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## Tetanus

### Overview<sup>1, 2, 3</sup>

Tetanus is an acute, potentially fatal disease that is characterized by generalized increased rigidity and convulsive spasms of skeletal muscles. Tetanus is almost entirely preventable through immunization. Tetanus is caused by the spore-forming bacterium *Clostridium tetani*; this organism is a wound contaminant. *C. tetani* spores (the dormant form of the organism) are a normal inhabitant of soil and are found in animal and human feces and are ubiquitous in the environment, especially where contamination by excreta is common. The spores enter the body through breaks in the skin (recognized or unrecognized), and germinate under low-oxygen conditions. Puncture wounds and wounds with a significant amount of tissue injury are more likely to promote germination. In recent years, a higher proportion of patients with tetanus 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 (ear infections), dental infection, animal bites, circumcision, abortion, and pregnancy. An increase in the number of tetanus cases among injecting-drug users in California has been noted since the early 1990s.

*C. tetani* produces a potent toxin tetanospasmin which is absorbed into the bloodstream. The toxin then reaches the nervous system, causing painful and often violent muscular contractions. The muscle stiffness usually first involves the jaw (lockjaw) and neck, and later becomes generalized. Tetanus is a noncommunicable disease—it is not transmitted from one person to another. Tetanus can manifest in one of four clinical forms: **generalized**, **local**, **cephalic** and **neonatal**.

**Generalized** tetanus (lockjaw) is a neurologic disease manifesting as trismus, followed by stiffness of the neck, difficulty in swallowing, and rigidity of abdominal muscles. The disease usually presents with a descending pattern. Other symptoms include elevated temperature, sweating, elevated blood pressure, and episodic rapid heart rate.<sup>3</sup> Onset is gradual, occurring over 1 to 7 days, and symptoms progress to severe generalized muscle spasms, which often are aggravated by any external stimulus. Severe spasms persist for 1 week or more and subside over several weeks in people who recover. Complete recovery may take months.<sup>3</sup>

**Local** tetanus is an uncommon form of the disease and manifests as local muscle spasms in areas contiguous to a wound. **Cephalic** tetanus is a rare form of the disease, occasionally occurring with otitis media, or associated with infected wounds on the head and neck causing dysfunction of cranial nerves. Both conditions may precede generalized tetanus.

**Neonatal** tetanus is a form of generalized tetanus occurring in newborn infants lacking protective passive immunity because their mothers are not immune. Neonatal tetanus is common in many developing countries where women are not immunized appropriately against tetanus and nonsterile umbilical cord-care practices are followed.

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The incubation period tetanus ranges from 3 to 21 days, with most cases occurring within 8 days. Shorter incubation periods have been associated with more heavily contaminated wounds, more severe disease, and a worse prognosis. In neonatal tetanus, symptoms usually appear from 4 to 14 days after birth, averaging 7 days.

For a more complete description of tetanus, refer to the following texts:

- *Control of Communicable Diseases Manual (CCDM)*, American Public Health Association, 19<sup>th</sup> ed. 2008.
- American Academy of Pediatrics. *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29<sup>th</sup> ed. 2012.
- Department of Health and Human Services, Centers for Disease Control and Prevention, *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 12<sup>th</sup> ed. 2012.

### **2010 Case Definition – Tetanus<sup>4</sup> - (11/13)**

#### ***Case Classification***

##### ***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.

**COMMENT:** *There is no definition for "confirmed" tetanus. The diagnosis of tetanus is made clinically by excluding other causes of tetanic spasms. Attempts to culture *C. tetani* are associated with poor yield (~30%), and a negative culture does not rule out disease. NOTE: *C. tetani* may be isolated from patients who **do not** have tetanus.<sup>3</sup>*

### **Information Needed for Investigation**

**Verify clinical diagnosis.** Prompt recognition of tetanus is important clinically because hospitalization and treatment are usually required. Prompt administration of tetanus toxoid and TIG may decrease the severity of the disease. Obtain demographic, clinical and laboratory information on the case from the attending physician, hospital, and/or laboratory. Obtain the other epidemiological information necessary to complete the [Disease Case Report \(CD-1\)](#) and [Tetanus Surveillance Worksheet](#) from the patient or a knowledgeable family member.

**Obtaining accurate, complete immunization and treatment histories.** Because tetanus is preventable, the possibility of failure to vaccinate should be investigated in every case. Each case should be used as a case-study to determine which factors contributed to the failure, and which measures could be taken to improve the vaccine delivery system and prevent such cases in the future. Was prophylaxis with tetanus toxoid-containing vaccine and TIG administered? Date started?

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**Identifying the source of infection.** Diabetes may be a risk factor for tetanus, and outbreaks of tetanus among injection-drug users have occurred. Is there a history of a wound or injury, recent injection drug use, tattooing, or body piercing? Is this an isolated case, or are there other cases?

**Provide information about tetanus to persons at risk and/or the general public.** Efforts should be made to promote awareness among physicians and infection control practitioners of the need to report suspected cases of tetanus promptly. An excellent Question-&-Answer [tetanus information sheet](#) in PDF format is available from the Immunization Action Coalition.

**Tetanus Surveillance.** Information obtained through case investigations is used to assess progress toward the disease elimination goals. The information is also used to raise awareness of the importance of immunization and to characterize persons or geographic areas in which additional efforts are required to raise vaccination levels and reduce disease incidence.

### **Notification**

- Contact the [District Communicable Disease Coordinator](#), the [Senior Epidemiology Specialist](#) for the District, or the Missouri Department of Health and Senior Services (MDHSS) - BCDCP, phone (573) 751-6113, Fax (573) 526-0235, or for afterhours notification contact the MDHSS/ERC at (800) 392-0272 (24/7) immediately if an outbreak\* of tetanus is suspected.
- If a case(s) is associated with a childcare center, BCDCP or the local public health agency (LPHA) will contact the Bureau of Environmental Health Services, phone (573) 751-6095, Fax (573) 526-7377 and the Section for Child Care Regulation, phone (573) 751-2450, Fax (573) 526-5345.
- If a case(s) is associated with a long-term care facility, BCDCP or the LPHA will contact the Section for Long Term Care Regulation, phone (573) 526-8524, Fax (573) 751-8493.
- If a case is associated with a hospital, hospital-based long-term care facility, or ambulatory surgical center BCDCP or the LPHA will contact the Bureau of Health Services Regulation phone (573) 751-6303, Fax (573) 526-3621.

\*Outbreak is defined as the occurrence in a community or region, illness(es) similar in nature, clearly in excess of normal expectancy and derived from a common or a propagated source.

### **Control Measures**<sup>2, 5, 6, 7, 8</sup>

Since herd immunity does not play a role in protecting individuals against tetanus, virtually all persons must be vaccinated. Recommendations for use of tetanus toxoid-containing vaccines, including contraindications, adverse events, and precautions, may be found in the following references: American Academy of Pediatrics, *Red Book: 2012 Report of the Committee on Infectious Disease*, 29<sup>th</sup> ed.,<sup>2</sup> or [CDC's \*Epidemiology and Prevention of Vaccine-Preventable Diseases\*, 12<sup>th</sup> ed., second printing](#),<sup>3</sup> or other suitable reference. **NOTE:** *ACIP recommends that all adults aged 19 years and older who have not yet received a dose of Tdap should receive a single dose. Tdap should be administered regardless of interval since last tetanus or diphtheria toxoid-containing vaccine. After receipt of Tdap, persons should continue to receive Td for*

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*routine booster immunization against tetanus and diphtheria, according to previously published guidelines. Currently, Tdap is recommended only for a single dose across all ages.*<sup>8</sup>

Sterilization of hospital supplies will prevent the rare instances of tetanus that may occur in a hospital from contaminated sutures, instruments, or plaster casts.

For prevention of neonatal tetanus, preventive measures (in addition to maternal immunization) include community immunization programs for adolescent girls and women of childbearing age and appropriate training of midwives in recommendations for immunization and sterile technique.

Appropriate wound care and debridement is critical to tetanus prevention. A guide to tetanus prophylaxis in routine wound management can be found in **Table 1** of the: [Centers for Disease Control and Prevention, Chapter 16: Tetanus, Manual for the Surveillance of Vaccine-Preventable Diseases \(5th Edition, 2012\)](#),<sup>5</sup> or the American Academy of Pediatrics, *Red Book: 2012 Report of the Committee on Infectious Disease*, 29<sup>th</sup> ed.,<sup>2</sup> or other suitable reference.

**Medical Management of Tetanus Case:**<sup>7</sup> Prompt recognition of tetanus is important clinically because hospitalization and treatment are usually required. Prompt administration of human tetanus immune globulin (TIG) (or equine antitoxin if human immune globulin is not available), a tetanus toxoid booster, agents to control muscle spasm, and aggressive wound care and antibiotics. If immunoglobulin is not available, tetanus antitoxin (equine origin) in a single large dose should be given intravenously, after testing for hypersensitivity.

Depending on the severity of disease, mechanical ventilation and agents to control autonomic nervous system instability may be required. An adequate airway should be maintained; tracheostomy, nasotracheal intubation, and/or mechanically assisted respiration, may be lifesaving. Sedation and muscle relaxant drugs should be used as indicated to control muscle spasms. Active immunization may be initiated concurrently with treatment.

Additional Information on the medical management of tetanus is available in the *Principles and Practice of Infectious Diseases*, 7<sup>th</sup> ed.,<sup>6</sup> or American Academy of Pediatrics. *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29<sup>th</sup> ed. 2012,<sup>2</sup> or other suitable reference. **NOTE:** Because tetanus is an uncommon disease, consultation on clinical management may be useful.

### **Laboratory Procedures**<sup>2</sup>

The diagnosis of tetanus is made clinically by excluding other causes of tetanic spasms, such as hypocalcemic tetany, phenothiazine reaction, strychnine poisoning, and conversion disorder. Attempts to culture *C. tetani* are associated with poor yield, and a negative culture does not rule out disease. A protective serum antitoxin concentration should not be used to exclude the diagnosis of tetanus.

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## **Reporting Requirements**

Tetanus is a Category 2 (A) disease and shall be reported to the local health authority or to the Department of Health and Senior Services within one (1) calendar day of first knowledge or suspicion by telephone, facsimile or other rapid communication.

As a Nationally Notifiable Condition, **tetanus cases prior to classification** are a **STANDARD** report to the Centers of Disease Control and Prevention (CDC). **STANDARD** reporting requires the Missouri Department of Health and Senior Services (MDHSS) to report to CDC by electronic transmission via WebSurv within the next normal reporting cycle.

1. For probable cases complete a “[Disease Case Report](#)” (CD-1), and a [Tetanus Surveillance Worksheet](#) (CDC).
2. Entry of the completed CD-1 into the WebSurv database negates the need for the paper CD-1 to be forwarded to the District Health Office.
3. MDHSS will submit weekly electronic reports to CDC.
4. Send the completed Tetanus Surveillance Worksheet to the District Health Office.
5. All outbreaks or “suspected” outbreaks must be reported as soon as possible (by phone, fax or e-mail) to the [District Communicable Disease Coordinator](#). This can be accomplished by completing the [Missouri Outbreak Surveillance Report](#) (CD-51).
6. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the [District Communicable Disease Coordinator](#).

## **References**

1. American Public Health Association. *Tetanus* In: Heymann D Ed. *Control of Communicable Diseases Manual*. 19<sup>th</sup> ed. Washington, D.C. American Public Health Association, 2008: pp 602-608.
2. American Academy of Pediatrics, *Tetanus*. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, eds. *Red Book: 2012 Report of the Committee on Infectious Disease*, 29<sup>th</sup> ed. Elk Grove Village, IL: American Academy of Pediatrics; 2012: pp 707-712.  
<http://www.cdc.gov/vaccines/pubs/pinkbook/tetanus.html> (11/13)
3. Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*, Tetanus. Atkinson W, Hamborsky J, Wolfe S, eds. 12<sup>th</sup> ed., second printing. Washington DC: Public Health Foundation, 2012. pp 291-300.
4. CDC’s National Notifiable Diseases Surveillance System (NNDSS) and Case Definitions.  
<http://wwwn.cdc.gov/nndss/> (11/13)
5. Centers for Disease Control and Prevention, *Chapter 16: Tetanus, Manual for the Surveillance of Vaccine-Preventable Diseases* (5th Edition, 2012)  
<http://www.cdc.gov/vaccines/pubs/surv-manual/chpt16-tetanus.html> (11/13)
6. Reddy, Pavani & Bleck, Thomas P. *Clostridium tetani* (Tetanus). In: Gerald L. Mandell, John E. Bennett, & Raphael Dolin, Eds. *Principles and Practice of Infectious Diseases*, 7<sup>th</sup> ed., Pennsylvania: Churchill Livingstone Elsevier, 2010: pp 3091-3096.
7. Centers for Disease Control and Prevention, *Tetanus, For Clinicians, Treatment*:  
<http://www.cdc.gov/tetanus/clinicians.html> (11/13)

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- Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap) Vaccine in Adults Aged 65 Years and Older — Advisory Committee on Immunization Practices (2012). MMWR 2012; 61/(25); 468-470. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6125a4.htm> (11/13)

### **Other Sources of Information**

- Centers for Disease Control and Prevention, National Immunization Program: <http://www.cdc.gov/vaccines/> (11/13)
- Immunization Action Coalition: <http://immunize.org/> (11/13)
- Missouri Department of Health and Senior Services: <http://health.mo.gov/living/wellness/immunizations/index.php> (11/13)
- CDC. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. MMWR 2006;55(RR-17). <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm> (11/13)