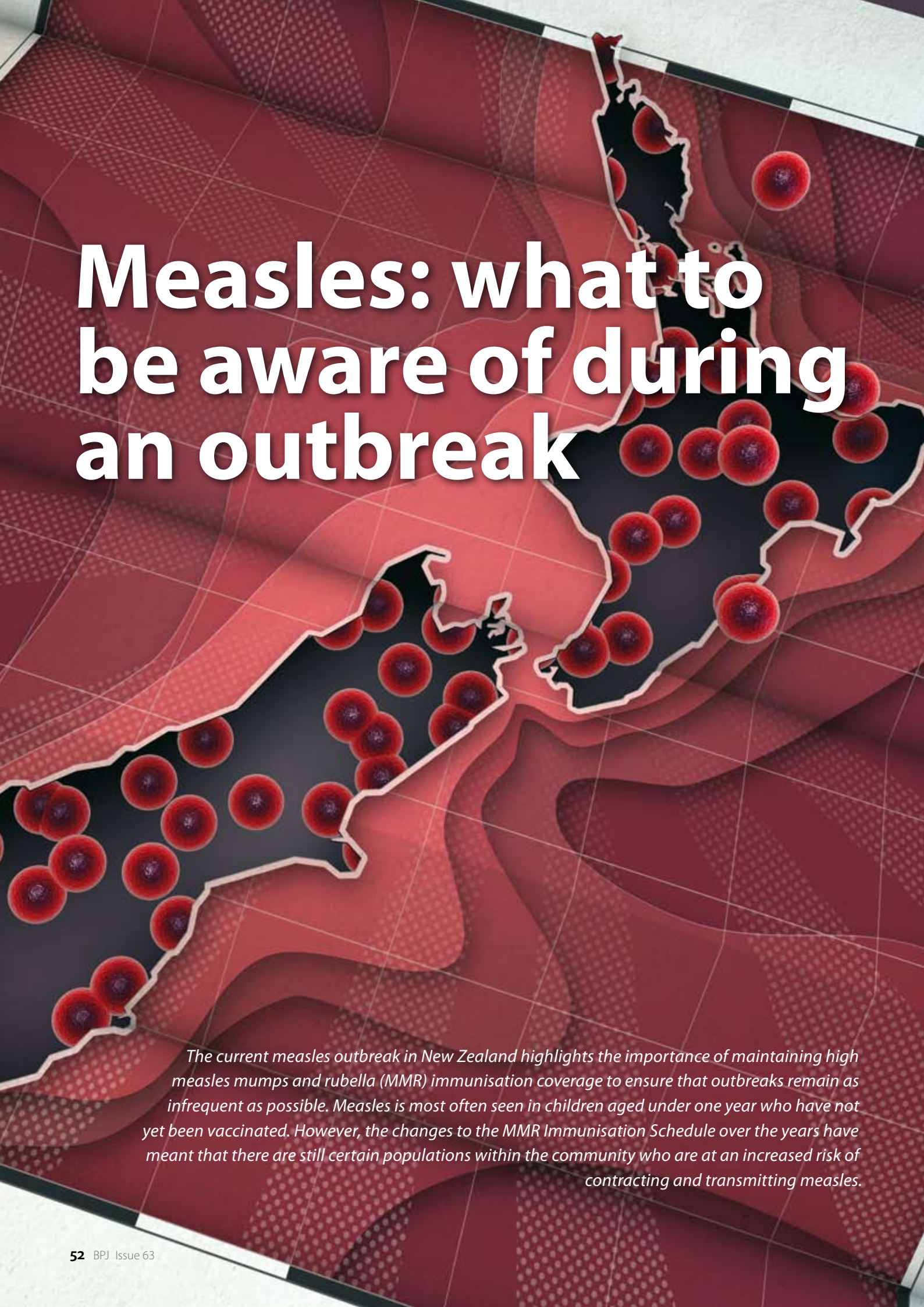
Measles: what to be aware of during an outbreak



The current measles outbreak in New Zealand highlights the importance of maintaining high measles mumps and rubella (MMR) immunisation coverage to ensure that outbreaks remain as infrequent as possible. Measles is most often seen in children aged under one year who have not yet been vaccinated. However, the changes to the MMR Immunisation Schedule over the years have meant that there are still certain populations within the community who are at an increased risk of contracting and transmitting measles.

New Zealand is currently in the midst of a measles outbreak, which began in December, 2013. As of 15 August 2014, 281 cases of measles have been reported in New Zealand, mostly linked to international travel (113 cases in Auckland and 125 in Waikato).[1]

Measles ("English measles", rubeola) is a highly contagious viral disease that is characterised by rash and fever and is associated with a number of serious complications. The best protection against measles is immunisation with the combined measles, mumps and rubella (MMR) vaccine. The MMR vaccine was added to the National Immunisation Schedule in January 1990, and is currently recommended for children at age 15 months with a second dose at age four years.[2] MMR replaced the separate measles and rubella vaccines that had previously been on the schedule since 1969 and 1970, respectively (for further details of the vaccination timeline see: "MMR vaccination", Page 54).[2]

To protect against measles, all people born on or after 1 January 1969 should receive two doses of a measles-containing vaccine.[2] Anyone who has only received a single measles vaccine prior to the introduction of the combined MMR vaccine should receive two doses of MMR to offer best protection. There is no safety concern in regards to giving an extra measles vaccine. People born prior to 1969 are considered to be immune to measles as it is presumed they would have been exposed to wild-type measles prior to the introduction of the measles vaccine.[2]

According to the World Health Organisation (WHO), 95% of the world's population born after the measles vaccination was introduced, need to be fully vaccinated against measles in order for the disease to be eliminated.[3] Between 1980 – 2012, 81% of children aged two years in New Zealand received a measles-containing vaccine.[3] In 2006 and 2007, 92 – 93% of children received the first dose of MMR, but only 89% received the second MMR dose.[3] These immunisation rates for MMR are not high enough to prevent outbreaks of measles. However, the most recent statistics for 2008 – 2011 are encouraging, with national coverage rates of 93% – 94% for the first dose of MMR in children aged two years.[3]

Who can contract measles?

Both adults and children can contract measles but the incidence rate decreases with increasing age. Children aged less than one year are still the most likely age group to be infected with measles as they have not yet received the MMR vaccine. However, there was an increase in the infection rates in adolescents aged 10 – 14 years during the 2009 and 2011 outbreaks.[3] This was likely due to changes in the MMR vaccination schedule and less than optimal vaccination rates for the birth cohort born between 1990 and 2000 (see: "MMR vaccination", Page 54). Measles infection results in lifelong immunity and people can only contract the disease once, but occasionally people who have received MMR can still contract measles (due to inadequate immune response or inadequate vaccination). Of the 68 cases of measles reported in 2012, 40 were in unvaccinated people (including 20 cases in children aged less than 15 months), 10 were in people who had received one dose of MMR and seven were in people who had received two doses of MMR. Vaccination status was unknown in the remaining 11 people.[2]

People most at risk of contracting measles include those who have not been vaccinated with MMR, those who are returning from international travel (due to higher risk of exposure in measles-endemic countries) and those born overseas in countries where appropriate vaccination is less likely.

What is measles?

Measles is caused by a paramyxovirus and transmission is by direct person-to-person contact via oropharyngeal and nasopharyngeal droplets, and less commonly via airborne spread or contact with infected surfaces, e.g. door handles and eating utensils, as the virus can survive on these surfaces for several hours. Measles is one of the most highly communicable of all infectious diseases. There is an incubation period of approximately 10 – 14 days after exposure before symptoms appear.[1]

The signs and symptoms are highly characteristic in most people and tend to appear in three stages:[7]

Prodromal stage, lasting three to four days, where symptoms can include fever of greater than 38°C, malaise, anorexia, diarrhoea, Koplik spots (tiny white spots like grains of salt on the buccal mucosa), the "3Cs" of cough, coryza (rhinitis) and conjunctivitis.

Exanthema (rash) stage, lasting four to five days, and characterised by a blotchy, bright red maculopapular rash that is generally not itchy. This rash typically starts behind the ears and then spreads to the face and neck and then the rest of the body.

MMR vaccination

MMR vaccination is fully subsidised on the National Immunisation Schedule. It is recommended that children are vaccinated at age 15 months with a second dose at age four years.[2] Anyone born in or after 1969 who has not received two documented doses of MMR needs two doses at least one month apart (Table 1).[2]

Because it is a live (attenuated) vaccine, MMR vaccination should not be given to pregnant women and pregnancy should be avoided for one month after vaccination.[4] The MMR vaccine is not contraindicated in women who are breastfeeding.[4]

Table 1: Recommended MMR vaccinations for protecting against measles in New Zealand[2]

Patient group	Recommended vaccination
Children born in New Zealand	Two doses of MMR; at age 15 months and at age four years
People born on or after 1 January, 1969 with no documented history of MMR vaccine (including those who have received a single measles-only vaccination)	Two doses of MMR; four weeks apart
People born before 1 January, 1969	MMR is not required

Vaccination with MMR is very effective. After one dose of the MMR vaccine, 90 – 95%, 95 – 96% and 90 – 97% of recipients aged greater than 12 months are protected from measles, mumps and rubella, respectively.[5] After the second dose, almost all recipients are immune to all three diseases.[5] The estimated duration of protection after administration of two doses is lifelong in more than 96% of recipients.[5] However, occasionally some people still contract measles despite having received two doses of MMR. This may be due to problems with the vaccine (inappropriate administration or storage), waning of immunity over time or maternal antibodies from breast-feeding blocking the vaccine, such as when doses are given in infants. If an immunised person does contract measles it is likely to be less severe.[6]

History of measles, rubella and MMR vaccination in New Zealand

The history of measles and rubella vaccination in New Zealand can provide useful information for clinicians as to which people are more likely to not be fully protected against measles and rubella.[2]

1969 Measles vaccine (one dose) introduced for children aged 10 months to five years (who will now be aged 40 – 45 years)

1970 Rubella vaccination (one dose) introduced for all children at age four years

1974 Age change for measles vaccination to age 12 months

1979 Due to low uptake of rubella vaccination at age four years (especially in boys) schedule changed to rubella vaccination in girls at age 11 years (the "schoolgirl" rubella vaccination programme)

1981 Age change for measles vaccination to age 12 – 15 months

1990 MMR vaccine is introduced for all infants at age 12 – 15 months, replacing the separate measles and rubella vaccines

1992 A second dose of MMR is added to the schedule at age 11 years

2001 The timing of the second dose of MMR is changed from age 11 years to age four years and a school-based, catch-up vaccination programme is offered to all children aged 5 – 10 years

For further information see MMR – frequently asked questions, available from: **www.immune.org.nz**

Convalescent stage where the rash fades leaving a temporary brownish stain on the skin.

Differential diagnoses for measles include other causes of rash, fever and conjunctivitis, e.g. drug sensitivities, roseola, enterovirus, adenovirus and infectious mononucleosis (EBV) infections, scarlet fever, Kawasaki disease and rubella.[8]

Laboratory testing and notification

Confirming clinically suspected cases of measles with laboratory testing is recommended. The virus is more likely to be present within the first week of onset of rash, so ideally sampling should occur within this time period.[9] Measles is a notifiable disease and the Medical Officer of Health should be notified as soon as measles is suspected and prior to laboratory confirmation.

A nasopharyngeal swab in a vial of universal transport medium is the preferred method of testing.[9] However, if unavailable, throat swabs may be used in young children. A blood sample (for serology) can also be used as long as the rash has been present for at least three days.[9] Local protocols on testing vary, i.e. whether testing is done locally or sent to another laboratory – clinicians should check with their local laboratory to see where testing is performed. Once measles has been isolated, samples are sent to the New Zealand National Measles Laboratory (at Canterbury Health Laboratories).[9]

N.B. Swabs are best taken in the general practice (or initial site of contact with the patient), so other patients at laboratory collection centres are not exposed to the virus.

For further information, see: **www.measles.co.nz/specimen-guidelines**

Prevention of transmission

People with measles are infectious for five days before and after the rash appears.[1] This can make prevention and control measures difficult to implement as people are infectious well before symptoms become apparent. However, some measures can be implemented in health clinics during outbreaks and when dealing with a patient with suspected measles. This can include having suitable triage and isolation areas for patients, allowing only immune staff to have contact with the patient, and having hand gels and surgical masks at reception areas and at practice entrances/exits. Children should be kept away from day care or school for at least five days after the rash appears.[7] Transmission between family/household members is common and people with suspected or confirmed measles should avoid contact with non-immune infants and pregnant women.

In the event of a measles outbreak, The Immunisation Advisory Centre advises that non-immunised children (who have not had measles and whose parents do not want them to receive MMR) who have contact with people with measles should not attend school or early childhood services (or be in public places) until notified. This may be for a period of 14 days (incubation time).

MMR and immunoglobulins as prophylaxis for measles

There are only a few management options available that may help prevent infection after people have potentially been exposed to measles. These include either active (MMR) or passive (human immunoglobulin) immunisation.

MMR: During outbreaks, or other circumstances when protection against measles is urgently required, MMR can be given to unvaccinated people, who are not immunocompromised, within 72 hours of exposure and this may prevent infection.[5] If measles infections are being reported in very young infants, MMR can given to children aged six to 12 months, i.e. infants are fast tracked for vaccination before the recommended age of 15 months.[2] However, as the immune response may not be as effective, the child will still require a further two doses of MMR at age 15 months and four years.[2]

Human normal immunoglobulin (HNIG): This is a preparation of concentrated antibodies (immunoglobulins) that are not specific to a particular infection, but can boost immunity in people who are immunocompromised. An Infectious Diseases Specialist or Paediatrician may recommend intramuscular (IM) administration of HNIG in the following scenarios:[4]

- In people with contraindications to MMR
- In immunocompromised children and adults
- In pregnant women
- In children aged less than 15 months who present more than 72 hours after exposure to measles
- In people who present more than 72 hours after exposure and have no history of measles OR have not received MMR

HNIG prophylaxis should be given as soon as possible after exposure to measles, but can be administered for up to six days. It should not be administered within three weeks of a live virus vaccine and live virus vaccines should not be given for 11 months after a patient has received HNIG.[2]

For further information on HNIG see: **www.nzblood.co.nz/assets/Transfusion-Medicine/PDFs/POST-EXPOSURE-PROPHYLAXIS-FOR-MEASLES-111G001.pdf**

Intravenous (IV) Immunoglobulin (Intragram P): is a similar preparation as HNIG but is administered via the IV and not the IM route. Intragram P can be considered in immunocompromised people who have had contact with a person with confirmed measles, people who require large doses of immunoglobulin prophylaxis, and people with a reduced muscle bulk for whom IM administration would be difficult.[2]

Treatment of measles

There are no specific antiviral treatments for measles and patients usually improve within seven to ten days without treatment. However, patients/parents can be advised about some measures to help control the symptoms. These can include:

- Using analgesia, e.g. paracetamol or ibuprofen, to reduce pain and discomfort
- Ensuring adequate fluid intake to avoid dehydration, especially if febrile
- Treating sore eyes. This can include wiping the crustiness from the eyelids and lashes using cotton wool and water (use a separate piece of cotton wool for each eye) and avoiding bright light

Complications of measles and follow up

Complications from measles are common and up to 30% of people experience at least one complication.[5] The most common complications (with approximate rates) are otitis media (7 – 9%), pneumonia (6%) and diarrhoea (8%).[5] The risks of complications are highest in children aged less than five years, in adults aged over 20 years and in people who have chronic co-morbidities (especially those who are immunocompromised).[5]

Approximately one in 1000 people who contract measles will die; pneumonia accounts for approximately two-thirds of these deaths.[5] Death rates are much higher than this in less developed countries. Some of the more serious complications of measles include acute encephalitis (approximately 0.1% of people) and subacute sclerosing panencephalitis, a rare degenerative central nervous system disease, which is always fatal, and occurs in approximately one in 100 000 people.[5] Contracting measles during pregnancy can increase the risk of premature labour and miscarriage.[5]

Patients should be informed of the possible complications of measles and advised to contact a health professional at any time when they are concerned about their symptoms, if their condition worsens, or if their symptoms are not resolving.

ACKNOWLEDGEMENT: Thank you to **Associate Professor Nikki Turner**, Department of General Practice and Primary Health Care, Director CONECTUS and the Immunisation Advisory Centre, University of Auckland and **Dr Emma Best**, Paediatric Infectious Diseases Consultant, Starship Children's Health, Auckland for expert review of this article.

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Rubella infections are relatively rare in New Zealand

Rubella ("German measles") is caused by a togavirus and is therefore a different disease to measles (rubeola). Transmission is via contact with infected nasopharyngeal and oropharyngeal secretions with an incubation period of approximately 16 – 18 days.[10] The infectious period is approximately seven days before the rash appears until at least four days after, but rubella is not as infectious as measles.[11] Rubella infections are rarely reported in New Zealand – only five cases of rubella were reported in 2011 – 12 and no cases of congenital rubella syndrome have been reported since 1998.[2] However, the exact prevalence of rubella is hard to establish as the illness can be mild and non-specific in childhood and many cases are not reported.

The clinical presentation of rubella is characterised by a discrete, pale-pink maculopapular rash starting on the face and neck and spreading to the rest of the body. The rash is not as confluent as that observed in measles (more discrete and does not tend to merge together) and usually fades on the third day. Other symptoms can include lymphadenopathy, fever (in children) and arthralgia (in adolescents and adults).

Approximately one-third of people with rubella are asymptomatic (subclinical infection) and all infections are considered relatively benign.[7] Rubella infections are only considered significant if there is a possibility that a pregnant woman has been in contact with a person with rubella due to the risk of congenital rubella syndrome (see below).[2] Rubella is a notifiable disease and the Medical Officer of Health should be notified as soon as rubella is suspected, followed by laboratory testing to confirm (serology).

Rubella in pregnancy

Ideally all women of child-bearing age should be aware of their rubella immune status. It is recommended that women are tested for rubella immunoglobulin G (IgG) antibodies (not subsidised) when pregnancy is planned.[2] Rubella IgG testing is part of routine antenatal care (subsidised) once a women is pregnant, and should be requested by the Lead Maternity Carer or General Practitioner.[2] Certain groups of women are more likely to be seronegative for rubella, including women aged over 35 years and women born overseas (especially in the Pacific Islands, Asia, sub-Saharan Africa and South America) and entering New Zealand after the age when routine childhood vaccinations are administered.[2] Women who have no evidence of rubella immunity can be given two doses of MMR, four weeks apart (but not during pregnancy).

The most serious complication of rubella is congenital rubella syndrome as a result of rubella infection during pregnancy (especially during the first trimester). The syndrome is characterised by miscarriage or stillbirth and foetal malformations, e.g. deafness and blindness, growth abnormalities and congenital heart disease.

Although MMR is contraindicated during pregnancy, the vaccine is not contraindicated in women who are breastfeeding. MMR may be given to protect against rubella in previously unimmunised and seronegative (no antibodies against rubella) post-partum women.[4] Human normal immunoglobulin is not recommended as prophylaxis for rubella in pregnant women exposed to the infection as it has not been shown to be effective.[5]

Pregnant women with low rubella IgG levels (<10 IU/mL) should be advised to avoid situations where contact is more likely (especially in the first trimester), e.g. international travel to countries with endemic disease or known outbreaks. MMR can be given after delivery of the infant (subsidised).[2]

For further information see: Routine laboratory testing during pregnancy" Best Tests (July, 2011).