Shigella & Pseudomonas

Shigella

- Species :

1. Shigella dysenteriae
2. Shigella flexneri
3. Shigella boydii
4. Shigella sonnei

Pathogenicity :

Bacillary dysentery : characterized by loose motion mixed with blood & mucus

Pathogenesis

- One of the important causes of bacillary dysentery
- **Mode of transmission:**

- Ingestion - contaminated fingers (most common), food, and water or rarely flies

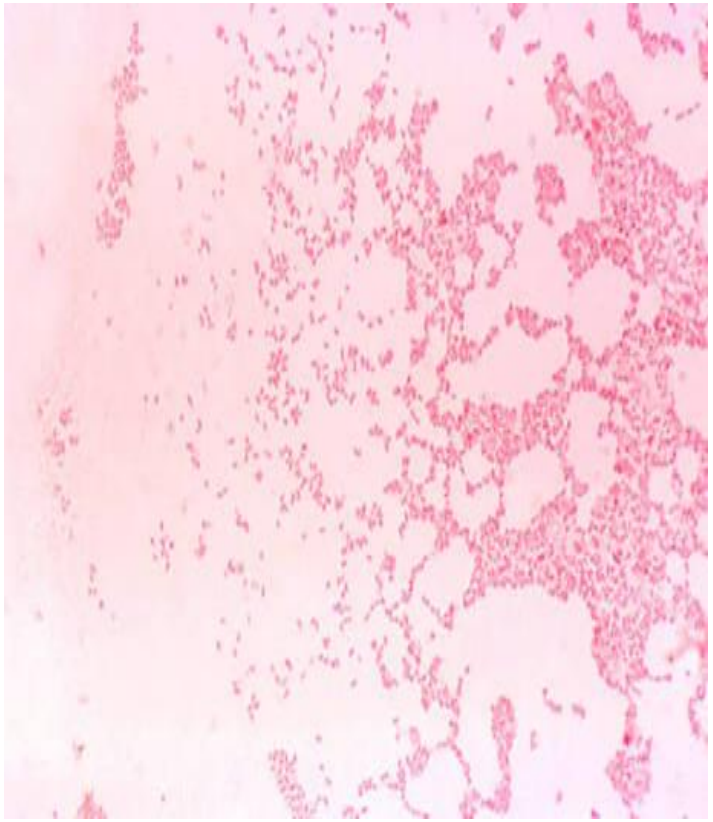
- **Minimum infective dose**: 10–100 bacilli are enough

Laboratory diagnosis

- **Sample collection** :
- Fresh stool or preferable direct swab of an ulcer taken by sigmoidoscope
- Fresh stool collected in sterile container & send to the laboratory immediately
- Transport medium : Sach’s buffered glycerol saline
- Inoculate in enrichment media (Selenite F broth)

- **Morphology :**

  Short, Gram negative bacilli
- Nonmotile
- Noncapsulated, Nonsporing
- 0.5 µ x 1- 3 µ in size
- Fimbriae may be present



Culture characteristics

- Aerobes and facultative anaerobes, optimum temperature of 37ºc,PH 7.4.
- Can grow on ordinary media
- On NA colonies are about 2mm in diameter,circular,convex,smooth & translucent.

- On MacConkey or DCA – colorless colony except Sh. Sonnei-late lactose fermenter

Laboratory Diagnosis

- **Selective media:**
- **selective media**:

- MacConkey agar - Non-lactose fermenting colonies

- **Highly selective medium**
- **DCA (Deoxycholate citrate agar)**: translucent colonies
- **XLD agar (Xylose lysine Deoxycholate)**: red without black center
- **SS agar (*Salmonella Shigella agar)***

Laboratory Diagnosis

- **Culture smear & motility testing**: short, gram-negative bacilli nonmotile, noncapsulated and non-sporing
- **Biochemical reactions**:
- **Catalase**: catalase positive except *S. dysenteriae serotype-1 and S. flexneri serotype-* 4a
- **Oxidase test** - negative
- **Mannitol fermentation**: All species ferment mannitol except *S. dysenteriae, Newcastle biotype* of *S. flexneri serotype-6 and rabaulensis biotype of S. flexneri serotype-4a*

Biochemical Reactions

- **Do not Lactose and sucrose fermentation**: except *S.sonnei* which is a late fermenter of both
- **Gas production**: All are anaerogenic except— Manchester and Newcastle biotypes of *S. flexneri type 6*
- **Indole production**: Most shigellae do not produce indole
- MR positive & reduce nitrates to nitrite.
- Urease and citrate negative
- TSI - alkaline/acid, no gas and no H2S

Laboratory Diagnosis

- **Decarboxylase test**: Lysine, arginine and ornithine Negative (except *S. sonnei* which decarboxylates ornithine)
- ONPG test - negative (except *S. Sonnei)*
- **Slide agglutination test:** Confirmation using group specific & species specific antisera
- **Bacteriocin or colicin typing -** done for *S. sonnei*
- **Antimicrobial susceptibility testing**

Treatment *Shigella*

- **Every case of shigellosis should be treated with antibiotics**
- **Ciprofloxacin** - drug of choice.
- Alternative drugs - ceftriaxone, azithromycin, pivmecillinam and some fifth-generation quinolones
- **Duration** - 3 days except for:
- *S. dysenteriae type 1 infection—5 days*
- Infections in immunocompromised patients—7–10 days
- **Oral rehydration solution (ORS)**

PSEUDOMONAS

Pseudomonas
(Ps. Pyocyanea, Bacillus pyocyaneus)

- Pseudomonas is the most commonly isolated species associated with human disease & nosocomial infections(hospital acquired infections)

Species :

- P.aeruginosa
- P.putida
- P.fluorescens
- P.stutzeri

Pathogenicity :

- ‘Blue pus’, the term aeruginosa, meaning verdigris which is bluish green in colour

Community acquired infections : suppurative otitis media, respiratory tract infection in cystic fobrosis

Healthcare associated infections:

A. **Localised lesions** :

- Infections of wounds & bedsores,
- eye & ear infections
- urinary infections following catheterisation ,
- burns infections,
- Iatrogenic infections following lumber puncture
- Post- tracheostomy pulmonary infections
- Ecthyma gangrenosum & other types of skin lesions

B.Generalised lesions :

- Septicemia & endocarditis in patients of leukemia, maliganancy & immunocompromised
- Infections of nail bed due to repeated exposure of detergent & water
- PUO (Shanghai fever) resembling typhoid fever
- Infantile diarrhoea , sepsis

Clinical Manifestations

- Can cause infections at almost all sites, most common being lungs, skin and soft tissues
- Most infections are Hospital Acquired Infections
- Risk factors - burn wounds, immunosuppression & post surgeries
- **VAP (ventilator associated pneumonia**
- **Chronic respiratory tract infections** – in cystic fibrosis, bronchiectasis or chronic pan bronchiolitis

Clinical Manifestations..

- **Bacteremia** leading to sepsis and septic shock
- **Infective endocarditis (native valves) -** IV drug abusers
- **Ear infections -** either mild **(Swimmer's ear** among children) or serious necrotizing form (**malignant otitis externa** in elderly diabetic patients)
- **Eye infections -** corneal ulcers (in **contact lens** wearers) and endophthalmitis secondary to bacteremia
- **Shanghai fever -** Mild febrile illness resembling typhoid fever

Clinical Manifestations...

- **Skin and soft tissue infections**

- Burns patients – MC organism to infect burn wounds

- **Ecthyma gangrenosum -** acute necrotizing condition resulting from bacteremia - febrile neutropenia and AIDS
- **Dermatitis -** cause outbreaks in spas and swimming pools
- Toe-web infections

Laboratory diagnosis

- Sample collection :

Pus, swab,sputum,urine

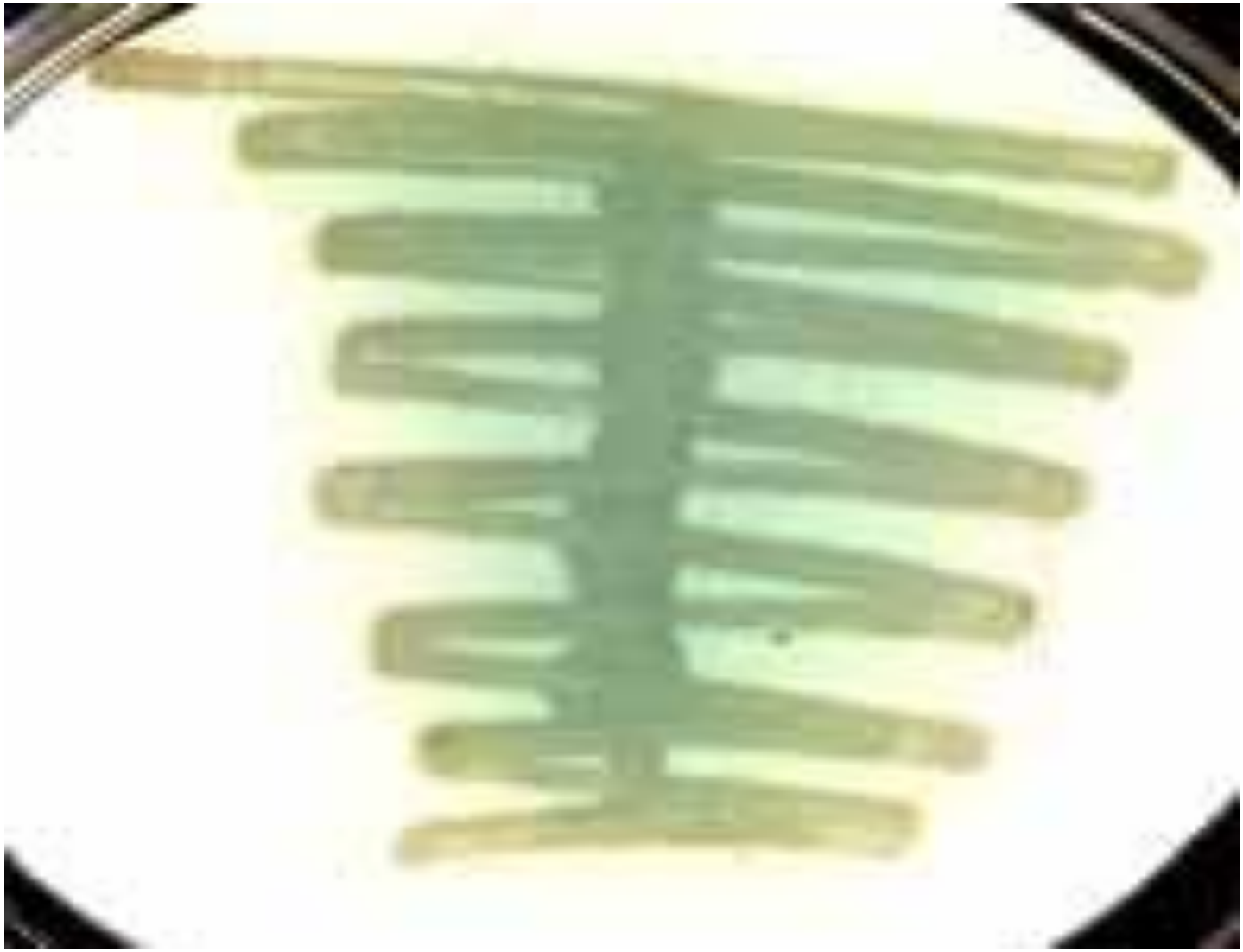
Morphology :

- Gram negative slender bacilli
- Actively motile
- Non capsulated (Often form a loose capsule)
- Clinical isolates are often piliated

Culture characters

- Strict aerobes, but can grow anaerobically if nitrate is available.
- N.agar : Large, opaque, irregular with musty or earthy smell. Produce pigments i.e. pyocyanin (bluish green), pyoverdin (greenish yellow), pyorubin (red), pyomelanin (brown)
- Mac Conkey agar: NLF
- Blood agar: hemolytic
- Selective media (Cetrimide agar)

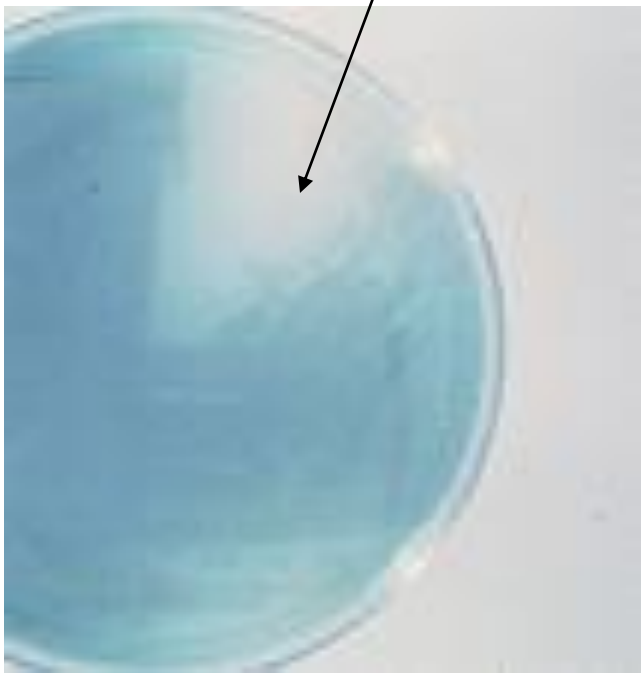
Pigment on N.agar



Pigment by Pseudomonas

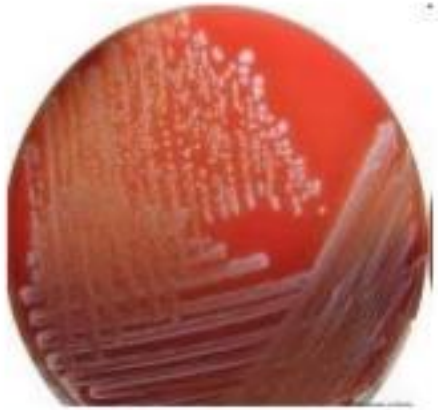
Pyoverdin pigment on Flo Agar

Pyocyanin pigment on Tech agar



Growing on

- ***Blood agar***
  - ➢ Similar to nutrient agar
  - ➢ Many are haemolytic



- ***Mac conkey agar***
  - ➢ Colourless,non lactose fermenter

- ***Cetrimide agar***
  - ➢ selective media

Biochemical reactions

- Glucose : Acid only
- IMViC : - - - +
- Catalase test : Positive
- Oxidase test: Positive
- Nitrates are reduced to Nitrite
- Arginine dihydrolase test : Positive

Treatment - Antipseudomonial antibiotics

- **Penicillins**: Piperacillin, mezlocillin, ticarcillin
- **Cephalosporins**: Ceftazidime,cefoperazone,ceftolozane, cefepime
- **β-lactam/β-lactamase inhibitor combinations** (piperacillin & tazobactam and cefoperazone- sulbactam)
- **Carbapenems**: Imipenem, meropenem and doripenem
- **Monobactam**: Aztreonam
- **Aminoglycosides**: Tobramycin, gentamicin, amikacin
- **Quinolones**: Ciprofloxacin, levofloxacin
- **Polymyxin** : Polymyxin B, colistin