TETANUS

Comprehensive study notes

Definition

- Tetanus is an acute, life-threatening condition caused by **neurotoxin tetanospasmin** from *Clostridium tetani*.
- Characterized by **muscle stiffness, spasms**, and **nervous system dysfunction**.
- Caused by toxin, **not by direct bacterial invasion**.
- Onset is insidious, starting from **jaw stiffness (trismus)** and progressing to generalized rigidity.
- No person-to-person transmission; infection occurs through **environmental exposure to spores**.
- Often follows **unclean injuries**, especially in settings with poor wound care.
- Disease progression can involve **autonomic dysfunction** and **respiratory muscle paralysis**.
- Remains a **major public health threat** in low-resource settings.
- Can occur at any age but especially dangerous in **newborns and elderly**.
- **Completely preventable** through vaccination and proper wound management.

Causative Agent: *Clostridium tetani*

- **Gram-positive**, rod-shaped, anaerobic bacterium.
- Forms **terminal spores** giving a characteristic **drumstick appearance**.
- Spores are **extremely resistant** to heat, drying, and disinfectants.
- Found naturally in **soil, dust, animal feces**, and on rusty objects.
- Spores can remain dormant in the environment for **years**.
- Becomes active under **anaerobic conditions** in wounds.
- Produces two toxins: **Tetanospasmin** (neurotoxin) and **Tetanolysin** (hemolysin).
- Non-invasive—disease results from **toxemia**, not infection.
- Common in **tropical climates** with poor hygiene and sanitation.
- Can enter through **minor injuries**, unnoticed by the patient.

Mode of Transmission

- Entry through **puncture wounds, lacerations, or surgical wounds**.
- High-risk wounds: **burns, animal bites, compound fractures**, and dental procedures.
- **Rusty metal** associated due to deeper wounds and anaerobic conditions.
- Infection from **contaminated instruments or traditional practices** (e.g., tattoos, piercings).
- **Neonatal tetanus** arises from **unhygienic cutting of umbilical cord**.
- Spores require **anaerobic, devitalized tissue** to activate.
- No human-to-human transmission.
- Found worldwide, but more prevalent in **developing countries**.
- **Intramuscular injections** or IV drug use with non-sterile needles can also be a source.
- Can occur **post-surgically** if sterilization is inadequate.

Pathogenesis

- Spores enter through the wound and **germinate in anaerobic conditions**.
- Vegetative forms release **tetanospasmin**.
- Toxin travels via **motor neurons** to the spinal cord and brainstem.
- Binds irreversibly to **presynaptic terminals**.
- Blocks release of **GABA and glycine**, the major inhibitory neurotransmitters.
- Results in **disinhibition of motor reflexes** → hyperactivity and spasm.
- No effect on sensory nerves → patient is conscious but in pain.
- Toxin also affects **autonomic neurons**, causing unstable BP, HR.
- Very small amounts of toxin can cause **severe symptoms**.
- Natural infection **does not confer immunity**—vaccination still needed.

Clinical Features

- **Trismus (lockjaw)** is often the earliest and most specific symptom.
- **Muscle rigidity** in jaw, neck, and back, progressing to full-body spasms.
- **Painful generalized muscle spasms** triggered by light, sound, or touch.
- **Risus sardonicus**: sustained facial muscle contraction causing a grin.
- **Opisthotonus**: extreme hyperextension and arching of the back.
- **Dysphagia and drooling** due to pharyngeal muscle involvement.
- Respiratory compromise due to diaphragm and intercostal spasms.
- **Autonomic instability**: fever, sweating, tachycardia, BP fluctuations.
- In **neonates**, presents with refusal to feed and rigidity.
- Consciousness remains **intact**, distinguishing it from CNS infections.

Diagnosis

- Primarily **clinical**, based on signs and history of injury.
- History of **lack of immunization or contaminated wound** supports diagnosis.
- **Culture of wound** may grow *C. tetani*, but often negative.
- **No blood tests** confirm tetanus—diagnosis remains clinical.
- **Spatula test**: reflex jaw clenching when spatula touches pharynx.
- CSF usually **normal**, which helps rule out meningitis.
- **Serum antitoxin levels** may help assess immunity, not diagnosis.
- **EMG** may show sustained muscle activity without relaxation.
- **No pathognomonic test**; diagnosis based on pattern of symptoms.
- WHO criteria used for **neonatal and maternal tetanus surveillance**.

Treatment

- **Clean and debride** the wound thoroughly to remove source of toxin.

- Start antibiotics—**Metronidazole** preferred due to less GABA inhibition.
- **Tetanus Immunoglobulin (TIG)** IM to neutralize unbound toxin.
- **Diazepam or Midazolam** for muscle spasm control.
- **Magnesium sulfate** may help in autonomic dysfunction and sedation.
- Admit to ICU for **airway management and supportive care**.
- Use of **ventilator support** if respiratory muscles are compromised.
- Provide **nutrition via NG tube** due to jaw and throat spasms.
- Pain control with **opioids and sedatives**.
- Start **active immunization** with TT, even during treatment.

🛡️ Prevention

- **Vaccination with Tetanus Toxoid (TT)** is the most effective measure.
- Given as part of **DPT, Td, or Tdap** vaccines.
- Immunization schedule includes **3 primary doses + 2 boosters** in infancy and childhood.
- **Pregnant women** given 2 doses of TT for maternal and neonatal protection.
- **Post-exposure prophylaxis** with TT and TIG for high-risk wounds.
- **Clean delivery practices** to prevent neonatal tetanus.
- **Surgical and trauma care** protocols include tetanus prophylaxis.
- Adults should receive **booster every 10 years**.
- Immunization of **injury-prone occupations** (farmers, welders) is critical.
- **Community awareness** and outreach for vaccine coverage expansion.

Public Health Importance

- Tetanus is a **notifiable disease** under Integrated Disease Surveillance.
- WHO aims for **elimination of maternal and neonatal tetanus (MNT)**.
- High burden in areas with **low immunization and poor sanitation**.
- Tetanus vaccine is part of the **Universal Immunization Program (UIP)**.
- High mortality rate—**case fatality can exceed 50%** without ICU.
- **Tetanus-prone injuries** must be identified early in healthcare settings.
- Essential part of **disaster response and conflict area medical care**.
- Focus on **skilled birth attendance** and clean delivery kits in rural areas.
- Ongoing **surveillance and vaccination campaigns** needed.
- **Health education** about wound care and vaccine compliance is crucial.

🧠 Mnemonic for Clinical Features: "STIFF BACK"

- **S**pasms
- **T**rismus (Lockjaw)
- **I**nvoluntary contractions
- **F**ever
- **F**acial grimace (Risus sardonicus)
- **B**ack arching (Opisthotonus)
- **A**utonomic dysfunction
- **C**onvulsions

- **K**iller if untreated

Mero healthline