

Tetanus occurs worldwide but is more commonplace in warmer climates and/or seasons¹. The bacterium is ubiquitous with the environment inhabiting soil as well as the intestinal tracts of humans and animals making it more prevalent in agricultural regions where there is a higher level organic matter in the soil^{1,3}. It is the only vaccine-preventable disease that is not transmitted from person to person². The disease is almost entirely preventable through immunization¹. Most of the cases that are reported are in unvaccinated persons or persons who had prior history of vaccination, but did not receive the routine 10 year booster dose².

A. Agent

C. tetani is a spore-forming, obligate anaerobic, gram-positive bacillus¹. The organism is sensitive to heat and cannot survive in the presence of oxygen².

B. Clinical Description:

Tetanus is an acute (and frequently fatal) disease characterized by convulsive spasms of skeletal muscles and generalized rigidity². There are four types: generalized tetanus, local tetanus, cephalic tetanus and neonatal tetanus^{2,3}. General tetanus is the most common form of tetanus and starts with trismus or lockjaw, then progresses to neck stiffness and then difficulty swallowing and abdominal muscle rigidity². Severe, painful, generalized muscle spasms occur frequently and last for several minutes duration². Complete recovery may take months for those who recover². Local tetanus causes muscle contractions in an area proximal to the infected wound, and may develop into generalized tetanus but milder². Cephalic tetanus occurs when *C. tetani* is present in the middle ear flora, or wounds following a neck/head injury affecting the cranial nerves^{2,3}. Neonatal tetanus occurs in newborn infants born to non-immune mothers and occur when the unhealed umbilical stump becomes infected².

C. Reservoirs:

Tetanus spores are prevalent in the environment as they are commonly found in the soil and intestines and feces of animals including horses, cattle, and dogs². Manure treated soil may contain many spores². Humans may also harbor the organism in their intestines².

D. Mode of Transmission:

Transmission typically occurs through contaminated wounds that may be major or minor wounds².

E. Incubation Period:

The incubation period ranges from 3 to 21 days, with most cases occurring within 14 days³. In general, the farther the injury site from the central nervous system, the longer

the incubation period. Shorter incubation periods have been associated with more heavily contaminated wounds, more severe disease, and a worse prognosis³. In neonatal tetanus, symptoms usually appear from 4 to 14 days after birth, averaging 7 days². Cephalic tetanus may have an incubation period as short as 1 to 2 days¹.

F. Period of Communicability:

Tetanus is not transmitted person to person².

G. Susceptibility and Resistance:

Susceptibility is universal and infection may not result in immunity³. Tetanus toxoid (TT) immunization induces active immunity for at least 10 years^{2,3}. Tetanus immune globulin (TIG) or tetanus antitoxin injection induces temporary passive immunity². Infants of immunized mothers acquire passive immunity that protects them from neonatal tetanus².

For Children²:

5 doses of DTaP are recommended 2 months, 4 months, 6 months, 15-18 months and 4-6 years and 1 dose of Tdap is recommended at 11-12 years.

For Adults²:

Tdap or Td booster is recommended every 10 years

Tetanus toxoid (vaccine) efficacy²:

Approximately 100% after a primary series

Immunity last approximately 10 years²

H. Treatment:

For tetanus treatment, a single dose of human TIG is recommended¹. All wounds should be cleaned and debrided properly, especially if there is extensive necrosis¹. Supportive care and pharmacotherapy help in controlling spasms². Antibiotics (e.g., metronidazole and/or penicillin G) are effective in decreasing the vegetative forms of *C. tetani*².

Disease Management

I. Clinical Case Definition:

Acute onset of hypertonia and/or painful muscular contractions (usually of the muscles of the jaw and neck) and generalized muscle spasms without other apparent medical cause (as reported by a health professional)⁴

J. Laboratory Criteria for Diagnosis:

None

Case Classification⁴

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.

K. Classification of Import Status:

N/A

L. Laboratory Testing:

Tetanus is a clinical diagnosis.

M. Assessing Laboratory Results:

N/A

N. Outbreak Definition:

There is no formal outbreak definition. Tetanus is rarely related to outbreaks as infections are linked to environmental exposures. In rare instances, an outbreak may be declared if there are more cases than expected that are epidemiologically linked by time and/or location.

Investigation Guidelines

O. Time Frame:

Report all probable and suspect cases to ADHS - Office of Infectious Disease Epidemiology Section, within 5 working days after the case or suspect cases is diagnosed, treated or detected⁴.

P. Forms:

CDC Tetanus Surveillance Worksheet:

<http://www.cdc.gov/vaccines/pubs/surv-manual/appx/appendix18-2-tet-wrsht.pdf>

Q. Investigation Guidelines:

a. Confirm diagnosis⁵

- i. Confirm diagnosis with appropriate medical provider and case definition.
- ii. Collect demographic data:
 1. Birth date, county, sex, race/ethnicity, address, phone number(s).
- iii. If case was hospitalized:
 1. Obtain medical records including admission notes, progress notes, lab report, and discharge summary.

b. Conduct case investigation⁵

- i. Date of illness onset, clinical and vaccine status data, hospitalizations (dates and duration of stay), site of infection, signs and symptoms, and complications (e.g. myocarditis, neuritis).
 - ii. Outcome (survived or date of death), with postmortem examination results and death certificate diagnoses; treatment, including date of administration and number of units of antitoxin, antibiotics given and dosages, duration of therapy.
 - iii. Laboratory: culture, biotype and toxigenicity test, PCR, molecular typing.
 - iv. Vaccine information: dates and types of diphtheria vaccination, number of doses, manufacturer name, and vaccine lot number; if not vaccinated, reason for not getting vaccinated.
 - v. Determination of risk factors and transmission settings:
 - vi. Onset or date of presentation to provider, include dates and location.
 - vii. Local or international travel history during period before illness
 - viii. High risk activities i.e., IV drug use, tattooing
 - ix. Immunization histories (both case and contacts): immunization dates and type.
 - x. Demographic information: Name, address, telephone, and occupation of case
 - xi. Determine risk factors, focus within possible period of incubation
 - 1. History of injury: nature of wound: type, size and location; date occurred; environment and circumstances
 - 2. If no history of acute injury, note any associated conditions (History of injury may be absent, particularly in diabetics)
 - 3. Recent surgical procedures and/or childbirth
 - 4. Recent injection drug use, tattooing or body piercing
 - 5. In neonatal tetanus, maternal country or origin and number of years of residence in the U.S.
 - xii. Inquire into delivery technique and methods of umbilical cord care.
 - xiii. Occupation and hobbies
 - xiv. History of military service
- c. **Conduct contact investigation**⁵
- a. Tetanus cannot be transmitted person-to-person, but individuals among the case's social group may not be adequately immunized against tetanus and are potentially at risk from exposure. Evaluate the situation for risks.
 - b. Exposure is defined as contact to a potential source of *C. tetani* in the environment in a manner that increases the risk for infection. (i.e., wounds including animal bites, parental injections)

d. Initiate control and prevention measures⁵

- a. Tetanus vaccine recommendation for those not fully immunized:
 - Five doses of pediatric diphtheria-tetanus-pertussis or diphtheria-tetanus (DTaP or DT) vaccine are recommended for children <7 years of age.
- b. A routine tetanus booster vaccination with tetanus-diphtheria or tetanus diphtheria pertussis (Td or Tdap) vaccine is recommended every 10 years for those 7 years and older. Tdap is recommended for the booster in adolescents age 11-18 and adults through 64 years if they have not previously received Tdap.

e. Isolation, Work and Child Care Restrictions⁵

None required

f. Case Management⁵

Report on any changes in patient status. The case’s status (alive or dead) should be determined 1 month after onset.

g. Contact Management, Including Susceptible Contacts⁵

Post-exposure wound management includes the appropriate use of tetanus toxoid and TIG (Refer to Table 1)

Table 1. Guide to tetanus prophylaxis in routine wound management¹

Post-exposure wound management includes the appropriate use of tetanus toxoid and TIG

History of Absorbed Tetanus Toxoid (doses)	Clean Minor Wounds		All other Wounds	
	Td/Tdap [†]	TIG [§]	Td/Tdap [†]	TIG [§]
Less than 3 doses or unknown	Yes	No	Yes	Yes
3 or more doses	No [§]	No	No [¶]	No

Source: *Epidemiology and Prevention of Vaccine-Preventable Diseases, 13th Edition. (CDC, 2021)*

* Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; avulsions; and wounds resulting from missiles, crushing, burns, and frostbite.

† Tdap is preferred to Td for adults who have never received Tdap. Single antigen tetanus toxoid (TT) is no longer available in the United States.

§ Yes, if it has been 10 years or longer since the last dose.

¶ Yes, if it has been 5 years or longer since the last dose.

h. Notifications

- The CDC requests a provisional report be filed by the state within 2 weeks of the initial report of disease to the state or local health department⁶.
- Report on any changes in patient status. The case’s status (alive or dead) should be determined 1 month after onset.

R. Outbreak Guidelines:

Refer to the outbreak section of the investigation manual.

Special Situations

S. Special Situations:

- **Health Care Setting Associated Control Measures:** Sterilization of hospital supplies will prevent tetanus that may occur in a hospital from contaminated sutures, instruments or plaster casts.

Resources

1. American Academy of Pediatrics. 2021 Red Book: Report of the Committee on Infectious Disease, 32nd Edition. Illinois, Academy of Pediatrics, 2021.
2. Tetanus [Internet]Centers for Disease Control and Prevention. The Pink Book: Epidemiology and Prevention of Vaccine-Preventable Diseases; 2021 [cited 2022Mar18]. Available from: <https://www.cdc.gov/vaccines/pubs/pinkbook/tetanus.html>
3. Heymann DL. Tetanus (Lockjaw). In: Control of communicable diseases manual. Washington, DC: American Public Health Association; 2015. p. 607-613.
4. Case Definitions for Communicable Morbidities [Internet]. Arizona Department of Health Services; 2022 [cited 2022Mar17]. Available from: <https://www.azdhs.gov/preparedness/epidemiology-disease-control/index.php#investigations-case-definition>
5. Tetanus Investigation Guideline. In: Kansas Department of Health and Environment, Disease Investigation Guidelines. Available from: <https://www.kdhe.ks.gov/DocumentCenter/View/7368/Tetanus-Investigation-Guideline-PDF>
6. Chapter 16: Tetanus [Internet]. Manual for the Surveillance of Vaccine-Preventable Diseases. Centers for Disease Control and Prevention; 2020 [cited 2022Mar18]. Available from: <https://www.cdc.gov/vaccines/pubs/surv-manual/chpt16-tetanus.html>