

Current recommendations for treatment of tetanus during humanitarian emergencies

WHO Technical Note

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Preface

The purpose of this technical note is to provide health professionals in United Nations agencies, nongovernmental organizations, donor agencies and local authorities working with populations affected by emergencies with up-to-date technical guidance on the clinical management of tetanus in emergency-affected populations, particularly following natural disasters.

The clinical management of communicable diseases such as tetanus represents a significant challenge to those providing health-care services in evolving situations. It is hoped that this technical note will facilitate activities to control communicable diseases among agencies working with emergency-affected populations.

Background

Tetanus is an acute, toxin-mediated disease caused by *Clostridium tetani*. Under favourable anaerobic conditions, such as in dirty, necrotic wounds, this ubiquitous bacillus may produce tetanospasmin, an extremely potent neurotoxin. Tetanus toxin blocks inhibitory neurotransmitters in the central nervous system, resulting in muscular stiffness and spasms that are typical of tetanus. The disease can affect any age group and case-fatality rates are high (10-80%) even where modern intensive care is available. There is no natural immunity against tetanus; protection can be provided by active immunization with tetanus toxoid-containing vaccine*, (TT: formalin-inactivated tetanus toxin) or administration of an anti-tetanus antibody (tetanus-specific immunoglobulin, TIG).¹

Transmission and clinical characteristics

Tetanus is not transmitted from person to person. Infection occurs when *C. tetani* spores are introduced into acute wounds from trauma, surgeries and injections, or chronic skin lesions and infections. Cases have resulted from wounds that were considered too trivial to warrant medical attention. The incubation period of tetanus is usually between three and 21 days (median 7 days). Shorter incubation periods (<7 days) along with delays in seeking treatment are associated with fatal outcomes. **Outbreaks of tetanus** related to injuries associated with natural disasters such as earthquakes and tsunamis have been documented^{2,3}.

Tetanus is characterized by muscle rigidity and painful muscle spasms. In generalized tetanus (the most common form), stiffness and pain often begin in the jaw muscles (trismus or “lock jaw”) and/or neck, shoulder and abdominal muscles. Early in the disease course, spasms are triggered by sensory stimuli such as touch, loud noises and bright lights. As the disease progresses, muscle groups throughout the body are affected and spontaneous generalized seizure-like tetanospasms develop. In the absence of the ability to provide ventilatory support, death is usually due to respiratory failure. Autonomic dysfunction, including hypertension and tachycardia alternating

* Tetanus toxoid is available as a single antigen vaccine (TT), and in combination with diphtheria toxoid and/or pertussis vaccine (DT, Td, DTwP, DTaP or dTap). Preparations with pediatric doses of diphtheria (D) and pertussis (P) vaccines are not recommended for use in those 7 years or older, however DT can be administered to all ages when Td is unavailable.

with bradycardia and hypotension can be present in more severe tetanus cases and is associated with a poorer prognosis.

Diagnosis

Tetanus diagnosis is strictly clinical; there are no confirmatory laboratory tests. The WHO definition of adult tetanus requires at least one of the following signs: trismus (inability to open the mouth) or risus sardonicus (sustained spasm of the facial muscles); or painful muscular contractions. Although this definition requires a history of injury or wound, tetanus may also occur in patients who are unable to recall a specific wound or injury.

Treatment of tetanus disease

General measures: if possible a separate ward/location should be designated for tetanus patients. Patients should be placed in a quiet shaded area and protected from tactile and auditory stimulation as much as possible. All wounds should be cleaned and debrided as indicated.

Immunotherapy: if available, administer human TIG 500 units by intramuscular injection or intravenously (depending on the available preparation) as soon as possible; in addition, administer age-appropriate TT-containing vaccine, 0.5 cc by intramuscular injection at a separate site. [Tetanus disease does not induce immunity; patients without a history of primary TT vaccination should receive a second dose 1–2 months after the first dose and a third dose 6–12 months later.]

Antibiotic treatment: metronidazole is preferred (500 mg every six hours intravenously or by mouth); Penicillin G (100,000–200,000 IU/kg/day intravenously, given in 2–4 divided doses). Tetracyclines, macrolides, clindamycin, cephalosporins and chloramphenicol are also effective.

Muscle spasm control: benzodiazepines are preferred. For adults, intravenous diazepam can be given in increments of 5 mg, or lorazepam in 2 mg increments, titrating to achieve spasm control without excessive sedation and hypoventilation (for children, start with doses of 0.1–0.2 mg/kg every 2–6 hours, titrating upward as needed). Large amounts may be required (up to 600 mg/day). Oral preparations could be used but must be accompanied by careful monitoring to avoid respiratory depression or arrest.

Magnesium sulphate can be used alone or in combination with benzodiazepines to control spasm and autonomic dysfunction: 5 gm (or 75mg/kg) intravenous loading dose, then 2–3 grams per hour until spasm control is achieved. To avoid overdose, monitor patellar reflex as areflexia (absence of patellar reflex) occurs at the upper end of the therapeutic range (4mmol/L). If areflexia develops, dose should be decreased.

Other agents used for spasm control include baclofen, dantrolene (1–2 mg/kg intravenous or by mouth every 4 hours), barbiturates, preferably short-acting (100–150 mg every 1–4 hours in adults; 6–10 mg/kg in children; by any route), and chlorpromazine (50–150 mg by intramuscular injection every 4–8 hours in adults; 4–12 mg every by intramuscular injection every 4–8 hours in children).

Autonomic dysfunction control: magnesium sulphate as above; or morphine. Note: β -blockers such as propranolol were used in the past but can cause hypotension and sudden death; only esmolol is currently recommended.

Airway / respiratory control: drugs used to control spasm and provide sedation can result in respiratory depression. If mechanical ventilation is available, this is less of a problem; if not, patients must be carefully monitored and medication doses adjusted to provide maximal spasm and autonomic dysfunction control while avoiding respiratory failure. If spasm, including laryngeal spasm, is impeding or threatening adequate ventilation, mechanical ventilation is recommended when possible. Early tracheostomy is preferred as endotracheal tubes can provoke spasm and exacerbate airway compromise.

Adequate fluids and nutrition should be provided, as tetanus spasms result in high metabolic demands and a catabolic state. Nutritional support will enhance chances of survival.

Prior to the availability of a vaccine and mechanical ventilation (during the 1920s–30s), careful monitoring and nursing care improved survival. If patients can be supported through one to two weeks of spasm and other complications, the chances of complete recovery greatly increase, particularly in non-elderly and previously healthy patients.

1 World Epidemiological Record. Tetanus vaccine: WHO position paper. 2006, 81, 197–208.

2 Aceh epidemiology group. Outbreak of tetanus cases following the tsunami in Aceh Province, Indonesia. *Glob Public Health*. 2006;1(2):173-7.

3 Sutiono AB, Qiantori A, Suwa H, Ohta T. Characteristic tetanus infection in disaster-affected areas: case study of the Yogyakarta earthquakes in Indonesia. *BMC Res Notes*. 2009 Mar 6;2:34.