

MVSc Programme VMC-602

Lecture - 10

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Corynebacteria

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Salient features:

- *Corynebacterium* species are:
 - Gram positive with *pleomorphic morphology*
 - small, non-spore forming,
 - non-motile,
 - catalase positive
- They appear as coccoid, club shaped, straight or slightly curved rods
- Arranged singly or in pairs or in *palisades of parallel cells*
- They may appear as ‘V’ or ‘Y’ shaped and also shows *Chinese letter*
- They have reserves of poly-phosphates called *metachromatic granules*



<https://www.google.com/search?q=corynebacterium&sxsrf=>

Salient features:

- Facultative anaerobe
- Required enriched media for growth
- The type species of the genus is *Corynebacterium diphtheriae*
- Important human pathogen causing diphtheria in children
- Diphtheria is a serious throat infection leading to impaired breathing
- The *C. diphtheriae*, lysogenized with *tox* gene containing *corynephage beta*, produces a very potent “diphtheria toxin”

Habitat:

- Corynebacterium species are found ubiquitously in nature:
 - Soil,
 - Water,
 - Food products etc.
- many of the corynebacteria remain as commensal on mucous membranes or skin of mammals

Important Species:

- Three important pathogenic species causing disease in animals and human are:
 - *Corynebacterium pseudotuberculosis*
 - *Corynebacterium renale*
 - *Corynebacterium diphtheriae*

Corynebacterium pseudotuberculosis:

- Facultative intracellular parasite
- Commensal on normal skin and mucous membrane of sheep and goats
- **Biochemically two strains are known:**
 - Non nitrate reducing **ovine /caprine** strain causes **Caseous lymphadenitis**
 - Nitrate reducing **equine / bovine** strain causes **Ulcerative lymphangitis**

Important Species:

Corynebacterium renale:

- Normal commensal on genital tract mucous membrane of bovine male and female.
- *C. renale* is classified into three types *i.e.*,
 - type I (renale);
 - type II (pilosum); and
 - type III (cystitidis).

They cause ascending infection affecting bladder, ureter and kidneys causing cystitis and pyelonephritis

Pathogenicity:

- causes suppurative infections
- Present as commensal on mucous membranes and tissue trauma allows them to invade and establish infection
- The major virulence factor of *C. pseudotuberculosis* is *Phospholipase D (PLD)*, a potent exotoxin
- PLD has been reported to act on sphingomyelin of cell membranes.
- Vaccination of goats with **PDL toxoid** has been reported to prevent the spread of bacteria

Pathogenicity:

- The **surface lipid** of *C. pseudotuberculosis* is another virulence factors
- **Shown to posses cytotoxic effect against mouse macrophages**
- The lipid coat prevents killing of this organism by macrophages
- Surface lipid also contributes in development of chronic abscessation
- **Fe-binding protein** is also as an important virulence factor
- The organism of *C. renale* group produces **urease** which hydrolyses urea into ammonia which causes mucosal irritation and damage.
- **Mycolic acid present in cell wall prevent destruction within phagocytes** and also cytotoxic for phagocytes.

Caseous lymphadenitis:

- A chronic suppurative condition of sheep and goats
- Caused by non-nitrate reducing biotype of *C. pseudotuberculosis*
- Important disease primarily of sheep with worldwide occurrence
- Goat population are also affected
- The organism affects most the sheep in the flock

Caseous lymphadenitis:

- The source infection is sub-clinically infected animal introduced to the herd
- Pus discharged from affected lymph nodes, contains the organism in large number
- The organism may survive in the environment for weeks to months,
- Infection acquire both by direct or indirect contact
- Animals with lung abscess may generate aerosol capable of infecting large number of animals in close contact

Clinical presentation:

- Formation of pyogranulomas
- Caseous abscessation of lymph nodes
- In sheep, lymph nodes show characteristics encapsulated abscessation
- Giving classical “*Onion ring appearance*” in cross section (pathognomonic lesion)
- The two possible forms are:
 - External and
 - Visceral form known which may also coexist

Clinical presentation:

- The majority of infections are external in nature affecting **superficial lymph nodes**
- In external form, lymph nodes that may be palpated externally are affected.
- The visceral form is ch / by abscession of internal lymph nodes and organs
- In sheep, **lung parenchyma and mediastinal lymph nodes** are primarily affected
- However, in **goats, superficial nodes of the head and neck** regions primarily are affected

Diagnosis:

- History along with clinical sign and symptoms are suggestive of this condition.
- Coryneform morphology may be seen in Gram stained smear.
- Isolation of *Corynebacterium pseudotuberculosis* may be attempted on blood agar.
- **Enhancement of hemolysis test-**
A synergistic haemolytic activity called “Enhancement of hemolysis” is observed when *C. pseudotuberculosis* is streaked across the line of *Rhodococcus equi*.
- **PLD based ELISA** have been developed for diagnosing the disease
- PCR test have also been developed and used for diagnosis

THE END

The images for slides are taken from resources available on internet and used for the purpose of teaching students