Lecture (4)

Salmonella and Shigella

Objectives:

- **Not given**

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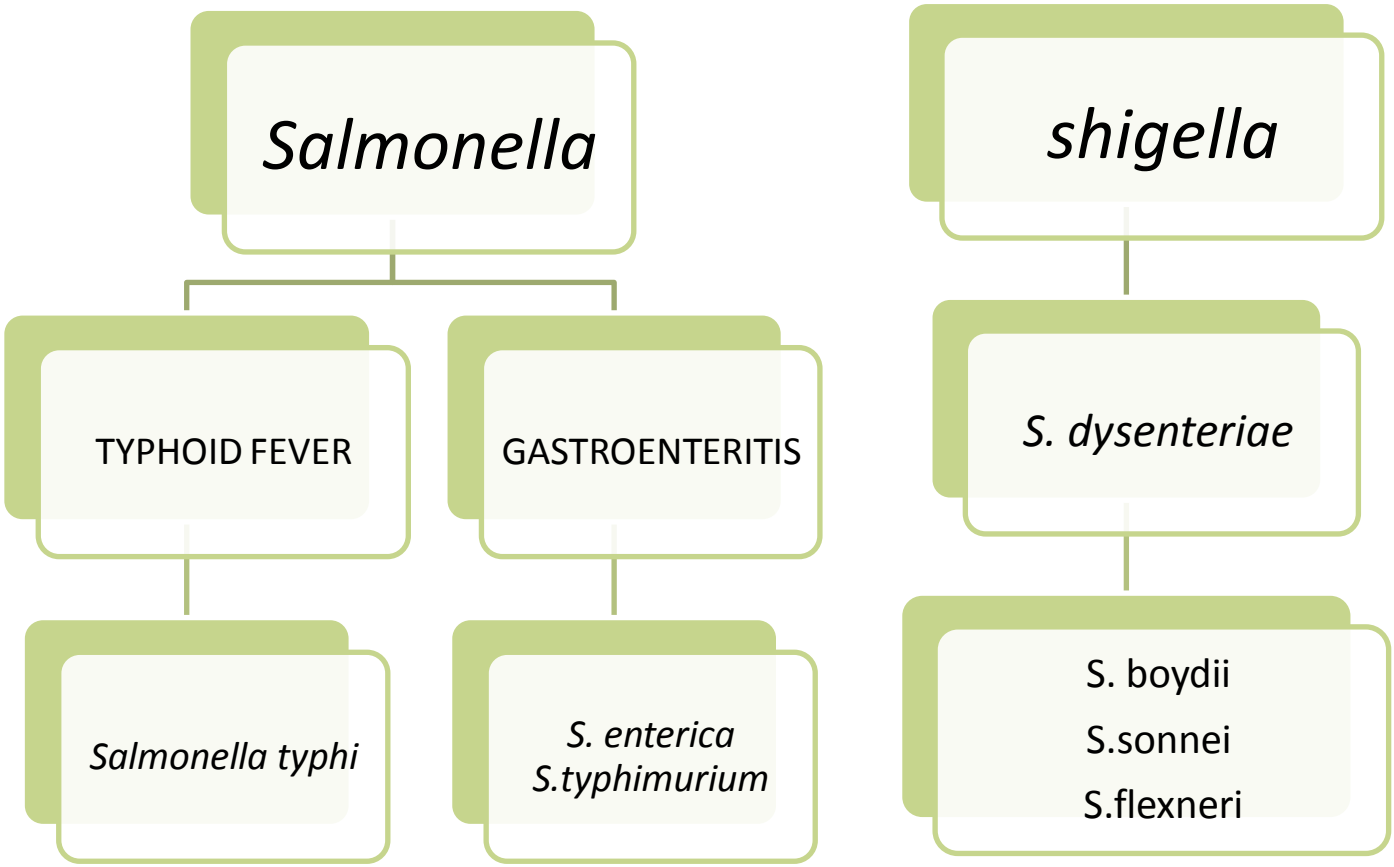
MIND MAP
(Salmonella and Shigella)



Salmonella

- Gram negative facultative anaerobic bacilli
- Non lactose fermenting colonies
- Motile (Flagella)
- Invasive --- can invaide wall of small intestine and reach the lymph nodes

Divided to two groups clinically:

Salmonella Typhi (Causes Typhoid fever) and Salmonella non-Typhi (Causes Gastroenteritis)

Virulence factors:

-Fimberia - adherence -Enterotoxin

Classification:

Has two species

1-S.enterica (six subspecies I, II, III, IV, V, VI)

2-S.borgori **(rare).**

-Cold blooded animal, birds, rodents, turtles, snake and fish **can be infected with salmonella**

Antigenic sructure

O. Somatic antigen: is an antigen located in the cell wall.
H. Flagellar antigen: Found in the flagella of motile bacteria.
K. Capsular antigen: found in the capsules of certain microorganisms.

V_I antigen in *Salmonella serotype typhi* cause of virulence *and prevent* phagocytosis

Clinical features:

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

(Carrier State means the person has the bacteria but is not affected. They carry the bacteria in the gallbladder). Treated by: removal of the gallbladder

Source:

By: (fecal-oral route)
Water food and milk contaminated with human or animal excreta.
❖ *Salmonella typhi* and *s. Paratyphi* , the source is human.

	TYPHOID FEVER "Enteric fever"	GASTROENTERITIS
Organism	Salmonella typhi ***S. paratyphi* A, B and C (less severe)**	S. enterica S.typhimurium
Source	ONLY From Human	Food poisoning milk, egg and handling Pets (From animals or humans)
Infective dose	10^6Bacteria (high compared to shigella)	10^6 Bacteria
symptoms	Prolonged fever Bacteremia Rose spots Fever Malaise Anorexia Constipation	fever, chills, watery diarrhea and abdominal pain
IP	9-14 days	8 – 36 hrs
Treatment	We start with Ceftriaxone OR Ciprofloxacin. If sensitive to ampicillin we switch to it.	• In uncomplicated cases > self limiting Fluid and electrolyte replacement only. • In complicated cases as **immunocomprimised** sickle cell ,hemolytic disorder or elderly and infant same as typhoid fever.
Notes	Antibody help in diagnosis Immunity here is cell mediated immunity Involvement of the reticuloendothelial system (liver, spleen, intestines and mesentery)	In sickle cell, ulcerative colitis, in immunocompromised, elderly or very young patient it may be severe à Cause non typhoidal bacteremia

Progress of Typhoid fever:

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

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.

Complication:

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

Shigella

- **Gram negative bacilli**
- **Non** lactose fermenter
- Non motile
- Not very invasive
- Can not reach blood stream
- **Low infective dose < 200 bacilli**

- *S.sonnei* most predominant in USA (fever, watery diarrhea)
- *S.flexneri* 2nd most common
- *S. Dysenteriae is the strongest one and* associated with (morbidity and mortality)

Shigella cause:

- bacillary dysentery (blood, mucus and pus in the stool)
- Penetrate epithelial cells leads to local inflammation, shedding of intestinal lining and ulcer formation

Antigenic structure:

- All species of shigella have O antigens and lack H antigen
- Some serotype has K antigen

Source of infection:

- Person to person
- Flies, fingers, in psychiatric wards > because it has a low infective dose.
- Food and water
- Young children in daycare, people in crowded area and anal oral sex in developed countries

Symptoms:

High fever, chill, abdominal cramp and pain accompanied by **tenesmous** , **bloody stool with mucus & WBC**.

- Can lead to rectal prolapsed in children
- Bacteremia in 4 % of severely ill patient > very very very rare (as the doctor said we have never heard of shigella bacteremia or shigella sepsis)

Treatment :

Empirical treatment with **Ceftriaxone** or **Ciprofloxacin**. > after doing sensitivity test if organism turns out to be sensitive to **ampicillin** we switch to it. Why? Because it is cheaper & safer.

Summery(important points)

Difference between Salmonella and shigella:

- Both are gram negative and intracellular organisms, so you need good cellularimmunity to get rid of the organisms.
- Both are Non lactose fermenter > so both are pale on Macconkey agar.
- **Slamonella** is **motile**, while **Shigella** is **non-motile**.
- **Salmonella** causes **watery diarrhea,** while **Shigella** causes **bloody diarrhea.**
- **Salmonella** mainly attacks the **small intestine**, while **Shigella** usually invades the **large intestine.**
- **Salmonella** is way **more invasive** that it can reach lymph nodes and blood stream and cause sepsis, **unlike shigella** which is **less invasive and localized.**
- **Treatment**: Shigellosis and typhoid fever must be treated. HOW?

  o We start with **Ceftriaxone** OR **Ciprofloxacin** Empirically, after doing sensitivity test and organism turns out to be sensitive to **ampicillin** we switch to it. Why? Because it is cheaper & safer.

  o Salmonellosis is self-limited and only requires fluid and electrolyte replacement **UNLESS** we are dealing with an **immunocomprimised** patient (because in this case we are afraid of dissemination leading to non-typhoidal bacteremia and other complications) Ex: sickle cell disease or child below 2 years or elderly or cancer patients in this case ⟶ we treat with **antibiotics**.

	TYPHOID FEVER: Human disease	**SALMONELLOSIS:** Zoonotic and human disease	**SHIGELLOSIS:** Human disease
organism	Salmonella typhi □ contain Vi antigen (Salmonella paratyphi causes paratyphoid fever, which is a milder disease)	Salmonella enterica, Salmonella typhimarium	S. dysenteriae S. boydii S.sonnei S.flexneri
history	Contact with infected person, drink water or eat food contaminated by feces of infected person (Waterborne disease)	Main source □ poultry and chicken ex: get infected after eating shawrma. Sickle cell disease is a risk factor	Contact with infected person or drink water or eat food contaminated by feces of infected person
Clinical presentation	First week: general symptoms (fever, malaise, headache) + constipation 2nd week: sustained fever + rose spots (Bacteremia must be present)	Fever, watery diarrhea, and abdominal cramps (Bacteremia only if immunocomprimised)	Fever, bloody diarrhea, abdominal cramps, and tenesmous. Bacillary dysentery □ blood, mucus and pus in the stool
complication	Perforation,peritonitis, death.	Bacteremia or sepsis	Intestinal obstruction, bacteremia is very very rare
treatment	Ceftriaxone OR Ciprofloxacin OR ampicillin.	Fluid and electrolyte replacement immunocpmrimised pt with antibiotics.	If fever>Ceftriaxone if Not>Ciprofloxacin or ampicillin or **oral TMP-SMX**

QUESTIONS

From MED431

Q1: patient presented with fever, nausea and vomiting, and watery diarrhea. Stool culture shows gram-negative motile bacilli, most likely organism:
A) Shigellla
B) Salmonella
C) Cholera
D) Campylobacter
Q2: in which of the following cases we do not treat with antibiotics:
A) Cancer patient with salmonellosis
B) 20 yrs old patient with salmonellosis
C) 20 yrs old patient with shigellosis
D) 20 yrs old patient with typhoid fever
Q3: A patient came to hospital because of with fever skin rash. While taking history " patient said (last week I had with Flu like illness, Headache, fever, and constipation). Doctor immediately admitted the patient and gave the patient IV ceftriaxone. Doctor also took tissue biopsy from the area of skin rash. What do you expect to see under microscope?
A) Gram positive dipplococci
B) Gram negative non-motile bacilli
C) Gram negative motile bacilli
D) Acid Fast Bacilli

QUESTIONS

Q4: patient presented with high fever, abdominal cramps, bloody diarrhea and tenesmous. Stool studies show presence of RBCs, pus cells and mucous. What is the most likely organism?
A) Shigella
B) cholera
C) salmonellatyphi
D) salmonellaenterica
Q5: in previous case, what is the drug of choice?
A) Ceftriaxone
B) Doxycycline
C) Metronidazole
D) Gentamycin

Answers: Q1:B Q2:B Q3:C Q4:A Q5:A

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