Tetanus (Lockjaw)

Disease Plan

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Last updated: September 20, 2018, by Bree Barbeau

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.
CRITICAL CLINICIAN INFORMATION

Clinical Evidence

<table>
<thead>
<tr>
<th>Signs/Symptoms</th>
<th></th>
</tr>
</thead>
</table>
| **Generalized** | Muscle stiffness, first affecting jaw and neck  
|                | Generalized, convulsive muscle spasms |
| **Localized**   | Persistent muscle contractions in area of injury |
| **Cephalic**    | Cranial nerve involvement |
| **Complications** | Breathing difficulty due to spasms of vocal chords or muscles of respiration  
|                 | Fractures of spine or long bones resulting from sustained contractions and convulsions  
|                 | Hypertension and/or abnormal heart rhythm resulting from hyperactivity of nervous system |

Period of Communicability

- Not transmitted person-to-person; no period of communicability

Incubation Period

- The incubation period ranges from 3 to 21 days, averaging about 10 days.
- In neonatal tetanus, symptoms usually appear from 4 to 14 days after birth, averaging about 7 days.

Mode of Transmission

- Primarily through contaminated wounds (surgical, burns, puncture wounds, crush wounds, animal bites, etc.)
- Not transmitted person-to-person

Laboratory Testing

Type of Lab Test/Timing of Specimen Collection

- No confirmatory lab tests; diagnosis is based on clinical syndrome
- Culture is associated with poor yield and is not recommended

Treatment Recommendations

Type of Treatment

- Wounds should be thoroughly cleaned; remove necrotic tissue and foreign material.
- Evaluate the patient’s immunization status. Persons with wounds that are neither clean nor minor, and who have had fewer than 3 doses of tetanus toxoid should receive tetanus toxoid (Td or Tdap) and tetanus immune globulin (TIG). (see under Treatment for details).
- Provide supportive therapy and maintenance of adequate airway if tetanic spasms are occurring.
- TIG is recommended for persons with symptoms of tetanus and those with <3 prior doses of tetanus toxoid. A single intramuscular (IM) dose of 3,000 to 6,000 is recommended for children 7 years or older and adults. TIG may be obtained at local area hospitals/pharmacies or ordered through the manufacturer ([http://www.grifolsusa.com/en/web/eeuu/bioscience/-/product/hypertet_s_d_tetanus_immune_globulin_human](http://www.grifolsusa.com/en/web/eeuu/bioscience/-/product/hypertet_s_d_tetanus_immune_globulin_human)).
- Intravenous immune globulin (IVIG) contains tetanus antitoxin and may be used if TIG is not available.

Prophylaxis

- Antibiotic prophylaxis against tetanus is neither practical nor useful in managing wounds

Case and Contact Management

Isolation/Quarantine of Case

- None

Case-Contact Management

- None
WHY IS TETANUS IMPORTANT TO PUBLIC HEALTH?

Tetanus is an acute, potentially fatal disease that is characterized by generalized increased rigidity and convulsive spasms of skeletal muscles. The muscle stiffness usually first involves the jaw (lockjaw) and neck, and later becomes more generalized. Tetanus is different from other vaccine-preventable diseases because it does not spread from person to person. The bacteria is usually found in soil, dust, and manure and enters the body through breaks in the skin - usually cuts or puncture wounds caused by contaminated objects. Today, tetanus is uncommon in the U.S., with an average of 29 reported cases per year from 1996 through 2009. Nearly all cases of tetanus are among people who have never received a tetanus vaccine, or adults who don’t stay up-to-date on their 10-year booster doses. Surveillance information is used to assess progress toward the disease elimination goals. The information is also used to raise awareness of the importance of immunization.

DISEASE AND EPIDEMIOLOGY

Clinical Description

Tetanus is an acute disease characterized by generalized rigidity and convulsive spasms of skeletal muscles. On the basis of clinical findings, three different forms of tetanus have been described.

- **Localized Tetanus**: Localized tetanus is an uncommon form of the disease in which patients have persistent muscle contractions in the same anatomical area as the injury. These contractions will usually occur for several weeks before subsiding. Sometimes localized tetanus will precede generalized tetanus.

- **Cephalic Tetanus**: Cephalic tetanus is a very rare form of the disease that involves the cranial nerves, especially in the facial area. Cephalic tetanus can result from a head injury or from the presence of *C. tetani* in the normal flora of the middle ear.

- **Generalized Tetanus**: Generalized tetanus accounts for roughly 80% of all reported tetanus cases. Onset is usually gradual, with muscle stiffness first affecting the jaw (trismus or lockjaw) and neck. Severe, generalized muscle spasms will follow and can continue for 3-4 weeks. Complete recovery can take several months. Neonatal tetanus is a form of generalized tetanus that is common in developing countries, but extremely rare in the U.S. Neonatal tetanus results from infection of the unhealed umbilical stump.

Complications associated with tetanus infection include: breathing difficulties due to spasms of the vocal cords or muscles of respiration, fractures of the spine or long bones resulting from sustained contractions and convulsions, and hypertension and/or abnormal heart rhythm.
resulting from hyperactivity of the autonomic nervous system. Nosocomial infections are also a problem in tetanus cases because of prolonged hospital stays.

**Causative Agent**
Tetanus is caused by a potent exotoxin produced by a bacterium – *Clostridium tetani*. *C. tetani* is a gram-positive, anaerobic bacillus capable of forming spores. The exotoxin that causes the clinical manifestations of tetanus is a neurotoxin called tetanospasmin, and is one of the most potent toxins known.

**Differential Diagnosis**
Differential diagnosis includes hypocalcemic tetany, phenothiazine reaction, strychnine poisoning, epilepsy, rabies, bacterial meningitis and hysteria.

**Laboratory Identification**
Tetanus is a clinical syndrome without confirmatory laboratory tests. The diagnosis of tetanus is made clinically by excluding other causes of tetanic spasms. Attempts to culture *C. tetani* are associated with poor yield, and a negative culture does not rule out disease. *C. tetani* is recovered from the wound in only 30% of cases, and it is sometimes isolated from patients who do not have tetanus.

**Treatment**
All wounds should be thoroughly cleaned with necrotic tissue and foreign material removed. Antibiotic prophylaxis against tetanus is neither practical nor useful in managing wounds; proper immunization plays the more important role. Rarely have cases of tetanus occurred in persons with a documented primary series of tetanus vaccine.

If tetanic spasms are occurring, supportive therapy and maintenance of an adequate airway are critical. Tetanus immune globulin (TIG) is recommended for persons with tetanus. TIG can only help remove unbound tetanus toxin. It cannot affect toxin bound to nerve endings.

- A single intramuscular dose of 3,000 to 6,000 units is generally recommended for children seven years or older and adults, with part of the dose infiltrated around the wound if it can be identified. Some experts recommend a lower 500 unit dose, which appears to be as effective as higher doses and may cause less discomfort.
- For children under seven years, dosing is 4 units/kg; some recommend administering 250 units.
- TIG has not been approved for IV administration. Intravenous immune globulin (IVIG) contains tetanus antitoxin and may be used if TIG is not available. This treatment can be considered when TIG isn’t available in a dose of 200 to 400 mg/kg. The Food and Drug Administration (FDA) has not licensed IGIV for this purpose.
- TIG may be obtained at local area hospitals/pharmacies or ordered through the manufacturer (http://www.grifolsusa.com/en/web/eeuu/bioscience/-/product/hypertet_s_d_tetanus_immune_globulin_human).

Persons with wounds that are neither clean nor minor, and who have had less than three doses of tetanus toxoid, or have an uncertain history of prior doses, should receive TIG as well asTd
Toxoid. This is because early doses of toxoid may not induce immunity, but only prime the immune system. The TIG provides temporary immunity by directly providing antitoxin. This ensures that protective levels of antitoxin are achieved, even if an immune response has not yet occurred.

### Tetanus Wound Management Recommendations

<table>
<thead>
<tr>
<th>Vaccination history</th>
<th>Clean, minor wounds</th>
<th>All other wounds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Td</td>
<td>TIG</td>
</tr>
<tr>
<td>Unknown or &lt;3 doses</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>≥3 doses</td>
<td>No*</td>
<td>No</td>
</tr>
</tbody>
</table>

*Yes if >10 years since last dose
^Yes if >5 years since last dose

### Case Fatality

The case fatality rate of tetanus ranges from 10% to more than 80% depending on age, the quality of care available, and the length of the incubation period. Case fatality rates for neonatal tetanus are highest, exceeding 80% among those with short incubation periods. Persons over the age of 60 years, and persons that are completely unvaccinated also have higher case fatality rates.

### Reservoir

The spores of *C. tetani* are ubiquitous in nature – most often found in soil and in the intestines and feces of many animals.

### Transmission

There is no person-to-person transmission of tetanus. Transmission primarily occurs through contaminated wounds, both major and minor. In recent years, a higher proportion of cases have had minor wounds, probably because severe wounds are more likely to be properly managed. Tetanus may follow elective surgery, burns, deep puncture wounds, crush wounds, otitis media, dental infections, animal bites, abortion, and pregnancy.

### Susceptibility

Anyone can get tetanus, however the disease is now rare in the U.S. because of routine immunization and improved wound management. Tetanus disease does not result in immunity.

### Incubation Period

The incubation period – time from exposure to illness – is usually between 3 and 21 days (average 10 days), although it may range from one day to several months, depending on the kind of wound. Most cases occur with 14 days. In general, shorter incubation periods are seen with more heavily contaminated wounds, more serious disease, and a worse outcome (prognosis).

In neonatal tetanus, symptoms usually appear from 4-14 days after birth, averaging about seven days.
**Period of Communicability**

Because tetanus is not transmitted from person-to-person, it has no period of communicability. Tetanus is the only vaccine-preventable disease that is not contagious.

**Epidemiology**

A marked decrease in mortality from tetanus occurred from the early 1900s to the late 1940s. In the late 1940s, tetanus toxoid was introduced into routine childhood immunization and tetanus became nationally notifiable. At that time, 500 to 600 cases (approximately 0.4 cases per 100,000 population) were reported per year.

After the 1940s, reported tetanus incidence rates declined steadily. Since the mid-1970s, 50-100 cases (~0.05 cases per 100,000) have been reported annually. From 2000 through 2007 an average of 31 cases were reported per year. The death-to-case ratio has declined from 30% to approximately 10% in recent years. An all-time low of 18 cases (0.01 cases per 100,000) was reported in 2009.

During 2001 through 2008, the last years for which data have been compiled, a total of 233 tetanus cases were reported, an average of 29 cases per year. Among the 197 cases with known outcomes the case-fatality rate was 13%. Age of onset was reported for all 233 cases, of which, 49% were among persons 50 years of age or older. The median age was 49 years (range 5-94 years). A total of 138 (59%) were male. Incidence was similar among races. The incidence among Hispanics was almost twice that among non-Hispanics. However, when intravenous drug users (IDUs) were excluded the incidence was almost the same among Hispanics and non-Hispanics. Between 18 and 37 cases of tetanus were reported annually in the U.S. between 2009 and 2012 (average 29 cases per year).

Almost all reported cases of tetanus are in persons who have either never been vaccinated, or who completed a primary series but have not had a booster in the preceding 10 years. Heroin users, particularly persons who inject themselves subcutaneously, appear to be at high risk for tetanus. Quinine is used to dilute heroin and may support the growth of *C. tetani*.

Neonatal tetanus is rare in the U.S., with only two cases reported since 1989. Neither of the infants’ mothers had ever received tetanus toxoid.

Tetanus occurs worldwide; the disease is sporadic and relatively uncommon in most industrialized countries, but is more common in agricultural regions and in areas where contact with animal excreta is more likely, and immunization is inadequate. Utah averages roughly one case of tetanus every 10 years. The last case occurred in 2009 and was a mild, localized tetanus case that was the result of a puncture wound.
PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility
- Investigate all suspect cases of disease, fill out and submit appropriate disease investigation forms.
- Provide education to the general public and clinicians regarding disease transmission and prevention.

Prevention
Vaccination is the best method to prevent infection. Tetanus vaccines are recommended for people of all ages, with booster shots throughout life. Immediate and proper wound care can also help prevent infection.

Recovery from tetanus may not result in immunity; second attacks can occur and primary immunization is indicated after recovery.

Chemoprophylaxis
There is no chemoprophylaxis for tetanus.

Vaccine
Tetanus toxoid is available as a single-antigen preparation, combined with diphtheria toxoid as pediatric DT or adult Td, and with both diphtheria toxoid and acellular pertussis vaccine as DTaP or Tdap. Tetanus toxoid is included in the routine vaccinations recommended for children. For current ACIP recommendations, visit: https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/dtap.html.

Childhood Immunizations
Children should start receiving tetanus vaccine at two months of age. For children younger than seven years, tetanus toxoid is generally administered together with diphtheria toxoid and pertussis vaccine as a triple vaccine. For children older than seven years, tetanus and diphtheria (Td) vaccine is recommended for primary vaccination and boosters. The schedule for childhood vaccination is:

<table>
<thead>
<tr>
<th>Dose</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary 1</td>
<td>2 months</td>
</tr>
<tr>
<td>Primary 2</td>
<td>4 months</td>
</tr>
<tr>
<td>Primary 3</td>
<td>6 months</td>
</tr>
<tr>
<td>Primary 4#</td>
<td>15-18 months</td>
</tr>
<tr>
<td>First Booster*</td>
<td>4-6 years</td>
</tr>
<tr>
<td>Tdap Booster</td>
<td>11-12 years</td>
</tr>
</tbody>
</table>

#Administered at least 6 months after 3rd dose & not before 12 months.
*The first booster is not necessary before entering kindergarten or elementary school if fourth dose is administered on or after the fourth birthday.
Adolescents aged 13-18 years who have not received a booster of Td should receive a dose of Tdap as their catch-up dose rather than Td. Adolescents who have already received a booster with Td at age 11-12 years are encouraged to receive a dose of Tdap also. The ACIP hasn’t defined an optimal interval between Td and Tdap. A five-year interval is recommended to reduce frequency of side effects, but a shorter interval may be used when protection from pertussis is needed.

Efficacy of the toxoid has never been studied in a vaccine trial. It can be inferred from protective antitoxin levels that a complete tetanus toxoid series has a clinical efficacy of virtually 100%. Cases of tetanus occurring in fully immunized persons whose last dose was within the last 10 years are extremely rare.

**Adult Immunizations**

Adults who have never received tetanus and diphtheria toxoid-containing vaccine should receive a series of three vaccinations. The preferred schedule is a single dose of Tdap, followed by Td ≥4 weeks later, and a second dose of Td 6-12 months later. Tdap may substitute for Td for any one of the three doses in the series. After a primary series of vaccine, adults should receive a Td dose every 10 years throughout life. Adults 19-64 years of age should substitute a single dose of Tdap to replace a single dose of Td for booster immunization if they have not received Tdap previously. Tdap may be given at a shorter interval than 10 years since the receipt of the last tetanus-toxoid containing vaccine to protect against pertussis. The safety of intervals as short as two years between administration of Td and Tdap is supported. All travelers should have current tetanus immunization (e.g., within the last 10 years prior to travel).

In October 2012, the Advisory Committee on Immunization Practices (ACIP) voted to recommend that healthcare personnel should administer a dose of Tdap during each pregnancy irrespective of the patient’s prior history of receiving Tdap (or Td). This strategy not only helps protect the mother from getting and passing pertussis on to her infant, but also provides passive immunity to the infant. Postpartum Tdap administration only provides protection to the mother — it does not provide immunity to the infant.

- To maximize the passive antibody transfer to the infant, you should administer Tdap during the early part of gestational weeks 27 through 36.
- Pregnant women should receive Tdap anytime during pregnancy if it is indicated (e.g., wound care, during a community pertussis outbreak).

**Isolation and Quarantine Requirements**

Tetanus is not transmitted from person-to-person. Therefore, there are no isolation and quarantine requirements.
CASE INVESTIGATION

Reporting
Tetanus should be reported within three working days of identification to the local health department or the Utah Department of Health. Report any illness to public health authorities that meets any of the following criteria:

1. An illness with generalized or local muscle spasms, or hypertonia in a person diagnosed by a medical professional to have tetanus.
2. An illness in a person whose death certificate lists tetanus as a cause of death or a significant condition contributing to death.

Other recommended reporting procedures
- All cases of tetanus should be reported.
- Reporting should be on-going and routine.
- Frequency of reporting should follow the state health department’s routine schedule.

Criteria for Reporting Tetanus (CSTE)

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Presentation</td>
<td></td>
</tr>
<tr>
<td>Muscle spasms</td>
<td>O</td>
</tr>
<tr>
<td>Hypertonia</td>
<td>O</td>
</tr>
<tr>
<td>Diagnosis of tetanus by a healthcare professional</td>
<td>N</td>
</tr>
<tr>
<td>Death certificate lists disease due to tetanus as a cause of death or a significant condition contributing to death</td>
<td>S</td>
</tr>
</tbody>
</table>

Notes:
S = This criterion alone is sufficient to report or confirm a case.
N = This criterion in conjunction with all other “N” and any “O” criteria in the same column is required to report or confirm a case.
O = At least one of these “O” criteria in each category in the same column (e.g., clinical presentation and laboratory findings)—in conjunction with all other “N” criteria in the same column—is required to report or confirm a case.

Case Definition (CTSE 2010)
In the absence of a more likely diagnosis, an acute illness with muscle spasms or hypertonia and diagnosis of tetanus by a healthcare provider; or death, with tetanus listed on the death certificate as the cause of death, or a significant condition contributing to death.
Case Classification: Note: there is no definition for “confirmed” tetanus.

Probable:
- In the absence of a more likely diagnosis, an acute illness with
  - muscle spasms or hypertonia; **AND**
  - diagnosis of tetanus by a health care provider; or
- Death, with tetanus listed on the death certificate as the cause of death, or a significant condition contributing to death.

Criteria for Case Classification of Tetanus (CSTE)

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Probable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical Presentation</strong></td>
<td></td>
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<td>Hypertonia</td>
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</tr>
<tr>
<td>Diagnosis of tetanus by a healthcare provider</td>
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</tr>
<tr>
<td>Death, with tetanus listed on the death certificate as the cause of death</td>
<td>S</td>
</tr>
<tr>
<td>or a significant condition contributing to death</td>
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Case Investigation Process

Interview the case and others who may be able to provide pertinent information.

A. Evaluate the diagnosis and assist with securing tetanus Immune Globulin (TIG):
   - Assess the clinical presentation (e.g., lockjaw, rigidity, spasms), risk factors (e.g., gardening, farm work, injection drug use), and immunization history for the patient.
   - TIG may be obtained at local area hospitals/pharmacies or ordered through the manufacturer (http://www.grifolsusa.com/en/web/eeuu/bioscience/-/product/hypertet_s_d_tetanus-immune-globulin-human).

B. Identify source of infection. Ask about the following exposures in the 3–21 days prior to onset:
   - Minor or major injury, particularly if contaminated with soil or manure,
   - Exposures to soil or manure,
   - Injection drug use, and
   - Use of alternative medicine treatments, e.g., for newborn umbilical stump.

C. Identify potentially exposed persons, noting outbreaks are extremely rare:
   - Collect name, age, onset date, and contact information of anyone reported to have a similar illness.
D. Environmental evaluation:
   - An environmental evaluation is usually not needed since tetanus spores are ubiquitous in the environment, and the source of the infection is rarely determined with certainty. Contact the Utah Department of Health or local health department if you have high suspicion for a source of infection, such as potentially contaminated heroin.

Outbreaks
In the rare case of an outbreak, search for the source, especially contaminated street drugs or other common-use injections.

Identification of Case Contacts
Since tetanus is not spread from human contact, identification of case contacts is not needed.

Case Contact Management
No contact follow-up is needed since tetanus is not transmitted from person to person.
REFERENCES


Epidemiology and Prevention of Vaccine-Preventable Diseases (12th Edition), Centers for Disease Control and Prevention; May 2012.


VERSION CONTROL

Update, Feb 16, 2016: General update to document format and revisions of thematic order.

Update, Feb 26, 2016: Added importance to public health section.

Update, Feb 26, 2016: Added narrative reporting information.

Update, Feb 26, 2016: Update to transmission.

Update, Feb 26, 2016: Update to case fatality.

Update, Feb 26, 2016: Update to immunizations and outbreaks.

Update, Feb 26, 2016: Reviewed CTSE case definition.

Update, Feb 26, 2016: Added UT-NEDSS Minimum/Required Fields.

Update, Feb 26, 2016: Added case investigation process.

Update, Dec 08, 2016: Updated CSTE case definition and verified references.

Update, March 14, 2018: Added Critical Clinician Information and Rules for Entering Test Results sections.

Update, September 20, 2018: Updated treatment, epidemiology, childhood and adult immunization, vaccine, and case investigation process sections.
✓ UT-NEDSS MINIMUM/REQUIRED FIELDS BY TAB

Demographic
- Area Code
- Birth Gender
- City
- County
- Date of Birth
- Ethnicity
- Race
- Last Name
- Phone Number
- State
- Street
- Street Number
- Unit Number
- Zip Code

Clinical
- Date Diagnosed
- Date of Death
- Died
- Disease
- Onset Date
- Was the patient vaccinated prior to injury?
- Date of last vaccination:
- Does the patient have diabetes?
- Hypertonia

- Muscle Spasms
- Wound history, date, location, cause, dirty or clean
- Has the patient injected drugs within the past year?
- If vaccinated, list vaccine type
- What is the country of birth?

Laboratory
- Organism
- Specimen Source
- Test Result

Epidemiological
- Childcare Association
- Imported from

Reporting
- Date first reported to public health

Administrative
- Outbreak Name
- State Case Status
- Outbreak Associated
ELECTRONIC LABORATORY REPORTING PROCESSING RULES

Tetanus Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Test Result</th>
<th>Create a New Event</th>
<th>Update an Existing Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
<td>Positive</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>IgG Antibody</td>
<td>Positive</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Tetanus Morbidity Whitelist Rule: If the specimen collection date of the laboratory result is 60 days or less after the event date, the laboratory result should be added to the morbidity event.

Tetanus Contact Whitelist Rule: Never added to a contact event.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.
**Tetanus Graylist Rule:** If the specimen collection date of the laboratory result is 30 days before to seven days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

**Other Electronic Laboratory Processing Rules**

- If an existing event has a state case status of "not a case," ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.