

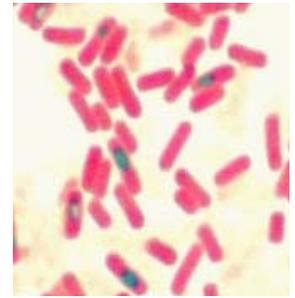
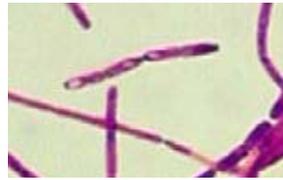
SPORE FORMERS, GRAM POSITIVE: *BACILLUS* AND *CLOSTRIDIUM*

3 March 2006, 30 July 2007, 15 Aug 07, 30 July 2008, 6 Aug 08, 29 July 09, 28 July 10, 27 July 11, 23 Aug 11, 4 Nov 15
 Bauman 2nd: 542-550, 3rd: 545-553, 4th: 550-553

Five genera of spore-forming, Gram positive bacteria (I will only hold my micro students responsible for two)

BACILLUS traits:

large non-motile rods
 facultative anaerobes
 common in soil
 most non-pathogenic



Bacillus anthracis

zoonotic disease, (animal reservoir,
 transmitted to humans)
 first demonstrated etiological agent (by Koch)

(p 551)

large bacillus (8 um) central spores, developed for germ warfare

Bacillus thuringiensis

produces intracellular diamond shaped crystals upon sporulation, kills insects (GI tract damage)
 Now inserted by genetic engineering into corn etc ("Bt" corn).

Bacillus cereus

common, can cause food poisoning in starchy foods like rice (Ceres = goddess of agriculture, grain).

Bacillus subtilis

soil bacteria, rarely pathogenic, can cause rosy bread dough, laundry additive, may be obligate
 aerobe, the standard in lab studies of Gm+

CLOSTRIDIUM traits:

fastidious organism
obligate anaerobe
requires neutral pH
spores thermophilic

requires rich medium
 cannot live in presence of O₂
 will not grow in acidic medium
 cannot kill by boiling, requires autoclaving: 121°C, 15'

C. perfringens

(p 553)

elaborates 11 toxins (!)
 anaerobic tissue infected
myonecrosis
 produces H₂,
 terrible foul odor

causes gas gangrene:
 especially in crushing wounds or diabetic
 [Muscle death process]
 (bubbles "snap, crackle and pop" when patient is moved)

Treatment: Debridement ("de-BREED-ment) (remove necrotic tissue), penicillin



C. botulinum ("sausage")

(p 554-555)

"Slipper" morphology if sporulated.
 Risk in non-acid foods, water bath canned, esp beans & grn peppers.
 Spores more resistant than any other anaerobe, resist 6 hr boiling.

Intoxication: Toxin coded for by **lysogenic phage**.

Most potent toxin known: binds to synaptic knob membrane, prevents release of acetylcholine
 causes **flaccid paralysis**. ("floppy baby" syndrome, risk feeding honey)

C. tetani: (556)

"lollipop" morphology if sporulated, non-invasive, spores, germinate:

After 4-10 days upon bacterial death, it lyses and releases exotoxin:

Intoxication: Tetanus exotoxin causes "lock jaw"
prevents release of inhibitory neurotransmitter in opposing antagonistic muscle.

(It used to be thought it prevented re-uptake...)

Antagonistic muscles therefore contract at the same time, =
 clonic contraction = **spastic paralysis**

tetanus ("to stretch") is the result (p 557)



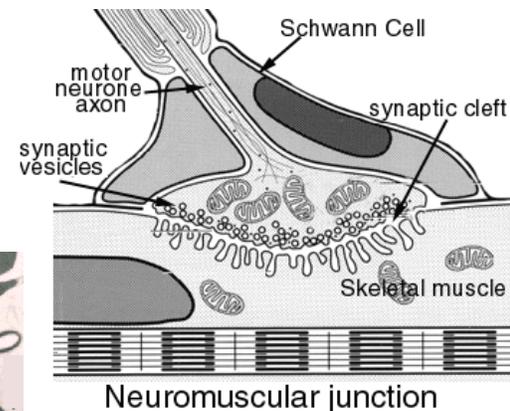
treatment: purified **antitoxin**:

inject horse repeatedly with toxoid, harvest its antibodies.
 inject these antibodies if you have tetanus
 (= antitoxin, gamma globulin fraction of serum)

protection:

toxoid: removed
toxicity: removed
antigenicity: retained

Treat toxin with formaldehyde (etc) detoxify.
 Part of standard DPT immunization:



C. difficile: explosive diarrhea **following Ab treatment**. † Mostly nosocomial (Antibiotic Associated Diarrhea).