

\* جامعة الانبار

\* كلية: الصيدلة

\* قسم: العلوم المختبرية السريرية

\* اسم المادة باللغة العربية: احياء مجهرية طبية I

\* اسم المادة باللغة الإنكليزية: **Medical Microbiology I**

\* المرحلة: الثانية

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\* عنوان المحاضرة باللغة العربية: سلمونيالا معوية

\* عنوان المحاضرة باللغة الإنكليزية: **Salmonella.**

# Salmonella

Food Poisoning



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## Salmonella

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Practical Medical Microbiology I



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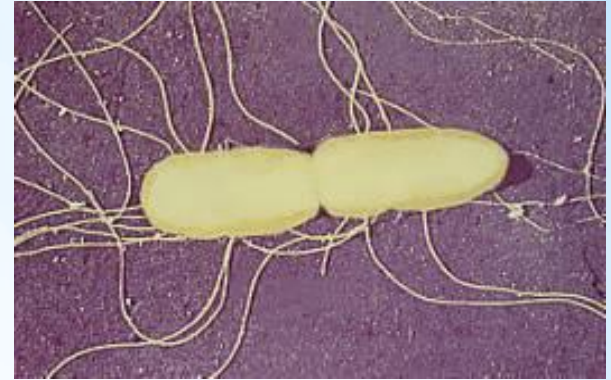
**\* Salmonellae are often pathogenic for humans or animals when acquired by the oral route.**

**\* They are transmitted from animals and animal products to humans where they cause enteritis, systemic infection, enteric fever and food poisoning**

**\***

## Morphology of Salmonella\*

- \* Gram negative bacilli
- \* Motile by peritrichous flagella



## Cultural Characters

- \* Aerobic / Facultatively anaerobic
- \* Grows on simple media - Nutrient agar,
- \* Temp 15 - 41°C / 37° C
- \* Colonies appear as large 2 -3 mm, circular, low convex,  
On MacConkey medium appear Colorless ( NLF )  
H<sub>2</sub> S produced by Salmonella typhi

## \*Important members are:

1. *S. typhi*
2. *S. paratyphi A,B,C*
3. *S. typhimurium*
4. *S. choleraesuis*



- ❖ This species are pathogenic for man and animals
- ❖ The organisms almost always enter via the oral route, usually with contaminated food or drink.
- ❖ The mean infective dose to produce clinical or subclinical infection in humans is  $10^5 - 10^8$  salmonellae.
- ❖ Among the host factors that contribute to resistance to salmonella infection are **gastric acidity**, **normal intestinal microbial flora**, and **local intestinal immunity**





## A-THE “ENTERIC FEVERS” (TYPHOID FEVER)

*Salmonella Typhi* (typhoid fever)  
*S. paratyphi* A,B,C (paratyphoid fevers)

B-BACTEREMIA WITH FOCAL LESIONS  
*S choleraesuis*

C-ENTEROCOLITIS (gastrointestinal diseases) and food poisoning:

salmonella *typhimurium*, S.  
Enteritidis



## \* **Diagnostic Laboratory Tests**

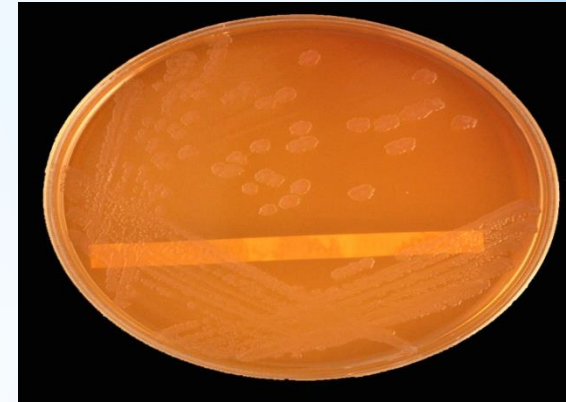
### \* **A-SPECIMENS**

- \* Blood for culture must be taken repeatedly. In enteric fevers and septicemias, blood cultures are often positive in the first week of the disease.
- \* Bone marrow cultures may be useful.
- \* Urine cultures may be positive after the second week.
- \* Stool specimens also must be taken repeatedly. In enteric fevers, the stools yield positive results from the second or third week on; in enterocolitis, during the first week.
- \* A positive culture of duodenal drainage establishes the presence of salmonellae in the biliary tract in carriers

\* **B. Bacteriologic methods for isolation of salmonellae:-**

\* **1. Differential Medium Cultures—**

\* **MacConkey's,**

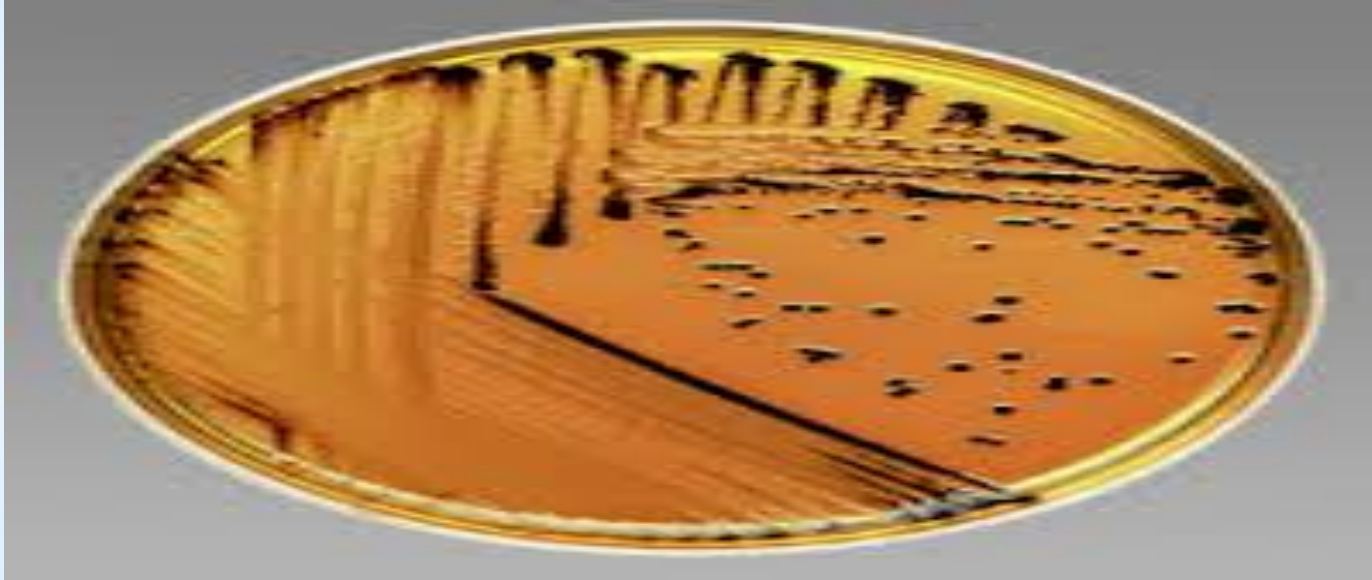


\* **Bismuth sulfite medium** permits rapid detection of salmonellae which form black colonies because of H<sub>2</sub>S production

\*



\* 2-Selective Medium Cultures—



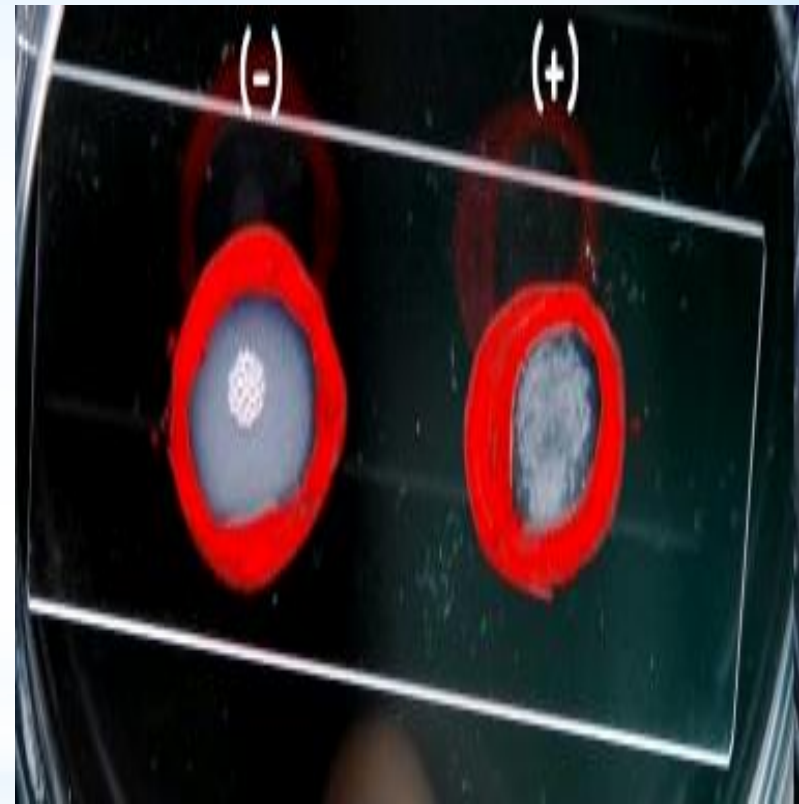
\* **salmonella-shigella (SS) agar,**

3- Enrichment Cultures(tetrathionate broth)

# C-Serologic methods\*

In slide agglutination\* tests a known serum and unknown culture isolate is mixed, clumping occurs within few minutes

Commercial sera are\* available for detection of A, B, C<sub>1</sub>, C<sub>2</sub>, D, and E.



# \* Tube Dilution Agglutination Test (Widal Test)–



\*The Widal test is an old serologic assay for detecting IgM and IgG antibodies to the O and H antigens of *Salmonella*.

Serial dilutions of sera are tested against unknown antigens from representative salmonellae.

# *Shigella*





- The natural habitat of shigellae is limited to intestinal tracts of humans, where they produce bacillary dysentery. (Shigellosis)
- It also can cause watery diarrhea with fever; change to dysentery
- .
- Shigella infections are almost always limited to the gastrointestinal tract; bloodstream invasion is quite rare.
- The essential pathologic process is invasion of the mucosal epithelial cells.
- Humans are only reservoir
- the infective dose is  $10^3$  organisms
- Shigellae are transmitted by “food, fingers, feces, and flies” from person to person

# \* DEFINITIONS

➤ **Dysentery** = inflammation of intestines (especially the colon (colitis) of the large intestine) with accompanying severe abdominal cramps, tenesmus, and frequent, low-volume stools containing blood, mucus, and fecal leukocytes.

➤ **Bacillary dysentery** = dysentery caused by bacterial infection with invasion of host cells/tissues and/or production of exotoxins



\* *Shigella* species are classified to four groups according in differences in somatic (O) antigen

\* **group A:** *Shigella dysenteriae*

\* **group B:** *Shigella flexneri*

\* **group C:** *Shigella boydii*

\* **group D:** *Shigella sonnei*



## General character:

- ✓ Short rods
- ✓ Gram-negative
- ✓ **Non-motile**
- ✓ Non-encapsulated
- \* Shigellae are facultative anaerobes but grow best aerobically.
- \* Convex, circular, transparent colonies with intact edges reach a diameter of about 2 mm in 24 hours
- \* **Non-lactose fermenting**
- \* All shigellae ferment glucose and form acid



## Laboratory diagnosis\*

### \* Specimen:

fresh stool.  
Rectal swab.  
Serum

## \* Microscopy:

➤ Microscopic examination is a gram negative bacilli.



# On culture media

\* On MacConkey agar

\* *Shigellae* form non-lactose fermenting pale colored or colorless and transparent colonies





\* On SS agar

\* Colonies are transparent, translucent or opaque and usually smooth (non lactose fermenting)

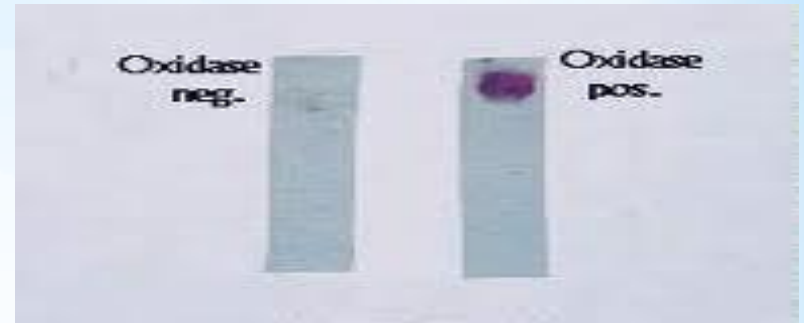




\* **Biochemical test**

\* **Oxidase test**

Cytochrome oxidase negative.



\* **Catalase test**

positive reaction



\* Urease

-ve

\* H<sub>2</sub>S

-ve.

\* lactose

-ve

\* Citrate

-ve

## \* SEROLOGY

Normal persons often have antibody against several *Shigella* species. However, serial determinations of titers may show a rise in specific antibody. Serology titers may show a rise in specific antibody.

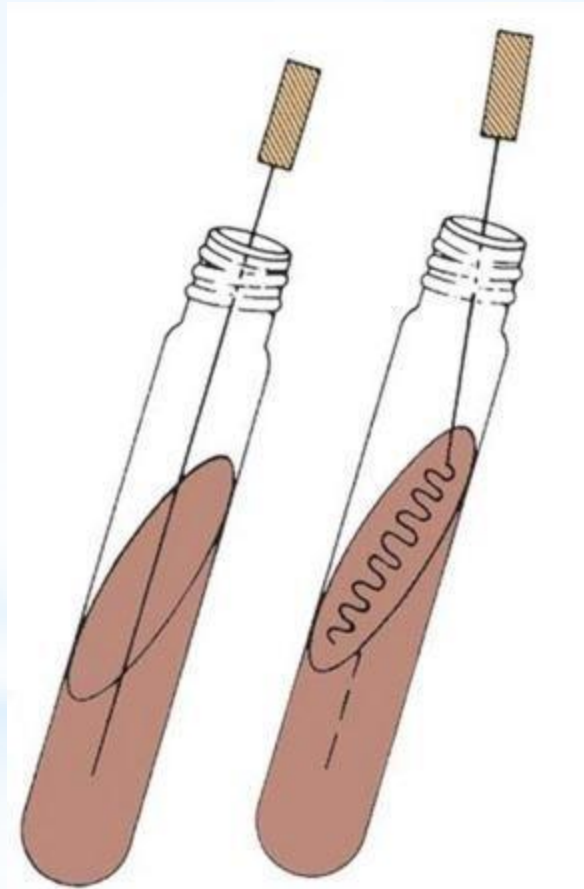
Serology is not used to diagnose shigella infections

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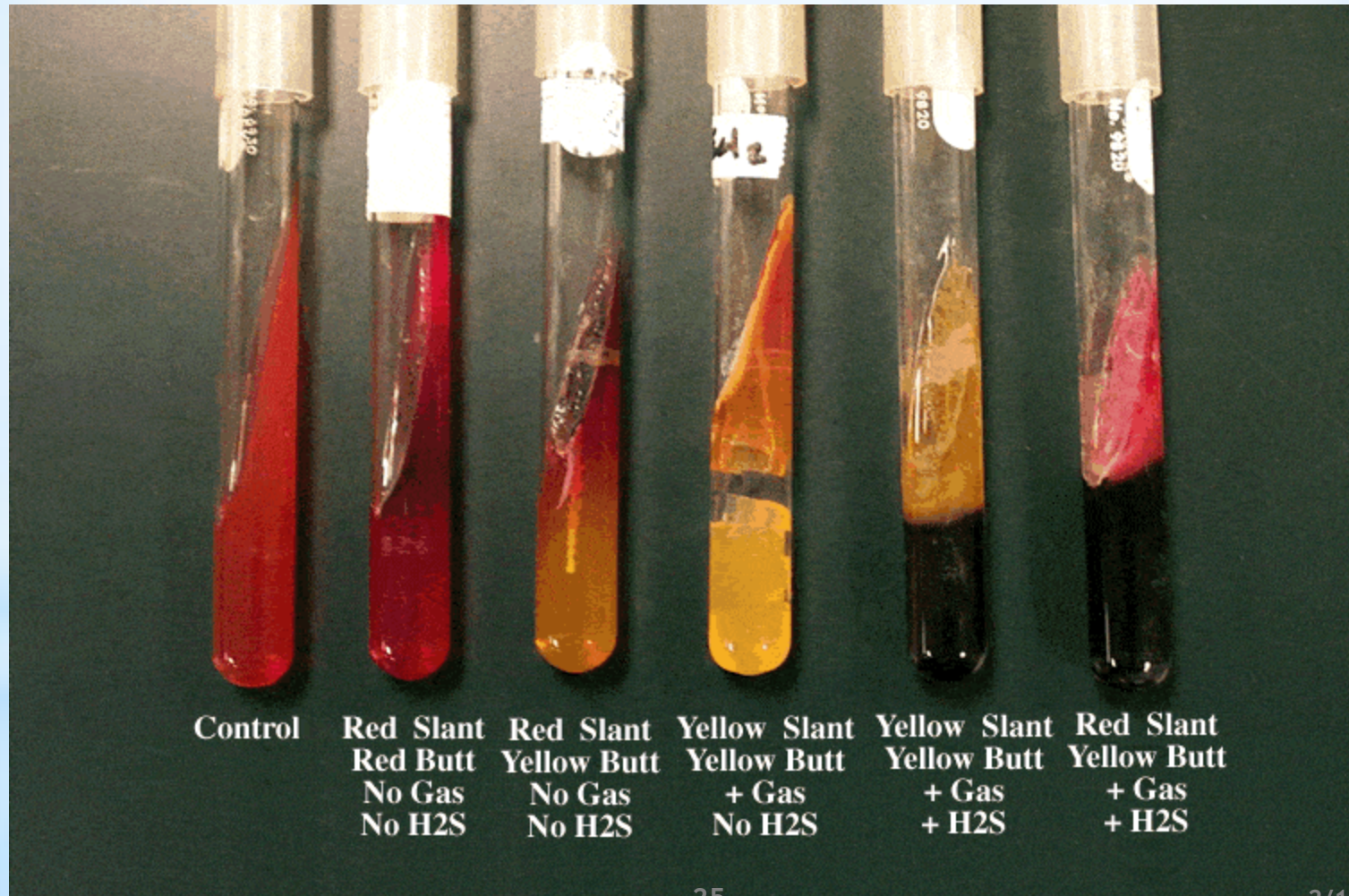
# Triple sugar- iron agar

- \* The triple sugar- iron agar test is designed to differentiate among the different groups of the Enterobacteriaceae, which are all gram negative bacilli capable of fermenting glucose with the production of acid, and to distinguish them from other gram negative intestinal bacilli.
- \* TSI Agar contains three sugars, **lactose 1%** and **sucrose in 1%** concentrations and **glucose in 0.1%** concentration
- \* **Iron:-ferrous sulfate:** Indicator of H<sub>2</sub>S formation
- \* **Phenol red:** Indicator of acidification (It is **yellow** in **acidic condition** and red under alkaline conditions).
- \* It also contains **Peptone** which acts as source of nitrogen

## \* Procedure for Triple Sugar Iron Agar (TSI) Test



# Interpretation of Triple Sugar Iron Agar Test\*





## Some example of Triple Sugar Iron (TSI) Agar Reactions

Name of the organisms	Slant	Butt	Gas	H <sub>2</sub> S
<i>Escherichia,</i> <i>Klebsiella,</i> <i>Enterobacter</i>	Acid (A)	Acid (A)	Pos (+)	Neg (-)
<i>Shigella,</i> <i>Serratia</i>	Alkaline (K)	Acid (A)	Neg (-)	Neg (-)
<i>Salmonella,</i> <i>Proteus</i>	Alkaline (K)	Acid (A)	Pos (+)	Pos (+)
<i>Pseudomonas</i>	Alkaline (K)	Alkaline (K)	Neg (-)	Neg (-)





**Thank You**