

# Pertussis

## Revision Dates

Case Definition	August 2011
Reporting Requirements	May 2018
Remainder of the Guideline (i.e., Etiology to References sections inclusive)	December 2005
<i>Updated Annex 1 (Page 10) – erythromycin estolate no longer available in Canada</i>	<i>January 2018</i>

## Case Definition

### Confirmed Case

Laboratory confirmation of infection:

- Isolation of *Bordetella pertussis* from an appropriate clinical specimen (e.g., nasopharyngeal swab)<sup>(A)</sup>

#### OR

- Detection of *B. pertussis* nucleic acid (e.g., PCR) from an appropriate clinical specimen **AND** one or more of the following:
  - cough lasting 2 weeks or longer
  - paroxysmal cough of any duration
  - cough with inspiratory “whoop”
  - cough ending in vomiting or gagging, or associated with apnea

#### OR

- A person who is epidemiologically linked to a laboratory-confirmed case with one or more of the following for which there is no other known cause:
  - paroxysmal cough of any duration
  - cough ending in vomiting, or associated with apnea
  - cough with inspiratory “whoop”.

### Probable Case (Outbreaks Only)

Cough lasting 2 weeks or longer in the absence of appropriate laboratory tests and not epidemiologically linked to a laboratory-confirmed case **AND** one or more of the following, with no other known cause:

- paroxysmal cough of any duration
- cough with inspiratory “whoop”
- cough ending in vomiting or gagging, or associated with apnea.

*\*The following suspect case definition is provided as a guideline to assist with case finding and public health management, and should not be reported to Alberta Health.*

### Suspect Case\*

One or more of the following, with no other known cause:

- paroxysmal cough of any duration
- cough with inspiratory “whoop”
- cough ending in vomiting or gagging, or associated with apnea.

<sup>(A)</sup> Refer to the [Provincial Laboratory for Public Health \(ProvLab\) Guide to Services](#) for current specimen collection and submission information.

## Reporting Requirements

### 1. Physicians, Health Practitioners and others

Physicians, health practitioners and others shall notify the Medical Officer of Health (MOH) (or designate) of the zone, of all confirmed cases in the prescribed form by mail, fax or electronic transfer within 48 hours (two business days).

### 2. Laboratories

All laboratories shall report all positive laboratory results by mail, fax or electronic transfer within 48 hours (two business days) to the:

- Chief Medical Officer of Health (CMOH) (or designate), and
- MOH (or designate) of the zone.

### 3. Alberta Health Services and First Nations Inuit Health Branch

- The MOH (or designate) of the zone where the case currently resides shall forward the initial Notifiable Disease Report (NDR) of all confirmed cases to the CMOH (or designate) within two weeks of notification and the final NDR (amendment) within four weeks of notification.
  - In an outbreak situation, the MOH (or designate) of the zone where the case currently resides shall forward the NDR of all confirmed and probable cases to the CMOH (or designate) in the above prescribed form.
- For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by phone, fax or electronic transfer within 48 hours (two business days):
  - name,
  - date of birth,
  - out-of-province health care number,
  - out-of-province address and phone number,
  - positive laboratory report, and
  - other relevant clinical / epidemiological information.
- For out-of-province and out-of-country susceptible contacts, the following information should be forwarded to the CMOH (or designate) as soon as possible:
  - name,
  - date of birth, and
  - out-of-province / country contact information.

## Etiology

Pertussis is an acute bacterial infection of the respiratory tract caused by *Bordetella pertussis*. *B. pertussis* is a small, gram-negative rod.

## Clinical Presentation (1)

The course of illness is typically divided into three stages. The first stage (catarrhal stage), is characterized by the insidious onset of coryza, sneezing, low-grade fever, and a mild occasional cough. The cough gradually becomes more severe. After 1-2 weeks the second (paroxysmal) stage begins. This is when the diagnosis is most often suspected. The cough increases in severity with repetitive coughing spells followed by an inspiratory whoop or posttussive vomiting or both. In the final (convalescent) stage, symptoms gradually wane over weeks to months.

Older children and adults can have atypical manifestations of pertussis with prolonged cough with or without paroxysms and no whoop. Pertussis is an often unrecognized cause of chronic cough or respiratory illness in this population. These infected individuals are able to transmit the disease to others who may be susceptible including unimmunized and incompletely immunized infants. The most serious pertussis disease occurs in young infants, who may experience complications such as pneumonia, seizures (febrile and afebrile) and encephalitis, and who are at the greatest risk of dying from these complications. The most common complication (and cause of death) is bacterial pneumonia. Neurological complications such as seizures and encephalitis may occur as a result of hypoxia from coughing or possibly the toxin. Other complications include otitis media, anorexia, apnea, pulmonary hypertension, and dehydration.

## Diagnosis (2, 3, 4)

Diagnosis is made through PCR testing of the organism from nasopharyngeal specimens (nasopharyngeal swab) obtained during the catarrhal and early paroxysmal stages of illness. Bronchoscopy specimens are also acceptable. The organisms do not have to be viable. The organism can be recovered from the case during the first 3-4 weeks of illness. It is particularly difficult to isolate in individuals who have been previously immunized. Collection kits are provided by the PLPH. PCR assay results will be available within 48 hours of receipt of the specimen at the PLPH.

## Epidemiology

### Reservoir (5)

Humans are the only known reservoir for *B. pertussis*. Adolescents and adults are considered to play a major role in the transmission of pertussis to infants and children.

### Transmission

Transmission occurs by direct contact with discharges from respiratory secretions of infected individuals by the airborne route, probably via droplets. Indirect spread through the air or contaminated objects occurs rarely, if at all.

### Incubation Period

The incubation period is commonly seven to 10 days with a range of 6-21 days.

### Period of Communicability

Pertussis is highly communicable. Individuals are most infectious during the early catarrhal stage and in the first two weeks after onset of paroxysmal cough. Communicability gradually decreases thereafter and becomes negligible in about three weeks. The length of communicability may be affected by age, immunization status or previous episode of pertussis, and appropriate

antimicrobial therapy. Infected individuals are no longer contagious after five days of appropriate antimicrobial therapy.

### Host Susceptibility

Recent evidence suggests that immunity from *B. pertussis* infection may not be permanent. It is highly communicable with a secondary attack rate of 80-90% among susceptible household contacts.

Epidemiological data indicates that a cohort of teenagers immunized between 1980 and 1992 is currently at a greater risk of pertussis because the whole-cell vaccine provided limited protection and immunity has waned. In Canada, it is estimated that between 10 and 25% of adolescents and adults are susceptible to pertussis. This group plays a role in the transmission of disease to infants and children.

### Occurrence

#### General (1,4,6)

Pertussis occurs worldwide. There is no distinct seasonal pattern although there is evidence to suggest an increase in the summer and early fall. Outbreaks occur every two to five years.

The first mention of pertussis was in a medical journal in 1540 and the first epidemic was reported in 1577. Widespread epidemics followed in the 17th and 18th centuries (1).

Before the introduction of routine vaccination in the 1940s, there were more than 27,000 cases of severe illness involving cough and more than 12,000 children died from pertussis in the US. The death toll in the US has been drastically reduced but in poor nations that are unable to sustain effective vaccination programs, more than 350,000 individuals die annually.

In most developed countries there has been a resurgence of pertussis activity since the early 1990s despite high vaccine coverage. This has been attributed to incomplete vaccination, waning immunity from old vaccines or increased awareness and detection of pertussis in adolescents and adults. Children less than 10 years of age are the most affected group but the number and proportion of cases involving an older population have increased over the last decade.

Rates of disease have been on the increase in the US and other parts of the world in the last decade. The number of deaths, mainly in infants, has also risen.

#### Canada (7)

One to three deaths occur each year in Canada, predominantly in unimmunized and partially immunized infants. The number of affected adolescents and adults has steadily increased and the morbidity in these cases is significant.

The incidence of pertussis in Canada has decreased by over 90% since the introduction of whole-cell pertussis vaccine in 1943; however, pertussis continues to be the most common of all diseases preventable by routine childhood immunization. Pertussis is endemic with epidemics occurring every 3-5 years. In the 1980s, approximately 1,000 to 3,000 cases were reported each year. The 1990s had a resurgence of cases with 2,700 to 10,000 cases being reported annually. The greatest incidence has been among infants less than one year of age, and the second highest rate is among 10-14 year olds. The cohort of teenagers immunized between 1980 and 1992 are currently at the greatest risk. They were immunized with whole-cell adsorbed vaccines which provided limited protection and immunity has waned with time.

Three Canadian studies have estimated the secondary attack rates (SAR) in household contacts. It has been estimated that the SAR for children aged 12-17 years is 12–14%; for adults aged 18-29 years the SAR is 11–18%; and for individuals 30 years of age and older, the SAR is between 8 and 33%.

Acellular pertussis vaccine was introduced in Canada in 1997–1998 for the primary series (two, four and six months) and booster doses at 18 months and 4-6 years replacing the previous whole-cell adsorbed vaccine.

### **Alberta (8)**

The last major province-wide outbreak occurred in 1990 with 5,133 cases reported (rate 199.1/100,000). This was a significant increase over previous years. The last reported death from pertussis was in 1998. It occurred in a previously healthy newborn whose mother developed pertussis (undiagnosed) prior to delivery. Whole cell pertussis vaccine was introduced in Alberta in 1939 and acellular pertussis vaccine was introduced in 1997 (9).

From 2000 to 2004, the rate of pertussis ranged from 9.4-18.8/100,000. The highest rate (18.8) was reported in 2004 when 684 cases were reported. Several regions experienced outbreaks at that time. This was more than double the number of cases reported in 2003 (340 cases). In 2004, the age range of reported cases was from 17 days old to 67 years of age. The highest incidence was in infants less than one year of age (149.4/100,000). Almost two-thirds (39/60) of these infants were not immunized with 28 of the 39 being less than two months of age. School aged children 10-14 years had the second highest rate of infection (89.4/100,000). Pertussis is also a frequent cause of cough illness in adolescents and adults and is likely under-diagnoses and under-diagnosed. Approximately one quarter of reported cases in 2004 were adults 20 years of age and older.

## **Key Investigation**

### **Single Case/Household Cluster (10)**

- Determine immunization history.
- Identify the possible source of infection.
- Identify contacts (3). Contacts include:
  - vulnerable persons\* who:
    - live in the same household as the case,
    - have had face to face exposure and/or have shared confined air with the confirmed case for more than one hour, or
    - have other significant exposure decided upon on a case by case basis (e.g., being coughed upon by a confirmed case),
  - individuals who are residing in households or working in or attending daycare centres and family day homes in which a vulnerable person\* also lives or attends on a regular basis.

### **\*Vulnerable persons include:**

- infants less than one year of age regardless of immunization status (due to the increased rate of mortality from pertussis in this age group) and
- pregnant woman in the third trimester (because of the risk of disease transmission from infected mother to neonate).

### Management of a Case (9,10)

- Supportive care.
- In high risk situations (i.e., setting in which there are vulnerable persons\*), the case should be excluded until five days after the start of antibiotic therapy.
  - If there is no treatment or treatment is incomplete, the case should be excluded:
    - for three weeks (21 days) from onset of the paroxysmal cough or
    - until the end of the cough, whichever comes first **and**
    - negative results from culture or PCR have been received.
- Exclusion of cases should be at the discretion of the MOH.

### Treatment of a Case (10)

- Alberta Health will provide publicly funded medications for the treatment of confirmed cases of pertussis.
- Antibiotics should be administered as soon as possible after the onset of illness.
- Treatment eradicates *B. pertussis* from the nasopharynx but has no effect on the clinical symptoms or course of pertussis unless given in the early (incubation period, catarrhal or early paroxysmal) stages of infection.
- There is no limit to the start date for treatment of confirmed cases of pertussis.
- Recommended medications are outlined in the table that follows (See Annex 1).

### Management of Contacts (10)

- Contacts and parents of contacts should be instructed about disease transmission as well as signs and symptoms of pertussis so that early diagnosis and treatment can be initiated when needed.
- Alberta Health will provide publicly funded medications for the post exposure prophylaxis of eligible contacts.
- Post exposure prophylaxis is provided to prevent the development of disease (if given early in the incubation period) and to limit secondary transmission to vulnerable individuals.
- Chemoprophylaxis should be offered to all eligible contacts regardless of immunization status as soon as possible and within 21 days of onset of cough in the case.
- If the case is the vulnerable person\* in the household, chemoprophylaxis is not required for contacts.
- An appropriate dose of acellular pertussis-containing vaccine should be offered to pediatric or adolescent eligible contacts as per the current immunization schedule.
- The management of pregnant contacts must be individualized and should be discussed with the MOH (or designate) or the contact's physician.
- Infants born to mothers who have had confirmed pertussis in the 2-3 weeks prior to delivery have an extremely high risk of disease.
  - Treatment for the mother and chemoprophylaxis for the newborn should be reviewed by the MOH (or designate).
- Recommended medications are outlined in the table that follows (See Annex 1).
- There should be notification of other contacts of confirmed cases in the following settings:
  - other households that have had contact with the confirmed case,
  - non-family daycare centres,
  - schools,
  - healthcare settings, and
  - work places.

**Preventive Measures**

- Educate the public about the risks of pertussis infection.
- Educate the public about respiratory etiquette i.e., coughing into tissues, hand washing following coughing, etc.
- Immunization is the mainstay for the control of pertussis.
- Primary immunization and booster doses with an acellular pertussis-containing vaccine should be provided as per the current Alberta Immunization Manual. Acellular pertussis-containing vaccines have an efficacy rate estimated to be 85% (6).

Superseded

## References

- (1) Public Health Agency of Canada. *National consensus conference on pertussis*. Toronto 2002.
- (2) Tilley P. *PCR testing changes*. Provincial Laboratory for Public Health. May 2004.
- (3) Tilley P. *PCR testing changes*. Provincial Laboratory for Public Health. June 2004.
- (4) Hewlett E and Edwards K. *Pertussis – Not just for kids*. N Engl J Med 2005;352-12.
- (5) Weir E. *Resurgence of Bordetella pertussis infection*. JAMC 2002;167(10).
- (6) Tam T and Bentsi-Enchill A. *The return of the 100-day cough: resurgences of pertussis in the 1990s*. CMAJ 1998;159(6).
- (7) Public Health Agency of Canada. *Prevention of pertussis in adolescents and adults*. Ottawa: CDR 2003;29-ACS-5.
- (8) Alberta Health and Wellness. *A summary of pertussis in Alberta: 2004*. Disease Control and Prevention. January 2005.
- (9) Alberta Health and Wellness. *Alberta Immunization Manual*. Disease Control and Prevention. January 2001.
- (10) Alberta Health and Wellness. *Alberta pertussis treatment and post exposure prophylaxis guidelines, November 2005*. Disease Control and Prevention. November 2005.



ANNEX 1: Recommended Antibiotics for Pertussis PEP <sup>(9)</sup>

Refer to the current Pertussis PEP Guidelines for prescribing information		
Antibiotic	Dosage	Comments
Azithromycin	<p><u>Children:</u> Day 1: 10 mg/kg/day once daily po to a maximum of 500 mg/day. Day 2–5: 5mg/kg/day one daily po to a maximum of 250 mg/day. Total: 5 days</p> <p><u>Adults:</u> Day 1: 500 mg once daily po Day 2: 250 mg once daily po Total: 5 days</p>	First line
Clarithromycin	<p><u>Children:</u> 15 mg/kg/day divided into 2 doses po x 7 days to a maximum of 1000 mg/day</p> <p><u>Adults:</u> 250–500 mg bid po x 7 days</p>	Second Line  Not recommended in pregnancy
Erythromycin	<p><u>Children:</u> not currently available</p> <p><u>Base (Adults):</u> 250–500 mg po QID x 7 days to a maximum of 2000 mg/day</p>	Third Line
Trimethoprim-Sulfamethoxazole (TMP-SMX)	<p><u>Children:</u> 8 mg/kg/day (TMP) and 40 mg/kg/day (SMX) divided into 2 doses po x 10 days to a maximum of:</p> <ul style="list-style-type: none"> <li>• 4–6mg/kg (TMP) and 20–30 mg/kg (SMX) q12h for children over 2 months of age and up to 40 kg;</li> <li>• 160 mg (TMP) and 800 mg (SMX) q12h for children over 2 months of age and 40 kg and over</li> </ul> <p><u>Adults:</u> 320 mg/day (TMP) and 1600 mg/day (SMX) divided into 2 doses x 10 days</p>	Alternate – used only if above drugs are contraindicated.  Cannot be used for children under the age of 2 months, in pregnancy or during lactation.