Clinical presentation patterns

Generalized tetanus

Neonatal tetanus

Localized tetanus

Cerebral tetanus

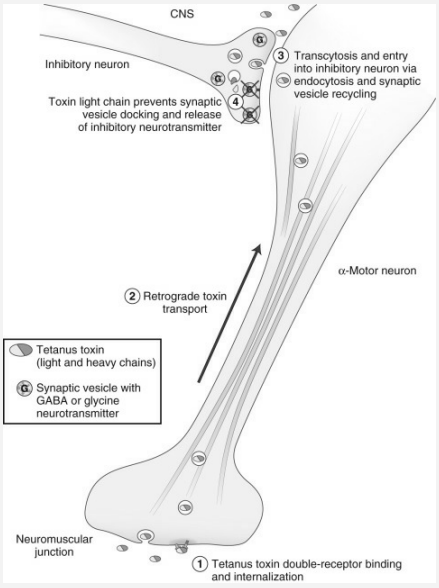
Since C. *tetani* spores cannot be eliminated from the environment, immunization and proper treatment of wounds and traumatic injuries are crucial for tetanus prevention.

Etiology

Tetanus is due to infection from the bacterium *Clostridium tetani* a gram-positive, spore-forming, obligate anaerobic bacillus. This bacteria and its spores are frequently found in hot and wet climates where the soil is rich with organic matter.
C. *tetani* may enter the human body through wound puncture, laceration, skin breaks, or inoculation with an infected syringe or insect bites. High-risk populations include those that have not been vaccinated, intravenous drug users, and those who are immunosuppressed. Other causes of infection are through surgical procedures, intramuscular injections, compound fractures, dental infections, and dog bites.

Tetanus can also develop as a consequence of chronic conditions such as abscesses and gangrene. Burn patients and patients undergoing surgery can also acquire the infection.

pathophysiology



C. *tetani* secretes the toxins, tetanospasmin, and tetanolysin. Tetanospasmin enters the presynaptic terminals in the neuromuscular endplate of motor neurons and inhibits neurotransmitter release of glycine and GABA.
The incubation period can last from one to 60 days but is, on average, around 7 to 10 days.

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Clinical features

Generalized Tetanus	typically have symptoms of autonomic over-activity. Tonic and periodic spastic muscular contractions are responsible for most of the classic clinical findings of tetanus such as: •Stiff neck •Opisthotonus •Risus sardonicus (sardonic smile) •A board-like rigid abdomen •Periods of apnea and/or upper airway obstruction due to vise-like contraction of the thoracic muscles and/or glottal or pharyngeal muscle contraction, respectively •Dysphagia
Duration of illness	Tetanus toxin-induced effects are long lasting because recovery is believed to require the growth of new axonal nerve terminals. The usual duration of clinical tetanus is four to six weeks.

The severity is related to the incubation period of the illness and the interval from the onset of symptoms to the appearance of spasms, the longer the interval, the milder the clinical features of tetanus. More severe illness is seen in those with deep penetrating wounds

Risk factors for neonatal tetanus

1. Unvaccinated mother
2. Home delivery
3. Septic cutting of the umbilical cord
4. Neonatal tetanus in a previous child
5. Infectious substances applied to the umbilical stump, such as animal dung, mud

Tetanus usually occurs in persons who are not immunized, partially immunized or fully immunized but lacking adequate booster doses.

Treatment and Management

Treatment modality	Advantages and Disadvantage	Summary of findings and level of confidence	Recommendation
Halting toxin production			
Wound management	Eliminate conditions ideal for spore germination		All patients with tetanus should undergo wound debridement to eradicate spores and necrotic tissue

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Treatment and Management (cont)			
Antimicrobial therapy	Metronidazole use has a theoretical advantage over penicillin use as the latter can potentially facilitate tetanospasmin activity	The first study to compare penicillin and metronidazole found a greater reduction in mortality in the metronidazole group. However, in three subsequent studies, there was no difference in mortality in patients treated with penicillin and those treated with metronidazole. In one of the former studies, patients receiving metronidazole required fewer muscle relaxants and sedatives. Level of confidence B	Metronidazole (500 mg intravenously [IV] every six to eight hours) is the preferred treatment for tetanus, but penicillin G (2 to 4 million units IV every four to six hours) is a safe and effective alternative. Suggested treatment duration of 7 to 10 days
Neutralization of unbound toxin			
Administration of immunoglobulins	Administration of immunoglobulins is beneficial. The best route of administration (intramuscular alone versus intrathecal plus intramuscular) is debatable	Evidence from two meta-analyses are conflicting	Human tetanus immune globulin (HTIG) is the preparation of choice. recommend a single dose of 500 units intramuscularly. The previously recommended dose range was 3000 to 6000 units. Given as soon as the diagnosis of tetanus is considered, with part of the dose infiltrated around the wound
Control of muscle spasms			

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Treatment and Management (cont)			
Benzodiazepines and other sedatives	Advantages: combined sedative, anticonvulsant and muscle relaxant effects Disadvantages: prolonged duration of action with long-acting drugs.	Used as standard therapy	Usual starting dose of diazepam for an adult is 10 to 30 mg IV and repeated as needed every 1 to 4 hours.
Neuromuscular blocking agents	Used when sedation alone is inadequate. Pancuronium, a long-acting agent, has been traditionally used, but it may worsen autonomic instability because it is an inhibitor of catecholamine reuptake	Evidence is limited to a few case series (level of evidence C)	Vecuronium or other cardiovascular inert neuromuscular blockers are preferred. Intrathecal baclofen given as an initial bolus in a dose ranging from 40 to 200 mcg followed by a continuous infusion of 20 mcg/hour was found to control spasms and rigidity
Autonomic dysfunction			
Magnesium sulphate	Advantages: readily available in resource-limited settings, has anticonvulsant, muscle relaxant properties, Disadvantages: needs close monitoring, Risk of hypocalcaemia, Less effective in severe disease	Meta-analysis shows no mortality benefit (level of evidence A)	Magnesium sulfate (loading dose 40 mg/kg over 30 minutes, followed by continuous infusion of either 2 g per hour for patients over 45 kg or 1.5 g per hour for patients ≤45 kg). During magnesium infusion, the patellar reflex needs to be monitored

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Treatment and Management (cont)

Beta blockade	Labetalol has frequently been administered because of its dual alpha- and betablocking properties. Beta blockade alone (propranolol)should be avoided because of reports of sudden death	Evidence limited to case reports and few case series (level of evidence C)	Use may be reasonable on a case by case basis Labetalol (0.25 to 1 mg/min) Morphine sulfate (0.5 to 1 mg/kg per hour by continuous intravenous infusion)

Level of evidence:A, data derived from multiple randomized clinical trials or meta-analysis; B, data derived from a single randomized trial or non-randomized trials; C, only consensus opinion of experts, case studies or standard of care.
GABA antagonist effect of penicillins and third-generation cephalosporins, may lead to central nervous system (CNS) excitability thus not recommended during treatment.

Supportive management

Prophylactic treatment with sucralfate or protein pump inhibitors may be used to prevent gastroesophageal hemorrhage from stress ulceration

Prophylaxis of thromboembolism with heparin, low molecular weight heparin, or other anticoagulants should be administered early

Physical therapy should be started as soon as spasms have ceased, since tetanus patients often are left with disability from prolonged muscle wasting and contractures

All patients require full tetanus toxoid immunization at recovery; having the infection does not give future immunity

HTIG should be administered at different sites than tetanus toxoid.
Intravenous immune globulin may be administered as an alternative if HTIG is not available

Prognosis

An established scale can be used to predict the prognosis of tetanus. One point is given for each of the following:
- Incubation - shorter than 7 days
- Onset - less than 48 hours
- Causes of tetanus - burns, surgical wounds, septic abortion, umbilical stump, compound fractures, or intramuscular injection
- Addiction to opiates
- Generalized tetanus
- Temperature - more than 104 F (40 C)
- Tachycardia - more than 120/min (150/min in neonates)

The total score indicates disease severity:
0-1 - mortality of less than 10%
2-3 - mortality of 10-20%

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Prognosis (cont)

4 - mortality of 20-40%
5-6 - mortality of more than 50%.

Some patients develop hypotonia and autonomic dysfunction that lasts for months or years. Even those who survive, need tetanus toxoid as the infection does not confer immunity.

Differential diagnosis

1. Drug-induced dystonias such as those due to phenothiazines
2. Trismus due to dental infection
3. Strychnine poisoning due to ingestion of rat poison
4. Malignant neuroleptic syndrome
5. Stiff-person syndrome

The only condition that mimics tetanus the **most** is strychnine poisoning. One of the typical symptoms of tetanus is trismus which may be present in many other conditions.

Complications

Vocal cord paralysis leading to respiratory distress
Hysteria
Neoplasms
Malignant hyperthermia
Autonomic dysfunction- leading to hypertension
Asphyxia
Long bone fractures
Paralytic ileus
Joint dislocation
Aspiration pneumonia
Pressure sores
Stress ulcers
Coma
Nerve palsy
Urine retention
Seizures

Sympathetic overactivity is the most significant cause of tetanus-associated mortality in critical patients

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References

Bae C, Bourget D. Tetanus. [Updated 2020 Feb 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459217/

Centers for Disease Control and Prevention. Tetanus. https://www.cdc.gov/vaccines/pubs/surv-manual/chpt16-tetanus.html (Accessed on February 24, 2020).

Kyu HH, Mumford JE, Stanaway JD, et al. Mortality from tetanus between 1990 and 2015: findings from the global burden of disease study 2015. BMC Public Health 2017; 17:179.

Rodrigo C, Fernando D, Rajapakse S. Pharmacological management of tetanus: an evidence-based review. Crit Care 2014; 18:217.

Yen LM, Dao LM, Day NPJ. Management of tetanus: a comparison of penicillin and metronidazole. Symposium of antimicrobial resistance in southern Viet Nam, 1997.

Thwaites CL, Yen LM, Loan HT, et al. Magnesium sulphate for treatment of severe tetanus: a randomised controlled trial. Lancet 2006; 368:1436.

Buchanan N, Smit L, Cane RD, De Andrade M. Sympathetic overactivity in tetanus: fatality associated with propranolol. Br Med J 1978; 2:254.

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