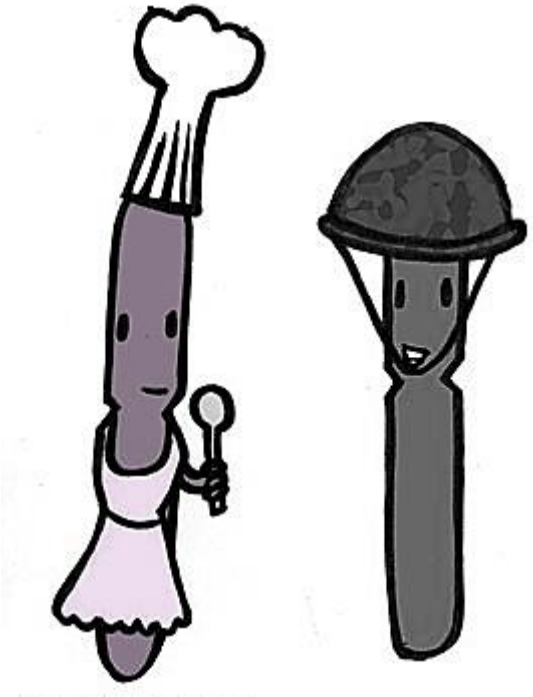
SALMONELLA & SHIGELLA

microBiology 434

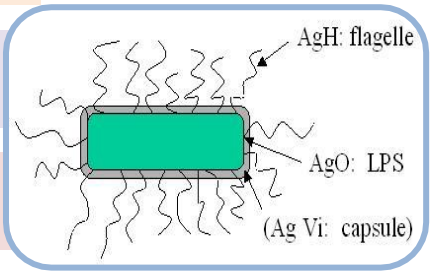


SALMONELLLA

ABOUT THE ORGANISM	VIRULENCE FACTORS	CLASSIFICATION
• **Gram negative facultative anaerobic bacilli** • **Non** lactose fermenting colonies • **Motile** • **Oxidase negative - catalase positive - intracellular**	• Fimbriae - adherence • Enterotoxin	• **S.enterica** (six subspecies I, II, III, IV, V, VI) • **S.bongori (rare)** • Cold blooded animal, birds, rodents, turtles, snake and fish

Antigenic structure:

- **O: SOmatic antigen**
  (Heat – stable) is lipopolysaccharide in the outer membrane
- **H. Flagellar antigen**
  (Heat labile)
- **K. Capsular antigen**
- **V_i in *Salmonella serotype typhi* (virulence) *vs* phagocytosis**



Clinical Features: Infect the small intestine

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

	1- Enteric (typhoid) fever	2- Gastroentritis
Subspecies	**S.Typhi & S.paratyphi A, B and C (less severe)** [non typhi type could be from animals or humans]	***S. enterica* subsp. *enterica*** Other S. Enterica subspecies
Source	**Only human** (Ingestion of contaminated food by infected or carrier individual)	Water food and milk contaminated with human or animal excreta
Symptoms & signs	❖Prolonged fever ❖ **Bacteremia** ❖Splenomegaly ❖**Dissemination to multiple organs** ❖**Leukopenia - lymphocytosis** ❖Involvement of the reticulo endothelial system (liver, spleen, intestines and mesentery	❖ Abdominal pain ❖ watery diarrhea ❖ Sometimes fever. ❖ It can cause bacteremia in immunosuppressing conditions.
Infective dose	**10^3 bacteria**	**10^6 bacteria**
IP	**IP: 9 – 14 days.**	IP: 8 – 36 hrs.
Note	❖Common in **tropical ,subtropical countries, traveler (sewage, poor sanitation)**	❖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.**

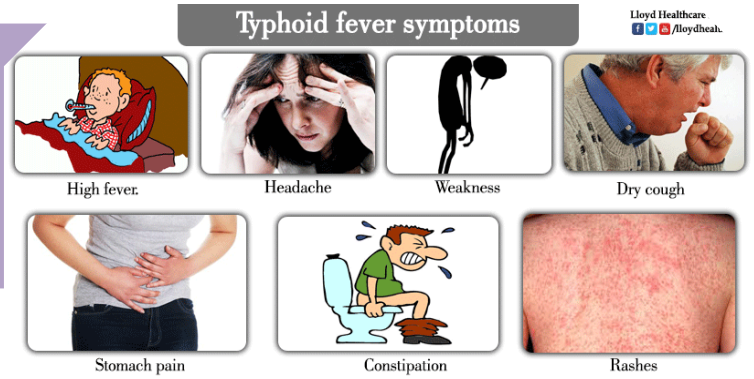
1st – 2nd – 3rd weeks events of enteric fever:

1st 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 (positive blood culture)

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:

- Ceftriaxone
- Ciprofloxacin
- Trimelhoprim \Sulfamethoxazole
- Ampicillin
- Azithromycin or Ceftriaxone from patients from India and South East Asia due to resistance of strains.
- Ciprofloxacin from patients from other areas.

***Salmonella* gastroenteritis uncomplicated cases require fluid and electrolyte replacement only.**

Complications:

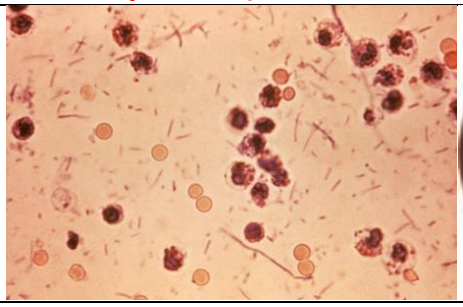
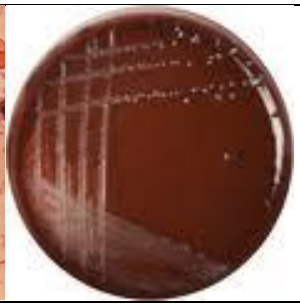
- Necrotizing cholecystitis \ Bowel hemorrhage and perforation
- Pneumonia and thrombophlebitis \ Meningitis, osteomyelitis, endocarditis and abscesses.

pathogenesis of salmonella typhi :

ingestion of salmonella =>primary bacteremia to reticuloendothelial system (liver , spleen bone marrow, lymph nodes and thymus) → when salmonella typhi is in blood antibodies are produced and these antibodies are diagnostic but not therapeutic.

[In infections by intracellular bacteria we should use antibiotic that act intracellularly]

SHIGELLA

PROFILE	• **Non lactose fermenting bacteria – Gram negative** • **Antigenic structure:** ○ **Has 4 species and 4 major O antigen groups** ○ **All have O antigens ,some serotype has K antigen** ○ **non motile → lack H antigen** ○ **Oxidase negative**
TYPES	• **S.sonnei: most predominant in USA** (fever, watery diarrhea) • **S.flexneri: 2nd most common** • **S. dysenteriae** and **S. boydii** are most commonly isolates in developing countries **[S. dysenteriae type 1 associated with morbidity and mortality the only one that causes bacteremia]**
TRANSMITTION	• **Human** is the only reservoir • Person to person through **fecal –oral** route • From **[Flies, fingers]** • Contaminated **Food and water** • **Low infective dose < 200 bacilli**
FOUND IN	• **Young adult (man who have sex with man)** • Young children in daycare, • people in crowded area • anal oral sex in developed countries
MOA	**Penetrate epithelial cells of the large intestine and leads to local inflammation, shedding of intestinal lining and ulcer formation** **[produce neurotoxin [pain] – cytotoxin [heamorrhage] – endotoxin]**
CAN CAUSE	**bacillary dysentery (blood, mucus and pus in the stool)**
SYMPTOMS	• High fever, chill, abdominal cramp and pain accompanied by **tenesmus , bloody stool with mucus & WBC** • **Incubation Period :** 24 - 48 hrs • 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) like O157-H7**
DYSENTRY STOOL & SHIGELLA CULTURE	 
TREATMENT	• **Antibiotic is used to reduce duration of illness including:** ○ **IV Ceftriaxon and Ampicillin [local and on gram negative]** ○ **oral TMP-SMX** ○ **Ciprofloxacin** ○ **Doxycycline.**

differences between salmonella and shigella are:

- **Salmonella** : motile (has flagella) + causes bacteremia
- **Shigella** : non motile (does not have flagella) + does not cause bacteremia.

MCQs:

1-Which of the following bacteria has the lowest infective dose?

a. Campylobacter jejuni b. Salmonella typhi

c. Vibrio cholera d. Shigella sonnei

2- all the following organisms are motile except?

a. E.coli b. Salmonella c. proteus d. Shigella

3.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

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

a) Watery diarrhea b) Prolong fever c) Bacillary dysentry d) Tenesmus

5.Gastroenteritis need an immediate antibiotic treatment in any patient ?

A)true B)false

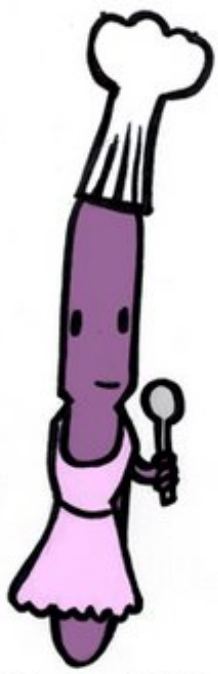
6.Which one of the following cause tenesmus?

a.v.cholera b.salmonella c.shigella d.E.coli

7.What is the second most common serotype of shigella in USA?

a. S.sonnei b.S.flexneri c.S.dysenteriae d.S.boydii

ANS: D – D – C – B – B – C - B



SALMONELLA ENTERITIDIS

Hi, my name is S. enteritidis.
I'm part of the enterobacteriaceae, from tribe 3, Salmonellae.
I'm a Gram negative bacteria.

When I have typhoidal strains people just call me S. typhi.
My typhoidal strains cause typhoid fever.
It's a serious systemic disease you get when I invade through your intestines to you blood.
It can be fatal!

I have thousands of non-typhoidal strains as well.
It can infect you through food and water and cause self-limiting diarrhoea.

My cousins S. paratyphi causes paratyphoid fever (but I just think he's copying me)

One of my most famous carriers is Typhoid Mary.
She was a cook and was quarantined until the day she died.

GOOD LUCK .. <3

حنان محمد عبدالمنعم

سارة الجاسر

حنان خشيم

نوف العريني

Hello.
My name is S. dysenteriae.
I'm a Gram negative bacteria in the Enterbacteriaceae family.
I'm also part of tribe I, Ecsherichiae.
My cousins S. flexneri, S. boydii, S. sonnei and I are all very close.
We all cause bacterial dysentery, a diarrhoea with blood and pus.
We can do this because we have Shiga toxin.
We can be transmitted on clothes and furniture.

I was all around in world war II and I killed King
Henry V!

SHIGELLA DYSENTERIAE