

ACTINOMYCETES

By: Dr. Neha Singh
Assistant Professor
Dept. of Microbiology.

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ACTINOMYCETES

Introduction

- ◆ Transitional forms between bacteria & fungi (Gram Positive filamentous bacteria intermediate in properties b/w true bacteria and fungi)

Like bacteria-

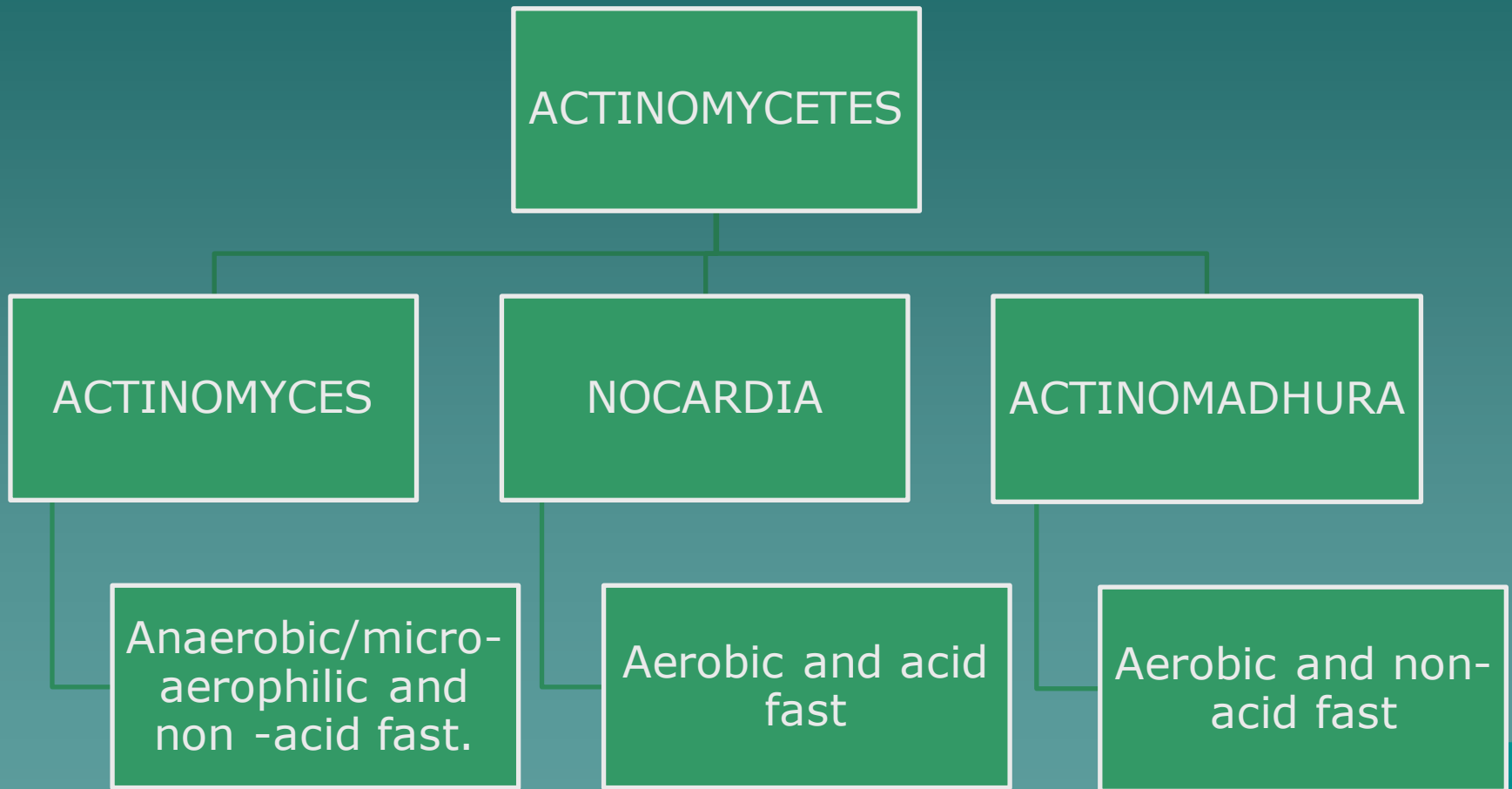
- ◆ 1) Prokaryotic nucleus
- ◆ 2) Cell wall – muramic acid
- ◆ 3) Susceptible to anti-bacterial antibiotics.

ACTINOMYCETES

Like fungi

- ◆ Form mycelial network of branching filaments
 - ◆ Hence are True Bacteria with a superficial resemblance to Fungi.
 - ◆ Are related to *Corynebacterium* and *Mycobacterium*.
 - ◆ Are Non-motile, Non-Sporing, Non-capsulated filaments that break up into small bacterial fragments and live freely in soil.
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- A stylized, dark teal silhouette of a mountain range is positioned in the bottom right corner of the slide, extending from the right edge towards the center.

CLASSIFICATION



ACTINOMYCES

- ◆ Actinomyces refers to the “ray like appearance” of the organism in the granules that characterise the lesions.
- ◆ Most are soil saprophytes and others are mouth commensals of both man and animals.
- ◆ Causes a disease Actinomycosis. In humans it is usually caused by *A. israelii*.

MORPHOLOGY

- ◆ Actinomyces is a GP, Non-Motile, Non-Sporing, Non-Acid fast organism.
- ◆ Often grow in mycelial forms and break up into coccid and bacillary forms . Most of them show true branching.
- ◆ Appearance of the organism in tissues is different than that on culture.
- ◆ In Pus sample it appears as GRANULES. When the granules are crushed b/w two slides and examined after Gram Staining they consist of **-Central filamentous, GP mycelium surrounded by a peripheral zone of swollen radiating CLUB shaped structures giving a "Sun-Ray appearance"**
- ◆ The clubs are Gram Negative, Acid-Fast and of host origin.
- ◆ The sulphur granules are white or yellowish in colour and found only in tissues. Size varies from minute specks to 5mm.

CULTURAL CHARACTERISTICS

- ◆ Anaerobic or micro-aerophilic
- ◆ Optimum Temp-37 degree C
- ◆ 5-10% Carbon dioxide
- ◆ Medias-BHI agar, BA ,Thioglycollate broth.Growth occurs after 2-4 days.
- ◆ A.israeli may take 7-14 days,forms Spidery Colonies on solid media in 48-72 hrs.
- ◆ In liquid media forms small fluffy balls below the surface of medium.

PATHOGENESIS

- ◆ Actinomyces causes a disease Actinomycosis-a chronic granulomatous ds characterised by- Multiple abscesses,Tissue distruction,Fibrosis and multiple sinuses.
- ◆ Actinomycosis occurs in 4 Clinical forms-
1)cervico-facial (commonest involving cheek and sub-maxillary regions) 2)Thoracic-Lungs
3)Abdominal-ileocaecal region 4) Pelvic-associated with the use of IUD's.
- ◆ Macroscopically,it presens as a Painless,Indurated swelling with Multiple discharging Sinuses.The Pus contains yellow coloured "Sulphur Granules"
- ◆ Actinomycosis may also present as MYCETOMA.

LAB DIAGNOSIS

- ◆ Demonstration of actinomycetes in lesion
- A. **Specimen**-Pus from lesions or is aspirated by sterile syringe/apply gauze pads on sinuses, Discharge from Fistula, Sputum in Pulm Ds or Tissue or Biopsy.
- B. **Microscopy**-Pus shaken with saline in a t.t, mixture allowed to settle, granules sediment is withdrawn with a capillary pipette, Granules crushed b/w two slides, smears prepared. One smear is Gram Stained and the other is stained by Acid-Fast method (decolourisation with 1% H_2SO_4)

LAB DIAGNOSIS

◆ MICROSCOPY

- a) Gram Staining shows: a dense network of thin GP filaments surrounded by a peripheral radiating GN “clubs” (Sun ray appearance)
- b) Acid-Fast Staining-shows central part as Non-Acid Fast surrounded by acid-fast “clubs”.

- ◆ In absence of sulphur granules, gram staining of pus shows GP branching filaments.

- c. **CULTURE:** Sulphur granules or pus washed and inoculated into thioglycollate broth and streaked on BHI agar and BA. Incubated anaerobically and aerobically, 5% CO₂, 37 degree C for 2 wks. Result-A. Israeli produce “spider colonies resembling molar teeth”.

- d. **BIOPSY:** H&E stained section shows-Myelial mass surrounded by pus cells and chronic inflammatory cells.

TREATMENT

- ◆ Surgical removal of the affected tissue along with Penicillin therapy.

MYCETOMA

◆ Defination

- Mycetoma is a localised, chronic granulomatous ds of the sub.cut and deeper tissues affecting commonly the foot and presenting as a tumor with multiple discharging sinuses.

◆ History

- The clinical syndrome was 1st described from Madura in India and was called MADHURAMYCOSIS.

◆ Mycetoma

- may be of Bacterial or Fungal Origin.

ACTINOMYCOTIC MYCETOMA

- ◆ Mycetoma – first described by Gill in Madura (1842)
- ◆ Maduramycosis-(madura foot)
- ◆ Aetiology
 - 1) Actinomyces (A.israeli&A.bovis)
 - 2) Nocardia- N.asteroides,N.brasiliensis,N.caviae
 - 3) Actinomadura (A.madurae,A.pelletieri)
 - 4) Streptomyces somaliensis

MYCOTIC MYCETOMA

- ◆ Caused by filamentous fungi:
 - *Madhurella mycetomi*
 - *Madhurella griseus*
- ◆ Mycetoma like lesion (BOTRYOMYCOSIS) is occasionally produced by *Staph.aureus*.

DIAGNOSIS OF MYCETOMA

- ◆ Diagnosis of Mycetoma is important for choosing appropriate treatment.
 - ◆ The colour of granules gives some clue to diagnosis.
 - ◆ Granules are white to yellow in Actinomycotic mycetoma while black in Mycotic mycetoma.
 - ◆ Isolation of organism in culture establishes the diagnosis.
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LAB DIAGNOSIS

◆ Actinomycotic mycetoma

- Granules – white/yellow
- Crush smear-Thin filaments($1\mu\text{m}$ diameter)

◆ Fungal mycetoma

- Granules-black
- Crush smear – Stout filaments(4- $5\mu\text{m}$ diameter)

NOCARDIA



NOCARDIA

INTRODUCTION

- ◆ Nocardia resemble Actinomyces morphologically but are strictly AEROBIC.
- ◆ Are Non-Motile, Gram Positive and Acid fast when decolourised with 1% H₂SO₄.
- ◆ Majority are environmental saprophytes. Few are pathogenic to man.

NOCARDIA

- ◆ Pathogenic species-
N.asteroides,N.brasiliensis,N.caviae.
Oppourtunistic pathogens in immuno
deficient patient(AIDS)
- ◆ Natural Habitat-Soil.
- ◆ Mode of infection is Exogenous,by
inhalation of the bacteria from
environmental sources.

PATHOGENESIS

◆ Lesions

- 1) Cutaneous-abcess,cellulitis
- 2) Subcutaneous-Actinomycotic mycetoma
- 3) Systemic-
 - 1) Pulmonary Ds-pneumonia,Lung abcess,tuberculosis
 - 2) Metastatic – brain,kidney& other organ

◆ N.asteriods and N.brasiliensis is the main opportunistic agents.

PATHOGENESIS

- ◆ It may also cause Mycetoma-a chronic granulomatous lesion involving the sub.cut and deeper tissues mainly localised in the foot region.
 - ◆ Common in barefooted agricultural workers or farmers.
 - ◆ Presents as a tumor with multiple sinuses.
 - ◆ The pus contains “Granules” larger than those of actinomycosis.
 - ◆ Popularly called Madhura Foot or Madhura disease.
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LAB DIAGNOSIS

- A. Sample-Pus or purulent sputum
- B. Microscopy-Direct microscopic examination:
 - A. Gram stain – gram positive branching filament
 - B. Zn Staining-decolourisation with 1% H_2SO_4 -AFB, though some species are Non-acid fast.



- c. Culture-The samples are inoculated on NA,SDA and BHI agar.

Incubated at 36 degree C for 3 wks.

Colony morphology is seen and isolate identified by staining.

- D. Nocardia also identified by Paraffin Bait technique.

CULTURE

- ◆ Culture – Aerobic, Nocardia grow easily on ordinary media. Growth is slow (5-14 days)
 - ◆ Common Media-NA,BHI agar and SDA. Culture plates incubated at 36 degree C for up to 3 wks.
 - ◆ Colonies formed are dry granular, wrinkled colonies with pigmentation (yellow, white or red)
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TREATMENT

- ◆ Treatment – cotrimoxazole-for 3 months or more.
- ◆ Norcardia are also susceptible to- Nalidixic acid, amikacin, cefotaxime etc.

THANK YOU