Fingers, wrists and knees are usually affected.

Post-infectious encephalitis occurs in 1 in 6,000 cases, more often in adult females. Haemorrhagic manifestations occur in approx. 1 in 3,000 cases, more commonly in children and are due to thrombocytopenia or vascular damage. Cerebral, GIT or renal haemorrhage may result. Effects may last from days to months, but most patients recover.

### ***Congenital rubella syndrome (notifiable)***

Maternal rubella infection in pregnancy may result in foetal loss or major defects affecting almost all organ systems. Manifestations may be delayed for up to 4 years. The congenital rubella syndrome (CRS) comprises eye, ear, heart and CNS defects. Deafness is the most common and sometimes the only manifestation, especially when infection occurs after 16 weeks gestation.

Cardiac defects include patent ductus arteriosus, pulmonary stenosis, septal defects and coarctation of the aorta. Eye defects include cataracts, microphthalmia, pigmentary retinopathy, and glaucoma. Neurological

problems include encephalitis, microcephaly, mental handicap, and behavioural problems. Other abnormalities include hepatitis, splenomegaly, thrombocytopenia, and growth retardation. Diabetes mellitus occurs frequently in later childhood in those with the CRS. Reinfection with rubella may occur, as impaired cell-mediated immunity has been demonstrated in some children with CRS.

The overall risk of defects depends on the stage of pregnancy. If followed up after birth, up to 85% of infants infected in the first 8-10 weeks will be affected. The risk of foetal damage declines to about 10-20%, with infection occurring between 11-16 weeks and with only deafness occurring up to 20 weeks of pregnancy. Defects are rare after 20 weeks.

**Preconceptional testing for rubella immunity is recommended.**

### Assessment of immunity

Satisfactory evidence of protection against rubella would include documentation of having received either 2 doses of rubella-containing vaccine or a positive antibody test for rubella. It has been reported that viraemic infection can occur in vaccinated persons who have low levels of detectable antibody. On rare occasions, clinical reinfection and foetal infection have been reported and CRS has occurred in infants born to women with serological evidence of rubella immunity prior to infection.

### Rubella vaccine

Rubella vaccine is only available as MMR (Measles, Mumps and Rubella vaccine). The vaccine contains attenuated measles, mumps and rubella which are cultured separately and mixed before lyophilisation.

The lyophilised powder is reconstituted using the diluent supplied and shaken well to completely dissolve the pellet. The reconstituted vaccine is yellow in colour and should only be used if clear and free from particulate matter.

An up-to-date list of licensed vaccines is contained in Appendix 1, or can be accessed on the IMB website, [www.imb.ie](http://www.imb.ie).

MMR does not contain thiomersal or any other preservatives. It must be kept refrigerated at 2-8°C, and protected from light. It should be used within 1 hour of reconstitution. Failure to adhere to these recommendations can result in loss of vaccine potency and diminished effectiveness.

Over 90% of individuals develop immunity to measles and rubella after 1 dose of vaccine. Two doses give protection in over 98% of people (see point 1, Indications). Between 61% and 91% are protected against mumps after 1 dose; and 98% are protected after 2 doses. Serological and epidemiological evidence indicates that vaccine-induced immunity is possibly lifelong.

Low rates of seroconversion occur in those under 12 months of age, because of maternal antibodies.

### **Deferral of MMR following blood or immunoglobulin transfusion**

Blood and blood products may contain significant levels of virus-specific antibody, which could prevent vaccine virus replication. Where possible, MMR should be deferred for at least 3 months after receipt of low-dose immunoglobulin, 6 months after red-cell transfusion, and 11 months after high-dose immunoglobulin (as for Kawasaki Disease). If the MMR vaccine is administered within these timeframes, a further dose should be given outside these times.

Laboratory investigation to determine vaccine response is not routinely recommended.

Persons who are tuberculin-positive may have a negative tuberculin test for 3 months after measles infection or MMR vaccine.

**Scientific evidence shows no association between the MMR vaccine and autism or inflammatory bowel disease.**

### **Dose and route of administration**

The dose is 0.5 ml by deep intramuscular injection. The deltoid is the recommended site of administration. The anterolateral thigh may also be used.

Alcohol swabs are best avoided as alcohol can inactivate the MMR vaccine. If alcohol is used to clean the skin it must be allowed to evaporate completely before the injection is given.

When other injectable vaccines are being given concurrently with MMR, different sites should be used.

**MMR may be given at the same time as DTaP, IPV, MenC, Hib and Hep B in situations where the latter are overdue.**

### Indications

1. All children at 12-15 months of age, with a second dose at 4-5 years of age. For older children who have not received 2 doses, MMR vaccine should be given as soon as possible, and a second dose one month later. Allowing 3 months between doses is likely to maximise the response rate in children aged under 18 months. Where protection against measles is urgently required the second dose can be given 1 month after the first. If children aged under 18 months are given the second dose less than 3 months after the first dose, they need a third dose to ensure full protection. This can be given at 4-5 years.  
MMR vaccine can be given to those who have a history of measles, mumps or rubella infection.
2. Measles outbreaks  
Outbreaks of measles should be controlled by immunising all susceptible individuals within 72 hours of contact, as vaccine-induced immunity develops more rapidly than natural antibody.
  - If these persons have had no previous measles vaccine, a second dose is given one month later.
  - During an outbreak, particularly if there are high attack rates in younger infants, MMR vaccine may be given to children as young as 6 months of age. However, maternal antibodies may compromise the response to the vaccine. Therefore children vaccinated before their first birthday should have a repeat vaccination at 12-15 months of age, at least 1 month after the first vaccine, with a further dose at 4-5 years of age.
  - Some persons may require HNIG (see below).
3. Children with chronic conditions such as cystic fibrosis, congenital heart or kidney disease, failure to thrive or Down syndrome are at particular risk of measles infection and should be immunised with MMR vaccine.
4. Children coming from low-income countries have probably received measles vaccine but not rubella or mumps vaccine. Therefore, unless there is a reliable history of vaccine administration, these children should be regarded as unimmunised, and given 2 doses of MMR one month apart.
5. Individuals born before 1978 are likely to have had measles infection. MMR vaccine should be offered to such individuals on request if they are considered at high risk of exposure.

6. Health-Care Workers (HCWs) in the following situations (see Chapter 18). Protection is important both for themselves and in the context of their ability to transmit measles to vulnerable groups.
  - Those who do not have evidence either of measles infection or of having received 2 doses of MMR vaccine should be given 2 doses of MMR, separated by at least 1 month.
  - If an outbreak occurs in an institution or an area served by an institution, HCWs should be given 1 dose of MMR.

Antibody response to the mumps and rubella components of the MMR vaccine **does not** develop quickly enough to provide effective prophylaxis after exposure to suspected mumps or rubella. Human normal immunoglobulin is not recommended for the post-exposure protection of pregnant women exposed to rubella. Human normal immunoglobulin is not routinely used as post-exposure protection from mumps.

### Contraindications

1. Anaphylaxis following a previous dose of MMR or one of its constituents (e.g. Neomycin, Gelatin)
2. Significantly immunocompromised persons, such as those with untreated malignant disease and immunodeficiency states other than HIV infection, and those receiving immunosuppressive therapy, high-dose x-ray therapy and current high-dose systemic corticosteroids (see Chapter 2)
3. Pregnancy. Furthermore, pregnancy should be avoided for 1 month after MMR

**There is no evidence to recommend or support the use of single vaccines against measles, mumps or rubella in place of the combination MMR vaccine.**

### The following are **NOT** contraindications to MMR vaccine

1. Allergy to egg, even anaphylaxis following egg. If there is a genuine concern regarding serious allergy, a paediatrician may be consulted and the vaccine given in hospital although this is not medically necessary. Currently-used measles and mumps vaccines do not contain significant amounts of egg cross-reacting proteins and recent data suggest that anaphylactic reactions to MMR are not associated with hypersensitivity to egg antigens but

- to other vaccine components (Gelatin or Neomycin)
2. Breast-feeding
  3. HIV-positive patients who are not severely immunocompromised
  4. Personal or family history of convulsions. Advice regarding the possibility and treatment of pyrexia should be given
  5. Immunodeficiency in a family member or household contact
  6. Uncertainty as to whether a person has had 2 previous MMR vaccines
  7. If women have received anti-RhD immunoglobulin it is not necessary to defer rubella vaccination as the response to the vaccine is not affected

### Precautions

1. Acute severe febrile illness, defer until recovery
2. Injection with another live vaccine within the previous 4 weeks
3. Recent administration of blood or blood products (see above)
4. Patients who developed thrombocytopenia within 6 weeks of their first dose of MMR should undergo serological testing to decide whether a second dose is necessary. The second dose is recommended if the patient is not fully immune to the 3 component viruses.

### Adverse reactions

Soreness and erythema may occur at the injection site (3-8%). Fever (6%), rash (7%), headache, vomiting and salivary gland swelling may occur. A febrile convulsion occurs in 1 in 1,000 children.

'Mini-measles' may occur 6-10 days after immunisation and consists of mild pyrexia and an erythematous rash. 'Mini-mumps' with salivary gland swelling may rarely occur during the third week after immunisation. Very rarely, anaphylaxis, erythema multiforme, thrombocytopenia, and nerve deafness have been reported.

The rubella component may occasionally produce a rash, mild arthralgia, and lymph-node swelling 2-4 weeks post-vaccination, particularly in post-pubertal females (up to 25% of recipients). The incidence is lower than after natural disease.

There is no evidence of congenital rubella syndrome or increase in other teratogenic effects in women inadvertently given rubella vaccine before or during early pregnancy, but pregnancy remains a contraindication. Adverse reactions are considerably less common (under 1%) after a second dose of MMR.

### Bibliography

American Academy of Pediatrics (2006). Red Book: Report of the Committee on Infectious Diseases. 27<sup>th</sup> ed. Elk Grove Village, IL: American Academy of Pediatrics.

Department of Health UK (2006). Immunisation against infectious disease (the Green Book). 3<sup>rd</sup> ed. London: The Stationery Office.





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