

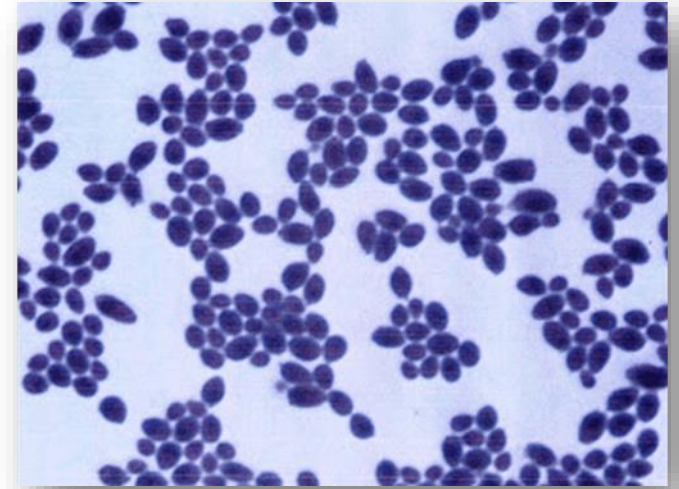
Second Professional Year (Veterinary Microbiology)

Candida species

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Habitat:

- Mucosal membranes of human and animals.
- Gut, skin, nasopharynx, external genitalia .
- Gi tract of birds.
- Soil, animal, ,in-animate objects and food.
- Worldwide distribution



Candida albicans

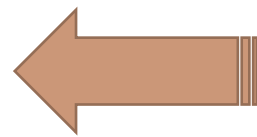
- A benign sugar fermenting yeast
- Commensal of intestinal ecology
- More than 600 strains of Candida
- May convert to pathogenic form on overgrowth and immunocompromised host pa



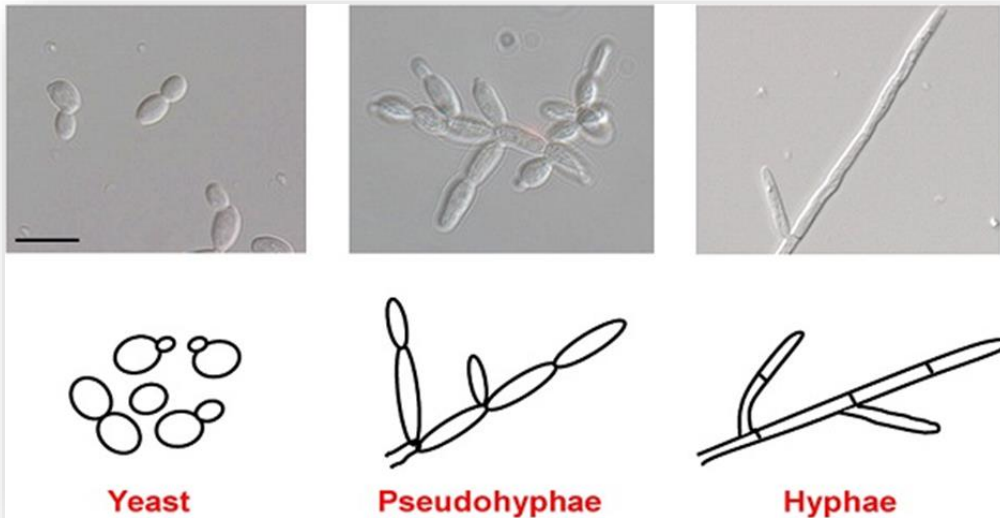
- Normally yeast like cell; harmless



- Becomes pathogenic by changing morphology into hyphal form



Morphology



- Small, oval, measuring 2-4 μm in diameter.
- Yeast form, unicellular, reproduce by budding.
- Single budding of the cells may be seen.
- Both yeast and pseudo-hyphae are gram positive.
- Encapsulated and diploid, also form true hyphae.
- Polymorphic fungus (yeast and pseudohyphal form)
- Can form biofilms
- Normal condition: Yeast
- Special condition (pH, Temperature): Pseudohyphae
- 80-90% of cell wall is carbohydrate

Cultural Characteristics

- SDA
- Creamy, pasty colonies, smooth after 24-48 hours at 25-37°C
- Yeast smell (odour).



Cultural Characteristics- Blood Agar

- White creamy colored
- Foot-like extensions from the margin.



CHROMagar

- Candida albicans on CHROMagar
- Green colonies



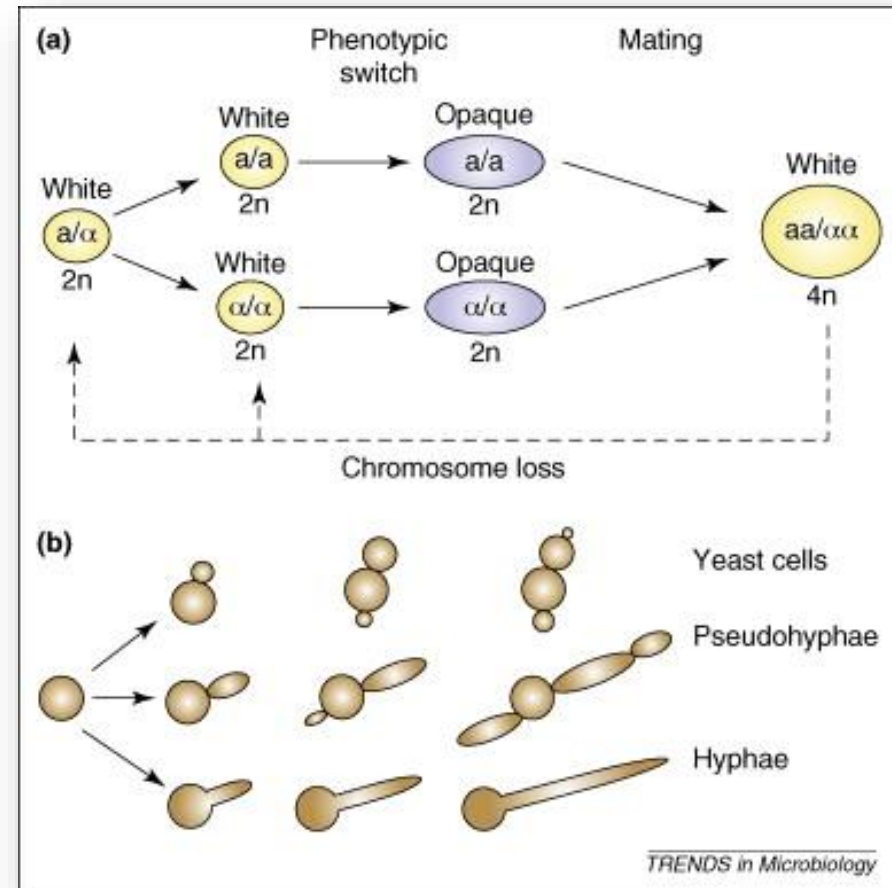
Cultural Characteristics- Potato Dextrose Agar

- Smooth creamy colonies after 24-48 hours

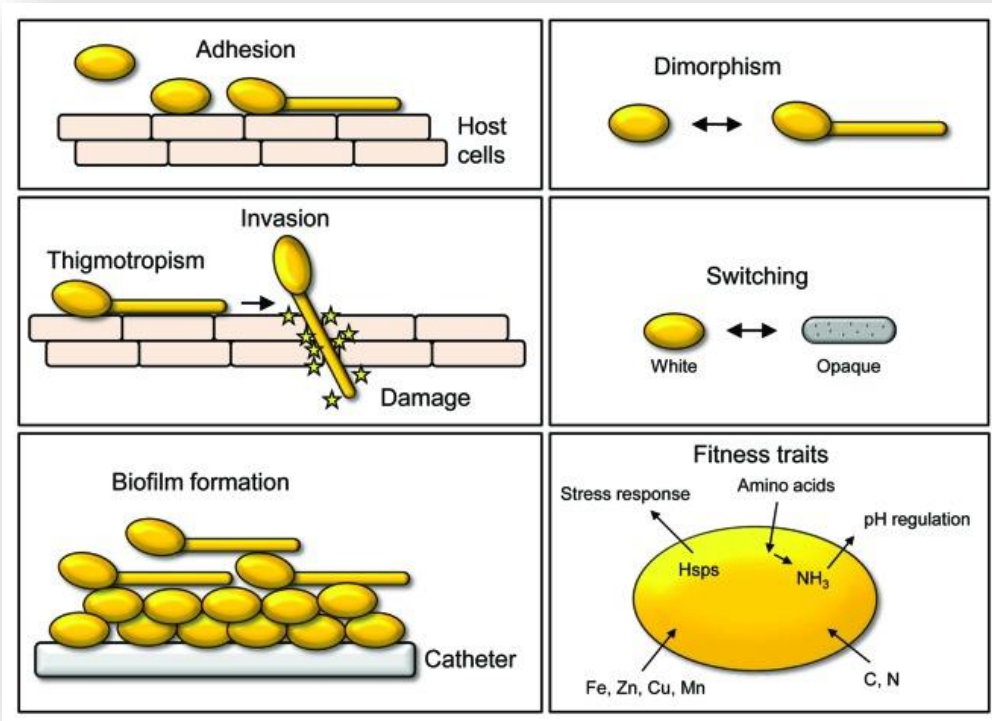


Life Cycle of *Candida albicans*

- Asexual and doesn't perform meiosis
- Ability to grow with **three distinct morphologies**- yeast, pseudo-hyphae and true hyphae
- Para-sexual life cycle
- Switch between different phenotypes (**Phenotype switching**)
- Diploid Stage \rightarrow form cells \rightarrow homozygous \rightarrow phenotypic switch from white to mating component 'opaque' cells \rightarrow mating of opaque cells (cell fusion) \rightarrow tetraploid cells \rightarrow loss of chromosomes (splitting) \rightarrow Diploid State
- White form: white and rounded cells forming dome-shaped colonies
- Opaque form: opaque, elongated cells forming a flatter colony.
- Opaque form is more efficient for mating than the white form



Pathogenesis of *Candida albicans*



- Opportunistic fungal pathogen → causes candidiasis in animals and birds
- **Host Recognition** via Adhesins
- **Invasion** through Enzymes - Hydrolases: Phospholipases, Lipases, Proteinases
- **Morphogenesis** - From Yeast form to Filamentous hyphae/pseudohyphae (Phenotypic Switching)

Virulence Factors of *Candida albicans*

- Polymorphism
- Adhesins (Als 3 Protein)
- Invasins (Als 3 Protein)
- Biofilm Formation
- Secreted hydrolases
- Metabolic Adaption

Candidiasis



Candidiasis → localized mucocutaneous disease

Etiology: *Candida* spp., mostly *Candida albicans*

- Factors associated with candidiasis
 - Breach of mucosal integrity
 - Indwelling
 - Intravenous
 - administration of antibiotics
 - immunosuppressive drugs
 - Immunosuppressive diseases.
- *Candida albicans* infects birds → involves oral mucosa, esophagus & crop.
- Superficial infections → limited to the mucous membranes of the intestinal tract of pigs and foals.

Systemic candidiasis

- Occurs in cattle, calves, sheep, and foals
- In cats- associated with oral and upper respiratory disease, pyothorax, ocular lesions, intestinal disease, and urocystitis.
- Infections in dogs and horses.
- cause arthritis in horses
- mastitis and abortion in cattle.
- Fungemia and Candida peritonitis - in dogs with perforating intestinal lesions often after surgery,
- mucosal and cutaneous candidiasis - immunosuppressed & dogs having diabetes mellitus .

Clinical symptoms and Lesions:

- Signs are variable and nonspecific
- associated more with the primary or predisposing conditions than with the candidiasis itself.
- **Calves**
- Calves with forestomach candidiasis - watery diarrhea, anorexia, and dehydration, with gradual progression to prostration and death.
- **Poultry**
- Affected chicks are listless and have reduced feed intake and growth rate.
- **Porcine**
- oral, esophageal, and gastric mucosa affected - diarrhoea and emaciation.

- Gross lesions of the skin and mucosae - single or multiple, raised, circular, white masses covered with scabs.
- The organism can penetrate keratinized epithelium and cause marked keratinous thickening of the mucosae of the tongue, esophagus, and rumen.
- In birds, the crop and esophageal lesions are white, circular ulcers with raised surface scabs that produce thickening of the mucosa; an easily removed pseudomembrane is common

Laboratory Diagnosis

- **Microscopy (Scraping)**


- Wet film examination by digestion in 10% KOH
- Visualization of pseudohyphae and budding yeast cells of candida
- Gram staining: Gram positive (+ve)

- **Isolation (Culture)**

- SDA: Creamy white, smooth colonies.
- CHROMagar: Green colonies.
- Blood agar: White creamy colored colonies with foot extension.
- PDA: Smooth creamy colonies.



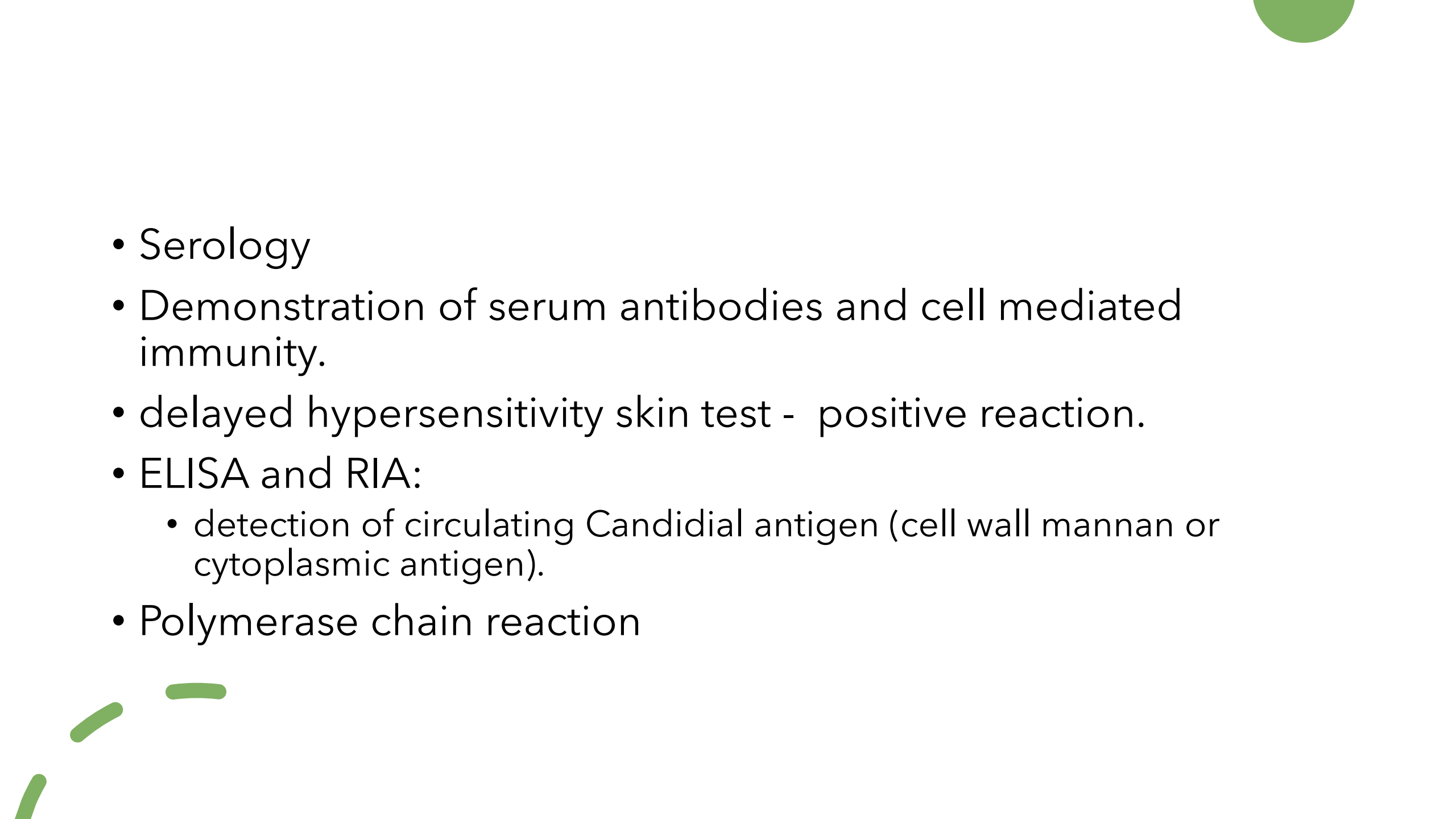
- **Identification of albicans**

- **Germ Tube Test:** produce germ tube test within 2 hours when incubated in human serum at 37°C.
 - **Chlamydospores:** produced by *C. albicans* on corn meal/rice agar at 25°C. They produces round thick walled chlamydospores borne terminally or laterally.
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- **Biochemical Tests:**

- Glucose and maltose fermentation- acid and gas.
 - sucrose and lactose non fermenter - Pale pink coloration in Tetrazolium reduction medium
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- Serology
 - Demonstration of serum antibodies and cell mediated immunity.
 - delayed hypersensitivity skin test - positive reaction.
 - ELISA and RIA:
 - detection of circulating Candidial antigen (cell wall mannan or cytoplasmic antigen).
 - Polymerase chain reaction



Any questions ???



Thanks