CANDIDIASIS

Learning objectives

To know in detail about,

- Diseases and main host of *Candida albicans*
- Candidiasis, moniliasis, thrush and crop mycosis
- Pathogenesis and pathogenicity of candidiasis
- Characterizaton of different candida species based on biochemical tests
- Different diagnostic techniques used to diagnose candidiasis
- Importance of biggy agar in isolation of *C.albicans*
- Germ tube test and Dalmu's technique

INTRODUCTION

- Candidiasis is a general term covering diseases caused by yeasts of the genus *Candida,* especially *C.albicans*.
- Candidiasis can occur either as a superficial or as a systemic infection.
- There are more than 150 species of *Candida,* but only *C.albicans* is commonly associated with disease in animals.
- Diseases and main hosts of *Candida albicans*

Host (s)	Disease (s)
Chicken, turkey, pigeon, ducklings	Crop mycosis or Avian moniliasis
Swine	Stomach ulcers and cutaneous candidiasis
Puppies, kittens, calves and foals	Mycotic stomatitis and enteritis
Mares and bitches	Genital tract infection

- Candidiasis of the alimentary tract often referred as thrush.
- In addition to *C.albicans* bovine mastitis is caused by *C.tropicalis*, *C.pseudotropicalis*, *C.parapsilosis*, *C.krusei* and *C.rugosa*.
- *C.parapsilosis* cause bovine abortion and *C.rugosa* has been implicated in pyometra in a mare.
- *Candida albicans* infections are also called as moniliasis, candidiasis and candidosis.

HABITAT

- *C.albicans* is worldwide in distribution. All *Candida* occur saprophytically.
- The *C.albicans* is a commensal of the oral, gastro-intestinal and genital tract of many species of animals and humans.
- *Candida species* are commonly present in the crop of birds.
- Faecal contamination of feed also responsible for disease transmission.

PATHOGENESIS

- Most infections are endogenous in origin and predisposing causes such as immunosuppression, prolonged antibiotic therapy and malnutrition.
- Disseminated candidiasis (or) systemic candidiasis is more common in immunosuppressed animals.
- *Candida* possesses adhesions consisting of fibrillar peptide, Mannans, which have an affinity for the fibronectin on the surface of cells.
- The yeast forms are responsible for tissue damage.
- Inhibition of yeast cell division results in hyphal elements that invade tissues.
- Possible virulence factors are cell wall glycoprotein, proteases, neuraminidase, chitin,

mannoprotein and lipids.
- The cell-wall glycoproteins have an endotoxin like activity.
- Infection caused by *C.albicans* frequently involves mucous membranes. Granulomatous lesions are rare.

PATHOGENECITY

Lesions

- In acute cases the lesions appear as tiny, discrete yellowish white (or) grayish white pustules which loosely adhere to the mucous membranes and rather resemble a small quantity of curdled milk.
- In acute cases, the wall of the crop is thickened and covered by a corrugated pseudomembrane of yellowish grey necrotic material giving the characteristic ‗turky-towelling' appearance.
- In avian moniliasis (or) thrush lesion are confined to the crop, less frequently invade the mouth, oesophagous, proventriculus, gizzard and intestine.

Symptoms

- Vomiting, diarrhoea and emaciation occur in pigs.
- In Cattle, candidiasis occurs following prolonged antibiotic therapy. Pneumonic and enteric symptoms are seen.
- The mastitis may be mild and self-limiting, spontaneous recovery may occur within a week.
- The disease has no diagnostic symptoms except that the affected birds shows unsatisfactory growth, stunted appearance, roughness of feathers, listlessness, loss of appetite, shrunken appearance of chest and tendency to stand around with head drowned on shoulder.
- High mortality occurs in young birds in acute cases.
- The mouth and oesophagous may show ulcer like patches.

DIAGNOSIS

Specimens

- Scrapings from lesions, centrifuged milk samples, biopsy or tissue samples in 10% formalin for histopathology.

- Based on morphology
  - *C.albicans* grows as oval, budding yeast cell on agar cultures & in animal tissues.
  - Pseudohyphae are also produced in animal tissue by elongation of yeast cells that fail to separate.
  - In Gram stained smears *C.albicans* appear as purple-blue yeast cell.
  - It can also be demonstrated in specimens by 10% KOH (or) by lacto phenol cotton blue.
  - The tissue sections stained by PAS-haematoxylin (or) methaneamine silver stains, the *C.albicans* appear as thin walled oval, budding yeast cells and/or in the form of pseudohyphae.
- Based on isolation and identification
  - *C.albicans* grows well on blood agar or SDA without inhibitors (*Candida* spp may be inhibited by cycloheximide).
  - The plates are streaked with a small inoculum as for bacteria. The cultures are incubated at 37°C, aerobically, for upto 5 days.
  - Colonies of *C.albicans* are white to cream, shiny, high convex and have a pleasant beery smell.
  - Smears from the colonies stained with Gram's or lactophenol cotton blue or methylene blue stain reveal thin walled budding yeast cell and pseudohyphae.
  - BiGGy agar (Bismuth-sulphite-glucose- glycine- yeast agar) can also be used

for the isolation and identification of *C.albicans*.

- Most bacterial contaminants are inhibited by the Bismuth sulphite. *C.albicans* and *C.tropicalis* strongly reduce the Bismuth sulphite to Bismuth sulphide.
- *C.albicans* gives smooth, circular, brownish colonies and no color diffusion into the surrounding medium.
- The colonies of *C.tropicalis* are similar but there is diffuse blackening of the medium after 72 hrs.

- Germ tube or serum tube test
  - A small inoculum from an isolated colony is suspended in 0.5 ml of sheep, bovine, rabbit or human serum and incubated at 37°C for 2-3 hrs.
  - A drop of the preparation is examined under phase contrast or high objective of the light microscope.
  - Small, thin walled tubes will be seen projecting from some of the yeast cells. This is charcteristic of *C.albicans*.
- Demonstration of Chlamydospore (Dalmu's technique)
  - Subsurface inoculation is made on corn meal- tween 80 or chlamydospore agar and the plates are incubated at 30°C for 2-4 days.
  - A thin coverslip is placed on the surface of the agar and examined under high power microscope to demonstrate thick walled chlamydospores borne on the tips of pseudohyphae.
  - Clusters of smaller blastospores may also be present.
- Based on biochemical test

Ability to utilize	***C.albicans***	***C. tropicalis***	***C. pseudotropicalis***	***C. parapsilosis***
Glucose	*Acid (A) and Gas (G)*	*A & G*	*A & G*	*A & G*
Sucrose	*A*	*A & G*	*A & G*	-
Maltose	*A & G*	*A & G*	-	-
Lactose	-	-	*A & G*	-
Chlamydospore on corn meal agar	+	-	-	-

- *Animal inoculation*
  - Rabbits and mice are susceptible to intra venous and intra peritoneal inoculation respectively. Abscesses develop in the kidney.

PREVENTION AND CONTROL

- The majority of the candidiasis cases are associated with predisposing diseases, unsanitary conditions or medication with antibiotics.
- Correction of this condition is the first step in therapy.
- Nystatin (Mycostatin) administered in the feed to treat candidiasis in chickens, turkeys, swine, dogs and cats.
- It has been administered in the mammary gland to treat mastitis in cattle.
- Amphotericin B is the most effective drug for the treatment of systemic candidiasis.
- Ketoconazole and clotrimazole have been effective in the treatment of mucocutaneous candidiasis.

HISTORY AND HABITAT

- Rhinosporidiosis is mycosis of cattle, horses, mules, dogs and humans and is characterized by large polyps, tumors or wart like lesions on the nasal and ocular mucous membrane.
- The causative agent is *Rhinosporidium seeberi*.

History

- Seeberi described the Rhinosporidiosis in Man during 1910.

Natural habitat and distribution

- The natural habitat of the organism is thought to be associated with stagnant water.
- The disease has worldwide distribution but its occurrence is most common in India and Srilanka.
- The disease has been reported in India more frequently in human beings.
- It is of interest that 90% infections involve the nose of male animals.
- In south India, particularly humid climatic areas, the disease is more in animals and in dry areas the disease mostly occur in man.

PATHOGENESIS

- The mode of transmission and mechanism of infection is not known.
- No evidence of animal-to-animal, animal to man and man-to-man transmission.
- It is however probable that injury plays a part in determining infection and that infection is sometimes from airborne soil particles.
- Inhalation of contaminated dust may also be a mode of transmission.

PATHOGENICITY

- Rhinosporidium lives in soil and it is believed that water is a necessary medium of transmission.
- Infection usually results from a local traumatic inoculation and is associated with water activities e.g. swimming in stagnant water.
- The infection is typically limited to the mucosal epithelium.
- Its life cycle begins with a round endospore(6-10 μm in diameter), which grows to become a thick-walled sporangium (100-450 μm in diameter) that contains up to several thousand endospores.
- Mature sporangiospores are approximately 7-9 um in size and escape through a pore that develops in the sporangial wall.
- The disease progresses with the local replication of *R. seeberi* and associated hyperplastic growth of host tissue and a localized immune response.
- Infection of the nose and nasopharynx is common; other parts include palpebral conjunctivae, skin, ear,genitals, and rectum.
- These polyps are pink to deep red, are sessile or pedunculated, and are often described as strawberrylike in appearance.
- Because the polyps of rhinosporidiosis are vascular and friable, they bleed easily upon manipulation.
- The polyps are chronic but are not painful.
- They can cause obstruction of the respiratory tract resulting in asphyxia.
- The rhinosporidial mass has been classically described as a strawberry like mulberry mass.

- This mass may extend from the nasal cavity into the nasopharynx and present itselfin the oral cavity. These lesions commonly cause bleeding from the nasal cavity.
- *Rhinosporidium seeberi* can also affect the lacrimal gland and also rarely the skinand genitalia.

Rhinosporidiosis in dogs

- Rhinosporidiosis is a very rare chronic (long-term) infection that typically occurs inthe mucous membranes of dogs.
- It most commonly occurs in the nose and nostrils, but can also take hold in the nose and eyes. Rhinosporidiosis belongs to the zoonotic class of fungal infections, meaningthat it can be transmitted to humans.
- Signs and symptoms of rhinosporidiosis include the following: sneezing, bleeding, wheezing, or labored breathing; an infection of the nostrils with a cauliflower-like growth; a polyp or other growth located near or on the nostril - this growth may be white or yellowish in color and may appear speckled or spotted because of the fungusassociated with the growth

DIAGNOSIS AND TREATMENT

- *Rhinosporidium seeberi* has not been grown in culture and no laboratory animals areavailable for cultivation.
- Only method of diagnosis is demonstration of spores and sporangia in wetmount preparations of nasal discharge and section of polyps.
- Spores are 6 - 7 µm in d.m. Spores increase in size and attaining a size of approximately 100 µm become transformed into sporangia by the deposition of a layer of cellulose within the chitinous wall. Numerous nucleoid division occur and itattains 200 -300µm in d.m.
- A sporangium contains approximately 16,000 to 20,000 spores.
- At one point, the sporangium thins to form a pore and the spores are escaped.
- In the tissue sections stained by H &E stain, various forms of sporangia are seen
- Young trophic forms: 10 to 100 µm in d.m. with single central basophilic karyosomesand amorphous cytoplasm.
- Mature forms 100 -300µm in d.m. containing sporangiospore.
- Empty and collapse form of sporangia.

Treatment

- Surgical excision of polyps. But there is a chance of recurrence.