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1.0 AUTHORITY

The authority for the control of communicable diseases through case and contact management exists under the BC Public Health Act (2008) . This is further detailed in Section 1.0 Preamble to BC Communicable Disease Control Manual, Introduction, Communicable Disease Control Manual.

2.0 GOAL

The goals of rubella control are to support the national and Pan American Health Organization (PAHO) goal to maintain elimination of cases of indigenously transmitted rubella and CRS from Canada and prevent transmission from imported cases.

The objectives of this guideline are:

- Promoting recognition and reporting of rubella and CRS cases
- Providing contact follow-up for all cases of rubella to prevent further transmission, and appropriate referral of women exposed in pregnancy to determine whether infection has occurred
- Instituting prompt outbreak control measures.

2.1 Target immunization coverage

- The Pan American Health Organization indicator is 95% of population cohorts aged 1–40 years have received a rubella containing vaccine
- To decrease the proportion of rubella-seronegative primigravida women to < 4% by 2010.

This will be accomplished by the immunization program through:

- Delivery of on-time immunization of children
- Immunization of previously unimmunized children and adults at opportune health encounters. This is particularly important for young girls and women of child-bearing age new to Canada, especially from countries where rubella vaccine is not routinely used. This includes much of the developing world and countries outside of North America and Western Europe.
- Postpartum immunization of rubella susceptible women.

3.0 DEFINITIONS

Mode of transmission: Rubella is spread through droplet transmission or direct contact with nasopharyngeal secretions of an infected person. Infants with CRS shed large quantities of virus in their pharyngeal secretions and urine.
Incubation period: ranges from 14 – 21 days and is usually 14 – 17 days.
Period of communicability: rubella is most contagious when the rash first appears. Virus may be shed for up to 7 days before to 7 days or more after rash onset. Infants with CRS may shed the virus for up to one year in their pharyngeal secretions and urine.

4.0 RUBELLA FLOW CHART

The flow chart describes actions to be taken by Public Health when notified of a case of rubella.

Case Identification

Receive notification of probable or confirmed case of rubella.
Confirm the diagnosis and obtain history from the case. See Section 5.1
Ensure specimens from a probable case are tested by both serology (both acute and convalescent sera must be collected) and virus detection.
Inform the medical health officer (MHO).

Case Management

Obtain history of the case. Attempt to ascertain case's source of infection.
Determine period of communicability and places and dates of likely acquisition and transmission. See Section 6.3
MHO is to exclude individuals with confirmed or probable rubella from work (including health care settings), school, or child care for 7 days after onset of the rash.
Assess whether case is pregnant. If case is pregnant, inform the maternity care provider and assess and report on outcome of pregnancy. Ensure infant is assessed for signs of Congenital Rubella Infection / Syndrome after birth.

Contact Management

- Identify contacts. Refer to Section 7.1.
- Prioritize identification of pregnant contacts.
- Assess susceptibility to rubella. See Section 7.3

- **Pregnant contacts:**
  - Confirm rubella susceptibility status.
  - If pregnant contact is susceptible, refer to Section 7.3.1 for appropriate management
  - Educate contacts about the signs and symptoms of rubella.
  - If susceptible pregnant woman does not become infected, administer MMR immediately postpartum.

- **Other (non-pregnant) contacts:**
  - Assess the rubella susceptibility status of all identified contacts.
  - Offer MMR vaccine to susceptible contacts who do not have a contraindication to the vaccine as soon as possible.
  - Educate contacts about the signs and symptoms of rubella.

Reporting

Report confirmed and probable cases of rubella in iPHIS/ Panorama or PARIS within 1 day of receipt of report.
Fax a completed Case Report Form for Measles, Mumps, and Rubella Enhanced Surveillance to Immunization Programs and Vaccine Preventable Diseases Service, BCCDC. See Section 8.0

5.0 CASE IDENTIFICATION

5.1 Confirm the Diagnosis

Investigate all clinically identified and laboratory reported cases of rubella as soon as possible and complete the individual case report in iPHIS (Integrated Public Health Information System), Panorama or PARIS.

Inform the local Medical Health Officer.

All categories of the surveillance case definition below are reportable.

Case status	Criteria
Confirmed Case	Laboratory confirmed: Laboratory diagnosis of infection in the absence of recent (i.e., in the previous 28 days) immunization with rubella-containing vaccine: • isolation of rubella virus from an appropriate clinical specimen, **or** • detection of rubella virus RNA, **or** • seroconversion or a significant (i.e., fourfold or greater) rise in rubella IgG titre by any standard serologic assay between acute and convalescent sera, **or** • detection of rubella IgM antibody using a recommended assay in a person with an epidemiologic link to a laboratory-confirmed case or who has recently travelled to an area of known rubella activity Epidemiologically-linked: Clinical illness (fever and rash, and at least one of the following: arthralgia/arthritis, lymphadenopathy, conjunctivitis) in a person with an epidemiologic link to a laboratory confirmed case
Clinical/Probable case	Clinical illness (fever and rash, and at least one of the following: arthralgia/arthritis, lymphadenopathy, conjunctivitis) • in the absence of appropriate laboratory tests, **or** • in the absence of an epidemiologic link to a laboratory-confirmed case, **or** in a person who has recently travelled to an area of known rubella activity

Clinical diagnosis of rubella is challenging and may be inaccurate because symptoms and signs are not unique to this disease. Laboratory confirmation of infection is recommended for all cases. Confirming the diagnosis is particularly important in pregnant women, cases who have contact with pregnant women, suspected cases of CRS, and during outbreaks.

Primary care providers should follow the outcome of pregnancy for all pregnant women with confirmed or probable rubella infection during pregnancy. Refer to Section 13.0 Congenital Rubella Syndrome and Section 14.0 Congenital Rubella Infection.

6.0 CASE MANAGEMENT

Initiate control measures immediately upon the identification of a case based on the index of suspicion for rubella, including a clinical case. Initiation of control measures need not await laboratory confirmation of the case.

6.1 Laboratory Testing

Diagnostic work-up of clinical and suspect cases should include both ***serology and virus detection*** (by RT- PCR testing and/or isolation in cell culture). Specimens should be sent to the BCCDC Public Health Microbiology & Reference Laboratory (BCPHMRL) for testing. Notify the medical microbiologist at BCCDC if priority testing is required: tel: 604-707-2627 from 8:30 – 4:30; 604-661-7033 (24 hours, 7 days per week). For laboratory test results, contact the BCPHMRL Lab Results Line (1-877-747-2522) or access the information through PLIS (Provincial Laboratory Information System).

Specimen receiving hours at BCPHMRL for Central Processing & Receiving Pre-Analytical 0730 - 2100 Monday to Friday and 0900 - 1700 Saturday. See the Guide to Programs and Services. For more information regarding testing and requisition forms, refer to PHSA Laboratories.

Many rash illnesses can mimic rubella infection and up to 50% of rubella infections can be subclinical. The only reliable evidence of rubella infection is:

- presence of rubella-specific IgM antibody; or
- demonstration of a significant rise in IgG antibody from paired acute and convalescent sera; or
- detection of rubella virus by isolation in cell culture; or
- detection of rubella virus by RT-PCR.

6.1.1 Virus Identification

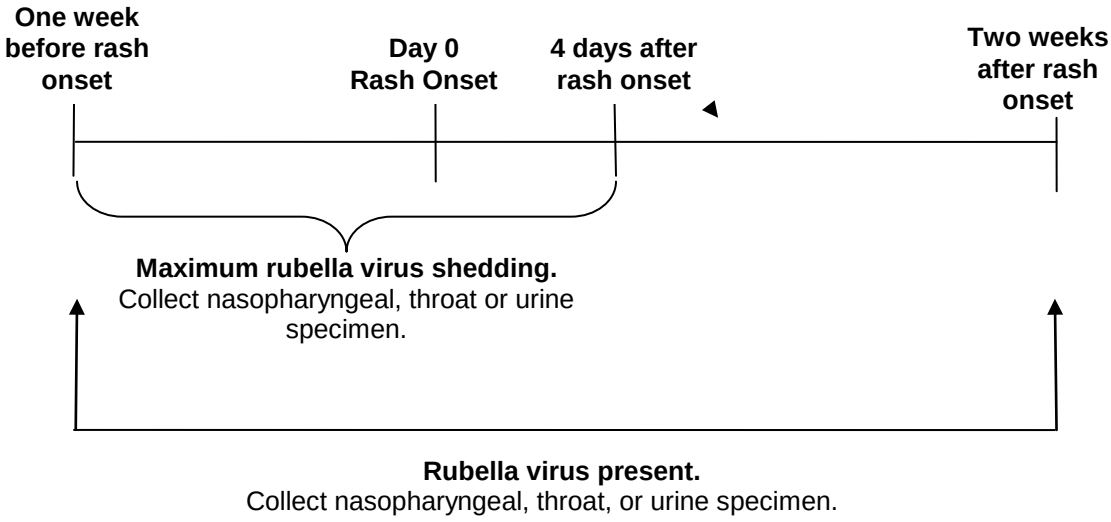
Nasopharyngeal or throat swab specimens and/ or urine should be taken for virus isolation. Virus may be isolated 1 week before to 2 weeks after rash onset. However, maximum viral shedding occurs up to day 4 after rash onset. For nasal/NP swabs, use a BCPHMRL flocked swab (COPAN, red top with viral transport media). For throat swabs use a BCPHL virus isolation swab (Starplex, S160V, blue top). For urine collection, use a sterile container.

An RT-PCR assay can be performed on individuals suspected of having rubella. Collect nasopharyngeal or throat swab or urine preferably within 6 days of rash onset. Rubella virus RNA can be detected one week before to 2 weeks after rash onset.

Place specimens on ice, and ship immediately to the BCCDC Public Health Microbiology & Reference Laboratory. If immediate transport is not feasible, place the specimen(s) in a refrigerator (not a freezer) and transport to the laboratory on ice within 24 hours.

Both RT-PCR and genotyping for rubella are done at the National Microbiology Laboratory in Winnipeg. Genotyping allows for linkage of cases in outbreaks and assessment of the global origin of a rubella infection.

Sample Collection for Rubella Virus Identification

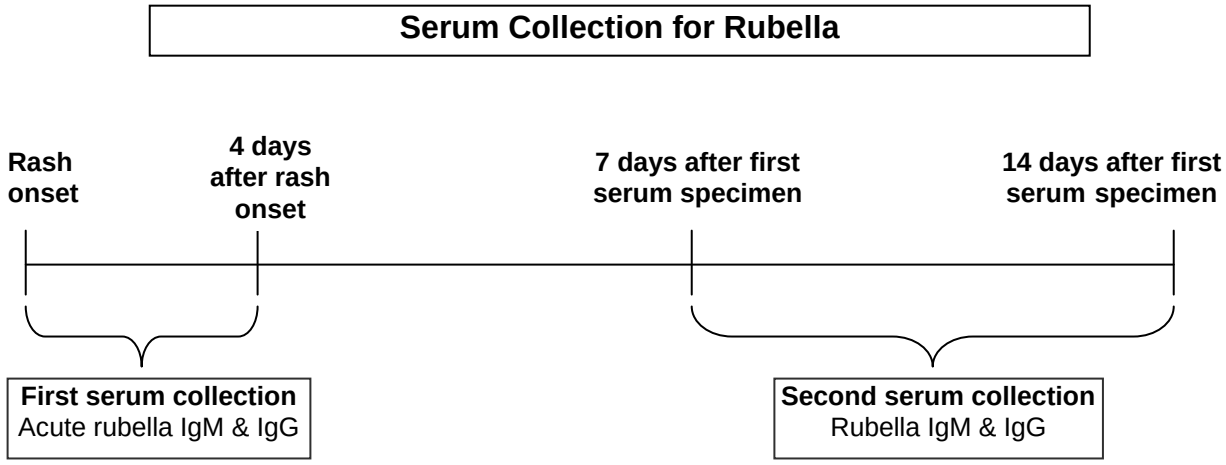


6.1.2 Serology

Seroconversion (change in IgG antibody concentration between acute and convalescent sera) is a commonly used method of confirming the diagnosis of rubella. Rubella serology also includes testing for rubella-specific IgM antibodies. The presence of rubella specific IgM antibodies or IgG seroconversion in the absence of recent MMR immunization strongly suggests recent rubella infection.

The first (acute) blood sample should be taken as early as possible (not later than 4 days) after onset of rash.

The second (convalescent) sample should be taken approximately 7 – 14 days later. Both samples should be tested for both rubella-specific IgG and rubella-specific IgM antibodies.



Typically the anti-rubella IgM will be present at the time of clinical presentation. IgM may be falsely negative if the specimen is taken too early in the clinical course (i.e., < 4 - 5 days after rash onset) but should be apparent in the 'convalescent' serum of a case of rubella.

IgM serology alone is not a reliable test for diagnosis of sporadic cases of rubella. As rubella incidence decreases, the predictive value of rubella IgM decreases. False positive and false negative results may occur. When testing a low prevalence population, the false positivity rate can be as high as 50%. For sporadic cases it is important that additional tests be done to confirm the IgM finding (i.e., acute/convalescent rubella IgG serology, RT-PCR, and/or virus isolation).

6.2 Interpretation of Test Results

For interpretation of serial acute and convalescent IgG results which are provided in International Units (IU) a four fold rise in the reported IgG IU/mL value is consistent with a rubella seroconversion and reflects a recent infection or MMR vaccination.

Interpretation of IgM results is more complex especially in sporadic cases without risk factors for rubella exposure (e.g., recent travel to a rubella endemic area or contact with a rubella case). IgM positivity should be accompanied by IgG seroconversion if truly reflective of an acute rubella infection.

Rubella Testing Results	
Test Result	**Interpretation**
Reactive rubella IgM antibody	Possible acute rubella infection. The sensitivity of commercial rubella IgM enzyme immunoassays has been found to be approximately 50% for samples collected ≤ 5 days after rash onset and > 90% for samples collected 1 to 4 weeks after rash onset.
Rubella IgG seroconversion [defined as a significant rise in rubella IgG antibody signal (four fold or greater) between samples obtained during the acute phase and the convalescent phase of illness]	Confirms acute rubella infection
Presence of rubella IgG (assesses immunity to rubella)	Reactive: > 10 IU/ml • rubella IgG antibodies present Equivocal: 6-10 IU/ml • rubella IgG antibody level is indeterminate Non-reactive: 0-5 IU/ml • rubella IgG antibodies not present at a significant level
Rubella RNA detection by RT-PCR (nasopharyngeal or throat swab, or urine)	Confirms acute rubella infection
Rubella virus isolation	Confirms acute rubella infection

If results are inconclusive or inconsistent, and for cases diagnosed by serology alone or initially, because rubella is now rare in BC, discuss with the medical health officer who may contact a medical microbiologist at BCCDC for a consultation tel: 604-707-2627 from 8:30 – 4:30; 604-661-7033 (24 hours, 7 days per week).

Immunization against rubella will result in a seroresponse of IgM and IgG rubella antibodies that is indistinguishable from acute infection. If resolution of such cases if required, testing for virus identification should be informative.

6.3 Case History

Consider both clinical and epidemiologic information along with the laboratory information. Prior vaccination history, travel and exposure history, and timing of sample collection relative to symptom onset are all relevant to interpretation of lab results. If dates of likely exposure are compatible with acquisition in BC, investigate for a source case.

Determine the case's **period of communicability.** Virus may be shed for up to 7 days before to 7 days or more after rash onset. Rubella is most contagious when the rash first appears. Infants with CRS may shed the virus for up to one year in their pharyngeal secretions and urine.

Use the "Measles, Mumps, and Rubella Enhanced Surveillance Case Report Form" to collect data and determine if the case report meets the case definitions for measles.

If the case travelled outside of BC during their infectious period, or may have acquired their infection elsewhere in Canada, inform BCCDC and provide the case's itinerary so that the appropriate Canadian public health authorities may be notified if indicated.

6.4 Case Treatment

Clinical management of cases is outside the scope of this guideline. There is no specific treatment for rubella and clinical management is largely supportive.

6.5 Future Immunization of the Case

It is preferable to defer all immunizations with live and inactivated vaccines until at least four weeks after illness onset in the case. People who have had laboratory confirmed rubella need not be immunized against mumps as they are considered immune. Rubella immune individuals, however, may be safely immunized with MMR vaccine for measles and/ or mumps protection.

6.6 Case Isolation

Isolation in the health care facility:
Cases in health care facilities should be managed with droplet precautions (in addition to routine practices) for 7 days after onset or a rash. This will reduce the exposure of other patients at high risk and of health care workers.

Isolation in the community:
Public health advice to confirmed and clinical cases of mumps should include the following: to practice good hand hygiene, avoid sharing drinking glasses or utensils, and cover coughs and sneezes with a tissue or forearm.

Congenital rubella syndrome:
Household contacts and care providers to infants with congenital rubella syndrome should be fully immunized against rubella (1 dose of rubella vaccine given after the 1st birthday). Contact isolation is indicated for children with confirmed or suspected congenital rubella syndrome until they are at least one year of age, unless 2 nasopharyngeal and urine culture results after 3 months of age taken at least 1 month apart are negative for rubella virus. Infection control precautions should be considered for such children hospitalized for congenital cataract extraction up to 3 years of age.

6.7 Exclusion of Cases

Clinical and suspect cases should be managed as confirmed cases until laboratory evidence suggests otherwise.

6.7.1 Exclusion of health care workers

Health care workers (HCWs) include and are not limited to: nurses; physicians; physiotherapists, laboratory technicians, HCW students; volunteers; medical office assistants; home care workers; emergency responders; and support staff in acute care, long-term care, home care, and community health settings.

Notify Occupational Health and/or Infection Control for the facility in which the case works. The case is also obligated to inform Occupational Health of their illness.

If the case is a HCW, the MHO should exclude them from work for at least 7 days after the appearance of a rash.

6.7.2 Exclusion from workplace, school, or child care settings

The MHO should exclude cases from school, daycare, post-secondary institution and the workplace for at least 7 days after the appearance of the rash if there are susceptible individuals present in that setting.

When the case is in a school setting, notify the appropriate school administrator.

7.0 CONTACT MANAGEMENT

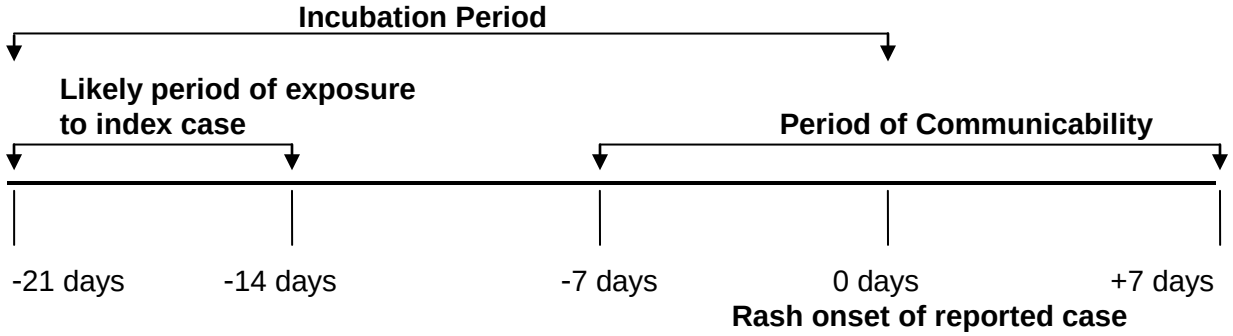
7.1 Contact Identification

Identify all individuals who had direct contact with the case during the period of communicability (i.e., 7 days before to 7 days after onset of the rash). This includes:

- household members;
- persons who share sleeping arrangements with the case, including shared rooms (e.g., dormitories);
- persons that have had direct contact with the oral/nasal secretions of an infectious case (e.g., close contact within a distance of 2 metres; sharing cigarettes, drinking glasses, food, cosmetics like lip gloss; kissing on the mouth);
- children and staff in child care and school facilities (as deemed necessary by the epidemiology of the outbreak).

Prioritize identification of pregnant contacts.

The Measles, Mumps, and Rubella Enhanced Surveillance Case Report Form may be used for data collection.



7.2 Case Travel

If the case travelled outside of BC during the infectious period, inform BCCDC and provide sufficient details about the case's itinerary to enable the affected public

health jurisdiction to receive the notification and take appropriate action for contact identification and management.

7.3 Assess susceptibility of contacts

Assess whether contacts are **immune** or **susceptible** to rubella. A **rubella-immune** individual is defined as having:

- documented receipt of one dose of live rubella virus vaccine (most often given as MMR) **or**
- laboratory evidence of rubella immunity (IgG antibody >10 IU) **or**
- laboratory confirmed acute infection.

7.3.1 Pregnant contacts

Confirm rubella susceptibility status. The following is a guide to the interpretation of rubella susceptibility status tests:

- Reactive (>10 IU/mL) rubella IgG antibodies present (immune).
- Equivocal (6-10 IU/mL) rubella IgG antibody level is indeterminate. Repeat testing may be considered.
- Non-reactive (0-5 IU/mL) rubella IgG antibodies not present at a significant level (susceptible).

Exposed susceptible pregnant women **who are susceptible** to rubella, or whose immunity to rubella has not been documented in past pregnancies or the current pregnancy, should be referred for assessment to determine whether they have been infected with rubella for future management of the pregnancy.

Pregnant contacts who are susceptible and do not become infected should be immunized in the immediate post-partum period.

Immune globulin (Ig) given after exposure to rubella does not prevent infection and is not routinely recommended for this purpose including in pregnancy.

7.4 Immunoprophylaxis of Susceptible Contacts

Offer MMR vaccine to non-pregnant susceptible contacts who do not have a contraindication to the vaccine. There is no indication for antibody testing prior to immunization. Administer MMR vaccine as soon as possible and preferably within 3 days of the exposure. Although live-virus rubella vaccine given after exposure has not been demonstrated to prevent infection, vaccine theoretically could prevent illness if administered within 3 days of exposure. Immunization of exposed non-

pregnant people is indicated because if the exposure did not result in infection, immunization will protect these people to future infection. Immunization of a person who is incubating natural rubella or who already is immune is not associated with an increased risk of adverse effects.

Rubella-containing vaccine is generally contraindicated in pregnancy because it is a live vaccine and the wild type virus is known to be teratogenic. However, no congenital defects attributable to rubella vaccine have ever been documented in the infants of mothers who received rubella vaccine during their pregnancy. Rubella vaccine may be considered during pregnancy during outbreaks if the risk assessment favours use of the vaccine to prevent infection during pregnancy, and has been supported by the Society of Obstetricians and Gynaecologists of Canada.

Immune globulin is not recommended for rubella for post exposure prophylaxis because it does not prevent infection.

In contacts who have received rubella vaccine post-exposure and develop symptoms fever and rash within a post-vaccine compatible time frame (potentially related to either the rubella or measles components), specimens must be collected for virus identification to confirm the diagnosis of rubella as serology will not distinguish between wild type infection and rubella vaccine seroresponse with IgM and IgG. Virus isolation and typing will distinguish wild from vaccine strain virus.

7.5 Exclusion of Susceptible Contacts

7.5.1 Health care settings

When a susceptible HCW is exposed to a case of rubella, conduct a risk assessment to determine whether the HCW may return to work. In consultation with the MHO, consider exclusion of the HCW from any work in the health care setting from the 7th day after the first exposure until the 21st day (inclusive) after the last exposure to the case of rubella. These time intervals reflect the incubation period and the potential period of communicability before the possible onset of symptoms.

Post-exposure vaccination is not proven to prevent rubella infection and does not allow for return to work prior to the maximum incubation period being expired. Vaccination will protect against rubella infection in future exposures.

Exclude any susceptible health care worker who is newly immunized from direct patient care for 21 days (i.e., the longest incubation period) after the last exposure to rubella. Receipt of post-exposure vaccine does not modify these exclusion recommendations.

HCWs who develop a rubella-like illness following exposure should be tested (including by culture/ RT-PCR) to confirm the diagnosis, and not return to work until no longer infectious (i.e., 7 days after rash appeared).

7.5.2 School, child care, or post-secondary educational settings

At the discretion of the MHO, susceptible contacts may be excluded from 7 days after the first exposure until 21 days after the last exposure. In an outbreak, exclusion should be continued until 3 weeks after the onset of rash in the last reported case.

7.6 Contact education

Advise susceptible contacts:

- about the signs and symptoms of rubella, how it is transmitted, and to isolate themselves at home immediately if any symptoms of rubella develop and for 7 days after the onset of rash;
- to observe for signs and symptoms of rubella beginning 14 to 17 days after the first contact with a case;
- to avoid other rubella susceptible people, pregnant women and immunocompromised persons 14 to 17 days after exposure to a case;
- to rapidly report any symptoms compatible with rubella to their doctor/health care provider. Advise them to call ahead before going to any health care facility, including laboratories, to inform the staff of rubella symptoms so that they can be isolated on arrival to avoid exposing any susceptible persons;
- to inform their local public health unit should they develop symptoms of rubella .

8.0 REPORTING

Fax the completed "Measles, Mumps and Rubella Enhanced Surveillance Case Report Form" to the Immunization Programs and Vaccine Preventable Diseases Service, BCCDC within 24 hours following receipt of the report: (fax 604 707-2515). In addition, complete the individual case report in iPHIS/ Panorama or PARIS within 7 days following identification of a suspect, clinical, or confirmed case of measles.

Update iPHIS or Panorama /PARIS if more or new information becomes available. Update the case status item if the case changes from confirmed, clinical or suspect status.

The BCCDC will notify other Canadian jurisdictions about the occurrence of measles via the Canadian Network for Public Health Intelligence (CNPHI).

BC participates in the Canadian Measles & Rubella Surveillance System (CMRSS) which includes real time reporting of epidemiologic and laboratory parameters to the Public Health Agency of Canada including National Microbiology Laboratory.

9.0 OUTBREAK MANAGEMENT

Consider a single case of rubella as a potential outbreak.

The main strategies in a rubella outbreak are to:

- Define at-risk (susceptible) populations
- Ensure susceptible individuals are rapidly immunized or excluded from exposure if a contraindication to immunization exists
- Maintain active surveillance and establish surveillance for CRS.

9.1 Intensify Surveillance

When a case of rubella occurs, a process of case finding to identify the source of infection and all subsequent cases should be undertaken. Institute surveillance measures to identify cases prospectively and retrospectively. Consult BCCDC the Immunization Programs and Vaccine Preventable Diseases Service about assistance with an outbreak investigation or other control strategies.

Investigate cases and identify contacts for all confirmed and probable cases of rubella. Assess whether contacts are immune or susceptible to rubella.

During an outbreak, from each generation of cases, test a small number of clinical cases to confirm that illness is due to rubella.

9.2 Immunization

Identify and vaccinate all susceptible individuals in the identified population that do not have any contraindications to rubella vaccine. Immunize all non-pregnant, rubella-susceptible women with rubella-containing vaccine at opportune encounters.

Notify the Immunization Programs and Vaccine Preventable Diseases Service at BCCDC of the outbreak and provide an estimate of the number of excess doses of vaccine required if expanded immunization services are being planned.

9.3 Communication

In order to protect pregnant women, ensure the medical community and the public are aware of a rubella outbreak.

Notify local health care providers about the outbreak, diagnostic testing requirements, reporting to public health and immunization recommendations including routine MMR vaccination for susceptible postpartum women.

Consider notifying other settings of the outbreak (e.g., child care centers).

Encourage pregnant women to discuss their rubella susceptibility status with their physician or primary health care provider.

Provide information for pregnant, rubella-susceptible women regarding the risk of CRS.

9.4 Analyze the Outbreak

Review the effectiveness of the local control measures and revise local protocols as necessary.

Following an outbreak, an epidemiological analysis of events provides a useful local reference.

10.0 CLINICAL DESCRIPTION

Rubella is a relatively mild viral illness characterized by a generalized erythematous maculopapular rash, lymphadenopathy, and low fever. The rash usually begins on the face and becomes generalized in 24 hours. It lasts about 3 days and is occasionally pruritic. The rash and other non-specific symptoms may be indistinguishable from infections caused by measles, parvovirus, adenoviruses, or enteroviruses. Up to 50% of infections are subclinical.

In children, the rash is often the first symptom of illness. Adults often experience a 1 to 5 day prodrome of low-grade fever, headache, malaise, mild coryza, and conjunctivitis. Postauricular, occipital, and posterior cervical lymphadenopathy may begin 5 – 10 days before the rash and last several weeks. Arthralgia or arthritis may occur in up to 70% of adult women with rubella but are rare in children and males. Joint symptoms usually occur about the same time as the rash and may last for up to one month.

Rare complications of rubella include encephalitis (1:5000 cases), thrombocytopenia (1:3000 cases), orchitis, neuritis, and a late syndrome of progressive panencephalitis.

Rubella in pregnancy is well recognized to produce anomalies in the developing fetus. The occurrence of congenital defects is up to 85% if infection associated with

maternal rash occurs during the first 12 weeks of gestation, 54% during the first 13 to 16 weeks of gestation, and 25% during the end of the second trimester.

Defects occur rarely when infection occurs after the 20th week of gestation. The overall risk of defects during the third trimester is probably no greater than that associated with uncomplicated pregnancies.
Congenital anomalies associated with Congenital Rubella Syndrome (CRS) include:

- Ophthalmologic – cataracts, retinopathy, microphthalmos, glaucoma
- Cardiac - patent ductus arteriosus, peripheral pulmonary artery stenosis, atrial or ventricular septal defects
- Auditory - sensorineural hearing impairment (deafness is often the only manifestation of CRS, especially when infection occurs after the 4th month of gestation)
- Neurologic – behavioural disorders, microcephaly, meningo-encephalitis, mental retardation.

Neonatal manifestations of CRS include:

- Growth retardation
- Interstitial pneumonitis
- Radiolucent bone disease
- Hepatosplenomegaly
- Thrombocytopenia
- Dermal erythropoiesis (“blueberry muffin” lesions).

Moderate and severe CRS is usually recognizable at birth; mild CRS with only slight cardiac involvement or hearing impairment may not be detected for months or even years after birth. Insulin-dependent diabetes mellitus is recognized as a frequent late manifestation of CRS. In addition, progressive encephalopathy resembling subacute sclerosing panencephalitis has been observed in some older children. Children with CRS have higher than expected rates of autism.

Prompt identification of suspected, probable, or confirmed cases of rubella is important to avoid transmission to susceptible pregnant women. Because many rashes are similar to rubella and up to 50% of rubella infections may be subclinical, the only way to confirm a rubella diagnosis is laboratory testing.

11.0 EPIDEMIOLOGY

Rubella is no longer endemic in BC and occurs rarely and in association with importation. A single outbreak was reported in the past decade.

No cases of rubella were reported in BC in 2013 or 2012, and one case was reported in 2011. The case was a female in her late 30s whose infection was

compatible with acquisition during travel to the Philippines. The woman was not pregnant at the time of infection and her vaccination status was unknown.

In 2010 the largest outbreak reported in BC in the past decade occurred, with nine cases associated with a workplace located in the Lower Mainland area. The index case was a male in his 40s with an unknown immunization history whose infection was compatible with acquisition during travel to the Philippines. Cases ranged in age from 39 to 60 years and 5 were female. Two cases were unimmunized and seven had unknown immunization status. None were hospitalized. No recognized infections occurred among pregnant women.

In BC there were 15 cases of rubella reported between 1998 and 2005. There were no cases in 2006 or 2007. One case of rubella occurred in a BC resident in 2008 and in 2009. The 2008 case resided on a college/ university campus, was a female student from SE Asia in her mid-20s, with no known rubella exposures, including no known travel during her incubation period. She had classic rubella symptoms, including a maculopapular rash, and was confirmed by serological testing to have rubella specific IgM and experienced seroconversion.

The 2009 case was an unimmunized 10 year old male with contact during his exposure period with a suspect rubella case who had in turn likely acquired his infection in Europe.

There have been no reported cases of congenital rubella syndrome in BC since a single case was reported in each of 2002 and 2004.

In Canada, the average number of rubella cases decreased significantly after the introduction of the MMR program for all infants in April 1983. The average number of rubella cases reported each year between 1971 and 1982 was 5,300. Between 1998 and 2004, the average number of cases reported annually dropped to less than 30.

In the years following the introduction of routine infant immunization, epidemics of rubella continued to occur every 3 to 10 years with incidence peaking both in the spring and winter months.

In 2005, an outbreak of rubella occurred in an unimmunized southwestern Ontario community which was opposed to immunization on religious grounds. Over 300 cases occurred in the community, primarily in unimmunized children <19 years of age (median age 11 years; range 0.3-34 years). Ten cases involved pregnant women but no cases of CRS were reported. As a result of immunization rates in excess of 95% in the general population, the outbreak did not spread to the surrounding community.

The outbreak in Ontario along with a handful of isolated cases demonstrate that limited rubella virus transmission will continue due to importation, secondary spread, and gaps in immunization coverage (e.g., unimmunized men or populations declining to participate in immunization programs).

Rubella occurs worldwide and is endemic in countries where rubella vaccine has not been introduced. It is estimated that at least 100,000 cases of CRS occur each year in developing countries. Nevertheless the number of imported cases into our setting remains low.

11.1 Rubella Immunization in BC

In 1970, rubella vaccine was recommended for infants and children 12 months to 11 years of age. In 1974, rubella vaccine was provided free of charge to all young women. MMR vaccine began to be used in the publicly funded immunization program in 1981 for children aged 12 months, preschoolers, and susceptible school children. In 1985, an MMR campaign was conducted over a 1 to 2 year period for school children in grades K to 12, with immunizations given by public health nurses in the schools. In 1986, the rubella immunization program for grade 5 girls was discontinued. In 1996, BC conducted a measles elimination campaign targeting children aged 19 months of age through to those attending post-secondary (college/ university) educational institutions. This campaign utilized measles-rubella (MR) vaccine, and did not deliver a second dose of mumps vaccine. In the same year, a policy of second dose of MMR vaccine at 18 months of age was recommended for measles elimination in addition to the first dose given at 12 months of age.

In 1996, BCCDC immunization guidelines also recommended a second dose of measles vaccine given as MMR vaccine to health care workers born after 1956 and to students of colleges and universities; this became publicly funded in 2006 and 2007, respectively.

The following tables summarize the number of doses of MMR vaccine recommended for BC residents based on its constituent components:

Health care workers

Year of birth	Measles	Mumps❷	Rubella❶	MMR vaccine
Prior to 1957	0 doses	0 doses	1 dose	1 dose
1957 – 1969	2 doses	1 dose		2 doses
1970+		2 doses		2 doses

All others

Year of birth	Measles	Mumps❷	Rubella	MMR vaccine
Prior to 1957	0 doses	0 doses	0 doses	0 dose
1957 – 1969			1 dose	1 dose
1970+	2 doses	1 or 2 doses		2 doses

❶One dose of MMR for rubella protection is recommended for all health care workers regardless of age, and for adults born after 1956 who do not have documentation of receiving 1 dose of rubella containing vaccine on / after their first birthday or laboratory evidence of immunity or laboratory confirmed rubella.
❷One dose of mumps vaccine is recommended for any susceptible adult born in 1970 and later. The following should receive two doses: children as per routine schedule; students of post-secondary educational settings and travelers to outside of North America. Health care workers should receive 1 dose if born between January 1, 1957- December 31, 1969; 2 doses if born on or after 1970.

12.0 CONGENITAL RUBELLA SYNDROME

Congenital Rubella Syndrome (CRS)	Definition	Reportable
Confirmed Case (Live Birth)	Two clinically compatible manifestations (any combination from Table 1, Columns A and B) with laboratory confirmation of infection: • isolation of rubella virus from an appropriate clinical specimen OR • detection of rubella virus RNA OR • Detection of rubella specific IgM antibody in the serum in the absence of recent immunization with rubella-containing vaccine OR • rubella IgG persisting for longer than would be expected (approximately 6 months following birth) from passive transfer of maternal antibody, or in the absence of recent immunization	Yes
Confirmed Case (Stillbirth)	Two clinically compatible manifestations with detection of rubella virus from an appropriate post mortem specimen.	Yes
Probable Case	In the absence of appropriate laboratory tests, a case that has at least • any two clinically compatible manifestations listed in Table 1, Column A OR • one manifestation listed in Table 1, column A, plus one listed in Table 1, Column B	No

Table 1 – Congenital Rubella Syndrome: Clinically Compatible Manifestations

Column A	Column B
Cataract or congenital glaucoma (either one or both count as one)	Purpura
Congenital heart defect	Hepatosplenomegaly
Sensorineural hearing loss	Microcephaly
Pigmentary retinopathy	Micro-ophthalmia
	Mental retardation
	Meningoencephalitis
	Radiolucent bone disease
	Developmental or late onset conditions, such as diabetes and progressive panencephalitis and any other conditions possibly caused by the rubella virus

13.0 CONGENITAL RUBELLA INFECTION

Congenital Rubella Infection (CRI)	Definition	Reportable
Confirmed Case	Laboratory confirmation of infection but with no clinically compatible manifestations: • isolation of rubella virus from an appropriate clinical specimen OR • detection of rubella virus RNA OR • Detection of rubella specific IgM antibody in the serum in the absence of recent immunization with rubella-containing vaccine OR • rubella IgG persisting for longer than would be expected (approximately 6 months following birth) from passive transfer of maternal antibody, or in the absence of recent immunization.	Yes

14.0 CONGENITAL RUBELLA SYNDROME AND CONGENITAL RUBELLA INFECTION

14.1 Case Management

When Congenital Rubella Syndrome (CRS) or Congenital Rubella Infection (CRI) is suspected, a laboratory diagnosis of rubella is essential. Congenital infection can be confirmed in infants by detection of the virus by isolation or RT-PCR, in neonatal urine or nasopharyngeal secretions, detection of IgM antibody to rubella virus in blood, and in an older infant, the persistence of IgG antibody to rubella virus beyond the age of 6 months.

14.2 Laboratory Diagnosis of Congenital Rubella Infection and Congenital Rubella Syndrome

Laboratory testing for CRI and CRS is performed at BCCDC Public Health Microbiology & Reference Laboratory. For BCCDC Serology Screening Requisition, refer to PHSA Laboratories.

Testing done on the baby includes virus isolation and identification from nasopharyngeal swab, throat swab, CSF, blood, or urine. Virus serology, including rubella specific IgM is done on the infant blood specimen.

Virus serology testing must also be performed on the mother.

The following test results can be used to rule out CRS:

- rubella antibody absent in the infant
- rubella antibody absent in the mother
- rubella antibody levels declining in the infant consistent with the normal decline after birth of passively transferred maternal antibody.

Transplacental IgG is expected to disappear at 6-12 months.

14.3 Contact Management

Consider children with CRS or CRI to be infectious for one year unless two consecutive nasopharyngeal and urine culture results are negative for rubella virus.

Ensure only individuals who are immune to rubella care for the infant.

Educate caregivers regarding the potential danger for susceptible pregnant contacts.

14.4 Reporting

Report all confirmed cases of Congenital Rubella Syndrome and Congenital Rubella Infection to the Immunization Programs and Vaccine Preventable Disease Service, BCCDC (fax: 604-707-2515).

Complete Congenital Rubella Syndrome / Congenital Rubella Infection Case Report Form .

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