

## Case 7 A hidden infection



Figure 7.1

Figure 7.1 shows a smear of a bacterial culture of a swab taken from an infected puncture wound on the hand of a farm labourer admitted to hospital with the clinical diagnosis of tetanus. He admitted that he had never had tetanus prophylaxis.

### What does the smear show?

The characteristic Gram-positive bacilli with terminal spores ('drumstick' spores) typical of *Clostridium tetani*.

### What is the normal habitat of this organism?

It is a normal inhabitant of faeces and of well manured soil – characteristically of farms and gardens.

### What are its bacteriological features?

It is a Gram-positive, capsulated, terminal spore-bearing, exotoxin-producing rod, which can only grow in strictly anaerobic conditions. Because of this last important feature, tetanus can only occur when the organism contaminates devitalized tissues where anaerobic conditions exist – for example, when a gardener puts a garden fork through his foot, or when a compound fracture is produced by a high velocity missile with considerable soft tissue destruction.



Figure 7.2 A soldier dying of tetanus from wounds received at the battle of Corunna in northern Spain, during the Napoleonic wars, 1809. Note the dramatic opisthotonus. Painting by Sir Charles Bell (1774–1842) hung in the Royal College Surgeons of Edinburgh.

Figure 7.3 Neonatal tetanus following umbilical infection in Sierra

### What are the effects of the tetanus exotoxin?

The exotoxin, tetanospasmin, is produced at the site of inoculation into ischaemic tissue and tracks along peripheral nerve axons to the central nervous system, where it becomes fixed in the anterior horn cells of the spinal cord and the motor nuclei of the cranial nerves. There it blocks the release of inhibitory neurotransmitters such as  $\gamma$ -aminobutyric acid (GABA) thus permitting unopposed excitatory activity from motor and autonomic neurons. This results in widespread spasm of the muscles in response to minimal sensory stimulation. Typically, the facial muscles become fixed in a 'smile' – the risus sardonicus – and spasm of the spinal muscles produces the extraordinary appearance of opisthotonus (Figs 7.2 and 7.3).

### List the effective prophylactic measures against this condition.

- Active immunization with tetanus toxoid (formalin-treated exotoxin) with booster doses at intervals of 10 years or at the time of injury.



Leone; note the risus sardonicus. (Photograph taken by one of us (CW) on our student elective.)

- Wound toilet comprises adequate excision of contaminated or potentially contaminated wounds to remove all dead tissue, combined with a course of prophylactic penicillin.
- Passive immunization is required where the patient has not been previously immunized (i.e. toxoid has not been given previously). This comprises human tetanus immunoglobulin, prepared from fully immunized subjects and should be given if the wound is heavily contaminated or is a puncture wound. A course of toxoid should also be given.