SALMONELLA & SHIGELLA

GIT BLOCK

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Objectives

1-Develop an algorithm using biochemical to identify and classify *Salmonella* and *Shigella*

2- Describe the antigenic structures and virulence factors of *Salmonella* and *Shigella*

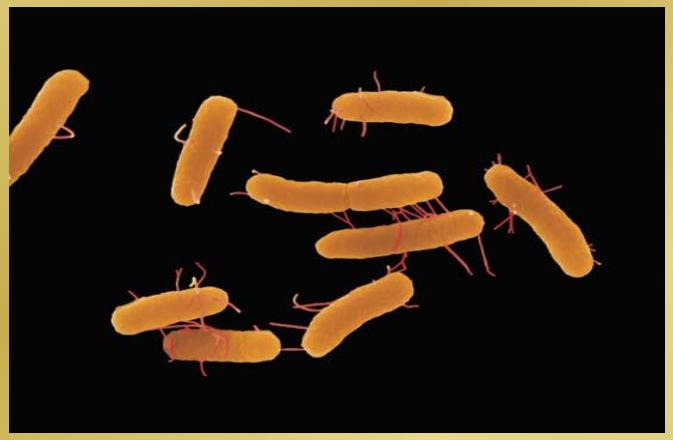
3- Compare the pathogenesis of various species of *Salmonella* and *Shigella*

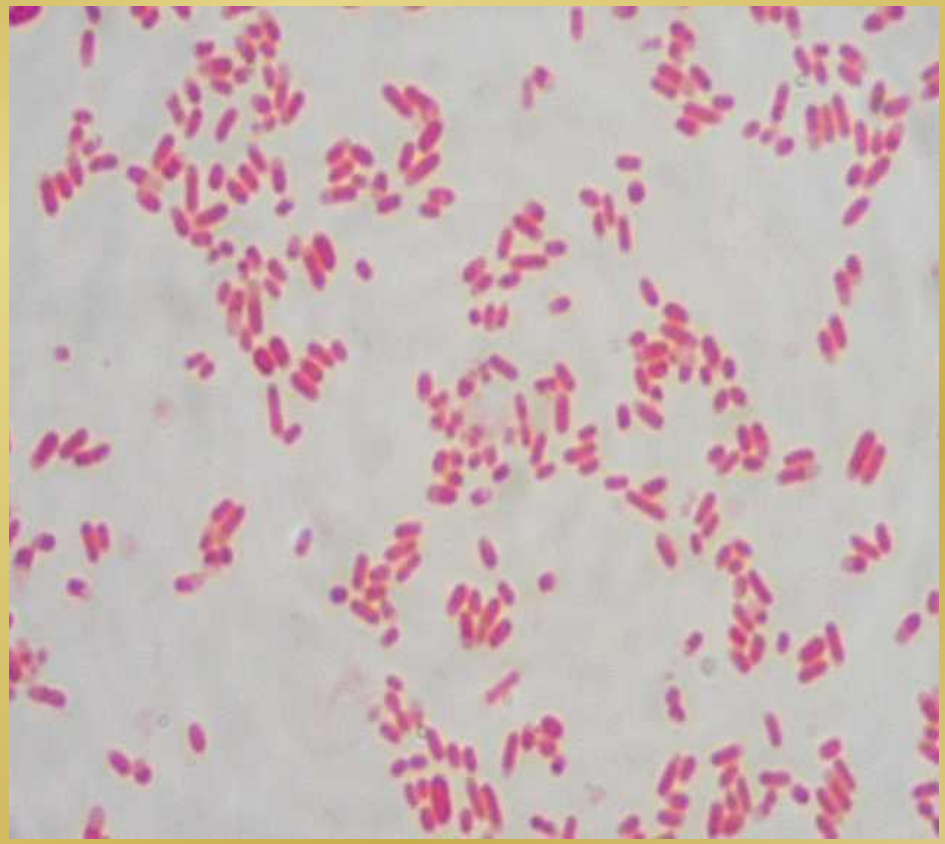
4-Describe the clinical features and risk factors for the infection with the two organisms

5- Describe the general concepts for the management of gastroenteritis caused by both organisms.

SALMONELLA

Salmonella





INTRODUCTION_

- Gram negative facultative anaerobic bacilli
- Non lactose fermenting colonies
- Motile

CLASSIFICATION

- Has two species *S.enterica* (six subspecies I, II, III, IV, V, VI) *S.borgori* (rare)

- Cold blooded animal, birds, rodents, turtles, snake and fish

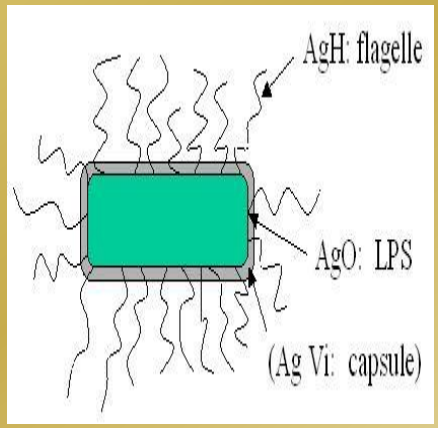
VIRULENCE FACTORS

- Fimbriae (Pili) : for adherence
- Enterotoxin

Antigenic structures

- O. Somatic antigen
- H. Flagellar antigen
- K. Capsular antigen

- **V_i surface polysaccharide antigen in *Salmonella serotype typhi* prevents phagocytosis & allow intracellular survival.**
- **O Antigen (Heat – stable) is lipopolysaccharide in the outer membrane**
- **H antigen (Heat labile)**



CLINICAL FEATURES

- Acute gastroenteritis
- Typhoid fever
- Nontyphoidal bacteremia
- Carrier state following *Salmonella* infection

Source

- **Water, food and milk contaminated with human or animal excreta.**
- ***Salmonella typhi* and *S. paratyphi* : the source is human.**

GASTROENTERITIS

- Food poisoning through contaminated food
- *S. enterica* subsp. *enterica*
- Source :poultry, milk, egg & egg products and handling pets
- Infective dose: 10^6 bacteria
- IP: 8 – 36 hrs.
- fever, chills, watery diarrhea and abdominal pain. Self limiting.
- In sickle cell ,hemolytic disorder and ulcerative colitis, elderly or very young patients; the infection may be very severe.
- Patients at high risk for dissemination ; antimicrobial therapy is indicated.

ENTERIC FEVER

- Prolonged fever
- Bacteremia
- Involvement of the reticulo endothelial system (liver, spleen, intestines and mesentery)
- Dissemination to multiple organs
- Ingestion of contaminated food by infected or carrier individual
- Caused by *Salmonella* serotype typhi or *S. paratyphi* A, B and C (less severe)
- Common in tropical ,subtropical countries, travelers due to inappropriate sewage disposal and poor sanitation.
- IP : 9 – 14 days.

First week: fever, malaise, anorexia, myalgia and a continuous dull frontal headache then,

- Patient develops constipation
- Mesenteric lymph node → blood stream liver, spleen and bone marrow
- **Engulfment of *Salmonella* by mononuclear phagocytes .**
- Bacteria released into the blood stream again and can lead to high fever .Positive blood culture at this stage.

2nd and 3rd week

- Sustained fever & prolonged bacteremia.
- Invade gallbladder and Payer's patches
- Rose spots 2nd week of fever
- Billiary tract → GIT
- Organism isolated from stool in large number.

Management & Treatment

- Ceftriaxone
- Ciprofloxacin
- Trimelhoprim – Sulfamethoxazole
- Ampicillin
- Azithromycin or Ceftriaxone for patients from India and SEAsia due to Ciprofloxacin resistance of strains. Ciprofloxacin can be used for patients from other areas.
- Uncomplicated cases of *Salmonella* gastroenteritis require fluid and electrolyte replacement only.

COMPLICATIONS

- Necrotizing cholecystitis
- Bowel hemorrhage and perforation
- Pneumonia and thrombophlebitis
- Meningitis, osteomyelitis, endocarditis and abscesses.

SHIGELLA

- Non lactose fermenting bacteria
- Cause bacillary dysentery (blood, mucus and pus in the stool)

ANTIGENIC STRUCTURE

- Has four species and four major O antigen groups
- All have O antigens ,some serotype has K antigen
- *Shigella* are non motile so lack H antigen

CLINICAL INFECTION

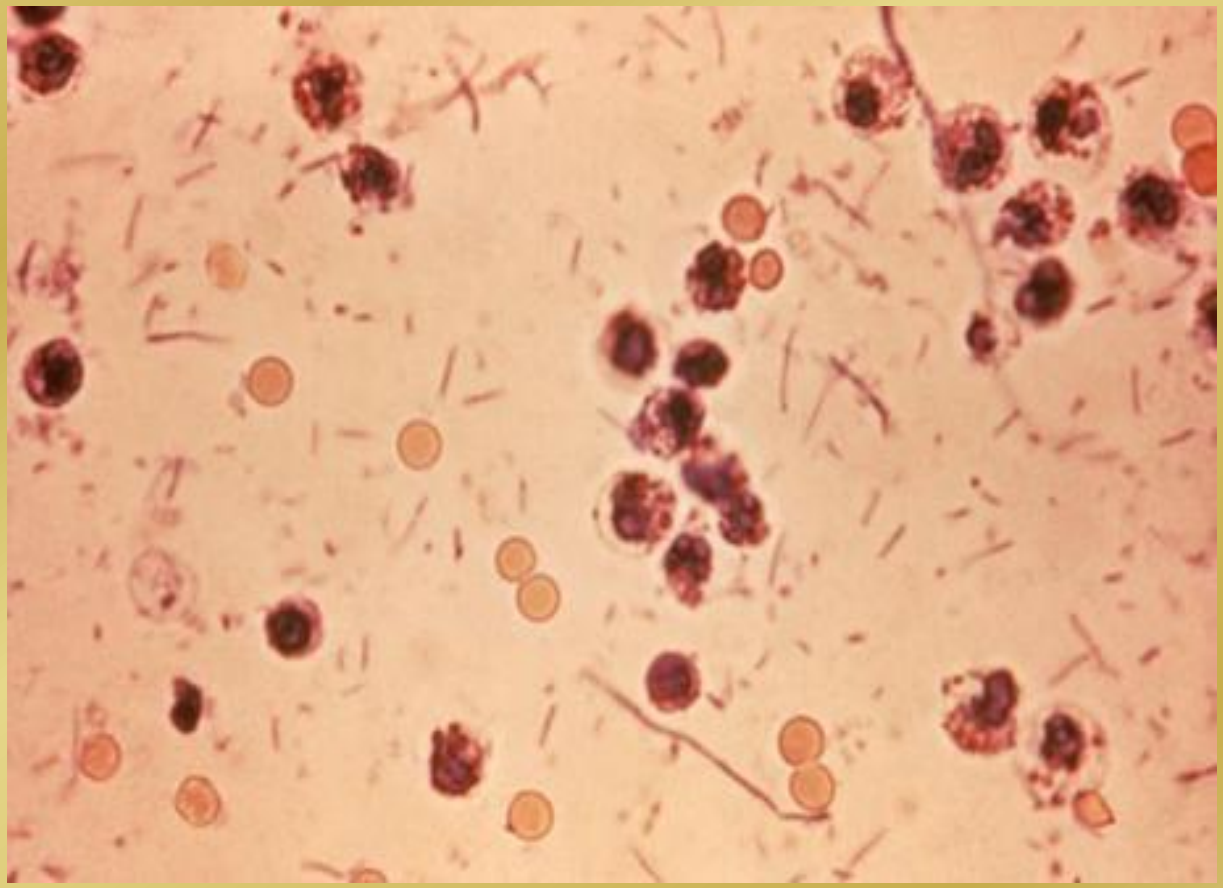
- *S.sonnei* : most predominant in USA. Produce fever & watery diarrhea.
- *S.flexneri* :2nd common in developing countries
- Young adult & (man who have sex with man)
- *S. dysenteriae* and *S. boydii* are most common isolates in developing countries
- *S. dysenteriae* type 1 associated with morbidity and mortality.
- Human is the only reservoir

- Person to person through fecal –oral route .
- Flies, fingers (have role in spread).
- Food and water.
- Young children in daycare, people in crowded area and anal oral sex in developed countries.
- Low infective dose < 200 bacilli
- Penetrate epithelial cells ,leads to local inflammation, shedding of intestinal lining and ulcer formation.

SYMPTOMS

- High fever, chill, abdominal cramp and pain accompanied by **tenesmus , bloody stool with mucus & leukocytes.**
- IP : 24 - 48 hrs
- Can lead to rectal prolapsed in children
- Complications: ileus, obstruction dilatation and toxic mega colon
- Bacteremia in 4 % of severely ill patient
- Seizures, HUS (hemolytic uremic syndrome)

DYSENTRY STOOL



Lab diagnosis of Salmonella & Shigella in stool

-Both are Gram negative bacilli

-Culture in selective media

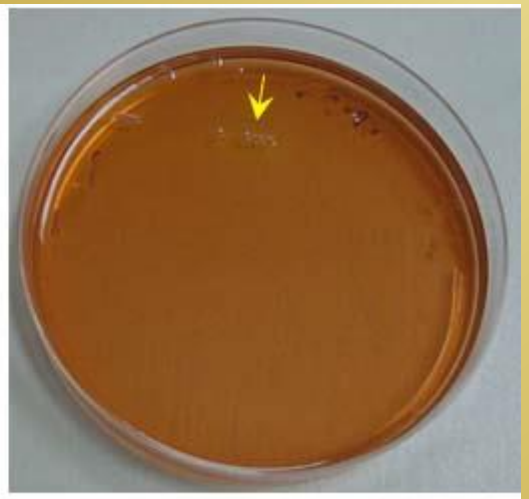
-Biochemical tests

-Motility test

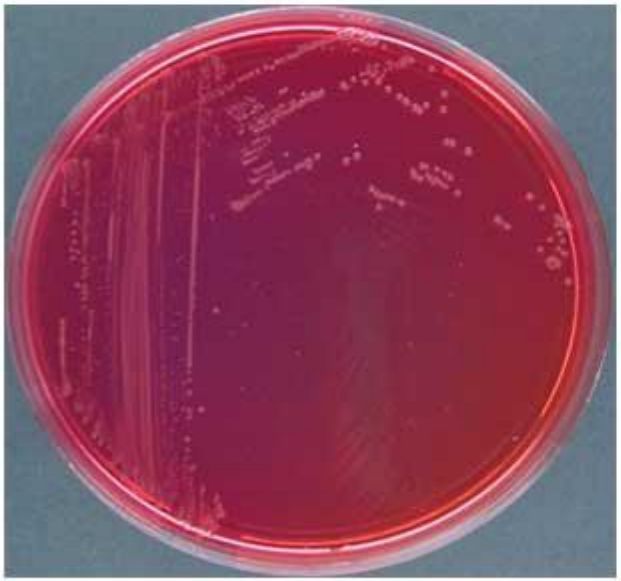
-Serology for serotypes.

Escherichia coli

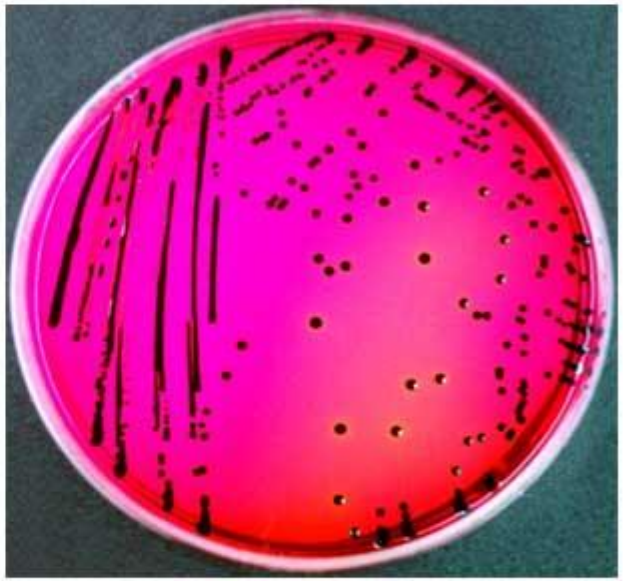
Salmonella



Shigella



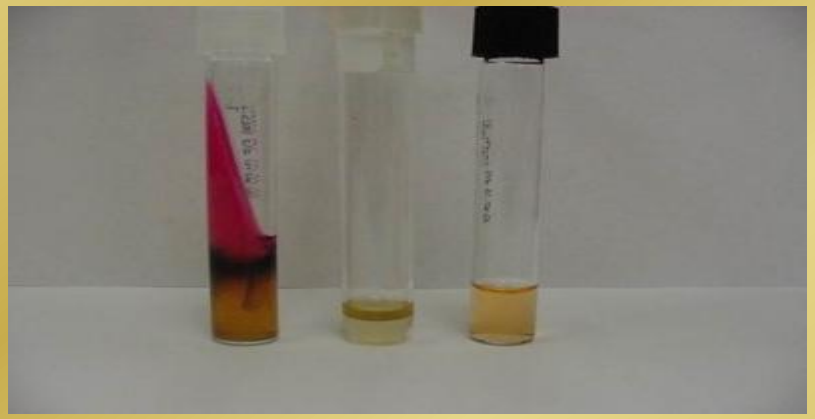
Shigella on XLD.



Salmonella on XLD.

Image Source: Faculty of Health and Medical Sciences - University of Copenhagen, Denmark

BIOCHEMICAL TESTS



MOTILITY TEST

SIM medium: Motility test

POSITIVE:
Organism moves away from stab

NEGATIVE:
Organism does **NOT** move away from stab

Serology

Usually in ***Salmonella, Shigella*** and ***E.coli*** *the* final detection is by serotyping using agglutination Ag+Ab test.

Treatment of *Shigella* Dysentery

-Antibiotic indicated if symptoms were severe and to reduce duration of illness.

-Antimicrobial agents depending on susceptibility testing including :

Ampicillin

Ceftriaxone

TMP-SMX

Ciprofloxacin