

Pertussis

(Also known as Whooping Cough)

IMMEDIATELY REPORTABLE DISEASE

Per NJAC 8:57, health care providers and administrators shall immediately report **by telephone** confirmed and suspected cases of pertussis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. The health officer (or designee) **must immediately institute the control measures listed below in section 6, “Controlling Further Spread,”** regardless of weekend, holiday, or evening schedules. A directory of local health departments in New Jersey is available at <http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml>.

If the health officer is unavailable, the health care provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.



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1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Pertussis is caused by *Bordetella pertussis*, a fastidious, gram-negative, pleomorphic bacillus.

B. Clinical Description and Laboratory Diagnosis

Pertussis begins with mild upper respiratory tract symptoms (catarrhal stage, lasting about one to two weeks) and can progress to severe paroxysms of cough (paroxysmal stage, lasting about two to three weeks), often with a characteristic respiratory whoop, followed by vomiting. Fever is absent or minimal. Symptoms wane gradually (convalescent stage). The clinical presentation of pertussis is variable and its diagnosis challenging. Disease in infants younger than six months of age may be atypical; apnea is a common manifestation and whoop often is absent. Older children and adults also can have atypical manifestations, with persistent cough and no whoop, or they may present with more classical symptoms. Physicians should include pertussis in their differential diagnosis for patients in all age groups who present with a prolonged cough illness. The duration of classic pertussis is six to ten weeks; however, more than half of the primary cases last less than six weeks, and a quarter of the patients have cough for three or more weeks. Pertussis is most severe when it occurs during the first year of life (particularly for preterm infants). Complications include seizures, pneumonia, encephalopathy, and death. The differential diagnosis for pertussis includes parapertussis, mycoplasma, chlamydia, respiratory syncytial virus, and adenovirus. Please refer to section 3 below for guidance on diagnostic tests. The standard laboratory tests utilized to determine diagnosis or case confirmation consist of the culture isolation of *B. pertussis* from a clinical specimen or a positive polymerase chain reaction (PCR) for *B. pertussis*.

C. Reservoir

Humans are the only host.

D. Modes of Transmission

Pertussis is transmitted person-to-person by direct or droplet contact with nasopharyngeal secretions of an infected person.

E. Incubation Period

The incubation period is usually seven to ten days, with a range of 4 to 21 days.

F. Period of Communicability or Infectious Period

If not on antibiotics: from two weeks before to three weeks after cough onset

If on antibiotics: from two weeks before cough onset through the fifth day of treatment

Maximum contagiousness occurs in the catarrhal stage before the diagnosis of pertussis is usually suspected.

G. Epidemiology

Pertussis occurs worldwide. It is endemic, with peaks occurring every two to five years. Pertussis exhibits no distinct seasonality in the United States as a whole. Asymptomatic infection (carriage) has been demonstrated and may play a role in transmission. Pertussis is highly infectious, with secondary attack rates of 70% to 100% among unimmunized household contacts.

Widespread immunization with pertussis vaccine since the 1940s is primarily responsible for the current relatively low morbidity and mortality from pertussis in the United States. However, incidence has been increasing since the early 1980s, most strikingly in adolescents and adults, who may serve as a source of infection for infants and underimmunized preschool children. This increasing incidence among older persons may be due to waning immunity in vaccinated individuals. Most cases in New Jersey continue to be among those incompletely immunized infants and toddlers or school children with religious or medical exemptions to pertussis vaccination.

Protection after DTP (diphtheria, tetanus, and pertussis)/DTaP (diphtheria, tetanus, and acellular pertussis) vaccination wanes and is absent 12 years after the last dose, which is usually given at kindergarten entry. Adolescents 11-18 years of age (preferably at age 11-12 years) and adults 19 through 64 years of age should receive a single dose of Tdap. For adults 65 and older who have close contact with an infant and have not previously received Tdap, one dose should be received. Tdap should also be given to 7-10 year olds who are not fully immunized against pertussis. Tdap can be given no matter when Td was last received.

H. Bioterrorist Potential

Pertussis is not considered to be a potential bioterrorist threat.

2 CASE DEFINITION

A. New Jersey Department of Health and Senior Services Case Definitions

Case Definition for Pertussis (as defined by the Centers for Disease Control [CDC], 1997)

1. Clinical Case Definition

A cough illness lasting two or more weeks with one of the following: paroxysms of coughing, inspiratory “whoop,” or posttussive vomiting, without other apparent cause (as reported by a healthcare professional).

2. Laboratory Criteria for Diagnosis

Laboratory diagnosis of pertussis is established by:

- Isolation of *B. pertussis* from a clinical specimen, OR
- Positive polymerase chain reaction (PCR) assay for *B. pertussis* DNA

3. Case Classification

PROBABLE

A case that meets the clinical case definition, is not laboratory-confirmed, and is not epidemiologically linked to a laboratory-confirmed case.

CONFIRMED

A case of acute cough illness of any duration with a positive culture for *B. pertussis*, OR

A case that meets clinical case definition and is confirmed by PCR, OR

A case that meets clinical case definition and is epidemiologically linked directly to a case confirmed by either culture or PCR

4. Outbreak Setting

A cough illness lasting two or more weeks (with or without additional symptoms) without other apparent cause, in an individual who is epidemiologically linked to a confirmed case.

In institutional settings, five or more clustered cases whose cough onset dates are separated by less than 42 days (two incubation periods), at least one of which is laboratory-confirmed

In household settings, one or more cases

3 LABORATORY TESTING SERVICES AVAILABLE

NOTE: Prior to drawing or sending any specimens to the Public Health and Environmental Laboratories (PHEL) for diagnostic/confirmation testing, call the New Jersey Department of Health and Social Services (NJDHSS) Vaccine Preventable Disease Program at 609.826.4860 for consultation and guidance. When submitting any specimens for testing, a Request for Bacterial or Viral Culture or Parasite Identification form, BACT-109 (Exhibit I), MUST be completed. This form is available at <http://www.state.nj.us/health/forms/bact-109.pdf>

Determining who has pertussis and who does not is often difficult. The diagnosis of pertussis is based on a characteristic clinical history along with a variety of laboratory tests, including: culture, polymerase chain reaction (PCR), direct fluorescent antibody (DFA), and serology. The latter two tests lack standardization, and they are generally not accepted as confirmatory tests; however, they can contribute to the overall clinical and laboratory assessment to help classify a given suspect case.

Culture is considered the “gold standard” laboratory test for pertussis and because of increased sensitivity and faster reporting, PCR was also added to the case definition as a confirmatory test in 1997. CDC recommends that PCR be used alongside culture, rather than as an alternative test. Collection methods for PCR are similar to those for culture, and often the same sample may be used for both tests. Whenever possible, a nasopharyngeal swab or aspirate should be obtained from all persons with suspected pertussis.

A. Culture

Isolation of *B. pertussis* by bacterial culture is the standard pertussis diagnostic laboratory test. A positive culture for *B. pertussis* confirms the diagnosis of pertussis. All persons with suspected cases of pertussis should have a nasopharyngeal (NP) aspirate or swab obtained from the posterior nasopharynx for culture. For *B. pertussis*, nasopharyngeal aspirates will yield similar or higher rates of recovery than nasopharyngeal swabs; throat and anterior nasal swabs yield unacceptably low rates of recovery. Therefore, specimens should be obtained from the posterior nasopharynx, not the throat. Specimens should be obtained using Dacron® or rayon swabs and should be plated directly onto selective culture medium or placed in transport medium. Regan-Lowe agar or freshly prepared Bordet-Gengou medium is generally used for culture; half-strength Regan-Lowe can be used as the transport medium.

Demonstration video of NP swab technique is available on the broadcast updates and resources webpage: <http://www.cdc.gov/vaccines/ed/surv07/surv07-resources.htm>.

B. Polymerase chain reaction for *B. pertussis* DNA

PCR testing of nasopharyngeal swabs or aspirates can be a rapid and sensitive method of diagnosing pertussis. Since its inclusion in the case definition in 1997, the proportion of cases confirmed by PCR has increased, and many laboratories now use only PCR to confirm pertussis. As of February 2007, there are no standardized PCR assays for pertussis; assay procedures, as well as sensitivity and specificity can vary greatly between laboratories. CDC recommends that PCR be used alongside culture, rather than as an alternative test. Direct comparison with culture is necessary for validation of PCR tests performed in different laboratories. Even when a laboratory has validated its PCR method, culturing for *B. pertussis* should continue; this is especially important when an outbreak is suspected, because isolation of the bacterium confirms pertussis (see above). State laboratories should retain the capability to culture pertussis.

Collection methods for PCR are similar to those for culture, and often the same sample can be used for both tests. **However, calcium alginate swabs cannot be used to collect nasopharyngeal specimens for PCR.**

C. Serologic testing

Serologic testing could be useful for adults and adolescents who present late in the course of illness, when both culture and PCR are likely to be negative. However, there is no FDA-approved diagnostic test. The currently available serologic tests measure antibodies that could result from either infection or vaccination, so a positive serologic response simply means that the person has been exposed to pertussis by either recent or remote infection or by recent or remote vaccination. Since vaccination can induce both IgM and IgA antibodies (in addition to IgG antibodies), use of such serologic assays cannot differentiate infection from vaccine response. At this time, serologic test results should not be relied upon for case confirmation of pertussis infection.

4 DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify sources and sites of transmission, and any additional cases
- To identify exposed persons, ensure timely administration of antimicrobial prophylaxis, and prevent further spread of the disease
- To monitor the effectiveness of outbreak control strategies
- To provide data to allow the effectiveness of new vaccine formulations and sequences
- To monitor the possible emergence of antimicrobial resistance and identify any other important changes in circulating *B. pertussis* organisms

B. Laboratory Reporting Requirements

New Jersey Administrative Code (NJAC 8:57-1) stipulates that confirmed and suspect cases of pertussis must be **immediately reported** by telephone to the local health department where the patient resides. If the laboratory director or his/her designee is unable to reach the local health department where the patient resides, call NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends). Telephone reports shall be followed by a report via confidential fax, over the Internet using the Communicable Disease Reporting and Surveillance System (CDRSS), or in writing to the health officer of the jurisdiction in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located. Please refer to the list of reportable diseases (http://www.state.nj.us/health/cd/documents/reportable_diseases.pdf) for information.

C. Healthcare Provider Reporting Requirements

NJAC 8:57-1 stipulates that a suspect or confirmed case of pertussis must be **immediately reported** by telephone to the health officer of the jurisdiction in which the patient lives, or if unknown, wherein the diagnosis was made. If the health officer is unavailable, the report shall be made to NJDHSS VPDP at 609.826.4860 (weekdays) or 609.392.2020 (nights/weekends).

D. Local Health Departments Reporting and Follow-Up Responsibilities

1. Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1) stipulates that each local health officer must report the occurrence of any case of pertussis, as defined by the reporting criteria in section 2A above. Current requirements are that cases be reported to the NJDHSS Immunization Program. Refer to the Health Officers Reporting Timeline (<http://www.state.nj.us/health/cd/reporting.shtml>) for information on prioritization and timeliness requirements of reporting and case investigation.

2. Case Investigation

- a. It is the health officer's responsibility to investigate the case by interviewing the patient and others who may be able to provide pertinent information.
- b. The local health officer shall document any suspected or confirmed pertussis case investigation on the NJDHSS Immunization Program's Pertussis Investigation Record (IMM-24), available at <http://web.doh.state.nj.us/apps2/forms/subforms.aspx?pro=cd#IMM-24>
- c. The investigation should provide information about (a) symptoms including cough duration; (b) pertussis immunization history, especially for those under 11 years of age; (c) laboratory findings; (d) contact identification and follow-up; and (e) recent contact with anyone with similar symptoms.

Communicable Disease Service Manual

- d. Upon completion of the investigation and its documentation on the IMM-24, the Pertussis Investigation Record is to be mailed to New Jersey Department of Health and Senior Services, Immunization Program, PO Box 369, Trenton, NJ 08625-0369.
- e. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the health officers to understand and, if necessary, institute the control guidelines listed directly below, but only after consultation with the NJDHSS Immunization Program.

E. Entry into CDRSS

The mandatory fields in CDRSS include disease, last name, county, municipality, gender, race, ethnicity, case status, and report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of *B. pertussis* cases. The “Tab” column includes the tabs that appear along the top of the CDRSS screen. The “Required Information” column provides detailed explanations of what data should be entered.

CDRSS Screen	Required Information
Patient Info	Enter the disease name (“PERTUSSIS”), patient demographic information, illness onset date, and the date the case was reported to the LHD. There are no subgroups for <i>B. pertussis</i> .
Addresses	Enter any alternate address (e.g., a daycare or school address). Use the Comments section in this screen to record any pertinent information about the alternate address (e.g., the times per week the case-patient attends day care or school). Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction.
Clinical Status	Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient’s care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection control professionals covering these facilities. Enter any treatment that the patient received (e.g., antibiotics) in the Treatment selection section. If immunization status is known, it should also be entered under the Immunizations section.

CDRSS Screen	Required Information
Signs/Symptoms	Check appropriate boxes for signs and symptoms and indicate their onset date. Make every effort to get complete information by interviewing the physician, family members, or others who might have knowledge of the patient’s illness. Also, information regarding the resolution of signs and symptoms should be entered.
Risk Factors	Enter complete information about risk factors to facilitate study of <i>B. pertussis</i> disease in New Jersey. If patient has not received immunizations because of a medical or religious exemption, please check risk factor in Risk factor(s) section and type of exemption in the “Attribute” box. Please document travel history of patient or any visitors to patient (e.g., domestic/international within past 21 days) in the Comments section.
Laboratory Eval	Indicate appropriate test, specimen collection date, test result, and, if applicable, test values. Isolation of pertussis microorganism by culture is the gold standard (“MICROORGANISM IDENTIFIED”) for diagnosis. PCR (“BORDETELLA PERTUSSIS DNA”) and serology should be used in addition to and not as a replacement for culture. NOTE: If laboratory results indicate that the test was performed using a kit not approved by the U.S. Food and Drug Administration, this should be documented in the Comments section.
Contact Tracing	Information regarding contacts is required for this disease including information on any household or other close contacts. If known, document any vaccine or travel history for contacts in Comments section. Identify susceptible high-risk contacts (e.g., pregnant women, immunocompromised or unvaccinated persons, infants under 12 months of age).
Case Comments	Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the Comments section. NOTE: Select pieces of information entered in the Comments section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports.

CDRSS Screen	Required Information
<p>Epidemiology</p>	<p>Indicate method of import in the Epidemiology section. Under the Other Control Measures section, indicate if the patient falls into any of the categories listed under Patient Role(s)/Function(s) (e.g., “DAYCARE ATTENDEE,” “DAYCARE PROVIDER,” “HEALTHCARE WORKERS,” “OTHER”). Record name and contact information for case investigators from other agencies (e.g., CDC, out-of-state health departments). Document communication between investigators in the Comments section.</p>
<p>Case Classification Report Status</p>	<p>Case status options are “REPORT UNDER INVESTIGATION (RUI),” “CONFIRMED,” “PROBABLE,” “POSSIBLE,” and “NOT A CASE.”</p> <p>All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of “REPORT UNDER INVESTIGATION (RUI).”</p> <p>Cases still under investigation by the LHD should be assigned a case status of “REPORT UNDER INVESTIGATION (RUI).”</p> <p>Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. “CONFIRMED,” “PROBABLE,” and “NOT A CASE” are the only appropriate options for classifying a case of pertussis. NOTE: “CONFIRMED” may be selected only if the case is clinically compatible and laboratory confirmed (culture positive or PCR positive and meets clinical case definition) or epidemiologically linked to a laboratory-confirmed case.</p> <p>Report status options are “PENDING,” “LHD OPEN,” “LHD REVIEW,” “LHD CLOSED,” “DELETE,” “REOPENED,” “DHSS OPEN,” “DHSS REVIEW,” and “DHSS APPROVED.”</p> <p>Cases reported by laboratories (including LabCorp electronic submissions) should be assigned a report status of “PENDING.”</p> <p>Once the LHD begins investigating a case, the report status should be changed to “LHD OPEN.”</p> <p>The “LHD REVIEW” option can be used if the LHD has a person who reviews the case before it is closed (e.g., health officer or director of nursing).</p> <p>Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to “LHD CLOSED.”</p> <p>“LHD CLOSED” cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the report status will be</p>

CDRSS Screen	Required Information
	<p>changed to “REOPENED” and the LHD will be notified by e-mail. Cases that are “DHSS APPROVED” cannot be edited by LHD staff.</p> <p>If a case is inappropriately entered (e.g., a case of influenza was erroneously entered as a case of pertussis) the case should be assigned a report status of “DELETE.” A report status of “DELETE” should NOT be used if a reported case of pertussis simply does not meet case definition. Rather, it should be assigned the appropriate case status, as described above.</p>

5 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (NJAC 8:57-1)

The current recommendations of CDC and NJDHSS (as of 2000) are as follows:

Minimum Period of Isolation of Patient

Until 21 days from onset of cough, or five days after initiation of appropriate antibiotic therapy.

Minimum Period of Quarantine of Contacts

If the contact is symptomatic, then use same restrictions as for cases. If the contact is an asymptomatic healthcare worker not receiving antibiotic prophylaxis, then exclude from the workplace for 21 days after last exposure or, if unknown, for 21 days after the onset of the last case in the setting. If the contact is asymptomatic, but not a healthcare worker, and exposed within the last 21 days, he/she should receive antibiotic prophylaxis but no exclusion is generally required.

NOTE: In certain situations or settings deemed to be high-risk, NJDHSS may recommend or require exclusion of asymptomatic contacts not receiving antibiotic prophylaxis and/or other contacts, and/or may extend the exclusion period beyond 21 days up to a maximum of 42 days.

Please refer to section 5B.5 on immunization of children under seven years of age.

B. Protection of Contacts of a Case

1. **Identify individuals or groups with close contact** with the case. In healthcare settings control guidelines are more stringent—please refer to section 5C, subsection on healthcare settings. As a general rule, “close contact” can be defined as

a. **Sharing indoor airspace** for at least ten hours per week.

- household contacts (including family day-care contacts)
- sharing same classroom
- extracurricular activities
- bus or carpool contacts
- work site, church, social contacts

Less exposure may be significant for high-risk contacts, such as

- infants
- underimmunized young children (see section 5B.5)
- immunocompromised individuals
- hospital room contacts (see specific instructions for healthcare settings, section 5C)
- pregnant women
- individuals with chronic respiratory disease (including asthma)

b. **Direct face-to-face contact** *regardless of the number of hours per week spent together.*

- close friends
- boyfriend/girlfriend
- sport teammates
- lunch partners
- medical staff and their patients (see instructions for healthcare settings, section 5C)
- babysitters and the children they care for

c. **Direct contact with respiratory/oral/nasal secretions of the case.**

- sharing food, eating/drinking utensils
- sharing lip gloss, lipstick, cigarettes, or similar items
- kissing
- medical/dental examination or procedure (suction, intubation, bronchoscopy, etc.) (see specific instructions for healthcare settings, section 5C)

2. **Refer all high-risk contacts** (as defined above), whether they have symptoms or not, for medical evaluation and complete the contact section of the Pertussis Investigation Report Form.

3. **Identify symptomatic contacts** to perform necessary follow-up of those with close contact identified in step 1 above. Questions to ask include

- Do you have cold symptoms (runny nose, sneezing); when did they start?
- Do you have a cough; when did it start?
- Describe your cough. (Ask open-ended question first; proceed to the following only if the interviewee does not give details.)

- Do you feel as if you are choking and cannot breathe?
 - Do you cough at night or is coughing worse at night?
 - Do you have coughing spells where you feel as if you cannot stop coughing?
 - Do you vomit after coughing?
 - Are there other people in your house (class, team, extracurricular group, worksite, close friends, etc.) with a cough?
 - How long have they been coughing?
 - What is their cough like?
 - Where do they work?
4. **Implement treatment/prophylaxis** of individuals with close contact to the case, as defined above, with the following provisos:
- a. If symptomatic people are already beyond their infectious period, which ends 21 days after cough onset, treatment is not of use. They should be referred for medical evaluation.
 - b. For asymptomatic people, if their last exposure occurred more than 21 days (one incubation period) ago, prophylaxis is not needed. However, for certain high-risk settings or individuals, NJDHSS may recommend extending the period for initiating prophylaxis to up to 42 days after last exposure.
 - c. For asymptomatic people whose only relevant exposure was to an epidemiologically linked case (not laboratory-confirmed), prophylaxis recommendations depend on the setting:
 - In the outbreak setting (with five or more cases, at least one of which is laboratory-confirmed), prophylaxis may be considered.
 - Outside of the outbreak setting (including in the household of the epidemiologically linked case), prophylaxis is not *routinely* recommended; such contacts may wish to consult their providers. However, in certain high-risk settings (e.g., some medical settings, residential schools for ill or handicapped children), NJDHSS may recommend prophylaxis of contacts.
 - d. **Precaution when treating or prophylaxing newborns:** An association between orally administered erythromycin and infantile hypertrophic pyloric stenosis (IHPS) has been reported in infants under six weeks of age. Since confirmation of erythromycin as a contributor to cases of IHPS will require additional investigation, and since alternative therapies are not as well studied, erythromycin is still recommended for the prophylaxis and treatment of disease caused by *B pertussis*. The following is recommended when administration of erythromycin to young infants is being considered:
 - Groups/individuals exposed to pertussis should be determined with precision in order to minimize unnecessary prophylaxis in infants.
 - Physicians who prescribe erythromycin to newborn infants should inform parents about the potential risks of developing IHPS and signs of IHPS, such as projectile vomiting or excessive irritability.
 - Cases of pyloric stenosis following use of oral erythromycin should be reported to MedWatch at 800.FDA.1088 (tel.) or 800.FDA.0178 (fax) and to the NJDHSS Immunization Program at 609.826.4860.

The earlier antibiotics are started, the more effective they are in preventing disease transmission from the case to the contact, as well as from the contact to others. Those with

Communicable Disease Service Manual

close contact with a confirmed case must take the antibiotics for the total prescribed number of days; *if they do not, they must repeat the entire antibiotic course from the beginning.*

The recommendations for treatment of cases and prophylaxis of contacts to cases are identical. The symptoms of pertussis may be modified if treatment is begun early, during the catarrhal stage. If begun later in the course of illness, treatment will decrease the infectious period but may not decrease the duration of cough or severity of disease.

See treatment/prophylaxis schedule below.

DRUG	CATEGORY	CHILD	ADULT
Erythromycin¹	Drug of choice	40–50 mg/kg/day PO divided into 4 doses/day for 14 days (maximum: 2 gm/day)	250–500 mg PO 4 times/day for 14 days
Trimethoprim (TMP)/ Sulfamethoxazole (SMX)²	Alternative choice	8 mg TMP/40 mg SMX/kg/day PO divided into 2 doses/day for 14 days (maximum: 320 mg TMP/1600 mg SMX per day)	160 mg TMP/ 800 mg SMX PO 2 times/day for 14 days
Clarithromycin³	For those unable to tolerate erythromycin	15–20 mg/kg/day PO divided into 2 doses/day for 7 days (maximum: 1 gm/day)	500 mg PO 2 times/day for 7 days
Azithromycin³	For those unable to tolerate erythromycin	10–12 mg/kg/day PO given as 1 dose/day for 5 days (maximum: 600 mg)	500 mg PO given as 1 dose/day for 5 days

PO = by mouth.

¹Some authorities prefer the estolate preparation for children but recommend avoiding its use in adults.

²Not recommended for use in children under two months of age or pregnant women.

³The optimal duration of therapy has not been defined for these new macrolides. Studies suggest that the usual five-day (azithromycin) to seven-day (clarithromycin) courses currently used may be effective, but this has not yet been definitively proven. These new macrolides are not recommended for use in children under six months of age or pregnant women.

The American Academy of Pediatrics states that the macrolides clarithromycin and azithromycin can be alternatives for patients who cannot tolerate erythromycin. In addition, doxycycline is sometimes used if a patient is unable to tolerate the usual antibiotics, and some studies have shown it to be effective. However, doxycycline should be avoided in pregnant women and in children under eight years old. For control purposes, it is reasonable to admit to school/work children/adults under treatment or being prophylaxed with azithromycin, clarithromycin, or doxycycline, in addition to those treated with erythromycin or trimethoprim/sulfamethoxazole.

- 5. Assess the immunization status of close contacts under age seven.** Contacts who are less than seven years of age and are unimmunized or have received fewer than five doses of DTP or DTaP should, in addition to receiving antibiotic prophylaxis, have pertussis

immunization initiated or continued according to the following guidelines, as soon as possible after exposure:

- a. Give first dose at six or more weeks of age; doses 1, 2, and 3 must be separated by at least four weeks.
 - b. Children who have received their third dose of DTP/DTaP six or more months before exposure should receive a fourth dose at this time.
 - c. Children who have received four doses of DTP/DTaP should get a booster of DTP/DTaP, unless a dose has been given within the past three years.
6. **Exclude** cases, suspect cases, and susceptible contacts from school and work as follows:
- a. **Cases:**
 - If it is 21 or fewer days since cough onset: exclude through the first five days of the full course of appropriate antibiotics or, if not treated, for three weeks after cough onset.
 - If it is more than 21 days since cough onset: they are no longer infectious, and no antibiotic treatment/exclusion is required.

NOTE: Documentation of a previous positive culture isolate of *B. pertussis* is considered proof of adequate immunity and additional doses of a pertussis-containing vaccine are not necessary.

- b. **Symptomatic contacts:** Refer them to their healthcare provider. Exclusion recommendations are the same as for a case (see immediately above), *regardless* of history of immunization, disease, symptoms, or laboratory test result.
 - c. **Asymptomatic contacts:** No exclusion is generally recommended except in healthcare settings, as described in section 5C, Healthcare Settings, instruction 6. If an asymptomatic contact becomes symptomatic, he/she should be treated as a case and excluded for the first five days of the full course of appropriate antibiotics. In certain situations deemed to be high-risk, NJDHSS may recommend exclusion of asymptomatic contacts not receiving antibiotic prophylaxis and/or may extend the exclusion period beyond 21 days up to a maximum of 42 days.
7. In institutional settings, **conduct systematic surveillance for cough illness** with active case finding and referral for medical evaluation, diagnostic testing, and antibiotic prophylaxis. In healthcare settings, surveillance should be initiated immediately after identification of a suspect case. Surveillance should continue through two incubation periods (42 days) after the date of cough onset in the last case. Please refer to section 5C, School Setting Recommendations, instruction 8 directly below for specific recommendations for implementing active surveillance in institutions.

C. Managing Special Situations: Schools, Day Cares, Healthcare Settings

School Setting Recommendations

Before planning or initiating any outbreak control measures, consult the NJDHSS Immunization Program at 609.826.4860.

1. Initiate surveillance by considering the exposed groups addressed in Section 5B.1.a–c.

Communicable Disease Service Manual

2. If the case is on any sports teams or in other extracurricular school groups, screen the other members for coughing. (These groups are an important mode of spread in middle and high schools.) Use questions listed in section 5B.3 to characterize cough.
3. Notify teachers who have a case in their classes to refer other coughing children to the nurse's office for evaluation. Use questions listed in section 5B.3 to characterize cough.
4. Notify other staff to refer any students who have been coughing for more than a week to the nurse's office. Use questions listed in section 5B.3 to characterize cough.
5. Determine whether there are any teachers (including student teachers) or staff who have been coughing. Use questions listed in section 5B.3 to characterize cough.
6. Refer symptomatic students, teachers, or other staff for medical evaluation and diagnostic testing (but testing is less important where a recognized outbreak is under way). High-risk individuals should also be referred to their providers, whether or not they have symptoms.
7. Keep track of **symptomatic individuals** in a line listing of cases in tabular form, which should include location (in schools, grade, and home room), cough duration, and what other symptoms are present (i.e., whether the person meets the clinical case definition). On a separate list, keep track of the **groups exposed** (classrooms, teams, etc.), recording the total number of members, how many have had cough for 7 to 13 days, how many have had cough for 14 or more days, and how many have had 14 or more days of cough plus another pertussis symptom (i.e., how many meet the clinical case definition). This will help in deciding whether whole groups need to be prophylaxed. (See Attachment B.)
8. Send letters of notification to parents and staff. A different set of letters and alerts should go to each of the following:
 - a. Individual with symptoms (suspect case): letter to the suspect case or, if a child, to the parents/guardians; letter for healthcare provider of suspect case; a *Pertussis Fact Sheet*
 - b. Asymptomatic individual with close contact as defined above (contact): letter to the contact or, if a child, to the parents/guardians; letter for healthcare provider of contact; *Pertussis Fact Sheet* and/or an *Alert Notice*
 - c. Enrollee in an outbreak setting who has neither symptoms nor close contact with a confirmed case: a *Fact Sheet* and/or an *Alert Notice*
 - d. Staff in an outbreak setting who has neither symptoms nor close contact with a confirmed case: a *Fact Sheet* and/or an *Alert Notice* and infection control letter for staff.

It is helpful and more expedient to telephone the contacts, at their homes, especially the symptomatic ones, as well as sending the alert letters home.

9. Recommend the treatment or prophylaxis of *symptomatic and asymptomatic* contacts who have had close contact with a confirmed case, as defined in section 5B.1.a–c, with the following exceptions:

- a. If symptomatic people are already beyond their infectious period, which ends 21 days after cough onset, treatment is not of use. They should be referred for medical evaluation.
- b. For asymptomatic people, if their last exposure occurred more than 21 days (one incubation period) ago, prophylaxis is not needed. However, for certain high-risk settings or individuals, NJDHSS may recommend extending the period for initiating prophylaxis to up to 42 days after last exposure.
- c. For asymptomatic people whose only relevant exposure was to an epidemiologically linked case (not laboratory-confirmed), prophylaxis recommendations depend on the setting:
 - In the outbreak setting (with five or more cases, at least one of which is laboratory-confirmed), prophylaxis may be considered.
 - Outside of the outbreak setting (including in the household of the epidemiologically linked case), prophylaxis is not *routinely* recommended; such contacts may wish to consult their providers. However, in certain high-risk settings (e.g., some medical settings, residential schools for ill or handicapped children), NJDHSS may recommend prophylaxis of contacts.

Those with close contact to a confirmed case should take the antibiotics for the prescribed number of days; *if they do not, they must repeat the entire antibiotic course from the beginning.*

Consult with the NJDHSS Immunization Program on decisions about how widely to prophylax in any institution since it will depend on the number of cases, the time sequence of cases, whether at least one is laboratory-confirmed, the setting, and other factors:

- d. **One laboratory-confirmed case:** Identify those with close contact as instructed in section 5B.1.a–c. Remember to consider any high-risk contacts, those individuals sharing indoor airspace for ten or more hours per week, those with direct face-to-face contact, and those with direct contact with respiratory/oral/nasal secretions of the case.

For classrooms, teams, and other groups in which there is one laboratory-confirmed case, after consultation with NJDHSS, it may be deemed appropriate to prophylax the whole group, unless 21 or more days have passed since cough onset in the last symptomatic person or the case was not present during his/her infectious period. The extent to which this recommendation is applied will vary according to the extent of exposure, the presence/absence of other coughing students, whether any other cases of pertussis have been reported in the area, and whether high-risk individuals or unvaccinated young children are present.

- e. **More than one confirmed case:** Identify those with close contact as instructed in Section 5B.1.a–c. For classrooms, teams, and other groups in which there is more than one confirmed case, at least one of which is laboratory-confirmed, and after consultation with the NJDHSS, it may be deemed *appropriate to prophylax the entire group*, unless 21 or more days have passed since cough onset in the last symptomatic person or the cases were not present during their infectious periods. Again, the extent to which this recommendation is applied will vary according to the extent of

Communicable Disease Service Manual

exposure, the presence/absence of other coughing students, whether there is any other reported pertussis in the area, and whether high-risk individuals or unvaccinated young children are present.

Please consult Attachment C for a diagrammatic version of these recommendations.

10. Exclude cases and those with close contact, according to the guidelines in section 5B.6.
11. Continue institutional and among contacts cough surveillance for *two incubation periods (42 days)* after the date of cough onset in the last case.

Daycare Center Setting Recommendations

Before planning or initiating outbreak control measures, consult the NJDHSS Immunization Program.

1. Initiate surveillance by considering the exposed groups addressed in section 5B.1.a–c.
2. Because of the age, immunization status, and other risk factors of many day-care attendees, make a special effort to identify exposed individuals and groups who are at higher risk of developing complications from pertussis, including
 - infants
 - underimmunized toddlers and preschoolers
 - pregnant teachers, staff, and volunteers
 - immunocompromised individuals
 - individuals with chronic respiratory disease (including asthma)These individuals should be referred to their providers, regardless of whether or not they have symptoms.
3. Review the immunization records of all enrollees. As stated above in section 5B.5, close contacts who are under seven years old and have received fewer than five doses of DTP or DTaP should, in addition to receiving antibiotic prophylaxis, have pertussis immunization initiated or continued according to the following guidelines, as soon as possible after exposure:
 - a. First dose should be given at six weeks of age or older; doses 1, 2, and 3 must be separated by at least four weeks.
 - b. Children who received their third dose of DTP/DTaP six or more months before exposure should receive a fourth dose at this time.
 - c. Children who have received four doses of DTP/DTaP should get a booster of DTP/DTaP, unless a dose has been given within the past three years.
4. Follow section 4C, School Setting Recommendations, instructions 4–11, taking note of the following:

Precaution when treating or prophylaxing newborns: An association between orally administered erythromycin and IHPS has been reported in infants under six weeks of age. Since confirmation of erythromycin as a contributor to cases of IHPS will require additional investigation, and since alternative therapies are not as well studied, erythromycin is still recommended for the prophylaxis and treatment of disease caused by *B. pertussis*. The NJDHSS Immunization Program recommends the following when administration of erythromycin to young infants is being considered:

- a. Groups/individuals exposed to pertussis should be determined with precision in order to minimize unnecessary prophylaxis in infants.
- b. Physicians who prescribe erythromycin to newborn infants should inform parents about the potential risks of developing IHPS and signs of IHPS, such as projectile vomiting or excessive irritability.
- c. Cases of pyloric stenosis following use of oral erythromycin should be reported to MedWatch at 800.FDA.1088 (tel.) or 800.FDA.0178 (fax) and to the NJDHSS Immunization Program at 609.826.4860.

Healthcare Settings

Due to the potential for transmission to individuals at high risk of complications from pertussis, exposure criteria and control measures in healthcare settings are more rigorous than in other settings. **Before planning or initiating any outbreak control measures, consult the NJDHSS Immunization Program.**

1. Apply the control measures below to all patients, families, and staff in close contact with confirmed cases. In healthcare settings, “close contact” includes the following:
 - a. having face-to-face contact, within three feet of the case, without wearing a surgical mask; *this includes conducting a medical examination, obtaining a nasopharyngeal culture, suctioning, intubating, or performing bronchoscopy or a similar procedure without wearing a mask;*
 - b. conducting any procedure that induces coughing of the case, even if farther from the case than three feet, without wearing a surgical mask;
 - c. coming into mucosal contact with respiratory, oral, or nasal secretions of the case directly or via fomites;
 - d. sharing a room with the case; degree of contact and risk of infection in such situations should be evaluated on a case-by-case basis;
 - e. having any other close contact to a case as defined in section 5B.1.a–c.
2. Treat the case-patient according to the schedule in section 5B.4. Treatment is unnecessary if more than 21 days have elapsed since cough onset. Put the case-patient in a private room, if available.
3. Give antibiotic prophylaxis to contacts of any confirmed case-patient, as indicated:
 - a. Contacts exposed within 21 days of their identification as contacts should receive antibiotic prophylaxis according to the schedule in section 5B.4 unless a specific medical contraindication exists. They and their providers should be notified of their contact with a confirmed case of pertussis.
 - b. Asymptomatic contacts whose last exposure was more than 21 days before their identification as contacts, as well as their providers, should be informed of their exposure and given information on the symptoms of the disease. For certain high-risk settings or individuals, NJDHSS *may* recommend extending the period for initiating prophylaxis beyond 21 days up to a maximum of 42 days after last exposure.
 - c. Please consult section 5B.4 for a fuller discussion of prophylaxis of contacts of epidemiologically linked cases.
 - d. **Precautions when treating or prophylaxing newborns:** An association between orally administered erythromycin and IHPS has been reported in infants under six weeks of age. Since confirmation of erythromycin as a contributor to cases of IHPS will require additional investigation, and since alternative therapies are not as well studied, erythromycin is still recommended for the prophylaxis and treatment of

disease caused by *B pertussis*. NJDHSS recommends the following when administration of erythromycin to young infants is being considered:

- Groups/individuals exposed to pertussis should be determined with precision in order to minimize unnecessary prophylaxis in infants.
 - Physicians who prescribe erythromycin to newborn infants should inform parents about the potential risks of developing IHPS and signs of IHPS, such as projectile vomiting or excessive irritability.
 - Cases of pyloric stenosis following use of oral erythromycin should be reported to MedWatch at 800.FDA.1088 (tel.) or 800.FDA.0178 (fax) and to the NJDHSS Immunization Program at 609.826.4860.
4. In addition to notifying providers, inform department heads, infection control, employee health, and other relevant personnel/departments of confirmed and suspect cases.
 5. Perform laboratory tests for symptomatic contacts, in addition to giving prophylaxis.
 6. Recommendations to exclude close contacts as follows:
 - a. **Staff, symptomatic:**
 - If it is 21 or fewer days since cough onset: Exclude through the first five days of the full course of appropriate antibiotics or, if not treated, for three weeks after cough onset.
 - If it is more than 21 days since cough onset: They are no longer infectious, and no antibiotic treatment/exclusion is required.
 - b. **Staff, asymptomatic:**
 - If they are not on antibiotic prophylaxis, exclude for 21 days after their last exposure or, if unknown, for 21 days after the onset of the last case in the setting. (If their last exposure occurred more than 21 days ago, prophylaxis/exclusion is generally not required.) However, in certain situations deemed to be high-risk, facilities may wish to exclude all asymptomatic healthcare workers, including those on antibiotics. In addition, NJDHSS may extend the exclusion period beyond 21 days up to a maximum of 42 days.
 - c. **Outpatients, symptomatic:** Restrict from public activities for the first five days of the full course of antibiotic therapy.
 - d. **Outpatients, asymptomatic:** No need to restrict their public activities.
 7. Infection control staff should isolate all confirmed and suspect inpatient cases. They should be placed on droplet precautions until five days of the full course of antibiotic therapy have been completed.
 8. Institutional employee health and infection control staff should provide surveillance for cough illness through two incubation periods (42 days) after the date of cough onset in the last case.
 9. Prescribe antibiotic prophylaxis for all household contacts of diagnosed cases because there is great potential for silent transmission in families. Symptomatic contacts should be evaluated, placed on antibiotic therapy, and excluded from activities for the first five days of therapy. Asymptomatic contacts need to receive antibiotic prophylaxis but do not need to restrict their public activities. However, if that asymptomatic contact is a healthcare worker not receiving antibiotic prophylaxis, that person should be evaluated and excluded if indicated, as described in section 5C.6. b. directly above.
 10. Assess the immunization status of close contacts under age seven years. See section 5B.5 on starting or continuing DTP/DTaP immunization.

11. Continue cough surveillance for *two incubation periods (42 days)* after the date of cough onset in the last case.

D. Preventive Measures

Routine childhood vaccination and postexposure antimicrobial prophylaxis are the best preventive measure against pertussis. Good personal hygiene (which consists of proper hand-washing, disposal of used tissues, not sharing eating utensils, etc.) is also important. Please refer to the most current versions of the ACIP [spell out]statement on pertussis (listed under References, below).

Additional Information

Additional information on pertussis can be obtained at the NJDHSS Web site at <http://www.state.nj.us/health/>. Click on “Health Topics A-Z” and scroll down to “Pertussis.”

References

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- Centers for Disease Control and Prevention. *Guidelines for the Control of Pertussis Outbreaks*. Atlanta, GA CDC; 2000.
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- Honein MA, Paulozzi LJ, Himelright IM, et al. Infantile hypertrophic pyloric stenosis after pertussis prophylaxis with erythromycin: a case review and cohort study. *Lancet*. 1999;354:2101–2105.

Attachment A: Pertussis Investigation Record (IMM-24)

Attachment B: Pertussis Contact and Surveillance Log Sheets

Attachment C: Outbreak Control Prophylaxis Algorithms

Exhibit I: Request for Bacterial or Viral Culture or Parasite Identification, BACT-109

Attachment A

Available at <http://web.doh.state.nj.us/apps2/forms/subforms.aspx?pro=cd#IMM-24>

Attachment B

PERTUSSIS CONTACT WORKSHEET (1/99)

Case Name: _____

NO.	NAME OF CONTACT (PHONE)	TYPE	AGE	SEX	RELATIONSHIP TO CASE	SYMPTOMS	TESTING STATUS / CONFIRMED CASE?	TREATMENT	<11 YRS DT(a)P Hx
		<input type="checkbox"/> HOUSEHOLD <input type="checkbox"/> OTHER (SPECIFY)		<input type="checkbox"/> M <input type="checkbox"/> F		COLD SYMPTOMS Y <input type="checkbox"/> N <input type="checkbox"/> COUGH Y <input type="checkbox"/> N <input type="checkbox"/> COUGH ONSET DATE ____/____/____ ≥ 2 WKS COUGH Y <input type="checkbox"/> N <input type="checkbox"/> PAROXYSM <input type="checkbox"/> WHOOP <input type="checkbox"/> VOMITING <input type="checkbox"/>		TYPE ----- START DATE ____/____/____	# DT(a)P'S _____ DATE OF LAST DT(a)P ____/____/____ BOOSTER RECOMMENDED <input type="checkbox"/>
		<input type="checkbox"/> HOUSEHOLD <input type="checkbox"/> OTHER (SPECIFY)		<input type="checkbox"/> M <input type="checkbox"/> F		COLD SYMPTOMS Y <input type="checkbox"/> N <input type="checkbox"/> COUGH Y <input type="checkbox"/> N <input type="checkbox"/> COUGH ONSET DATE ____/____/____ ≥ 2 WKS COUGH Y <input type="checkbox"/> N <input type="checkbox"/> PAROXYSM <input type="checkbox"/> WHOOP <input type="checkbox"/> VOMITING <input type="checkbox"/>		TYPE ----- START DATE ____/____/____	# DT(a)P'S _____ DATE OF LAST DT(a)P ____/____/____ BOOSTER RECOMMENDED <input type="checkbox"/>
		<input type="checkbox"/> HOUSEHOLD <input type="checkbox"/> OTHER (SPECIFY)		<input type="checkbox"/> M <input type="checkbox"/> F		COLD SYMPTOMS Y <input type="checkbox"/> N <input type="checkbox"/> COUGH Y <input type="checkbox"/> N <input type="checkbox"/> COUGH ONSET DATE ____/____/____ ≥ 2 WKS COUGH Y <input type="checkbox"/> N <input type="checkbox"/> PAROXYSM <input type="checkbox"/> WHOOP <input type="checkbox"/> VOMITING <input type="checkbox"/>		TYPE ----- START DATE ____/____/____	# DT(a)P'S _____ DATE OF LAST DT(a)P ____/____/____ BOOSTER RECOMMENDED <input type="checkbox"/>
		<input type="checkbox"/> HOUSEHOLD <input type="checkbox"/> OTHER (SPECIFY)		<input type="checkbox"/> M <input type="checkbox"/> F		COLD SYMPTOMS Y <input type="checkbox"/> N <input type="checkbox"/> COUGH Y <input type="checkbox"/> N <input type="checkbox"/> COUGH ONSET DATE ____/____/____ ≥ 2 WKS COUGH Y <input type="checkbox"/> N <input type="checkbox"/> PAROXYSM <input type="checkbox"/> WHOOP <input type="checkbox"/> VOMITING <input type="checkbox"/>		TYPE ----- START DATE ____/____/____	# DT(a)P'S _____ DATE OF LAST DT(a)P ____/____/____ BOOSTER RECOMMENDED <input type="checkbox"/>

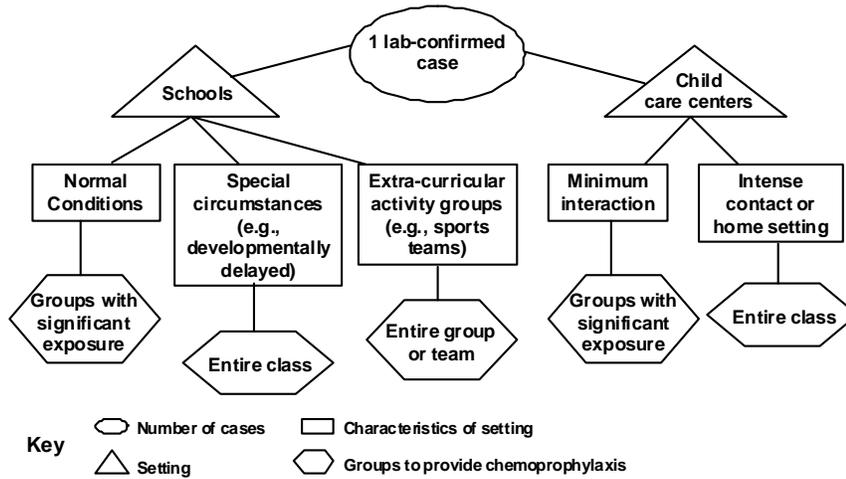
NO INFANT IN HOUSEHOLD

INFANT(S) IN HOUSEHOLD

COMMENTS _____

page ____ of ____

Antimicrobial prophylaxis algorithms for a single case of pertussis in a child care or school setting



Note: Every situation is different and should be evaluated separately. Consult NJDHSS before undertaking outbreak control activities. Please refer to the text for more detailed guidance.

New Jersey Department of Health and Senior Services

**New Jersey Department of Health and Senior Services
P. O Box 361
Trenton, NJ 08625-0361**

Lab ID No.

**REQUEST FOR BACTERIAL OR VIRAL CULTURE
OR PARASITE IDENTIFICATION**

Leave shaded items blank; shaded boxes are for official use only.

Patient Name (Last, First, MI)		Sex <input type="checkbox"/> Male <input type="checkbox"/> Female	DOB / /	Patient ID	
Patient Address		City	State	Zip Code	
Ethnicity <input type="checkbox"/> Hispanic/Latino <input type="checkbox"/> Non-Hispanic/Non-Latino		Race <input type="checkbox"/> White (European, No. African, Middle Eastern) <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> Asian <input type="checkbox"/> American Indian or Alaskan Native <input type="checkbox"/> Black or African American <input type="checkbox"/> Other			
Submitter (Agency, Hospital, Lab, etc.)		Submitter Case Number	CDRSS Case Number		
Submitter Address		City	State	Zip Code	
Contact Person		Telephone Number ()	Fax Number ()		
Physician Name		Telephone Number ()	Fax Number ()		
Physician Address		City	State	Zip Code	
Specimen Information: Source (Blood, Stool, etc.) _____ Collection Date: ___/___/___ Time: ___:___ <input type="checkbox"/> AM <input type="checkbox"/> PM				Date / Time Received at PHEL	
Suspected Organism:		Outbreak # (if applicable) E -	NJDHSS Test Code		
Test Requested: Serotyping/Serogrouping of: <input type="checkbox"/> Salmonella <input type="checkbox"/> Shigella <input type="checkbox"/> E. coli O157:H7 <input type="checkbox"/> H. influenzae <input type="checkbox"/> N. meningitidis <input type="checkbox"/> Other: _____					
Viral Testing: <input type="checkbox"/> Norovirus <input type="checkbox"/> Other Virus (specify): _____ *Note: Stool submitted for viral testing must be stored and transported at 2-8° C. Parasitology: <input type="checkbox"/> Ova and Parasite <input type="checkbox"/> Blood Smear					
Drug Information: Does this organism show unusual antibiotic resistance? <input type="checkbox"/> Yes <input type="checkbox"/> No Which antibiotic (attach susceptibility sheet)? _____					
Travel Information (REQUIRED IF SUBMITTING BLOOD SMEAR FOR PARASITE IDENTIFICATION): Is there a history of travel? <input type="checkbox"/> Yes <input type="checkbox"/> No Where (country): _____ Return Date: _____					

BACT-109
FEB 06