



## Tetanus

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### Introduction

Tetanus is an acute, vaccine-preventable disease caused by an exotoxin (tetanospasmin) produced by *Clostridium tetani*. *C. tetani* is a slender Gram positive anaerobic rod, which is heat sensitive and cannot survive in the presence of oxygen. It develops a terminal spore that is resistant to heat, antiseptics, phenol and other chemical agents. Tetanus occurs worldwide and tetanus spores are present in soil and the faeces of a number of animals [1].

### Epidemiology

#### Global epidemiology

The organism that causes tetanus, *Clostridium tetani* is ubiquitous throughout the world. As the disease is acquired through environmental exposure, it is one of the few vaccine-preventable diseases that is infectious but not contagious from human-to-human. The incidence of tetanus in a country or region depends on vaccine coverage in both children and adults. In resource-rich countries, such as the UK, vaccine coverage is high [2] and the number of tetanus cases reported is very low. In resource-poor countries however, vaccine coverage is variable and the incidence tends to be higher.

The World Health Organization (WHO) reported 15,516 worldwide cases of tetanus in 2005, and an estimated 290,000 deaths between 2000 – 2003; most of these cases occurred in neonates [3, 4].

Neonatal tetanus is an important problem in resource-poor countries where routine vaccination coverage may not be adequate and unclean procedures are practiced such as when the umbilical cord is cut after childbirth. The 1989 World Health Assembly set a goal to eliminate neonatal tetanus globally (definition of elimination being <1 cases per 1000 live births in each health district in every country) by 2000; this has not yet been achieved but progress has been made [5]. In 2003, there were 8,997 cases of neonatal tetanus reported to the WHO; 78% of those were reported from ten countries; four countries in sub-Saharan Africa (465 in Democratic Republic of the Congo, 353 in Chad, 316 in Uganda, 238 in Guinea), three in SE Asia (2,245 in China, 238 in Cambodia, 239 in the Philippines), and three in the Indian sub-continent (1,691 in India, 812 in Pakistan, 390 in Bangladesh) [6]. Since the elimination goal was set, the global number of cases reported has decreased for both neonatal cases and total tetanus cases, although the numbers must be interpreted with caution as there is great variability in reporting systems. For example, some countries such as China and Chad only report neonatal cases, and some countries are unable to submit any data for some years.

## **Tetanus in travellers from England and Wales**

Tetanus is occasionally reported in England and Wales. Since 1991, there has been an average of eight cases reported each year; there have been no cases of neonatal tetanus in England and Wales for over 30 years [7]. The majority of cases reported between 1984 and 2003 occurred in those over 65 years of age, probably because they were born before routine vaccination schedules for tetanus were implemented. In 2003 nine of the 12 reported cases occurred in injecting drug users (IDUs) aged between 20 and 47 years [8,9]. Tetanus can be caused by contamination of drugs with spores of drugs during the production, distribution, storage, cutting, reconstitution and injection of drugs [8]. In 2004, 23 cases were reported, fifteen of them in IDU's. One case died. Tetanus associated with foreign travel is rarely reported in England and Wales [9].

## **Tetanus in travellers from Scotland**

During 2003 and 2004 there were three cases reported in Scotland.

## **Risks for Travellers**

Tetanus is uncommon in most resource-rich countries of the western hemisphere; the WHO Western Pacific and European regions have largely controlled clinical tetanus through universal vaccination. However, no country is free of *C. tetani*, so maintaining immunity in travellers is important [10,11,12].

## **Transmission**

Tetanus spores are present in the intestine of most mammals including horses, sheep, cattle, dogs, cats, rats, guinea pigs and chickens. They are passed into soil via faeces, making them ubiquitous in the environment. The disease is acquired when material containing tetanus spores contaminates a wound that could be major or minor in severity. Wounds with a high risk for tetanus are those that show one or more of the following: devitalised tissue, deep puncture, contact with soil or manure, and clinical evidence of sepsis [10]. In resource-rich regions of the world many cases are associated with IDUs, when the drugs, injecting equipment or puncture site may be contaminated [13,14]. In anaerobic conditions spores germinate and tetanospasmin is produced which disseminates throughout the body via the blood, leading to the clinical symptoms of tetanus [10, 14].

## **Signs and symptoms [1,15]**

The incubation period of the disease is usually a week, but ranges from 3 to 21 days. Generally, the further the injury site is from the central nervous system the longer the incubation period. The risk of fatality is highest in persons who have the shortest incubation period.

Signs and symptoms can be categorised according to the type of symptoms:

### **Local tetanus**

This is a rare and mild form of the disease. Local tetanus is characterised by persistent contraction of muscles in the same anatomic area as the injury, and may persist for several weeks before gradually subsiding. In some cases local symptoms may precede the development of generalised tetanus.

### **Cephalic tetanus**

Cephalic tetanus is a form of generalized tetanus, occurring when the tetanus spores enter through the middle ear, following a middle ear infection or a head injury. Generalised disease may or may not develop and prognosis is often poor.

### **Generalised tetanus**

Generalised tetanus accounts for about 80% of cases worldwide. After a period of general malaise, trismus (also known as lockjaw) develops. This is characterised by spasm of the facial muscles and produces a characteristic grinning expression (risus sardonicus). Stiffness of the neck, difficulty in swallowing, and rigidity of muscles in the back, thorax and extremities follow. Autonomic dysfunction is seen with the temperature rising between 2°C and 4°C above normal, sweating, elevated blood pressure, and episodic rapid heart rate. Spasms lasting for several minutes also may occur and continue for 3 to 4 weeks.

Complications include respiratory failure, aspiration pneumonia and fractures of the spine or long bones resulting from sustained contractions/convulsions. With intensive medical support, death from tetanus occurs in 10-20% of cases.

### **Neonatal tetanus**

Neonatal tetanus is the main form of tetanus in resource-poor areas of the world. Illness begins three to 14 days after birth. Without specific treatment death occurs in more than 95% of cases; even with therapy mortality is still 25-90% [15]. Death usually occurs secondary to infection of the umbilical stump if the end is cut with unsterilised instruments. The custom in some cultures is to smear animal dung on the open end of the stump. Failure to thrive, poor sucking, grimacing and irritability are quickly followed by intense rigidity and spasms.

### **Treatment [10]**

All wounds must be cleaned and debrided (if necessary) to make conditions less favourable for production of tetanospasmin.

Tetanus toxoid and human tetanus immune globulin should be given depending upon the vaccination status of the patient.

Intravenous antibiotics should be given to kill *C. tetani*.

Benzodiazepines can be used for sedation and to control the spasms. A neuromuscular blocker may be necessary.

Intubation and respiratory support if needed.

Intensive medical and nursing care in quiet, darkened conditions.

### **Prevention**

Effective vaccination is available and all persons should be immunised regardless of age.

Travellers should be up to date on their tetanus immunisation, be aware of the risk of accidents while travelling, and the importance of seeking urgent medical attention in the case of a penetrating wound [11,12].

### **Tetanus Vaccination Information**

The Summary of Product Characteristics (SmPC) for the individual vaccine should be consulted for specific information relating to the product [16,17,18]. Tetanus toxoid vaccine is now only available as a combination vaccine.

## Indications for use of vaccine

For immunization against diphtheria and/or tetanus and/or polio in travellers over 10 years, who need a primary course or booster doses [10].

Travellers to areas where medical attention may not be accessible if a tetanus prone injury occur and whose last dose of a tetanus-containing vaccine was more than 10 years previously, should receive a booster dose of Td/IPV, even if the individual has received 5 doses of vaccine previously.

## Availability of vaccine

Details of the current tetanus-containing vaccines are found in the summary table.

## Vaccine Schedules [16,17,18]

Vaccine	Manufacturer/distributor	Schedule	Length of protection	Age range
Pediacel® (16) (diphtheria, tetanus, 5 component acellular pertussis, inactivated polio vaccine and Haemophilus influenzae type b vaccine – DTaP/IPV/Hib)	Sanofi Pasteur MSD	Primary immunisation at 2, 3 and 4 months	Three years DTaP/IPV and life for Hib	2 months – 10 years
Repevax® (17) (low dose diphtheria, tetanus 5 component acellular pertussis and inactivated polio vaccine – dTaP/IPV)	Sanofi Pasteur MSD	Pre-school booster; single dose	Seven years for the dT/IPV. No data on aP.	3 years, 4 months – 5 years
Revaxis® (18) (low dose diphtheria, tetanus and inactivated polio vaccine Td/IPV)	Sanofi Pasteur MSD	Single dose booster.	10 years.	10 years and over

## Interrupted courses

It is not necessary to restart an interrupted series of a vaccine or toxoid or to add extra doses; the normal schedule should be resumed as soon as possible. Longer than recommended intervals between doses do not reduce final antibody concentrations, although protection may not be attained until the recommended number of doses has been administered.

### Pediacel® [16]

There is no data regarding the administration of Pediacel® for one or two doses and use of different vaccines for other doses. Therefore it is recommended that infants who receive Pediacel® for the first dose should also receive this vaccine for the second and third doses of the primary immunisation series.

### Repevax® [17] & Revaxis® [18]

Not applicable, single dose.

## Contraindications [10,16,17,18]

Confirmed anaphylactic reaction to a previous dose of a tetanus containing vaccine or

A confirmed anaphylactic reaction to neomycin, streptomycin or polymyxin B (which may be present in trace amounts).

If an individual is acutely unwell, immunisation may be postponed until they have fully recovered. This is to avoid wrongly attributing any new symptom or the progression of symptoms to the vaccine.

Neurological complications of unknown origin within 7 days of previous vaccination

## Adverse Events

### **Pediacel® [16]**

In controlled clinical studies performed with Pediacel®, 71% of 451 infants immunised at 2, 4 and 6 months experienced a reaction (pain, erythema or oedema) at the injection site within the first 24 hours after vaccination. Also 64% of infants experienced a systemic reaction, which was of moderate to severe intensity in 16%.

### **Repevax® [17]**

#### **Children 5 to 6 years old**

In a clinical study, children were primed at 3, 5 and 12 months of age with a DTaP vaccine with no additional dose in the second year of life. These children received Repevax® at 5 to 6 years of age. The most frequently reported adverse events occurring during the first 24 hours included the following:

Very common (>10%): injection site pain and swelling; fatigue

Common (1-10%): injection site erythema and pruritis; fever > 38°C

Uncommon (0.1%-1%): Diarrhoea, vomiting

The rates of general symptoms after the first day but within 10 days after vaccination were low; only fever (> 38°C) and fatigue were reported in >10% of subjects. Transient severe swelling of the upper arm was reported in <1% of subjects.

#### **Children 3 to 5 years old**

150 children primed at 2, 3 and 4 months of age with DTwP vaccine (with no additional dose in the second year of life) received Repevax® at 3 to 5 years of age. The most frequently reported adverse reactions occurring during the first 7 days included the following:

Very common (>10%): injection site pain, erythema and swelling; fatigue, fever >37.5°C, irritability

Common (1-10%): injection site bruising and dermatitis; diarrhoea, vomiting and rash

### **Revaxis® [18]**

In clinical studies, the most common events occurring after vaccine administration were local injection sites reactions (pain, erythema, induration and oedema) reported by 65 to 80% of subjects in each trial. These usually had their onset with the 48 hours following vaccination and persisted for 1 to 2 days. These reactions are sometimes accompanied by injection site nodules.

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Committee to Advise on Tropical Medicine and Travel (CATMAT)  
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