**Section 1:**

ABOUT THE DISEASE

**A. Etiologic Agent**

Tetanus is caused by a potent exotoxin produced by *Clostridium tetani,* a spore-forming, anaerobic, gram-positive bacillus.

**B. Clinical Description**

Generalized tetanus (or lockjaw) is an acute, neurologic disease characterized by painful skeletal muscular contractions. *C. tetani* is a non-invasive wound contaminant that produces a toxin that blocks nerve signals to skeletal muscles. The autonomic nervous system may also be affected. Onset is gradual, occurring over 1–7 days. Tetanus can be fatal.

Generalized tetanus is the most common clinical manifestation. Usually, the muscle stiffness first involves the jaw (lockjaw) and neck, and then progresses to severe generalized muscle spasms, which are frequently aggravated by any external stimulus. Spasms continue for 3 to 4 weeks and complete recovery may take months.

Neonatal tetanus, which usually arises from contamination of the umbilical stump, is a form of generalized tetanus occurring in infants lacking passive immunity because their mothers are not immune. Inability to nurse is the most common presenting sign.

Localized tetanus is manifested by local muscle spasms in areas contiguous to a wound, although history of an injury or an apparent portal of entry may be lacking.

Cephalic tetanus is a rare form of the disease, occasionally occurring with otitis media in which *C. tetani* is present in the flora of the middle ear or following injuries to the head. There is involvement of the cranial nerves, especially in the facial area, and often results in flaccid cranial nerve palsies rather than spasms.

Complications of the disease include laryngospasm (spasm of the vocal cords) and/or spasm of the muscles of respiration, leading to interference with breathing; fractures of the spine or long bones, which may result from sustained contractions and convulsions; and hyperactivity of the autonomic nervous system, which may lead to hypertension and/or an abnormal heart rhythm. Other complications may include increased susceptibility to nosocomial infections, pulmonary embolism (particularly in persons who use drugs and elderly patients), and aspiration pneumonia. The case-fatality rate for generalized tetanus ranges from 10–20% even with modern intensive care; without healthcare, the case-fatality can reach 90%. Fatality is highest in the elderly, unvaccinated persons, and neonatal cases. The case fatality rate also varies inversely with the length of the incubation period and the availability of experienced intensive care unit personnel and resources. In about 20% of tetanus deaths, no obvious pathology is identified, and death is attributed to the direct effects of tetanus toxin.

**C. Vectors and Reservoirs**

*C. tetani* is a normal inhabitant of soil and the intestinal tracts of animals and humans. It is ubiquitous in the environment, especially where contamination by excreta is frequent.

**D. Modes of Transmission**

There is no person-to-person transmission of tetanus. Wounds, both major and minor, recognized or unrecognized, are the sites at which the organism enters, multiplies, and produces toxin. Cases of tetanus have followed injuries considered too trivial for medical consultation. 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, insect and animal bites, chronic sores and infections, intravenous (IV) drug use, intramuscular injections, and unhygienic abortion or childbirth practices.

**E. Incubation Period**

The incubation period for generalized tetanus usually ranges from 3 to 21 days (average 8-10 days), with most cases occurring within 14 days. However, it may range from one day to several months, depending on the kind of wound. In general, the further the injury site is from the central nervous system, the longer the incubation period. In neonates, the incubation period is usually 4–14 days after birth, averaging 7 days. The incubation period for cephalic tetanus is short, usually 1 to 2 days. In general, shorter incubation periods are associated with more heavily contaminated wounds, more severe disease, and a worse prognosis.

**F. Period of Communicability or Infectious Period**

There is no infectious period as tetanus is not transmitted from person to person. Tetanus is the only vaccine-preventable disease that is not contagious.

**G. Epidemiology**

Tetanus occurs worldwide but is most frequently encountered in densely populated regions in hot, damp climates with soil rich in organic matter, particularly agricultural areas where contact with soil and animal excreta is more likely. In 2019, there were an estimated 73,000 tetanus cases globally resulting in an estimated 34,700 deaths, mostly in low- and middle-income countries in Africa and Asia. In tropical climates and rural areas where immunization is inadequate, people are especially at risk, and neonatal tetanus is common.

Tetanus is sporadic and relatively uncommon in the U.S. and in most industrial countries, mostly because of widespread use of tetanus toxoid as part of routine immunization and improved wound management. From 2009–2018, an average of 29 (range 18–37) cases were reported per year in the U.S. Of the 297 cases reported during this 10-year timeframe, there were 19 deaths, all in adults age 55 years or older. Almost all reported cases have occurred in individuals who had never been vaccinated or who completed a primary series but had not had a booster dose in the preceding ten years.

Diabetes, a history of immunosuppression, and intravenous drug use may be risk factors for tetanus. From 2009 through 2017, diabetes was associated with 13% of all reported tetanus cases, and a quarter of all tetanus deaths. Intravenous drug users accounted for 7% of cases from 2009 through 2017. Heroin users, particularly those who inject themselves subcutaneously with quinine-cut heroin, appear to be at high risk for tetanus. Quinine is used to dilute heroin and may favor growth of *C. tetani*. People employed in certain occupations have an increased risk for puncture wounds, lacerations, and abrasions. In addition, tetanus affects primarily older adults. Neonatal tetanus is rare in the U.S.

Three cases of tetanus have been reported in MA from 2019-2021, one of which resulted in the death of an elderly woman. Prior to this, the most recent case of tetanus in Massachusetts was reported in 1996. All recent cases were in adults who were not up to date with the vaccination.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tetanus Cases in Massachusetts 2019-2021** | | | | | |
| **Year** | **Sex** | **Age Group** | **Vaccination Status** | **Type of Exposure** | **Death** |
| 2019 | Female | 80-85 | Not up to date | Puncture wound to upper extremity; outside | Yes |
| 2020 | Male | 45-50 | Not up to date | Puncture wound to upper extremity; home | No |
| 2021 | Male | 20-25 | Not up to date | Laceration to upper extremity; outside | No |

**H. Bioterrorist Potential**

This pathogen is not considered to be of risk for use in bioterrorism.

**Section 2:**

REPORTING CRITERIA AND LABORATORY TESTING

**A. What to Report to the Massachusetts Department of Public Health (MDPH)**

Report any suspect or probable case of tetanus, as diagnosed by a health care professional.

*Note: See Section 3C for information on how to report a case.*

**B. Laboratory Testing Services Available**

There are no laboratory findings characteristic of tetanus, and the diagnosis does not depend on bacteriologic confirmation. The diagnosis is entirely clinical by excluding other possibilities, including hypocalcemic tetany, prescribed drug interactions, phenothiazine reaction, strychnine poisoning, and odontogenic infections. *C. tetani* is recovered from the wound in only 30% of cases, and it is sometimes isolated from patients who do not have tetanus.

Sera collected before administration of human tetanus immune globulin (TIG) can support the existence of susceptibility if the result demonstrates very low or undetectable anti-tetanus antibody levels. However, tetanus can occur in the presence of “protective” levels of antitoxin (>0.1 IU by standard enzyme immunoassay [EIA]); therefore serology can never exclude the diagnosis of tetanus.

The MDPH State Laboratory Institute (MA SPHL) does not provide testing services for tetanus diagnosis.

**Section 3:**

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

**A. Purpose of Surveillance and Reporting**

* To assure early evaluation, and where appropriate, treatment with tetanus-toxoid containing vaccine and/or tetanus immune globulin (TIG), antibiotics and hospitalization.
* To identify groups and areas in which risk of disease is highest (due to under-immunization, occupation, other practices, etc.) so that prevention efforts can be focused.

**B. Laboratory and Health Care Provider Reporting**

Tetanus is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report by telephone to the LBOH in the community where the case is diagnosed, all probable or suspect cases of tetanus, as defined by the reporting criteria in Section 2A.

**Due to the potential severity of tetanus, the MDPH requests that information about any case be immediately reported by telephone (24 hours a day, 7 days a week) to an MDPH epidemiologist at the MDPH Division of Epidemiology by calling (617) 983-6800.**

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *C. tetani* infection shall immediately report such evidence of infection, directly by phone, to the MDPH Division of Epidemiology at (617) 983-6800.

**C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities**

*Reporting Requirements*

MDPH regulations *(105 CMR 300.000)* stipulate that tetanus is reportable to the LBOH and that each LBOH must report any case of tetanus or suspect case of tetanus, as defined by the reporting criteria in Section 2A. Cases should be reported as soon as possible (24 hours a day, 7 days a week) to an MDPH epidemiologist at the MDPH Division of Epidemiology by calling (617) 983-6800. An MDPH epidemiologist, in collaboration with the LBOH, may complete the optional Centers for Disease Control and Prevention (CDC) *Tetanus Surveillance Worksheet*. Cases will then be reported to the MDPH Division of Surveillance, Analytics and Informatics (DSAI).

*Case Investigation*

**MDPH will usually take the lead on tetanus case investigation (including the case report in MAVEN) and case management recommendations, in collaboration with the LBOH. The MDPH will keep the LBOH informed of all significant developments and will request the assistance of the LBOH as needed.**

In order to assess the likelihood that a suspect case is a true case, the MDPH and/or other public health staff helping in the investigation should ask about:

1. Clinical presentation (symptoms, hospitalization, complications, pre-existing conditions);
2. What else is in the differential and has anything been ruled out;
3. Tetanus immunization history, including date of last booster dose;
4. Country of origin and length of residency in U.S.;
5. Military dates of service (if any);
6. Risk factors for disease, such as history of a wound or injury, chronic wounds (e.g., decubitus ulcer, diabetic ulcers), recent injection drug use, recent prescription history, tattooing, or body piercing;
7. Occupations or hobbies involving contact with soil or manure; and
8. Treatment/prophylaxis with tetanus toxoid-containing vaccine, TIG, or antibiotics.

For neonatal cases, ask about: a) maternal country of origin; b) number of years of residence in the U.S.; and c) maternal vaccination

Please note that complete case follow-up includes collection and reporting of ALL demographic data elements found in MAVEN Demographic Question Package including age, gender, sexual orientation, race, ethnicity, disability, occupation, and preferred language.

Since tetanus is not transmitted from person to person, there are no routine control measures for a case of tetanus.

**Due to the extreme potency of the tetanus toxin, tetanus disease does not result in immunity. Active immunization with tetanus-containing vaccine should begin or continue as soon as the person’s condition has stabilized.**

*Using MAVEN (for questions related to MAVEN, please contact MAVENHelp@mass.gov)*

Administrative Question Package

* Monitor your workflows in MAVEN for any new cases of tetanus.
* Once a new event appears in this workflow, complete the following:
  + In the Administrative Question Package (QP) and under the “Local Health and Investigation” “Step 1 - LBOH acknowledged” by selecting “Yes”.
  + The “LBOH acknowledged date” will then auto populate to the current day.
  + Completing this first step will move the event out of this workflow and into your
  + “Online LBOH notified but Case Report Forms (CRF) are pending” workflow.
  + Note the date you started your investigation by answering “Step 2 – Investigation started” as “Yes” and then note the date where shown.
  + Record your name, agency, and phone numbers where shown in “Step 3 - LBOH/Agency Investigator.”

Demographic Question Package

* **Record all** **demographic and employment information.** It is particularly important to complete the **Race/Ethnicity, Place of birth (country), and Occupation questions.**

Clinical Question Package

* Complete the “Diagnosis/Clinical Information” section, providing the following:

o Diagnosis date

o Date of symptom onset

Vaccine and IG Information Question Package

* Enter vaccine type and date for any documented doses of tetanus containing vaccine (e.g., DTaP, Tdap).
* If the case has no documentation of tetanus-containing vaccines or does not know his or her history*, “Vaccination history unknown*” should be selected. If the case is known to be unvaccinated, “*No vaccine administered*” should be selected and an answer to the question “*Reason inadequate doses (or no booster) given*” should be entered.

Risk/Exposure/Control & Prevention Question Package

* Accurately record all risk questions included in the question package. For the question “Where did this case acquire this illness?” select the most appropriate transmission setting or mark the answer as “Unknown” if no source can be identified.

*Completing Your Investigation*

1. If you were able to complete a case investigation and follow-up is complete, mark “Step 4 – Case Report Form Completed” as “Yes” and then choose Local Board of Health (LBOH) –Ready for MDPH review for the Completed by variable.
2. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the question packages with as much information as you have gathered, and then complete “Step 4 - Case Report Form Completed” as “No” and choose a primary reason why the case investigation was not completed from the choices provided in the primary reason answer variable list.
3. Institution of disease control measures is usually an integral part of case investigation. However, there are no routine control measures for a case of tetanus other than encouraging vaccination.

**Section 4:**

CONTROLLING FURTHER SPREAD

This section provides detailed recommendations. LBOH should familiarize themselves with the information. However, the MDPH usually will take the lead on implementing these measures, in collaboration with the LBOH.

**A. Isolation and Quarantine Requirements *(105 CMR 300.200)***

None.

**B. Protection of Contacts of a Case**

Since tetanus is not transmitted from person to person, there is no immunization or prophylaxis necessary for contacts of a case. However, the immunization status of contacts/household members should be assessed, and vaccination should be strongly encouraged to ensure all are up to date (especially if they share similar risk factors). If the patient is hospitalized, use the occasion as an opportunity to assess the patient’s immunization status, and follow standard precautions.

**C. Managing Special Situations**

*Tetanus Prophylaxis in Routine Wound Management*

Appropriate immunization is central to tetanus prophylaxis. The need for active immunization (with age-appropriate tetanus toxoid-containing vaccine) and/or passive immunization (with TIG) depends on the condition of the wound and the patient’s immunization history. Refer to the table in the current [Pinkbook: Tetanus | CDC](https://www.cdc.gov/vaccines/pubs/pinkbook/tetanus.html) under *Guide to Tetanus Prophylaxis* for prophylaxis recommendationsor the CDC Tetanus for Clinicians webpage.

People should receive tetanus toxoid-containing vaccine even for clean, minor wounds if it has been 10 years or greater since their last dose of tetanus toxoid-containing vaccine. For all other wounds not considered to be clean and minor (including, but not limited to, wounds contaminated with dirt, feces, soil, or saliva; puncture wounds; crush wounds; burns, and frostbite), tetanus toxoid-containing vaccine should be administered if it has been 5 years or greater since their last dose of tetanus toxoid-containing vaccine.

Regardless of immunization status, dirty wounds should be properly cleaned and debrided. Wounds should receive prompt surgical treatment to remove all devitalized tissue and foreign material as an essential part of tetanus prophylaxis. It is not necessary or appropriate to debride puncture wounds extensively.

*TIG for prophylaxis:* Persons who have contaminated and dirty wounds and who have had fewer than 3 prior doses of toxoid-containing vaccines should receive TIG for prophylaxis. People with HIV infection or severe immunodeficiency who have contaminated wounds (including minor wounds) should also receive TIG, regardless of their history of tetanus immunizations. Refer to the Red Book or CDC Tetanus for Clinicians webpage for current recommendations.

*Case Management*

Refer to the most recent Red Book for current case management recommendations. The current Red Book recommendations are:

1. Wound care: All wounds should be properly cleaned and debrided, especially if extensive necrosis is present. In neonatal tetanus, wide excision of the umbilical cord is not indicated.

2. Human tetanus immune globulin (TIG, human): TIG is recommended for the treatment of tetanus. The optimum therapeutic dose has not been established. However, experts recommend a single dose of 500 IU for children and adults, which appears to be as effective as higher doses ranging from 3,000 to 6,000 IU and causes less discomfort. The preparation available in the U.S. must be given intramuscularly. Some authorities recommend infiltration of part of the dose locally around the wound, although the efficacy of this approach has not been proven.

3. Intravenous immune globulin (IGIV): IGIV anti-tetanus antibodies may be considered for treatment if TIG is not available. Clinicians can use IGIV at a dose of 200 to 400 milligrams per kilogram (mg/kg). However, approval by the Food and Drug Administration (FDA) has not been given for this use.

4. Antimicrobial therapy: Oral (or intravenous) metronidazole (30 mg/kg per day, given at 6-hour intervals; maximum 4 g/day) is the antimicrobial agent of choice and is effective in reducing the number of vegetative forms of *C. tetani* that are potentially present in a contaminated wound. Parenteral penicillin G (100,000 U/kg per day, given at 4- to 6-hour intervals; maximum 12 million U/day) is an alternative treatment. Therapy for 7 – 10 days is recommended.

5. Vaccination: Because disease does not result in immunity, administer Td or Tdap (or for children less than seven years, DTaP, DT) if this was not done during wound management.

6. Supportive care and pharmacotherapy to control spasms are of major importance.

**D. Preventive Measures**

*Personal Preventive Measures/Education*

CDC recommends diphtheria, tetanus, and acellular pertussis vaccination across the lifespan. Children younger than 7 years of age receive DTaP or DT, while older children and adults receive Tdap and Td. **Please refer to CDC resources for the current age-appropriate immunizations schedule:**

* [Diphtheria, Tetanus, and Pertussis Vaccine Recommendations | CDC](https://www.cdc.gov/vaccines/vpd/dtap-tdap-td/hcp/recommendations.html)
  + Generally, children receive 5 doses of DTaP (2 months, 4 months, 6 months, 15-18 months, and 4-6 years). Adolescents should receive a single dose of Tdap at 11 to 12 years of age.
* [Birth-18 Years Immunization Schedule | CDC](https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fschedules%2Fhcp%2Fchild-adolescent.html)
* [ACIP DTaP Vaccine Recommendations | CDC](https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/dtap.html)
* [Pregnancy Guidelines and Recommendations by Vaccine | CDC](https://www.cdc.gov/vaccines/pregnancy/hcp-toolkit/guidelines.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fpregnancy%2Fhcp%2Fguidelines.html#tdap)
  + \*Pregnant women should receive a **single dose of Tdap during each pregnancy irrespective of the patient’s prior history of receiving Tdap**, preferably between 27 and 36 weeks of gestation although Tdap may be given at any time during pregnancy.
* [Revaccinating Healthcare Personnel with Tdap | CDC](https://www.cdc.gov/vaccines/vpd/pertussis/tdap-revac-hcp.html)

Catch-up Schedule:

In general, it’s recommended to use minimum intervals if an accelerated schedule is desired. For specific catch-up schedules based on age and prior vaccination history, refer to:

* [Catch-up Immunization Schedule | CDC](https://www.cdc.gov/vaccines/schedules/hcp/imz/catchup.html)
  + [Tetanus toxoid-containing vaccine, Catch-up Schedule, Age 4 months - 6 years](https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/dtap.pdf)
  + [Tetanus toxoid-containing vaccine, Catch-up Schedule, Age 7 years - 9 years](https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/tdap-1.pdf)
  + [Tetanus toxoid-containing vaccine, Catch-up Schedule, Age 10 years - 18 years](https://www.cdc.gov/vaccines/schedules/downloads/child/job-aids/tdap-2.pdf)

Health care providers and the public must be educated on the necessity of primary immunization with tetanus-diphtheria toxoid and ten-year booster doses, the hazards of puncture wounds and closed injuries, and the potential need after injury for active and/or passive prophylaxis. Because tetanus is preventable, each case should be considered a failure to vaccinate effectively and should be used as a means of determining how to prevent further failures from occurring. Surveillance information should be used to raise awareness of the importance of immunization and to characterize persons or places in which additional efforts are required to raise immunization levels and to decrease disease incidence.

For the 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 aseptic technique and infection control.

Please refer to the most current versions of MDPH’s [*Vaccine Administration Guidelines*](https://www.mass.gov/service-details/vaccine-administration-and-clinical-guidance)*,* MDPH’s [model standing orders for diphtheria- and tetanus-containing vaccine,](https://www.mass.gov/lists/vaccine-model-standing-orders) and [*Massachusetts Immunization Program State-Supplied Vaccines*](https://www.mass.gov/resource/vaccine-management) *and* [*Patient Eligibility Criteria*](https://www.mass.gov/doc/availability-table-childhood-0/download)for recommended schedules, groups recommended, and groups eligible to receive state-supplied vaccine.

*Environmental Measures*

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

ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for tetanus. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

*Note: The most up-to-date CDC case definitions are available on the CDC website at* [*Tetanus (Clostridium tetani) 2010 Case Definition | CDC*](https://ndc.services.cdc.gov/case-definitions/tetanus-2010/) *.*

**Case Definition for Tetanus**

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.

**Case Classification**

*Probable*

A clinically compatible case, as reported by a health care professional.

There is no definition for "confirmed" tetanus.

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