

Non-Lactose Fermenters

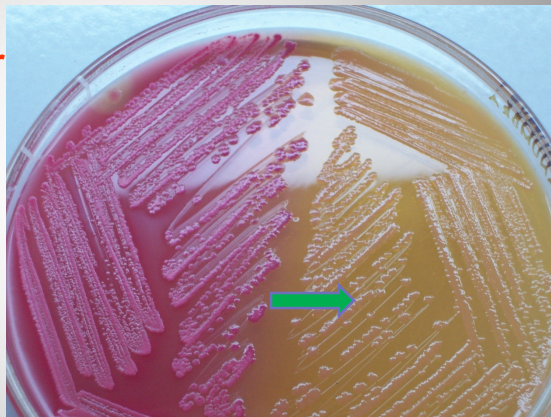


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Enterobacteriaceae\ Non-lactose fermenters

Pale-colour colonies
on MacConkey agar

- *Proteus*
- *Shigella*
- *Salmonella*
- *Yersinia*





Salmonella

- Comprises of about **2,500** serotypes
- Parasite of intestine of poultry and animals (cattles)
- *S. typhi* and *paratyphi* – human are the only hosts

Antigenic structure

- Somatic (O) antigen
- Flagellar (H) antigen
- Virulence (Vi) antigen – by *S. typhi* & *S. paratyphi* C

Classification

A. Ewing's classification

Three species:

- 1) *S. typhi* (one serotype)
- 2) *S. choleraesuis* (one serotype)
- 3) *S. enteritidis* (> 2,400 serotypes)

Kaufman-White classification

Each serotype given a species name

(>2,400 species e.g. *S.dublin*, *S.tamale* etc)

Salmonella

Important members are:

- *S.typhi*
- *S. paratyphi A,B,C*
- *S. typhimurium*
- *S. choleraesuis*

Diseases caused by salmonella

1. Gastroenteritis - *S. typhimurium*
2. Enteric fever - *S. typhi* (**typhoid fever**)
- *S. paratyphi A,B,C* (paratyphoid fevers)
3. Bacteremia - mostly *S. choleraesuis*, *S. typhi*

Transmission

- Animal food stuffs
- Poultry – (eggs infected trans-ovarially)
- Contaminated water and vegetables
- Ingestion of raw milk has been associated with outbreak
- Seasonal variation – peak in summer – fall

Diseases caused by *Salmonella*

Gastroenteritis (Enterocolitis)

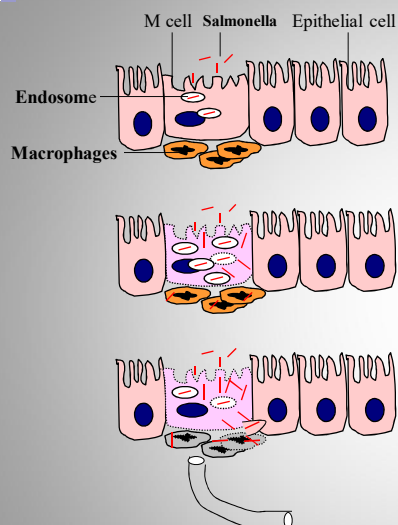
- Most common cause is *S. typhimurium*
- **Infective dose** : 10,000 bacilli or more.
Patients on antacid drugs – a smaller dose.
- **Incubation period** : 24-48 hours.

PATHOGENESIS

- After ingestion → bacilli are internalized by induced endocytosis in the epithelial cells of ileum & colon → penetrate to lamina propria → inflammation and poor absorption.
- PMNL response limits infection to gut
- Bacteremia is infrequent.

CLINICAL FEATURES:

- Nausea & vomiting
- Abdominal cramps & diarrhea



Pathogenesis of Typhoid Fever

Salmonella are taken up by M cells in the small intestine by endocytosis.

Bacteria multiply within endosomes and kill M cells. **Bacteria are discharged from base of cell** and are taken up by macrophages in Peyer's patches.

The bacteria multiply inside cells leading to death of macrophages. Are carried via lymphatics to macrophages in mesenteric LN, liver, spleen, bone marrow where they multiply and cause bacteremia.

Symptoms of the disease probably due to Endotoxins.

Enter RES
Cause bacteremia

Infection of Gall Bladder
Infection of intestinal lymph follicles

Clinical features of enteric fever

First Week

- Gradual increase in fever-step-ladder pattern
- Generalized aches & pains
- Anorexia & constipation
- Relative bradycardia

Second Week

- High-grade fever
- Abdominal pain & diarrhea, weakness
- Enlarged spleen, rose spots on abdomen

Third Week:

- If no complications – recovery starts.

Lab identification

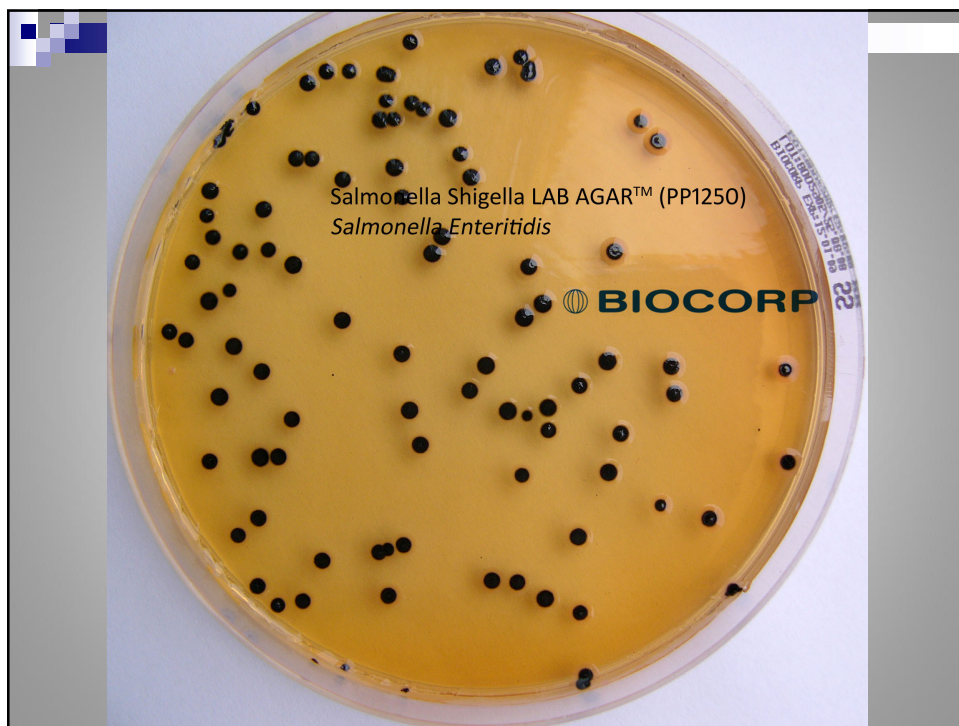
Specimen : stool or blood

Microscopy

- **Methylene blue** staining to see **PMNLs** : if present

Culture on:

- MacConkey or *Salmonella* – *Shigella* agar (**SS Agar**)
Non-lactose fermenting colonies identified by:
 - Motility (**motile**)
 - **TSI** – Butt – acidic, Slant – alkaline; **with H₂S**



Complications of enteric fever

- Intestinal perforation in terminal ileum
- Abscess formation
- Pneumonia
- Myocarditis, damaged heart valves
- Thrombophlebitis, IVC
- Carrier state (3%)

What is the reservoir for Salmonella typhi?

- A) Wild rodents
- B) Soil
- C) Humans
- D) Pigs
- E) Fowl