Bacillus species

The genus is comprised of more than 50 species with diverse characteristics. Most Bacillus species are :

1-large, Gram-positive, endospore producing rods up to 10.0 micrometer in length.

2-**A** few non-pathogenic species

3-Gram-negative, and organisms in smears prepared from old cultures decolorize readily.

4-In smears from tissues or cultures, cells occur singly, in pairs or in long chains (Fig. bellow**).**

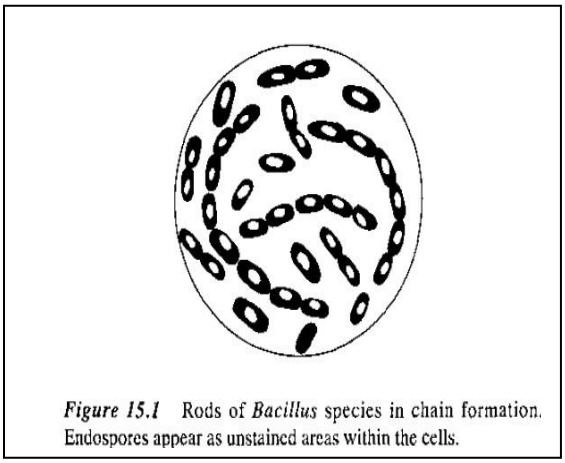

Figure 15.1 Rods of *Bacillus* species in chain formation. Endospores appear as unstained areas within the cells.

5-***Bacillus*** species are catalase-positive, aerobic or facultatively anaerobic and, with the exception of ***Bacillus anthracis*** and ***B. mycoides,*** motile.

6- Most species are saprophytes with no pathogenic potential.

Bacillus anthracis is the most important pathogen in the group. The name ***Clostridium piliforme*** has been proposed for ***Bacillus piliformis,*** the agent of Tyzzer's disease.

Tyzzer's disease is a highly fatal bacterial disease that affects a wide range of animals, primarily young animals, and is caused by the spore-forming bacterium Clostridium piliforme. It is mainly transmitted through the ingestion of contaminated food, water, or bedding materia

Usual habitat

-*Bacillus* species are widely distributed in the environment mainly because they produce highly resistant endospores.

-In soil, endospores of ***B. anihmcis*** can survive for more than 50 years.

- **Some *Bacillus* species** can tolerate extremely adverse conditions such as desiccation and high temperatures.

Differentiation of *Bacillus* species

The ability to grow aerobically and to produce catalase distinguishes ***Bacillus*** species from the ***dostridi****a*, which are also Gram-positive, endospore-forming rods.

Differentiation of ***Bacillus*** species is largely based on colonial characteristics and biochemical tests. Many **species,** including ***B. anthracis,*** do not produce capsules when grown on laboratory media.

Colonial characteristics of *Bacillus* species which are pathogenic for animals and man: -

Bacillus anthracis colonies are up to 5 **mm** in diameter, flat, dry, greyish and with a 'ground glass' appearance after incubation for 48 hours.


Single Colony of *Bacillus*

At low magnification, curled outgrowths from the edge of the colony impart a characteristic, 'medusa head' appearance.

Rarely, isolates are weakly haemolytic.

-Bacillus cereus colonies are similar to those of ***B, anthracis*** but are slightly larger with a greenish tinge. The majority of strains produce a wide zone of complete haemolysis around the colonies.

Because they have some similar characteristics, ***B. anthracis*** and ***B. cereus*** require careful differentiation (Table bellow).

-Bacillus licheniformis colonies are dull, rough, wrinkled and strongly adherent to the agar. Characteristic hair-like outgrowths are produced from streaks of the organisms on agar media. Colonies become brown with age. The name of this species derives from the similarity of its colonies to lichen.

Table 15.2 Clinical manifestations of diseases caused by *Bacillus anthracis* and other *Bacillus* species.

Bacillus species	Susceptible animals	Clinical manifestations
B. anthracis	Cattle, sheep	Fatal peracute or acute septicaemic anthrax
	Pigs	Subacute anthrax with oedematous swelling in pharyngeal region; an intestinal form with higher mortality is less common
	Horses	Subacute anthrax with localized oedema; septicaemia with colic and enteritis sometimes occurs
	Humans	Skin, pulmonary and intestinal forms of anthrax are recorded in man periodically
B. cereus	Cattle	Mastitis (rare)
	Humans	Food poisoning, eye infections
B. licheniformis	Cattle, sheep	Sporadic abortion
B. larvae	Bees	American foulbrood

Clinical signs and pathology

The incubation period of anthrax ranges from hours to days.

-In **cattle and sheep** the disease is usually septicemic and rapidly fatal.

Although most animals are found dead without previous signs, pyrexia with temperatures up to **42°C,** depression, congested mucosae and petechiae may be observed.

Animals which survive for more than one day may abort or display subcutaneous oedema and dysentery.

-In **pigs**, infection generally results in oedernatous swelling of the throat and head along with regional lymphadenitis. If oedema in the laryngeal region does not interfere with breathing, affected pigs may survive.

-The clinical course of anthrax in **horses** is often prolonged for several days. Following introduction of spores into abrasions, extensive subcutaneous oedema of the thorax, abdomen or legs may develop. Swelling of the pharynx, similar to that in pigs, has been described.

-In **dogs**, which are rarely affected, the course of the disease and pathological changes resemble those observed in affected pigs.

Treatment

If administered early in the course of the disease, high doses of penicillin ***G*** or oxytetracycline may prove effective.

Control

Suspected cases of anthrax must be reported immediately to appropriate regulatory authorities. Control measures **should** be designed to take account of the prevalence of disease in a particular country or geographical region.

In endemic regions:

-Annual vaccination, particularly of cattle and sheep, is advisable.

-Chemoprophylaxis, employing long-acting penicillin, should be considered when outbreaks threaten valuable livestock.

-A killed vaccine is available for humans who may be exposed to infection in the course of their work.

In **non-endemic regions** following a disease outbreak:

-Movement of animals, their waste products, feed and bedding from affected and adjacent premises must be prohibited.

-Personnel implementing control measures should wear protective clothing and footwear which must be disinfected before leaving the affected farm.

- Foot-baths containing sporicidal disinfectant *(5%* formalin, or **3%** peracetic acid) should be placed at entrances to affected farms.

-Contaminated buildings should be sealed and fumigated with formaldehyde before bedding is removed.

-Immediate disposal of carcases, bedding, manure, fodder and other contaminated material is mandatory. Carcases should be incinerated ***or*** buried **deepIy** away from water courses.

- Contaminated material and equipment must **be** disinfected with 10% formalin or, if appropriate, incinerated.

- Scavanger animals should not be allowed access to suspect carcases and insect activity should be minimized by application of insecticides on and around carcases.

- In-contact animals should be isolated and kept under close observation for at least 2 weeks.