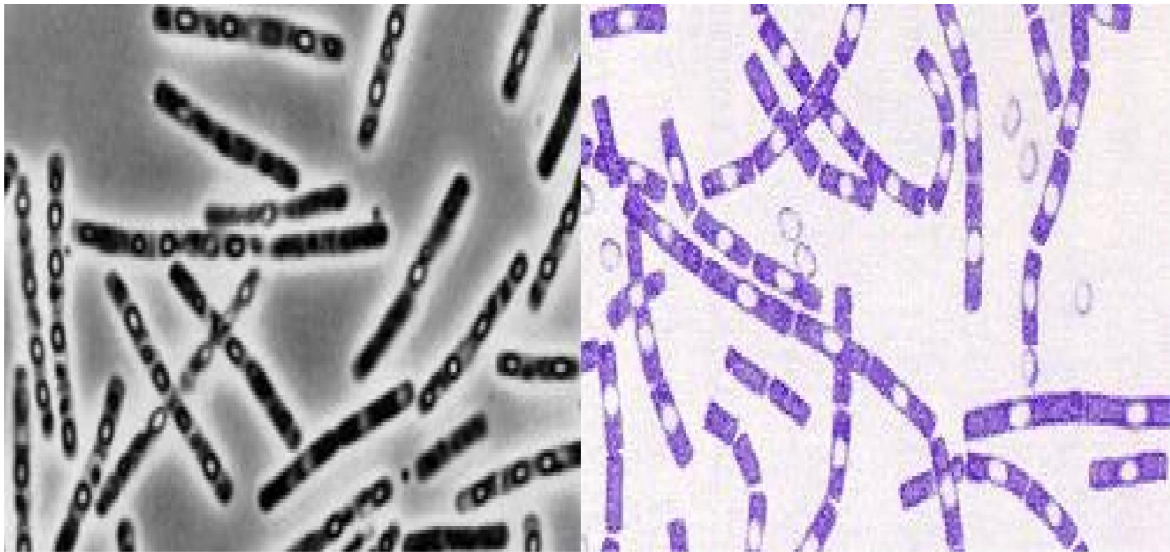


Bacillus SPECIES



**SPECIAL
MICROBIOLOGY**



Instructor

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Ph.D Vet Microbiology

GENERAL CHARACTERISTICS

- Large, Gram-positive rods
- Endospores produced
- Aerobes or facultative anaerobes
- Growth on non-enriched media with a characteristic medusa-head colonial morphology & greyish discoloration flat large colonies.
- Most species motile, catalase-positive and oxidase-negative
- Hydrolyze starch into simple sugars.
- Majority are non-pathogenic environmental organisms
- *Bacillus anthracis* causes **anthrax** (**SUDDEN DEATH**) are non-motile & non-haemolytic.
- *Bacillus licheniformis* is implicated in sporadic abortions in cattle and sheep
- *Bacillus cereus* is implicated in food poisoning & eye infection in man.

Usual habitat

- *Bacillus* species are widely distributed in the environment, mainly because they produce highly resistant endospores.
- In soil, endospores of *B. anthracis* can survive for more than 50 years.
- *Bacillus* species can tolerate extremely adverse conditions such as desiccation, high temperatures and chemical disinfectants.

Differentiating features of <i>Bacillus anthracis</i> and <i>B. cereus</i>		
Feature	<i>B. anthracis</i>	<i>B. cereus</i>
Motility	Non-motile	Motile
Appearance on sheep blood agar	Non-haemolytic	Haemolytic
Susceptibility to penicillin (10-unit disc)	Susceptible	Resistant

Lecithinase activity on egg yolk agar	Weak and slow	Strong and rapid
Effect of gamma phage	Lysis	Lysis rare
Pathogenicity for laboratory animals (application to scarified area at tail base of mouse)	Death in 24 to 48 hours	No effect



Anthrax

- **Anthrax** is a severe disease, one of the sudden death diseases that affects virtually all mammalian species including humans caused by *B. anthracis*.
- The disease, which occurs worldwide, is endemic in some countries and in defined regions of other countries.

- Ruminants are highly susceptible, often developing a rapidly fatal septicaemic form of the disease. Horses are moderately susceptible to infection, while carnivores are comparatively resistant. Birds are almost totally resistant to infection.

Virulence Factors of *B. anthracis*

The virulence of *B. anthracis* derives from the presence of:

- 1) **Capsule**
- 2) **The complex toxin consists of three antigenic components**
 - A. **Protective antigen**
 - B. **Oedema factor**
 - C. **Lethal factor.**

Anthrax disease can take 3 forms:

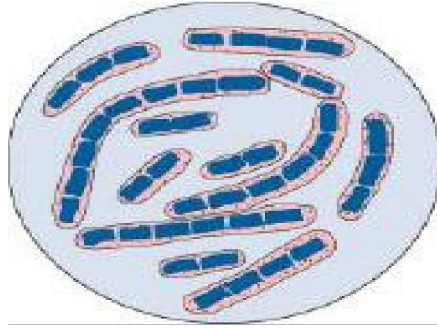
- ✓ Involving the skin (cutaneous) (wool sorter disease) – 20% mortality
- ✓ Involving the lungs (respiratory) (inhalational) – 90% mortality
- ✓ Involving the digestive system (gastrointestinal) – 100% mortality

DIAGNOSIS

- Carcasses of animals that have died from anthrax are bloated, putrefy rapidly and do not exhibit rigor mortis. Dark, unclotted blood may issue from the mouth, nostrils and anus. The carcasses of such animals **should not be opened** because this will facilitate sporulation, with the risk of long-term environmental contamination.



- Thin smears of blood or fluid from the ear or tail vein, stained with **polychrome methylene blue**, reveal long chains of square-ended, blue-staining rods surrounded by pink capsules (**M'Fadyean reaction**).



- Culture and isolation: Blood agar and MacConkey agar are inoculated with the suspect specimens and incubated aerobically at 37°C for 24 to 48 hours.
- Identification criteria for isolates:
 - A. Colonial morphology
 - B. M'Fadyean reaction
 - C. Absence of growth on MacConkey agar
- pathogenicity tests in laboratory animals
- Biochemical test profile.
- The Ascoli test: To detect antigens of *B. anthracis* in biological materials such as hides with *B. anthracis* antiserum.
- Agar gel immunodiffusion (AGID)
- Complement fixation (CFT)
- ELISA
- Immunofluorescence tests
- PCR-based tests