

**GRAM NEGATIVE
NON-SPORE FORMING
ANAEROBE**

**Dr. Pankaj Kumar
Department of Veterinary Microbiology
Bihar Veterinary College, Patna**

General Characteristics:

- Gram Negative
- Non Spore forming
- Anaerobe
- Present on mucous membrane of Man and Animals
- Digestive and Urogenital tracts
- Excreted in Faeces
- Survival in environment - poor

Important Species:

- *Fusobacterium necrophorum*
 - formerly *Spherophorus necrophorus*
- *Dichelobacter nodosus*
 - formerly *Bacteroides nodosus*

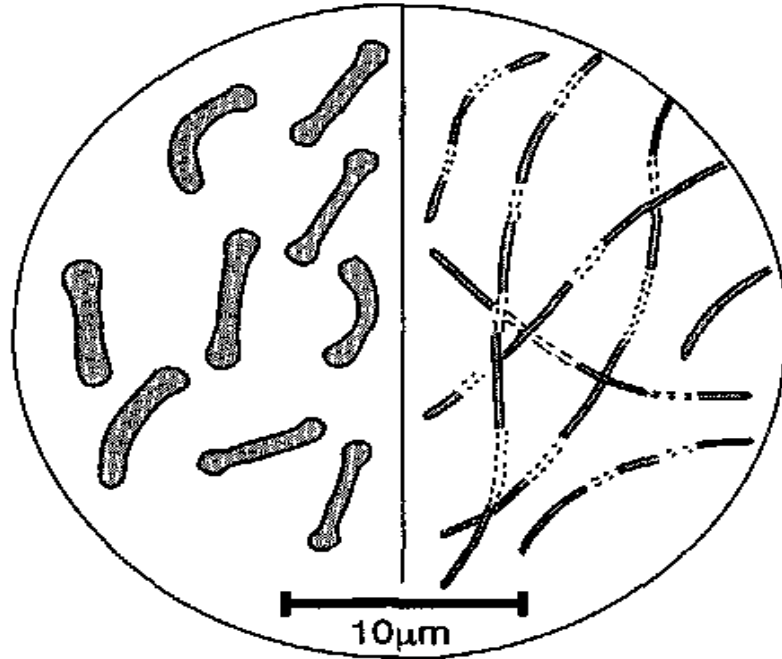


Figure 32.1 Straight or curved rods of *Dichelobacter nodosus* (left) showing characteristic swellings at one or both ends and slender, non-branching filaments of *Fusobacterium necrophorum* which tend to stain irregularly.

Source – Quinn et al., 2002

Differentiation of species:

- Bacterial morphology
- Colony appearance
- Antibiotic susceptibility
- Fatty acid production

Growth requirement:

- Mostly strict anaerobe
- Can not survive in presence of oxygen
- Sample collected should be maintained under anaerobic condition
- Anaerobic transportation medium should be used
- Samples should be processed promptly

Cultural requirement:

- Require Enriched medium
- Pre-reduced blood agar with 5-10% ruminant blood
- Supplementation with yeast extract, vitamin K, haemin
- Anaerobic Jar with 10% CO₂ and Hydrogen
- Incubation 37 degree C for upto 7 days

Cultural requirement:

- Can be grown in thioglycollate medium
- Cooked meat broth
- Supplementation of Vitamin K and Haemin required
- Powdered hoof material is added for growing *Dichelobacter nodosus*

Clinical Condition:

- Usually associated with mixed infection
- Grows under low oxygen tension (Eh – negative reduction potentials)
- Entry is facilitated by injury/ trauma
- Growth of other facultative anaerobe makes the environment conducive
- Virulence factor – *F. necroforum*- leucotoxin, Haemagglutinin, Hemolysin, dermatotoxin, LPS etc.

Synergism in mixed infections:

- *Arcanobacterium pyogenes* produces a heat labile factor which stimulates *F. necrophorum* replication. In turn, *F. necrophorum* produces a leukotoxin which aids survival of *A. pyogenes*
- In cases of ruminant pedal infection *F. necrophorum* facilitates tissue invasion by *D. nodosus* and is itself stimulated by a growth factor elaborated by *D. nodosus*

Species	Disease condition	Bacteria implicated
Sheep	Interdigital dermatitis	<i>Fusobacterium necrophorum</i> <i>Dichelobacter nodosus</i> (benign strains)
	Heel abscess and lamellar suppuration	Mixed anaerobic flora including <i>Arcanobacterium pyogenes</i> ^b <i>F. necrophorum</i> , and others
	Footrot	<i>Dichelobacter nodosus</i> <i>Fusobacterium necrophorum</i> <i>Arcanobacterium pyogenes</i> ^b Unidentified spirochaete
Cattle	Interdigital necrobacillosis (Foul-in-the-Foot)	<i>Fusobacterium necrophorum</i> <i>Porphyromonas levii</i>
	Interdigital dermatitis	<i>Dichelobacter nodosus</i> <i>Fusobacterium necrophorum</i> <i>Prevotella</i> species Spirochaetes?
Pigs	Foot abscess in young pigs and bush foot (lamellar suppuration) in older animals	Mixed anaerobes

Source- Quinn et al., 2002

Foot rot:

- **Foot rot** is an acute and highly infectious disease
- Characterised by swelling and lameness; easily recognised by its appearance and foul odour
- Become chronic if treatment is not provided
- High temperature and humidity predisposes this condition
- *F. necrophorum* first invades the interdigital skin - damage to the skin - leading to interdigital lesions and slight inflammation
- Followed by invasion of the foot by the foot rot bacterium *Dichelobacter nodosus*



Source: <https://www.google.com/search?q=foot+rot+in+cattle&sxsrf=>

Calf Diphtheria:

- Caused by - *F. necrophorum*
- The organism invades through damage in pharyngeal or laryngeal mucosa
- Ch/ by necrotic pharyngitis or laryngitis in calves under 3 months of age
- Clinical signs include fever, depression, anorexia, excessive salivation, respiratory distress and a **foul smell from the mouth**
- **Fatal necrotizing pneumonia** develops in later stage
- Potentiated Sulphonamide is used for treatment

THANKS