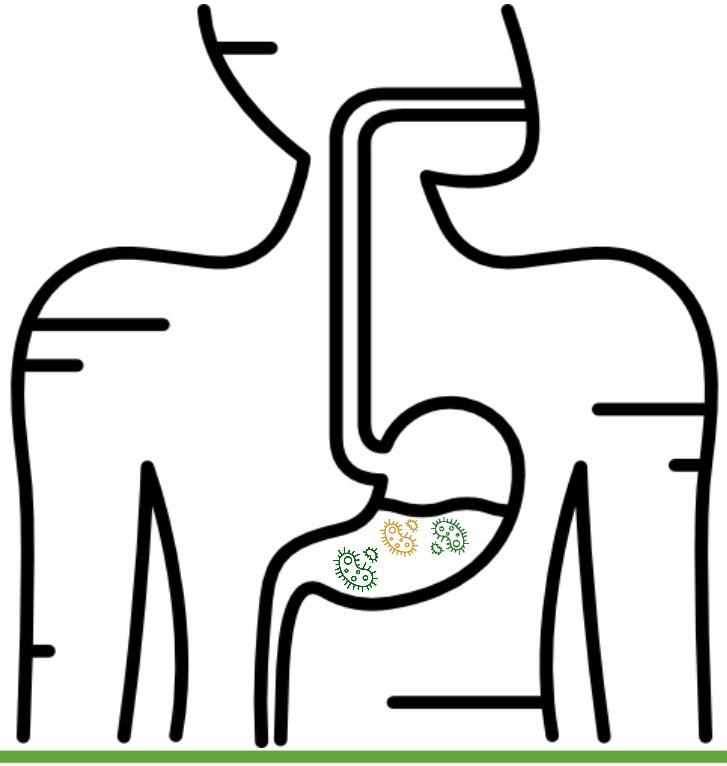
MEDICINE
KING SAUD UNIVERSITY

MICROBIOLOGY436



تمت المراجعة
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LECTURE: Salmonella & shigella

Editing File

- Important
- Doctor's notes
- Extra explanation
- **Only F** or **only M**

"لا حول ولا قوة إلا بالله العلي العظيم" وتقال هذه الجملة إذا داهم الإنسان أمر عظيم لا يستطيعه ، أو يصعب عليه القيام به .

Objectives :

1-Develop an algorithm using biochemical tests to

identify and classify *Salmonella* and *Shigella*

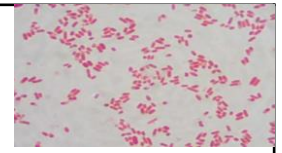
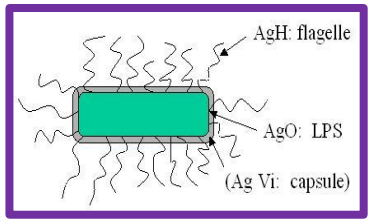
2- Describe the antigenic structures and virulence factors of *Salmonella* and *Shigella*

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

introduction	 • Gram negative facultative anaerobic bacilli • Non lactose fermenting colonies • Motile Have flagella • highest during the rainy season in tropical climates and during the warmer months in temperate climates.
Classification	• Has two species: 1. S.enterica (six subspecies I, II, III, IV, V, VI) 2. S.borgori (rare) "doctor note: S.Non typhe : Cold blooded animal, birds, rodents, turtles, snake and fish" "doctor note: S.Typhe : human transmission"
Virulence factors	• Fimbria for adherence (reason for bacteremia) • Enterotoxin • Endocytosis: SPI 1 T3SS / TLR • Replication in microphage 
Antigenic structures	• O. somatic antigen • H. flagellar antigen (motile) • K. capsular antigen • Vi (V=virulent) surface polysaccharide antigen in Salmonella serotype typhi (virulence) prevents phagocytosis & allow intracellular survival • O Antigen (Heat – stable) is lipopolysaccharide in the outer membrane **A,B,C1,C2,D,E** • H-antigen (Heat labile)

Clinical features
• Acute gastroenteritis • Typhoid fever • Non-typhoidal 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 the common cause • Source poultry الدواجن, milk, egg & egg products and handling pets • Infective dose 10^6 bacteria It needs large number of bacteria to start the disease • IP 8 – 36 hrs. IP 12-48 hrs • fever, chills, watery diarrhea and abdominal pain, self limiting in immunocompetent • In sickle cell, hemolytic disorder and ulcerative colitis, elderly or very young patient the infection may be very severe. Require treatment. May cause septicemia or meningitis in the young patient • Patient At high risk for dissemination & antimicrobial indicated

Enteric fever(Typhoid 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, and travelers to these countries due to inappropriate sewage disposal and poor sanitation.
- IP ： 9 – 14 days.

Stages are important

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 (multiply intercellularly)
- Bacteria Released into the blood stream again that can lead to high fever (blood culture positive)

Second and third 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

COMPLICATION Can effect any organ
• Necrotizing cholecystitis • Bowel hemorrhage and perforation • Pneumonia and thrombophlebitis • Meningitis, osteomyelitis, endocarditis and abscesses.

ANTIBIOTIC & MANAGEMENT
○ Enteric fever: • Ceftriaxone • Ciprofloxacin • Trimelhoprim – Sulfamethoxazole • Ampicillin • Azithromycin or Ceftriaxone from patients from India and SE Asia due to resistance of strains. Ciprofloxacin from patients from other areas. ○ Salmonella gastroenteritis: • uncomplicated cases require fluid and electrolyte replacement only.

- **Shigella**

CLINICAL INFECTION	• Non lactose fermenter gram negative bacteria • Cause bacillary dysentery (blood, mucus and pus in the stool) • S.sonnei most predominant in USA (fever, watery diarrhea) from pork • Young adult (man who have sex with man) • S.flexneri 2nd most common developing countries (homosexual) S. dysenteriae most common • S. dysenteriae and S. boydii are most common isolates in developing countries • S. dysenteriae type 1 associated with morbidity and mortality. Very serious infection • Human is the only reservoir
ANTIGENIC STRUCTURE	• Has 4 species and 4 major O antigen groups: **S.dysenteriae, S.flexneri. S.boydii & S.sonnei.** • All have O antigens some serotype has K antigen (heat labile removed by boiling) • Shigella are non motile, lack H antigen
TRANSMISSION	• Person to person through fecal –oral route • Flies, fingers (have a 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 (can be transmitted easily unlike salmonella)More serious and virulent than salmonella • Penetrate epithelial cells leads to local inflammation, shedding of intestinal lining and ulcer formation. Usually not go deep so no bacteremia due to rarely invading the blood
SYMPTOMS	• High fever, chill, abdominal cramp and pain accompanied by tenesmus, bloody stool with mucus & WBC • IP : 24 - **48 /72** hrs

COMPLICATION

- Can lead to rectal prolapsed in children
- Complication ileus, obstruction dilatation and toxic mega colon
- Bacteremia in 4 % of severely ill patient
- Seizures, HUS (hemolytic uremic syndrome)

Lab diagnosis of Salmonella & Shigella in stool

- Both are Gram negative bacilli
- Culture in selective media (selenite enrichment broth media MAC, SS and XLD,HEA BS0)
- Biochemical tests
- Motility test
- Serology for serotypes, Sero-grouping based on O and H antigen
  1- sereny test

TREATMENT

- Antibiotic indicated if symptoms were severe and used to reduce duration of illness
- Antimicrobial agents depending on susceptibility testing Including:
  - ✓ Ampicillin or IV Ceftriaxone or oral TMP-SMX or Ciprofloxacin or doxycycline

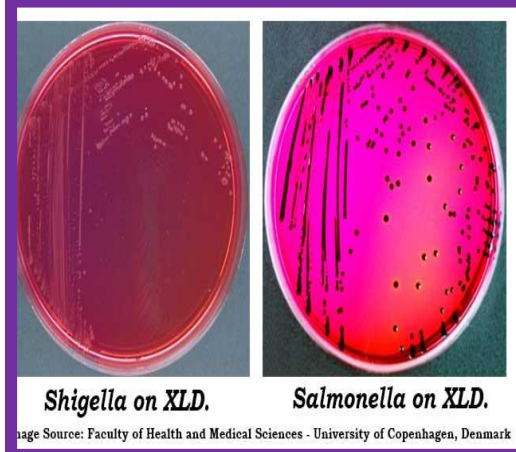
Why do we need a selective media ?
Because if we culture the stool directly will show large number of different kind of bacteria and we wont be able to detect the salmonella and shigella

Only in male's slides:

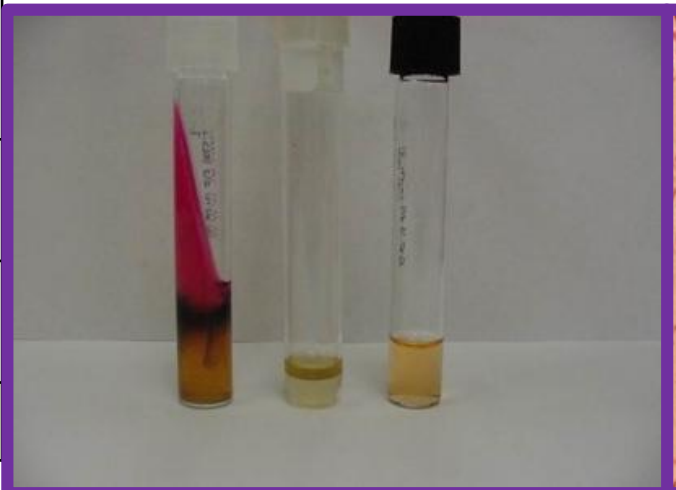
SALMONELLA SPECIES AND SUBSPECIES	NO. OF SEROTYPES WITHIN SUBSPECIES	USUAL HABITAT
S. enterica subsp. enterica (I)	1504	Warm-blooded animals
S. enterica subsp. salmae(II)	502	Cold-blooded animals and the environment*
S. enterica subsp. arizonae (IIIa)	95	Cold-blooded animals and the environment*
S. enterica subsp. diarizonae (II Ib)	333	Cold-blooded animals and the environment*
S. enterica subsp. houtenae (IV)	72	Cold-blooded animals and the environment*
S. enterica subsp. indica(VI)	13	Cold-blooded animals and the environment*
S. bongori (V)	22	Cold-blooded animals and the environment*
Total	2541	

Serology

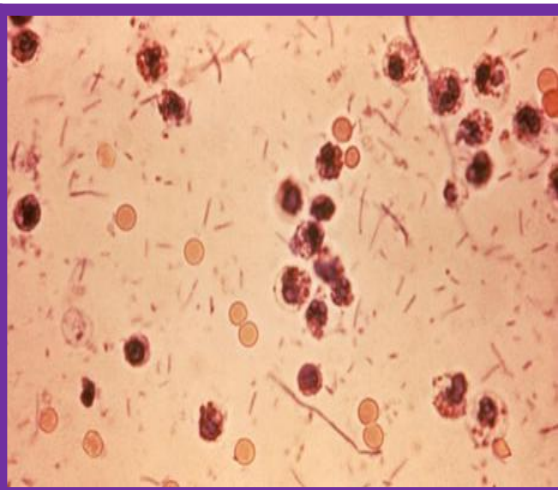
Usually in ***Salmonella, Shigella*** and ***E.coli*** *the* final detection is by serotyping using agglutination Ag+Ab test.



BIOCHEMICAL TESTS:



DYSENTRY STOOL:



	SALMONELLA	SHIGELLA
Epidemiology	S typh india, south America, Africa Non-typh worldwide approximately 10^6 bacteria 200,000 death	Low infective dose < 200 bacilli
Microbiology	Gram negative facultative anaerobic bacilli Non lactose fermenting colonies, nitrate positive but oxidase negative Motile	Gram negative facultative anaerobic bacilli Non lactose fermenting colonies Non-motile
Source	*Salmonella typhi and S. paratyphi the source is human* Salmonella Non-Typhi→Cold blooded animal, birds, rodents, turtles, snake and fish	Human is the only reservoir fecal –oral route ,Flies, fingers,Food and water, Young children in daycare, people in crowded area and anal oral sex in developed countries
Classification	**Two species** 1-S.enterica (six subspecies I, II, III, IV, V, VI) >2500 serotype 2-S.borgori (rare)	S.sonnei S.flexneri S.dysenteriae and S. boydii
Virulence	S.Typhi: Vi (virulence); H. Flagellar antigen; O. somatic antigen LPS, HS Salmonella non-typhi: K. capsular antigen; H. Flagellar antigen; O. somatic antigen (	Shigella (T3SS cytotoxic) K. capsular antigen NO H Flagellar antigen(non-motile) O. somatic antigen (HL)
Pathogenesis	Fimbria - Adherence Enterotoxin	Penetrate epithelial cells leads to local inflammation, shedding of intestinal lining and ulcer formation
Clinical	**Gastroenteritis** **S. enterica subsp. enterica** IP 12 – 48 hrs. fever, chills, watery diarrhea and abd pain 8% bacteremia In sickle cell, HIV(10-100X) hemolytic disorder and ulcerative colitis Graft, elderly or very young Treatment not indicated unless above **Typhoid Fever** **Salmonella typhi and S. paratyphi A,B and C** IP : 9 – 14 days. Prolong fever, bacteremia and dissemination. 1st wk Constipation, Mesenteric lymph node→ blood other organs ie liver (monocytes) -faint salmon-colored maculopapular skin lesions 2-3 wks prolonged fever, payer's patches and gallbladder → Diarrhea	S.sonnei (US) S.flexneri (second) S. dysenteriae T 1 and S. boydii IP 1-3 days High fever, chill, abdominal cramp and pain accompanied by tenesmus of bloody stool with mucus & WBC
Complication	Necrotizing cholecystitis Bowel hemorrhage and perforation Pneumonia and thrombophlebitis Meningitis, osteomyelitis, endocarditis and abscesses Chronic carrier 4-5wks child (0.4%) 50% up to 6 mos (G) . 3mons carrier and 4% chronic (TF)	Can lead to rectal prolapsed in children Complication ileus, obstruction dilatation and toxic mega colon Bacteremia in 4 % of severely ill patient Seizures, HUS
Diagnosis	Culture on selective selenite enrichment broth media MAC, SS and XLD,HEA BS Serogrouping Sensitivity Blood culture	Culture on selective media sam as salmonella Serotyping Sensitivity

VERY VERY IMPORTANT

You can find it HERE

Treatment	Ampicillin,Trimelhoprim – Sulfamethoxazole Ceftriaxone, Ciprofloxacin or Azithromycin	Ampicillin,Trimelhoprim – Sulfamethoxazole, Ceftriaxone, Ciprofloxacin
Prevention	For S.typhi killed and live attenuated, 1 wk before travel to endemic area	Improve food process and water treatment and sanitation

QUIZ:

1.Salmonella is a motile bacteria, while Shigella is a non-motile bacteria:

A) True B) False

2.A patient diagnosed with Enteric fever, which subspecies you're supposed to see in his biopsy?

A) Salmonella enterica
B) Shigella dysenteriae
C) Salmonella typhi and paratyphi
D) Shigella sonnei

3. Acoording to the patient in Q.2, which one of theses symptoms will be present in his case?

A) Watery diarrhea
B) Prolong fever
C) Bacillary dysentry
D) Tenesmus

Answers :
1-A 2-C 3-B

THANK YOU FOR CHECKING OUR WORK, BEST OF LUCK!

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Doctors slides