



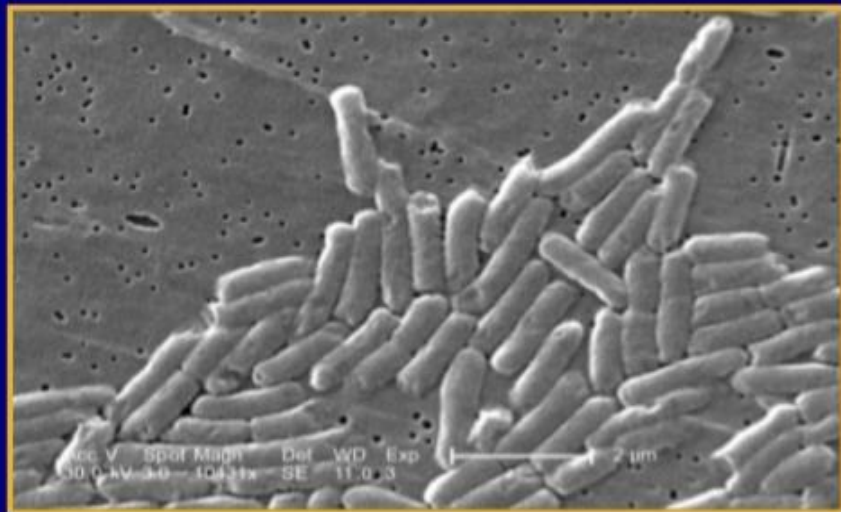
SALMONELLOSIS

BY DR AMNA ARSHAD

- Bacteria of the genus *Salmonella* are highly adapted for growth in both humans and animals and cause a wide spectrum of disease.
- The growth of *S. Typhi* and *S. Paratyphi* is restricted to human hosts, in whom these organisms cause **enteric (typhoid) fever**.
- The remaining serotypes (**non-typhoidal Salmonella or NTS**) can colonize the gastrointestinal tracts of a broad range of animals, including mammals, reptiles, birds and insects.

Etiology

- Salmonellae are gram negative, non-spore forming, facultatively anaerobic bacilli.
- Two species
 - *S. bongori*
 - *S. enterica*
(*S. Typhimurium*)
 - Six subspecies
- More than 2500 known serovars
 - Many zoonotic (non-typhoidal)



Etiology

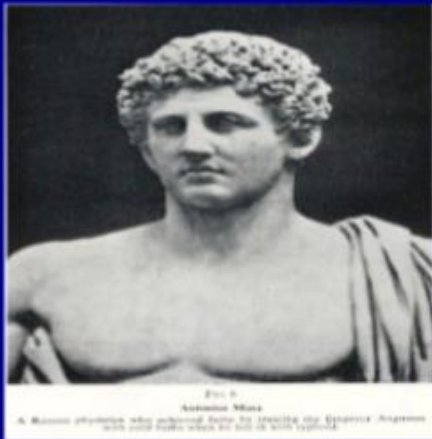
- All salmonellae are grouped based on the somatic O antigen, the surface virulence (Vi) antigen (restricted to *S. Typhi* and *S. Paratyphi*) and flagellar H antigen.

Etiology

- Somatic or O Antigens contain long chain lipopolysaccharide (LPS) cell-wall components.
- Flagellar or H Antigens are strongly immunogenic and induces antibody formation rapidly and in high titers following infection or immunization.

- Typhoid fever is a systemic disease characterized by fever and abdominal pain caused by dissemination of *S. Typhi* or *S. paratyphi*.
- It is associated with enlarged Peyer's patches and mesenteric lymph nodes.

History



Antonius Musa, a Roman physician who achieved fame by treating the Emperor Augustus 2,000 year ago, with cold baths when he fell ill with typhoid.

Thomas Willis who is credited with the first description of typhoid fever in 1659.



History

French physician **Pierre Charles Alexandre Louis** first proposed the name “**typhoid fever**”



William Wood Gerhard who was to differentiate clearly between typhus fever and typhoid in 1837.

History



Carl Joseph Eberth who discovered the typhoid bacillus in 1880.

Georges Widal who described the 'Widal agglutination reaction' of the blood in 1896.



Typhoid fever affects roughly 20 million people each year and kills an estimated 600,000.

Epidemiology

- *S. typhi* and *S. paratyphi* are pathogenic exclusively in humans.
- The source of infection is sick human or bacteriocarrier.
- People are typically infected with *S. typhi* through food and beverages contaminated by a chronic stool carrier (fecal-oral route of transmission).
- Less commonly, carriers may shed the bacteria in urine, saliva and breast milk.
- Typhoid fever is potentially fatal if untreated.

Cases

- A case is infectious as long as bacilli appears in stools or urine.
- Case may be missed, mild or severe.

Carriers

- Temporary/incubatory- excrete bacilli for 6 to 8 weeks
- Chronic- excrete bacilli for more than a year, organism persist in gall bladder/biliary tract. e.g. "Typhoid Marry" real name Mary Mallon

HOST FACTORS

- Age- occur at any age but highest incidence in 5-19 yrs age group.
- Sex- cases more in Males than Female; carrier rate is more in females.
- Immunity- antibody may be stimulated by infection or immunization. Antibody against (O) antigen is higher in patient with the disease and antibody against (H) antigen is higher in immunized person.

ENVIRONMENTAL & SOCIAL FACTORS

- Typhoid fever regarded as “Index of general sanitation” in any country.
- Increase incidence in July-September.
- Outside human body bacilli found in
 - water- 2 to 7 days
 - soil irrigated with sewage- 35 to 70 days
 - ice & icecream- over a month food- multiply & survive for sometime
 - milk- grow rapidly without altering its taste
 - vegetables grow in sewage plant.

Pathogenesis

Ingestion of contaminated food or water



Invade small intestine and enter the bloodstream



Carried to the liver, spleen and bone marrow



Multiply and reenter the bloodstream

Pathogenesis

Bacteria invade the gallbladder, biliary system and the lymphatic tissue of the bowel and multiply in high numbers



Then pass into the intestinal tract and can be identified for diagnosis in cultures from the stool tested in the laboratory

Clinical Course

Incubation period – averages 10-14 days (ranges from 3 to 21 days) depending upon the dose of the bacilli ingested, the host's health and immune status.

Clinical Course

- Prolonged (continued) fever (38.8-40.5) for up to 4 weeks if untreated.
- Headache (80%)
- Chills(35-45%)
- Cough (30%)
- Sweating (20-25%)
- Myalgias (20%)
- Malaise (10%)
- Arthralgia (2-4%)

Gastrointestinal symptoms:

- Anorexia (55%)
- Abdominal pain (30-40%)
- Nausea (18-24%)
- Vomiting (18%)
- Diarrhea (22-28%) more common than
- Constipation (13-16%)
- Coated tongue (51-56%)
- Splenomegaly (5-6%)
- Abdominal tenderness (4-5%)

Clinical Course

- **First week:** Malaise, headache, cough & sore throat in prodromal stage. The disease classically presents with step-ladder fashion rise in temperature (40 - 41°C) over 4 to 5 days, accompanied by headache, vague abdominal pain, and constipation or pea soup Diarrhoea.
- **Second week:** Between the 7th -10th day of illness, mild hepato- splenomegally occurs in majority of patients. Relative bradycardia may occur and rose-spots may be seen.

Clinical Course

- **Third week:** The patient will appear in the "typhoid state" which is a state of prolonged apathy, toxemia, delirium, disorientation and/or coma. Diarrhoea will then become apparent. If left untreated by this time, there is a high risk of intestinal hemorrhage and perforation.

Complications

- Gastrointestinal bleeding (10-20%)
- Intestinal perforation (1-3%)

(Most commonly occur in the third and fourth weeks of illness and result from hyperplasia, ulceration and necrosis of the ileocecal Peyer's patches at the initial site of Salmonella infiltration).

Neurological complications

- Neurological complications occur in 2-40% of patients .
- Meningitis
- Guillain-Barre Syndrome
- Neuritis
- Neuropsychiatric symptoms

Diagnosis

- Microbiological procedures
- Serological procedures
- New diagnostic tests

Microbiological procedure

- Blood Cultures Bacteremia occurs early in the disease
- Blood Cultures are positive in
 - ❖ 1st week in 90%
 - ❖ 2nd week in 75%
 - ❖ 3rd week in 50%
 - ❖ 4th week and later in 25%

SEROLOGICAL PROCEDURE

FELIX-WIDAL TEST

Significant Titers helps in Diagnosis

- Serum agglutinins raise abruptly during the 2nd or 3rd week
- Following Titers of antibodies against the antigens are significant when single sample is tested

O > 1 in 160

H > 1 in 320

- Testing a paired sample (7-10 days) for raise of antibodies carries a greater significance

- Polymerase chain reaction and DNA probe assays to detect *S. Typhi* in blood are being developed.



CONTROL

- CONTROL OF RESERVOIRS
 - CONTROL OF SANITATION
 - IMMUNIZATION
- 



CONTROL OF RESERVOIR

- CASES

Early diagnosis

Notification

Isolation

Treatment

Disinfection and followup



- CARRIERS

Identification


Treatment

Surveillance

Healthy education




CONTROL OF SANITATION

- Protection of drinking water supplies
 - Improved sanitation
 - Food hygiene
 - Health education
- 



IMMUNIZATION

- Can be given at any age > 2 yr
 - Recommended to endemic areas, house contacts, school children, travelers etc
- 

Parenteral vaccine – Vi CPS

- This single-dose injectable typhoid vaccine, consisting of purified Vi polysaccharide from the bacterial capsule.
- Given in 1 dose, with a booster every 2 years.
- This vaccine is recommended for use in children over 2 years of age.
- Sub-cutaneous or intramuscular injection
- Efficiency : 55%

The oral live attenuated vaccine (TY21a)

- This is a live-attenuated-bacteria vaccine manufactured from the Ty21a strain of *S. typhi*.
- Not recommended for use in children younger than 6 years of age.
- The course consists of one capsule orally, taken an hour before food with a glass of water or milk on days 1, 3, 5 and 7 with a booster every 5 years.
- Efficiency: 51%

Treatment

- **Ciprofloxacin** (first line) 500mg bid (PO) or 400mg q12h (i/v) – (5-7 days)
- **Amoxicillin** (second line) 1g tid (PO) or 2g q6h (i/v) – (14 days)
- **Chloramphenicol** 25mg/kg tid (PO or i/v)- (14-21 days)
- **Trimethoprim-sulfamethoxazole** 160/800 mg bid (PO) – (14 days)



Thank You