Neonatal and Paediatric Tetanus

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Case 1

- 9 year old female, HIV uninfected
- Presented to ENT with:
- 5/7 history of sore throat
- 2/7 history of odynophagia and dysphagia (not able to swallow solids)
- No fever
- No history of trauma or foreign body ingestion

Examination

- Orientated
- BP109/56, PR 123/m, T 36.4
- No stridor, no hoarse voice, no visible neck swelling or lymphadenopathy
- Tonsils not enlarged or inflamed


BANE NKOSIFEZILE
R

Investigations

- FBC: WCC=16.77; Hb=13.9, MCV=86.3, Platelets=388
- CRP = 13

- Flexible laryngoscope – Normal
- Contrast swallow- Delayed gastric emptying

Progress

- Unable to swallow water or secretions
- Mother thinks child is ? ‘Faking it’
- Unable to walk to the toilet at times
- Referred to Paediatrics

Examination

- Tearful but orientated to time, place and person
- Pupils equal and reactive to light
- Lying stiffly in bed
- Apyrexial, normal vitals
- Growing well previously, no significant loss of weight
- Secretions+++
- Difficulty in talking ? Bitten the side of the tongue

Examination

- Normal CVS and respiratory exams
- Abdomen:
  - Difficult to examine, rigid but not tender
- CNS:
  - ? Meningism (stiff neck)
  - Tone increased in arms and legs
  - Normal reflexes

Investigations

- Normal CT brain
- LP
  - opening pressure = 9mmHg
  - 0 polys and 0 lymphs,
  - Protein=0.17; Glucose = 3.17
- Normal calcium, magnesium and phosphate

Management

- NG tube inserted as child was unable to eat
- During insertion of NG tube, child became apnoeic and blue
- ? Seizure – stiff with tongue thrusting

- Loaded with phenytoin with some improvement

Progress

- Rigid, opisthotonic
- Developed trismus
- Two further episodes of stiffening with significant obstruction of breathing
- Second episode required CPR and oxygen sats dropped to 39% with associated bradycardia

- EEG: normal
- Mom bought RTHC – no 5 year immunisations chartered

Tetanus

- Diagnosis of exclusion
- Neurology consult ?? Dystonic reaction – no response to orphenadrine (biperiden not available)

Management

- Tetanus toxoid vaccine given
- Unable to access human tetanus immune globulin, pooled intravenous immunoglobulin given instead
- Intubated and transferred to Nelson Mandela Children's Hospital for ongoing ICU care

Management

- Tracheostomy done
- Recurrent spasms requiring benzodiazepines
- No autonomic instability


STORZ

Case 2

- 7 day old male
- Mom 17 year old scholar
- Primary caregiver gran
- NVD at term , BW=2.9kg
- From informal settlement in North West Province

history

- Presented to Klerksdorp Hospital Casualty
- 3-day history of irritability, poor feeding and episodes of jerkiness (?convulsions)

- Weight = 2 200 g
- Dehydrated
- Ophisthotonic posturing with spasmic movements
- No dysmorphism
- Presumptive seizures were aborted with clonazepam and phenobarbitone

Picture: WHO_SurveillanceVaccinePreventable_14_NeonatalTetanus_R1.pdf/14

- Metabolic acidosis
- Hyponatraemia
- Hyperkalaemia
- Hypocalcaemia
- Normal glucose
- Normal LP, cranial ultrasound
- No evidence of sepsis

Differential diagnosis

- Neonatal sepsis with meningitis
- Neonatal convulsions ? aetiology
- ? Congential Adrenal Hyperplasia
- Neonatal tetanus

progress

- Intubated for airway protection
- Benzodiazepines for seizures
- No clinical improvement

progress

Neonatal tetanus – diagnosed on D4

No tetanus immunoglobulin given

Tetanus toxoid given

Spasms were intractable:

- Phenobarbitone, phenytoin, clonazepam, midazolam, levetiracetam and eventually lignocaine
- MgSo4 as boluses and then infusion

progress

- Nursed in quiet environment and minimal handling
- Developed pneumonia
- Periods of apnoea
- Autonomic dysfunction – sudden episodes of bradycardia and increased bronchial secretions

progress

- Hypertonicity and scissoring noted after extubation
- Cranial ultrasound repeatedly normal

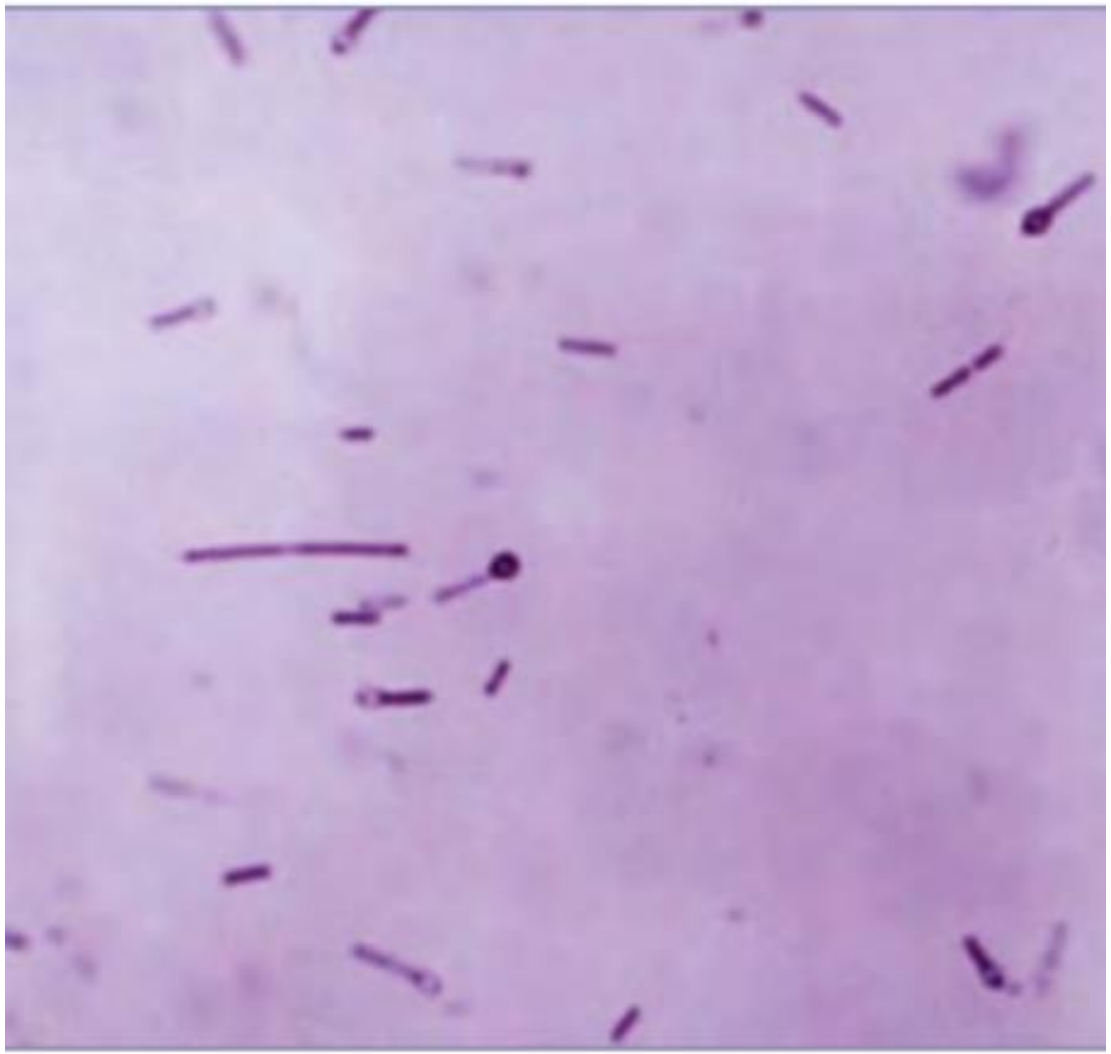
- Not seen:
  - Tendon and joint injury
  - Fractures
  - Hypotension

progress

- Extubated on D29
- Rehabilitation with multidisciplinary team
- During rehabilitation on D57 – grandmother disclosed that cow dung was applied to the umbilicus after delivery
- Appropriate neurodevelopmental milestones at 6 months of age and at 2 years of age

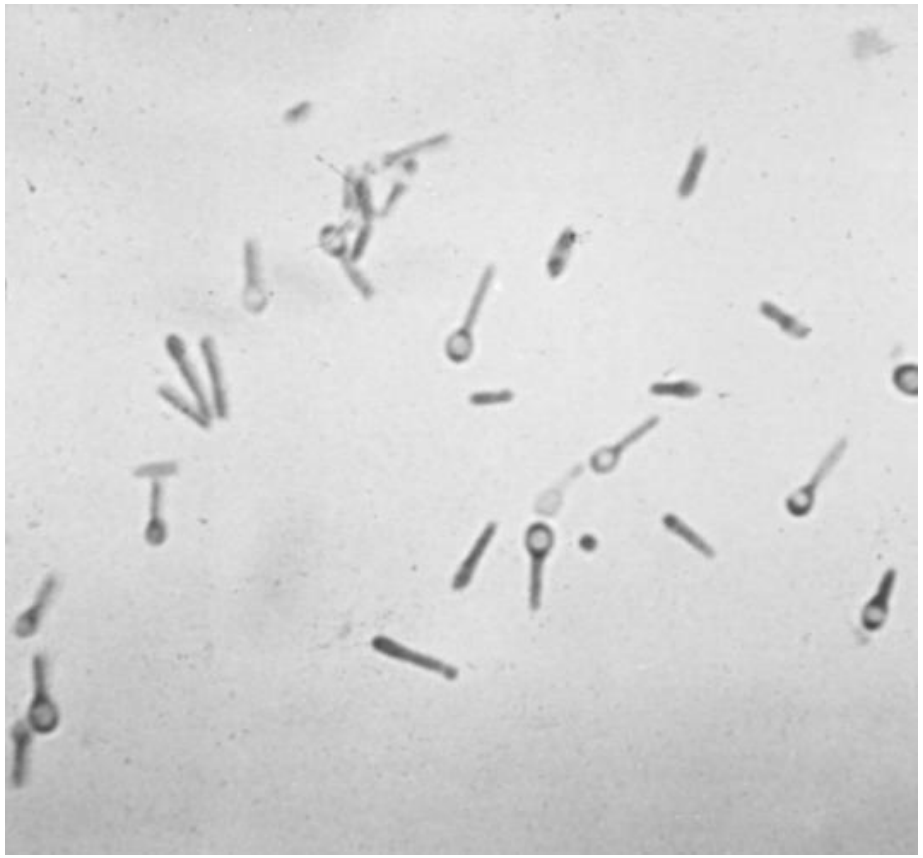
Tetanus

- Characterised by muscle spasms
- Caused by the toxin tetanospasmin released by *Clostridium tetani*
- Found in soil



	Aerobic	*Anaerobic*
Large spore forming	• Bacillus cereus • Bacillus anthracis	• Clostridium perfringens • Clostridium difficile • Clostridium botulinum • Clostridium tetani
Small non-spore forming	• Listeria monocytogenes • Corynebacterium diphtheriae • Aerobic actinomycetes (incl Nocardia spp)	• Proprionibacterium • Lactobacillus spp

Gram positive bacilli classification



Causes and Risk Factors

- Lacerations, punctures, chronic wounds, skin ulcers, animal bites, fissures of foot, burns, postsurgical sites
- Anaerobic conditions allow germination of spores
- Neonatal tetanus: Umbilical cord is cut with nonsterile instrument or contaminated by unclean conditions

Tetanospasmin

A potent plasmid-encoded exotoxin produced by C tetani

Binds to gangliosides at the myoneural junction of skeletal muscle, blocking inhibitory impulses to motor neurons

4 overlapping clinical forms

1. Generalised Tetanus (Lockjaw)
2. Local
3. Cephalic
4. Neonatal

Generalised Tetanus

- Trismus
- Severe muscular spasms
- Onset is gradual, occurring over 1 to 7 days
- Symptoms progress to severe, painful generalized muscle spasms, which are often aggravated by any external stimulus.
- Autonomic dysfunction

Risus Sardonicus

Lancet 2019; 393: 2331

Image 134.4
The face of an infant with neonatal tetanus with risus sardonicus. Copyright Martin G. Myers, MD.

Trismus

Image 134.2
Trismus in an adult with tetanus. Courtesy of Charles Prober, MD.

Opisthotonus

Local Tetanus

manifests as local muscle spasms in areas contiguous to a wound

Image 134.8
A preschool-aged boy with localized tetanus secondary to the parent attempting to drain an impetigo lesion with a mesquite thorn contaminated with tetanus spores. Courtesy of Edgar O. Ledbetter, MD, FAAP.

Cephalic tetanus

- a dysfunction of cranial nerves associated with infected wounds on the head and neck
- Local and cephalic tetanus can precede generalized tetanus

FIG. 244.5 Cephalic tetanus. Right facial paresis is present in addition to the grimace. *(From Veronesi R, Focaccia R. The clinical picture. In: Veronesi R, ed.* Tetanus: Important New Concepts. *Amsterdam: Excerpta Medica;*

Neonatal Tetanus

Definition

- A neonate with the normal ability to suck and cry during the first 2 days of life, and
- between 3 and 28 days of age cannot suck normally and
- becomes stiff or has spasms

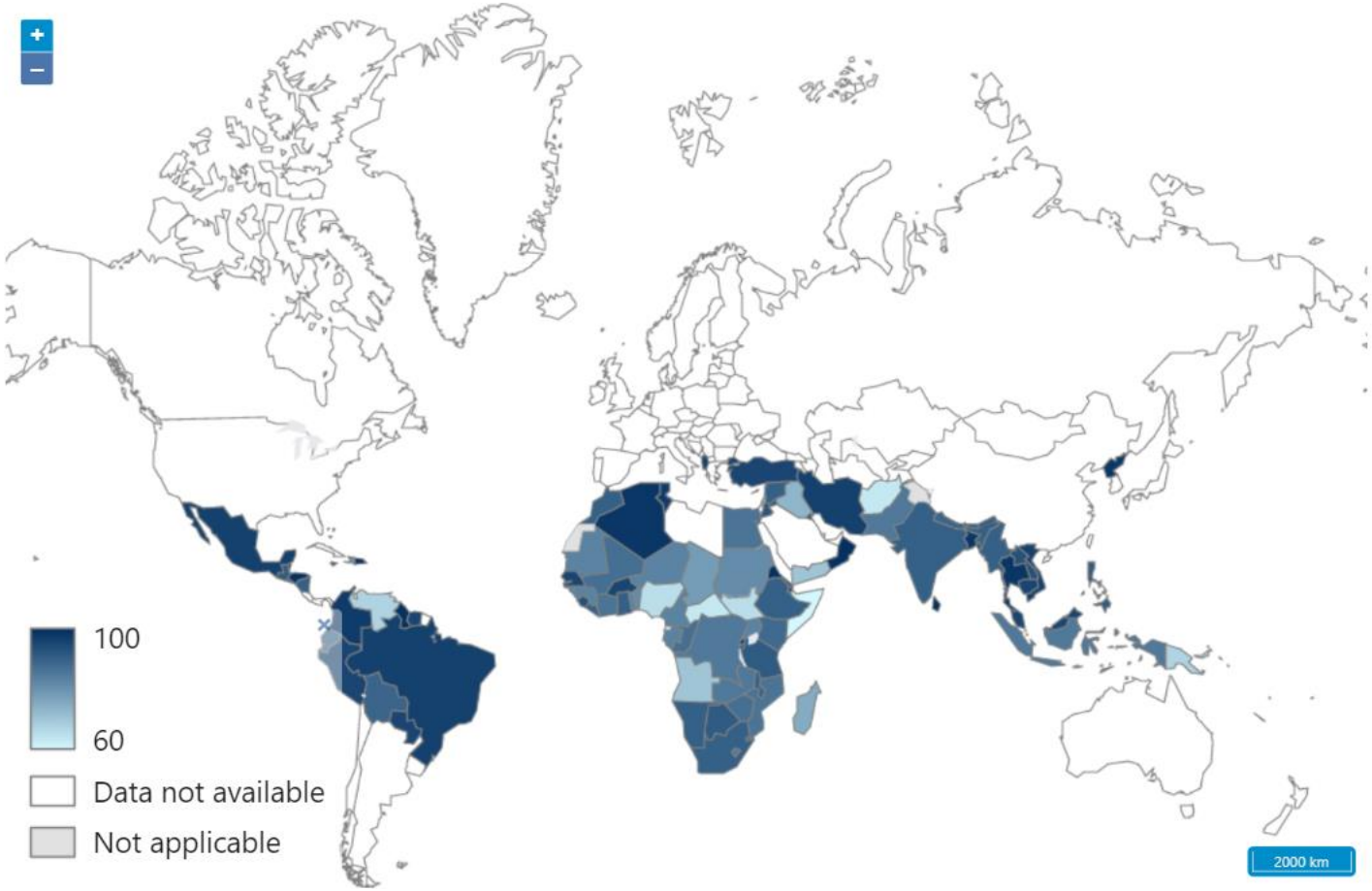
Neonatal Tetanus

- May occur in neonates born without passive immunity
- Usually through infection of the unhealed umbilical stump
- Mortality rate exceeds 90% and developmental delays are common among survivors

Neonatal Tetanus

- Poor prognostic factors:
  - Age < 10 days
  - Symptoms < 5 days before presentation
- Apnoea is leading cause of death in 1st week
- Sepsis is leading cause in 2nd week

Neonates protected at birth against neonatal tetanus (PAB) (%) WHO 2022



Neonatal tetanus (NT) elimination

- <1 NT case per 1,000 live births in a year in every district of a country

Neonatal tetanus affects the vulnerable …

- Women with no antenatal care and no TT, home delivery and untrained attendance
- Women who went for ANC but received no TT
- Women who deliver at health centre or at home, but practices were not be clean

➢ **Critical role of surveillance and sharing of findings for corrective actions with both, EPI and Maternal, Neonatal and Child Health (MNCH)**

Paediatric Tetanus

- Clinical diagnosis -Triad

1. Muscle rigidity
2. Muscle spasms
3. Autonomic instability

Diagnosis

Clinical diagnosis

- DDX:
  - Strychnine poisoning
  - Dystonic reactions –drug induced (e.g. phenothiazines)
  - Trismus due to dental infection
  - Stiff-person syndrome
  - Hypocalcaemic tetany
- Anti-tetanus antibodies

Culture of Wound

- Poor sensitivity and specificity
- *Clostridium tetani* is isolated from wounds in up to 30% of such cultures
- Growth of *Clostridium tetani* does not always indicate tetanus toxin production
- Growth of *Clostridium tetani* may be present without symptoms in adequately immunized persons

Treatment Goals

Prevent Disease Progression

Supportive and Symptomatic Care

Prevent Disease Progression

- Neutralize unbound toxin
  - Tetanus immune globulin (intramuscular)
- Tetanus toxoid vaccine (no immunity develops after natural infection)
- Halt toxin production with antibiotics and source control
  - Metronidazole or penicillin
  - Thorough wound cleaning and debridement

Supportive and symptomatic care

- ICU for airway management and to monitor for autonomic complications
- Intubation or tracheostomy
- Placed in a quiet, darkened part of the ICU

Supportive and symptomatic care

- Control muscle spasms and autonomic instability
  - Benzodiazepines
  - Propofol
  - Magnesium sulphate

Supportive and symptomatic care

- Nutritional support
- Fluids (high creatine kinase)
- Catheterise
- Physical therapy once spasms subsided

Prognosis

- Duration of disease: 4-6 weeks
- Fatality rate: 10-20% with optimal ICU care
- Neonatal mortality rates much higher

Prevention

1. Immunisation
2. Prophylactic wound management
3. Hygienic practices during childbirth and neonatal care

	Recommendation
Routine vaccination	
Infancy (<1 year)	Primary series of three doses (DTP3: DTwP or DTaP)
4–7 years	Tetanus toxoid-containing booster
12–15 years	Tetanus toxoid-containing booster
Adults (eg, first pregnancy or military service)	Tetanus toxoid booster—ie, total of 6 doses. For those receiving their first tetanus vaccine as adolescents or adults, a total of five appropriately spaced doses
Pregnant women with inadequate or unknown vaccination history	Two doses of tetanus toxoid-containing vaccine. An effort is made to complete a total course of five vaccinations (eg, postnatal visits and subsequent pregnancies)
All women of childbearing age in high-risk areas for maternal and neonatal tetanus	Three doses of tetanus toxoid, usually during a 12-month period

DTP3=diphtheria, tetanus, pertussis. DTwP=tetanus toxoid combined with diphtheria toxoid and whole-cell pertussis. DTaP=tetanus toxoid combined with diphtheria toxoid and acellular pertussis vaccines.

Table: **WHO recommendations for tetanus immunisation to prevent maternal and neonatal tetanus**[97]

Lancet 2015; 385: 362–70

Prevention Wound Management

- Clean
- Debride
- ? Tetanus-prone:
  - Wounds contaminated with dirt, soil, feces, or saliva
  - Wounds with presence of necrotizing or devitalized tissue
  - Penetrating or puncture injury
  - Frostbite
  - Burns
  - Crush injuries
  - Avulsions

Public Health England

NHS

Post exposure management for Tetanus Prone Wounds

Immunisation Status	Immediate treatment					Later treatment
	Clean wound[1]	Tetanus Prone		High risk tetanus prone		
Those aged 11 years and over, who have received an adequate priming course of tetanus vaccine[1] with the last dose within 10 years	None required	None required		None required		Further doses as required to complete the recommended schedule (to ensure future immunity)
Children aged 5-10 years who have received priming course and pre-school booster						
Children under 5 years who have received an adequate priming course						
Received adequate priming course of tetanus vaccine[3] but last dose more than 10 years ago	None required	Immediate reinforcing dose of vaccine		Immediate reinforcing dose of vaccine	One dose of human tetanus immunoglobulin[2] in a different site	
Children aged 5-10 years who have received an adequate priming course but no preschool booster						
(Includes UK born after 1961 with history of accepting vaccinations)						
Not received adequate priming course of tetanus vaccine[3] (Includes uncertain immunisation status and/or born before 1961)	Immediate reinforcing dose of vaccine	Immediate reinforcing dose of vaccine	One dose of human tetanus immunoglobulin[2] in a different site	Immediate reinforcing dose of vaccine	One dose of human tetanus immunoglobulin[2] in a different site	

1 Clean wounds are defined as wounds less than six hours old, non-penetrating with negligible tissue damage.

2 If TIG is not available, HNIG may be used as an alternative.

3 At least three doses of tetanus vaccine at appropriate intervals. This definition of "adequate course" is for the risk assessment of tetanus-prone wounds only. The full UK schedule is five doses of tetanus containing vaccine.

Patients who are severely immunosuppressed may not be adequately protected against tetanus, despite having been fully immunised and additional booster doses or treatment may be required.

immunisation
Helping to protect everyone

South Africa

Neonatal tetanus has been eliminated in South Africa since 2002

- Definition: < 1 case per 1000 live births in a district

South Africa

- 7 tetanus cases notified Jan-April 2020
  - 2 were neonatal tetanus
- Between 2014 and 2019, there were seven neonatal tetanus cases in South Africa
  - two in 2014, two in 2015, one in 2017, and two in 2019

Notify

Category 2 notifiable condition

conclusion

- Prevention
  - Tetanus is a severe disease
  - High mortality in the absence of good intensive care treatment
  - Where intensive care is available, tetanus treatment is lengthy and costly

references

- Tetanus Lam Minh Yen, C Louise Thwaites; Lancet 2019; 393: 1657–68
- Mandell CH 244
- Maternal and neonatal tetanus C Louise Thwaites, Nicholas J Beeching, Charles R Newton; Lancet 2015; 385: 362–7
- WHOSurveillanceVaccinePreventableNeonatalTetanus

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