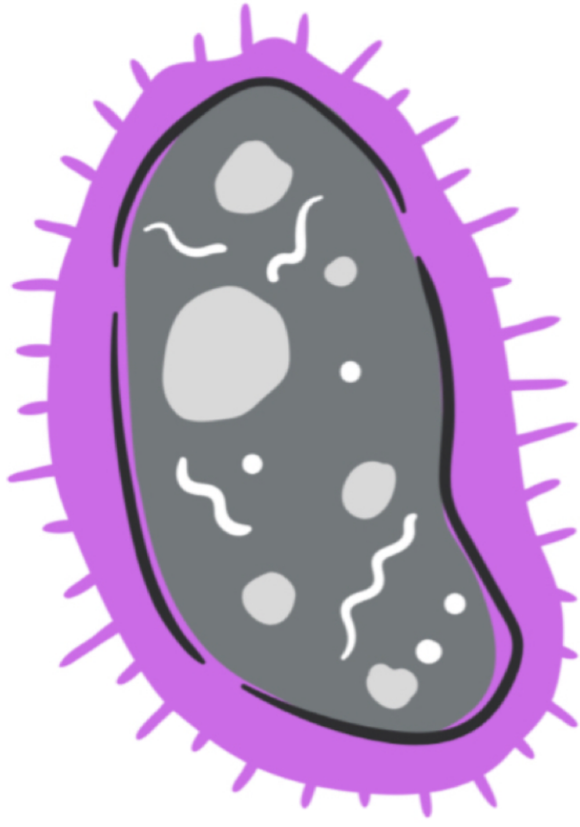
GIS

Sheet no. 4

Microbiology



Done by: Salsabeel Aljawabrah
Correction: Salsabeel Aljawabrah
Doctor: Nader Alaridah

Pay attention!

-**I will write the slides content that the doctors mentioned, with bold black.**

-What was mentioned in the slides while doctor skipped them, with small letters.

-<u>What doctor focused on and said اللي بهمني تعرفه, with underlined shape .</u>

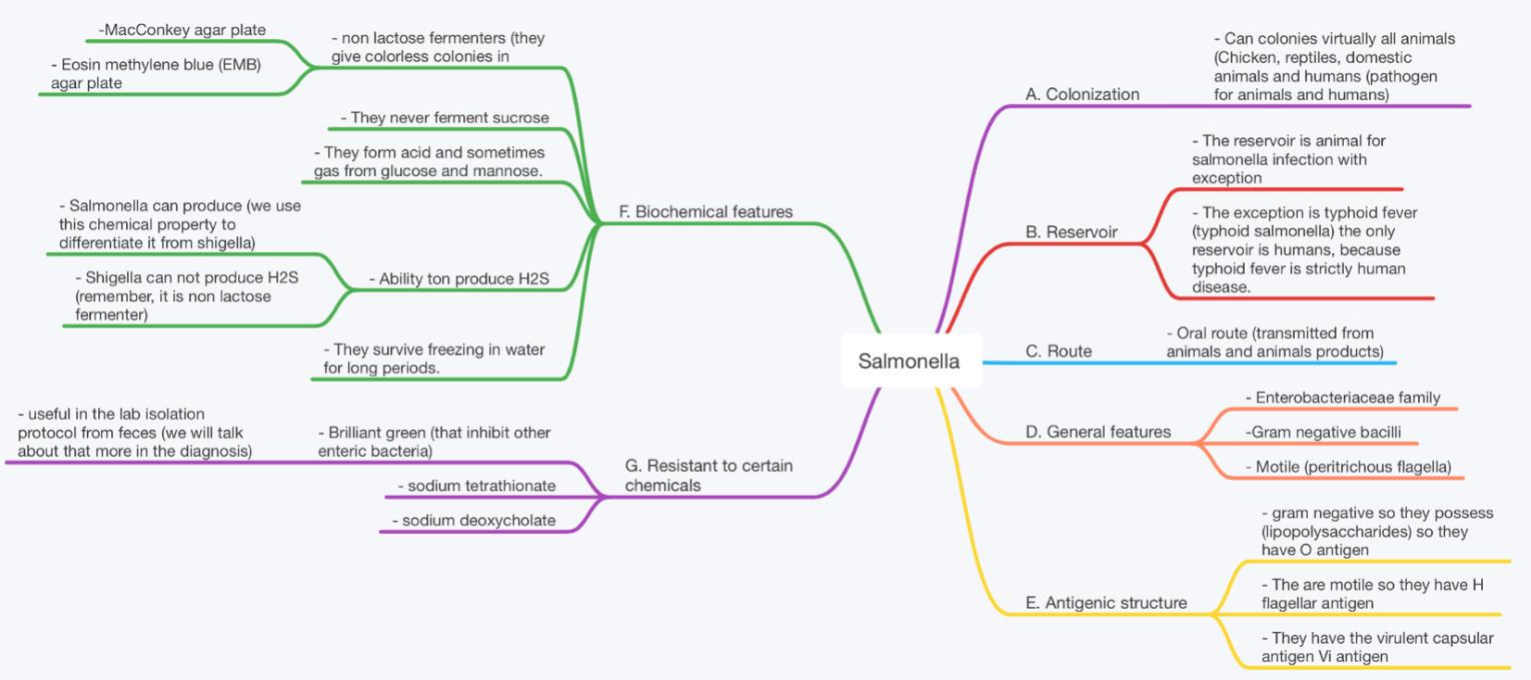
-The rest of Dr. Nader speech will be written in a normal shape.

……

We talked in the previous lecture about 2 genera of Enterobacteriaceae (diarrheagenic (Enteropathogenic) E.coli & shigella) Now we will talk about A. Salmonella, B. Yersenia;

A. Salmonella

1. Overview



They ferment glucose rather than oxidize it , they are oxidase negative.

2. Naming

a.Naming is complex and controversial but one of the most accepted nomenclature systems you will see is composed from 3 parts:

1- Genus which is Salmonella.

2- Then the species, there are two species

- **Enterica** (affects that humans and worm blooded animals (animals that can keep their temperature higher than their environment), **the species of our interest**.
- Bongori (affects cold blooded animals)

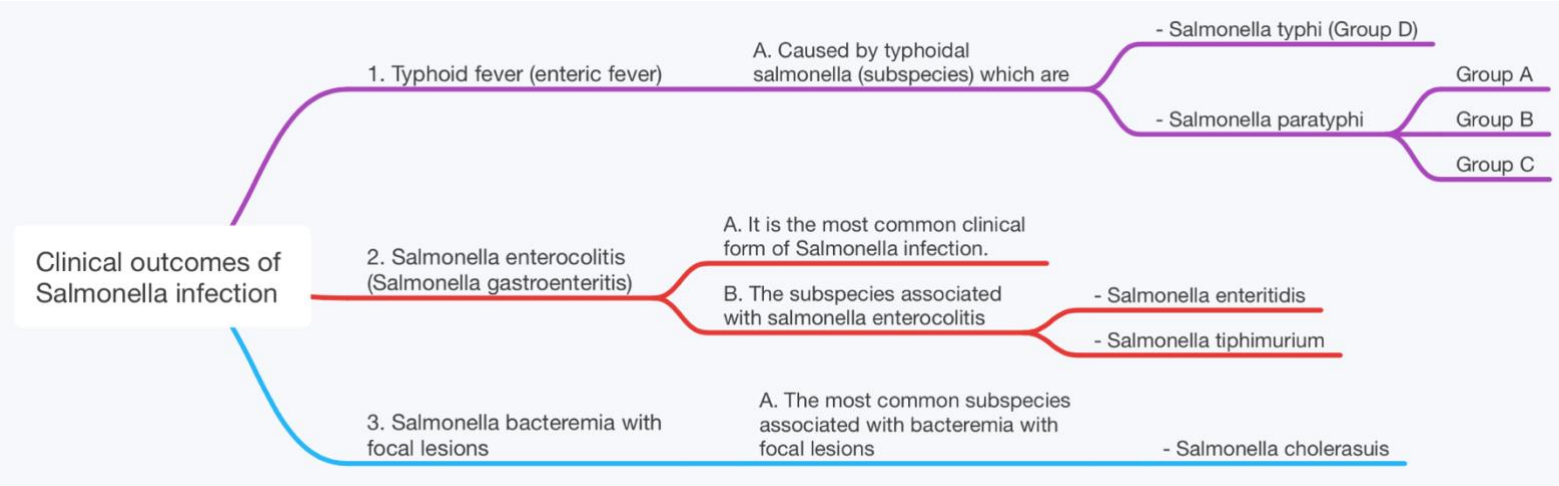
3- Subspecies (serotype/ serovars), there are more than 2,400 serotypes of salmonella.

We will discuss 5 serotypes **(Typhi, paratyphi, enteritidis, typhimurium and cholerasuis).**

3. Overview of the three clinical forms of Salmonellosis

<u>You must differentiate between typhoidal salmonella (ST) and non-typhoidal salmonella (NST).</u>

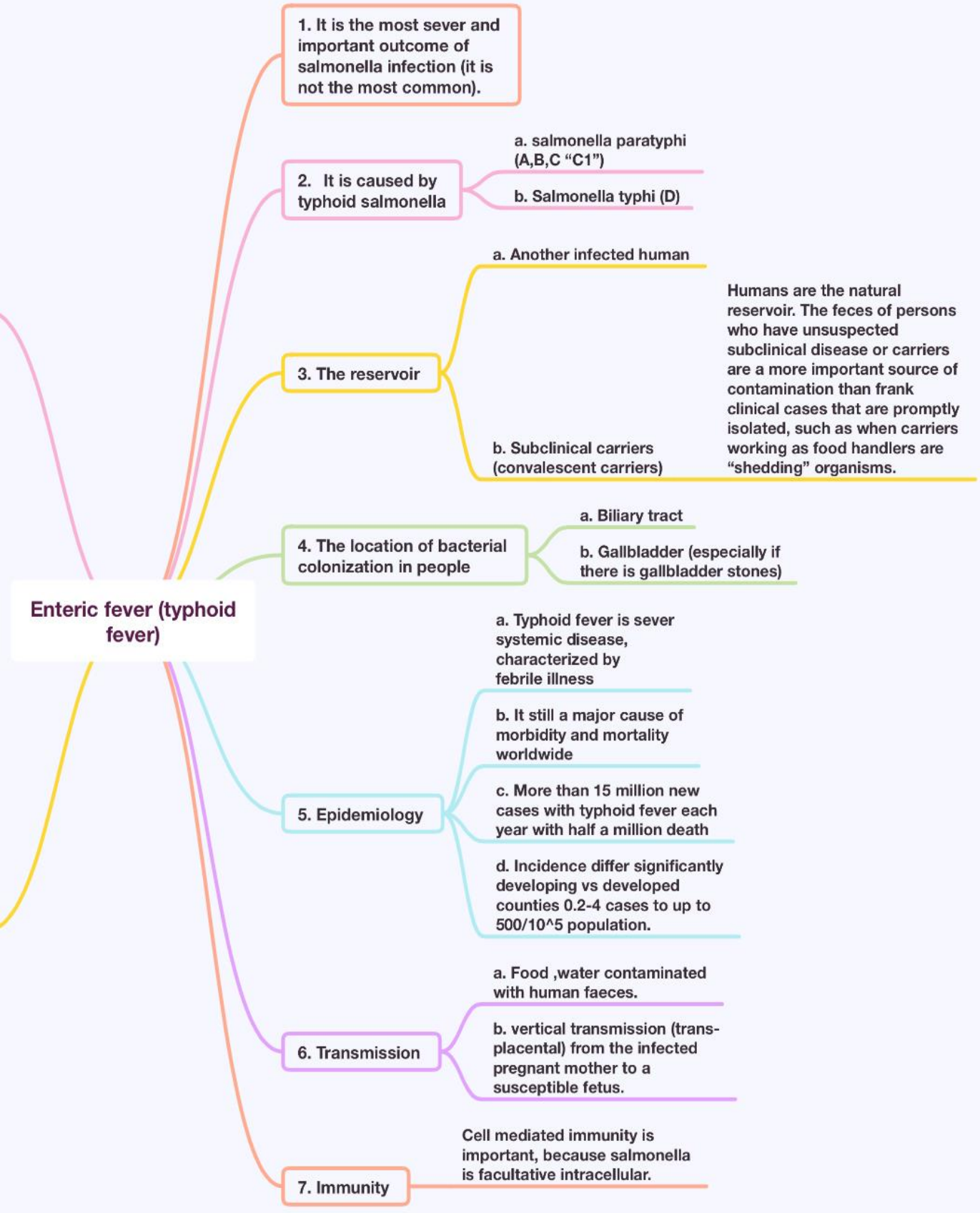
- The disease caused by Salmonella is called **Salmonellosis**.
- Typhoidal salmonella is caused by Salmonella paratyphi (A,B,C) and Salmonella typhi (group D), While non typhoidal salmonella caused be any serotypes other than typhi and paratyphi.
- The three following clinical outcomes of Salmonella infection might overlap.
- They used to divide Salmonella paratyphi to four groups:
  Group A, Group B, Group C, Group D (which is now known as Salmonella typhi, it cause the most sever form of typhoid fever).
- These five serotypes belongs to enterica species.



4. Three clinical forms of Salmonellosis in details

A. Enteric fever (typhoid fever) (here is a summary, try to join the following 2 paper together (printing issue)

- Most serious, not most common.
- Caused by Salmonella typhi and paratyphi.
- Reservoir is infected humans and subclinical carriers.
- Transmission by contaminated food and water and from mother to fetus.
- Colonization in biliary tract and gallbladder if there are stones.
- Immunity by cell-mediated immunity (**facultative intracellular**).
- Acid sensitivity: 1) needs higher inoculum. 2) anti acids users are at high risk.
- Lumen of intestines → M cells → payer's patches (multiplication in lamina propria monocytes) → Intestinal L.N → mesenteric L.N → Thoracic duct → blood → reticular-endothelial cells in spleen, liver and bone marrow.
- Inflamed mucosa and epithelium causing ulcers healing without scare.
- **<u>Culture, blood + , stool +</u>**


Enteric fever (typhoid fever)
1. It is the most sever and important outcome of salmonella infection (it is not the most common).
2. It is caused by typhoid salmonella
a. salmonella paratyphi (A,B,C "C1")
b. Salmonella typhi (D)
3. The reservoir
a. Another infected human
b. Subclinical carriers (convalescent carriers)
Humans are the natural reservoir. The feces of persons who have unsuspected subclinical disease or carriers are a more important source of contamination than frank clinical cases that are promptly isolated, such as when carriers working as food handlers are "shedding" organisms.
4. The location of bacterial colonization in people
a. Biliary tract
b. Gallbladder (especially if there is gallbladder stones)
5. Epidemiology
a. Typhoid fever is sever systemic disease, characterized by febrile illness
b. It still a major cause of morbidity and mortality worldwide
c. More than 15 million new cases with typhoid fever each year with half a million death
d. Incidence differ significantly developing vs developed counties 0.2-4 cases to up to 500/10^5 population.
6. Transmission
a. Food ,water contaminated with human faeces.
b. vertical transmission (trans-placental) from the infected pregnant mother to a susceptible fetus.
7. Immunity
Cell mediated immunity is important, because salmonella is facultative intracellular.

Enteric fever (typhoid fever)

8. Pathogenesis

a. After ingestion and passage of salmonella to the stomach, the organism faces the high acidity inside (salmonella is acids sensitive) and this has two reflexes :

1. We need high (inoculum/ dose) of salmonella because large amount of this organism will die after reaching the acid environment (the dose is so many folds in comparison to shigella.

2. The anti acids drug users are at high risk

b. Once the salmonella attached to the mucosa of small intestine they invade the payer's patches (specifically the microfold cells)
It is facultative intracellular bacteria. These steps beside are called transient bacteraemia.

First: They invade the microfold cells and reach the payer's patches.

Second: they multiply in the mononuclear cells in lamina propria and transported to the other intestinal lymph nodes

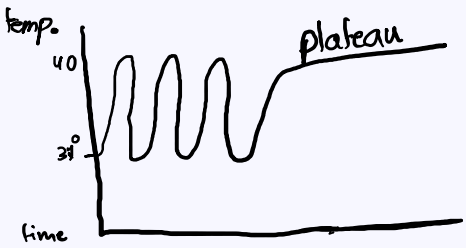
Third: transported to mesentric lymph node

Fourth: transported to the thoracic duct

Fifth: transported to the blood

Sixth: Circulating organism reach reticule-endothelial cells in liver ,spleen and bone marrow and circulating endo -toxin cause prolonged fever.

c. then you have inflamed mucosa and lymphatic and salmonella in the blood (Necrosis and sloughing of overlaying epithelium producing ulcer that may bleed. Ulcers heal without scarring.)



9. Clinical manifestations

a. Incubation 7-14 days. Onset is insidious postingestion of contaminated food or drink.

b. Signs and symptoms after incubation period.

1. One week

1. Postinfection fever associated with headache (the first sign to begin), Temp. increase in a stepwise fashion become unremitting and high (a high platuea). NSAIDS and other antipyretic drugs will not work in this situation

2. Abdominal pain and diarrhea beginning fluctuating with constipation (later)

3. Malaysia, anorexia and myalgia

2. Second week

High fever ←

1. Fever continues

2. Respiratory symptoms (cough, epistaxis) and fatigue.

3. abdominal symptoms more sever.

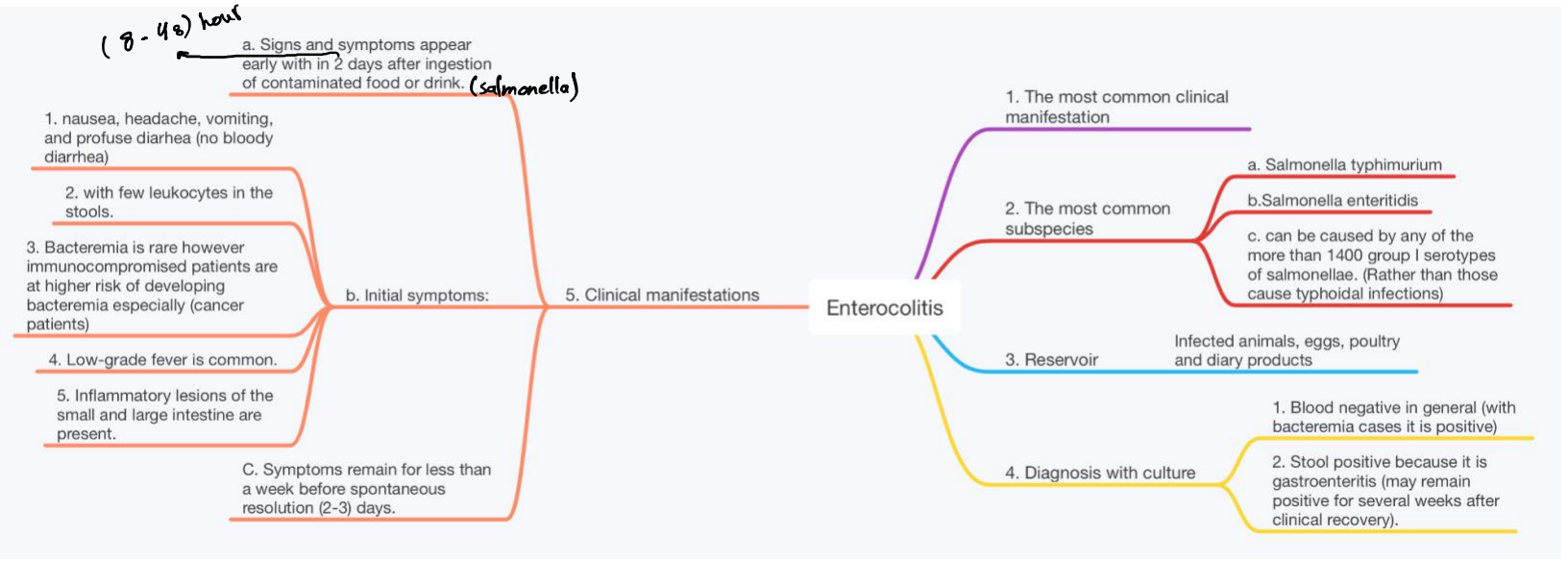
4. Faint rose spots and rash on the abdomen and chest and back (the trunk) macula.

3. Third and fourth week

a. Disease might resolve spontaneously

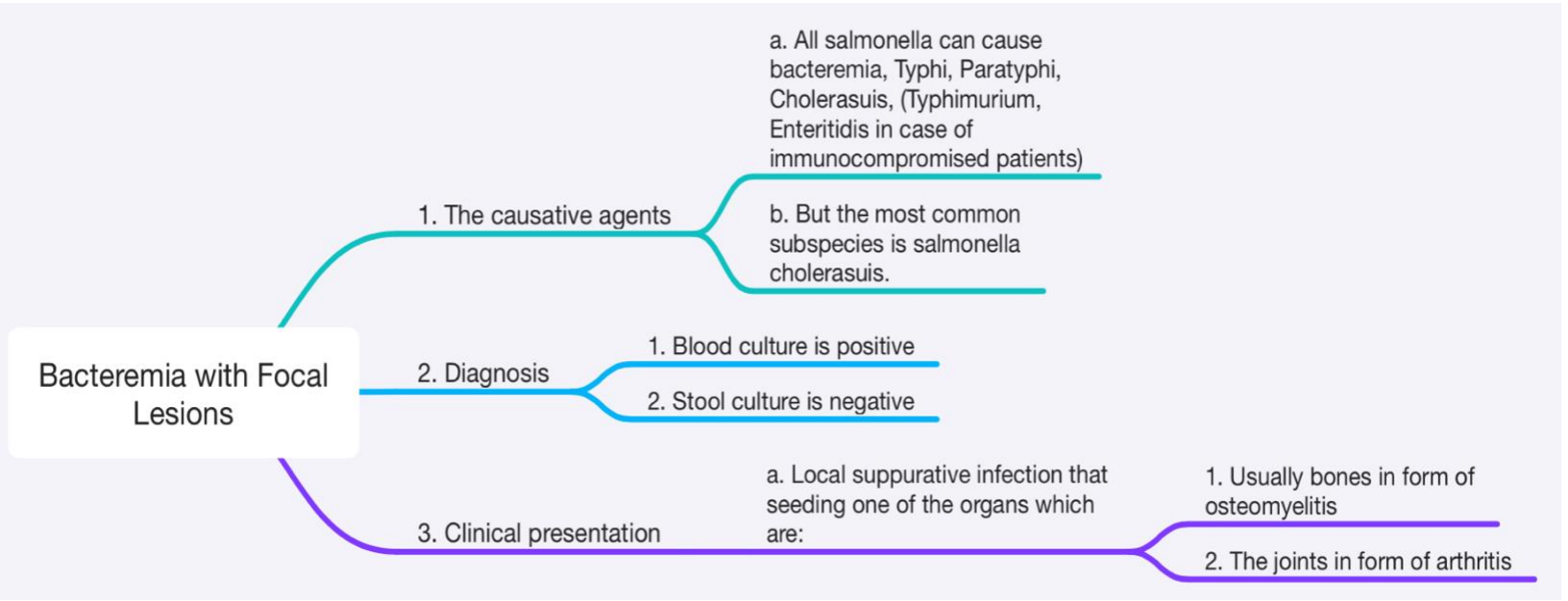
b. In the pre-antibiotic era, the chief complications of enteric fever were intestinal hemorrhage and perforation, and the mortality rate was 10–15%. But nowadays with the presence of antibiotics it's less than 1%.

B. Enterocolitis (gastroenteritis)



C. Bacteremia with Focal Lesions.

- More than 10% of bacteremia with focal lesions seeding <u>bones (osteomyelitis)</u> and joints (arthritis).
- It has been noticed that bacteremia is either dependent on:
  1. Serotype of salmonella.
  2. Some features related to the exposed patient himself like being immunocompromised (cancer) then the probability of bacteremia is much higher.
  3. Other diseases specifically **<u>the sickle cell anemia patients, they have more probability of developing bacteremia from salmonella infection.</u>**



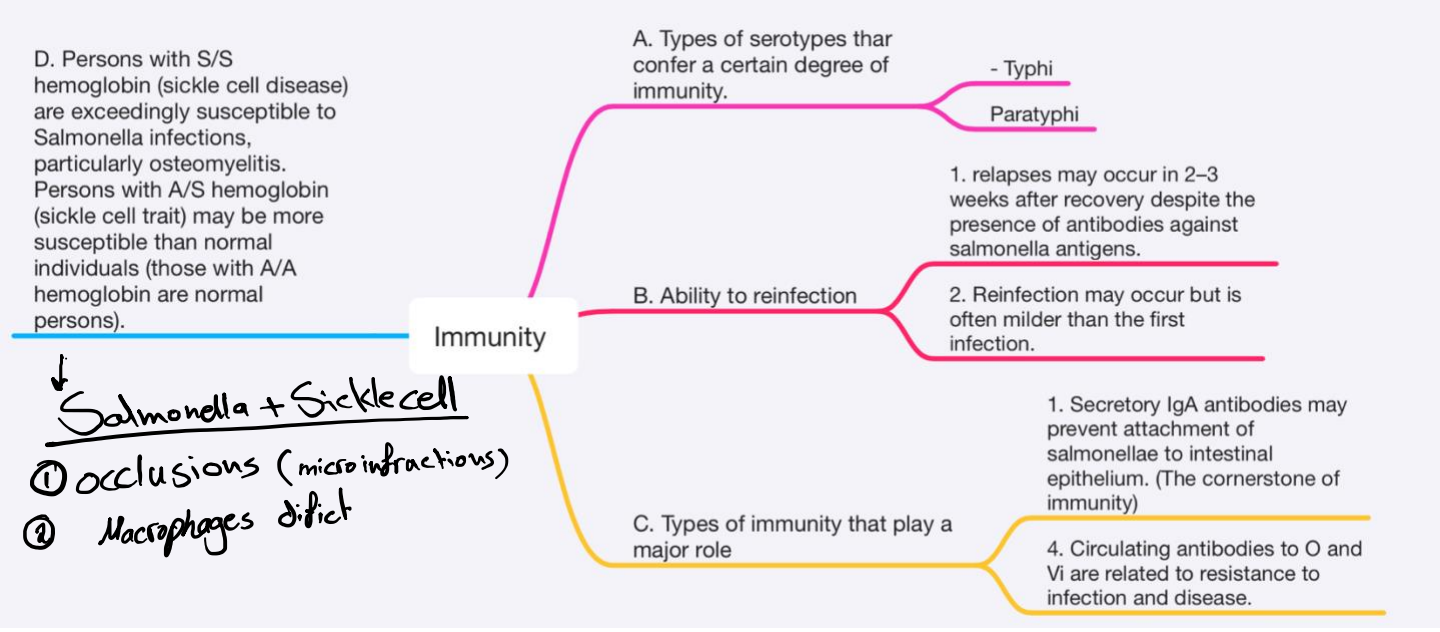
5. How to diagnose Salmonella infections

- The primary diagnostic method is culture from the blood and that is typical with typhoid fever as well as bacteremia with focal lesions.
- As an approach of Salmonella culturing protocol consists of 3 steps:
    1. Enrichment culture.
    2. Differential and selective medium culture.
    3. Final identification.

- ✓ Serology → slide agglutination test:
  Here we have the colonies (we suspect that they are salmonella colonies but we consider them unknown colonies) we mixing them on a slide with a known sera to a salmonella antigen (H,O,Vi) , if there are antibodies specific to salmonella antigens, then agglutination takes place (within a few minutes) (positive test).
  This test is particularly useful for rapid preliminary identification of cultures. There are commercial kits available to agglutinate and serogroup salmonellae by their O antigens: A, B, C1 , C2 ,D, and E.

- ✓ Tube dilution agglutination test (the famous name …. Widal test) …. Was used in the past (doctor said in one of the sections that he will not ask about it)
  A. We look for antibodies against salmonella in patient serum itself.
  B. Serial dilutions of unknown sera of suspected patient are tested against antigens from representative salmonellae (in the lab we have the antigen representative for the salmonella and we get the serum from the patient) .
  C. The interpretive criteria when single serum specimens are tested vary, but a titer against the O antigen of greater than 1:320 and against the H (flagellar) antigen of greater than 1:640 is considered positive.
  D. Serology is not relied upon because of cross-reaction antibodies from previous either: 1. Immunization for typhoid for example 2. Or infection with other intestinal pathogens (cannot be relied upon to establish a definitive diagnosis of typhoid fever and are most often used in resource poor areas of the world where blood cultures are not readily available).
  E. Serum agglutinins rise sharply during the second and third weeks of S Typhi infection.
  F. At least two serum specimens, obtained at intervals of 7–10 days, are needed to prove a rise in antibody titer.
  G. False-positive and false-negative results occur.
  H. High titer of antibody to the Vi antigen occurs in some carriers. Alternatives to the Widal test include rapid colorimetric and EIA methods.

6. Immunity

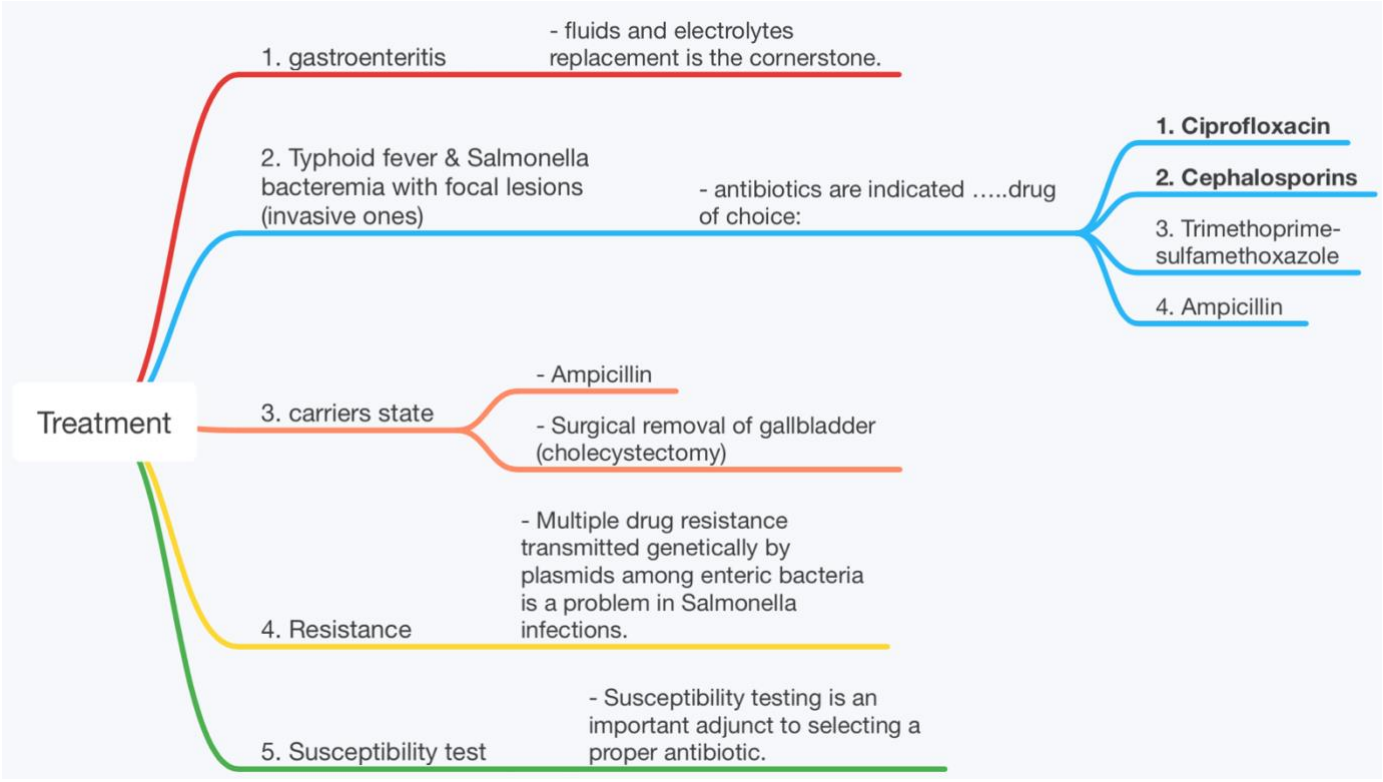


There is a vaccine ↓

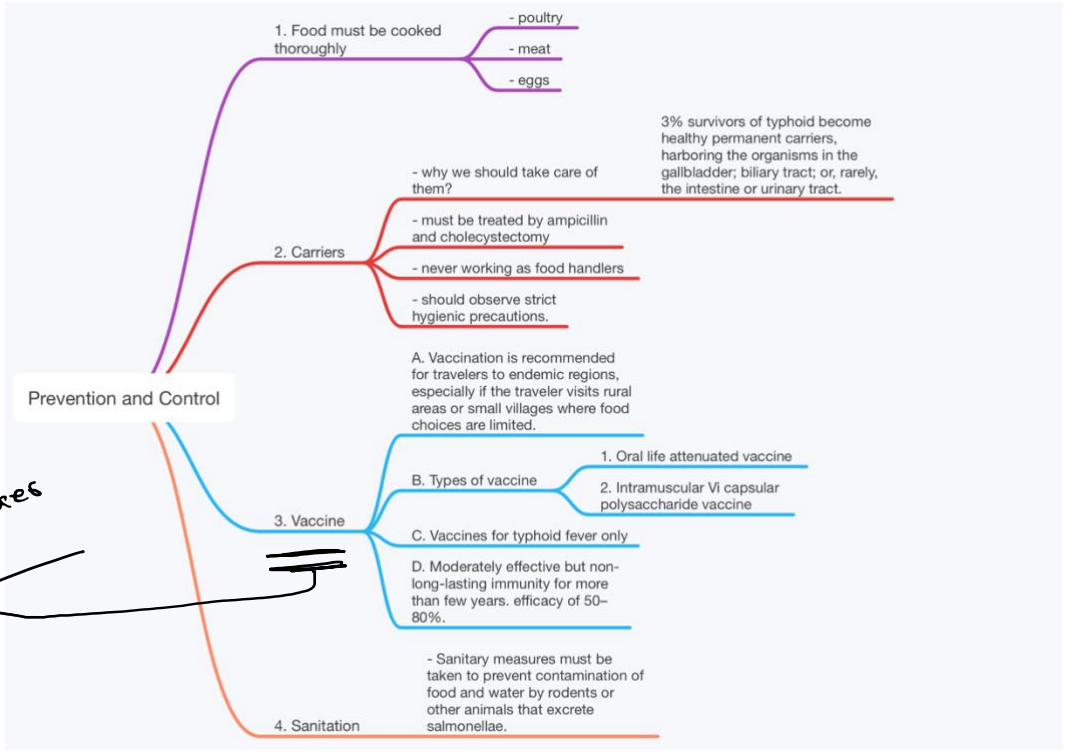
Later on

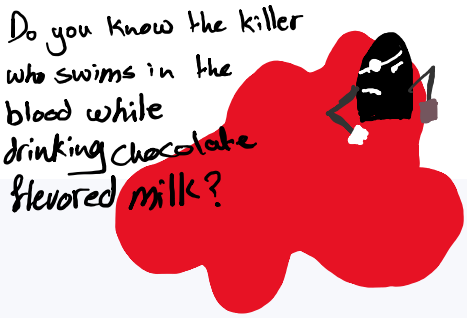
7. Treatment

- How to treat salmonella it is dependent on the clinical form.
- **Antimicrobial** treatment of Salmonella **enteritis** in **neonates** is important. In enterocolitis, clinical symptoms and excretion of the salmonellae may be prolonged by antimicrobial therapy. In severe diarrhea, ***replacement of fluids and electrolytes is essential.***
- In most carriers, the organisms persist in the gallbladder (particularly if gallstones are present) and in the biliary tract. Some chronic carriers have been cured by ampicillin alone, but in most cases cholecystectomy must be combined with drug treatment (drugs don't have that success).

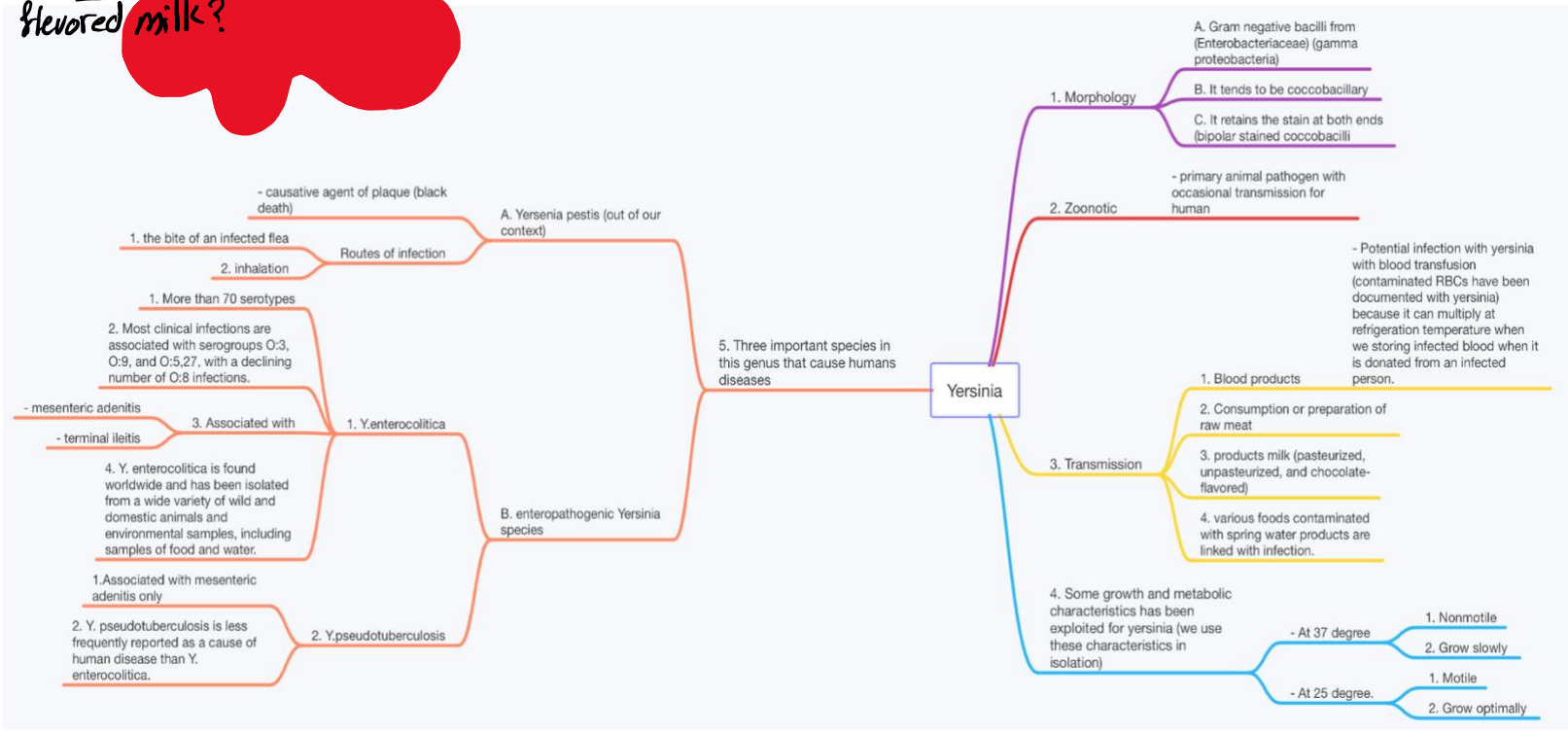


8. Prevention and Control





B. Yersinia

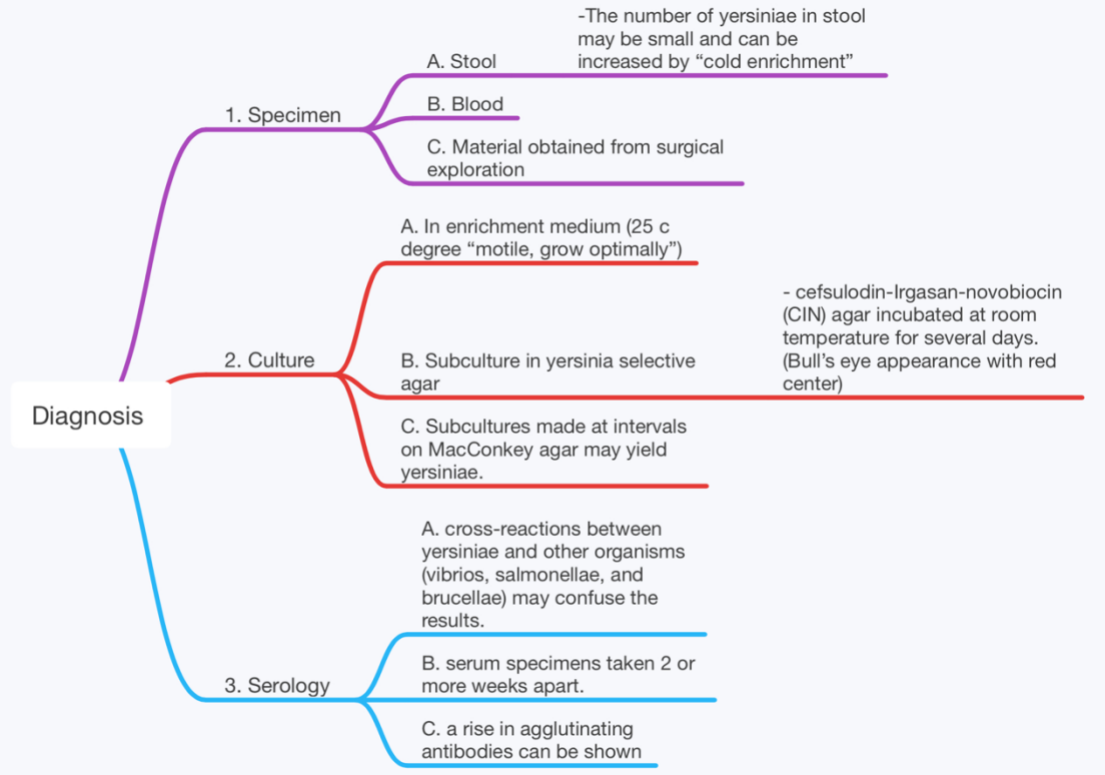


• Pathogenesis

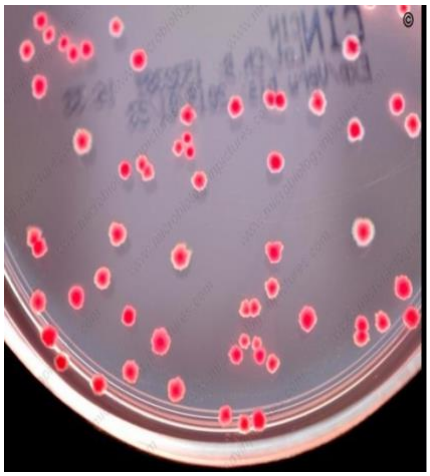
• Clinical manifestations

- ❖ Be reminded that Y.enterocolitica and Y.pseudotuberculosis Both of them can result in mesenteric adenitis which characterized by (abdominal pain and fever) and for this scenario of abdominal pain and fever, one of the top differential diagnosis is acute appendicitis, so when we want to remove the inflamed appendix, the actual cause is yersinia enterocolitica or pseudotuberculosis.
- ❖ The most common form of yersinia infection in the gastrointestinal tract is the Yersenia gastroenteritis and this takes place mostly in children and it is characterized by fever diarrhea as well as abdominal pain.
- ❖ Yersenia is one of the infections that cause post infection sequel like reactive arthritis and Reiter syndrome that usually takes place after a month of infection.

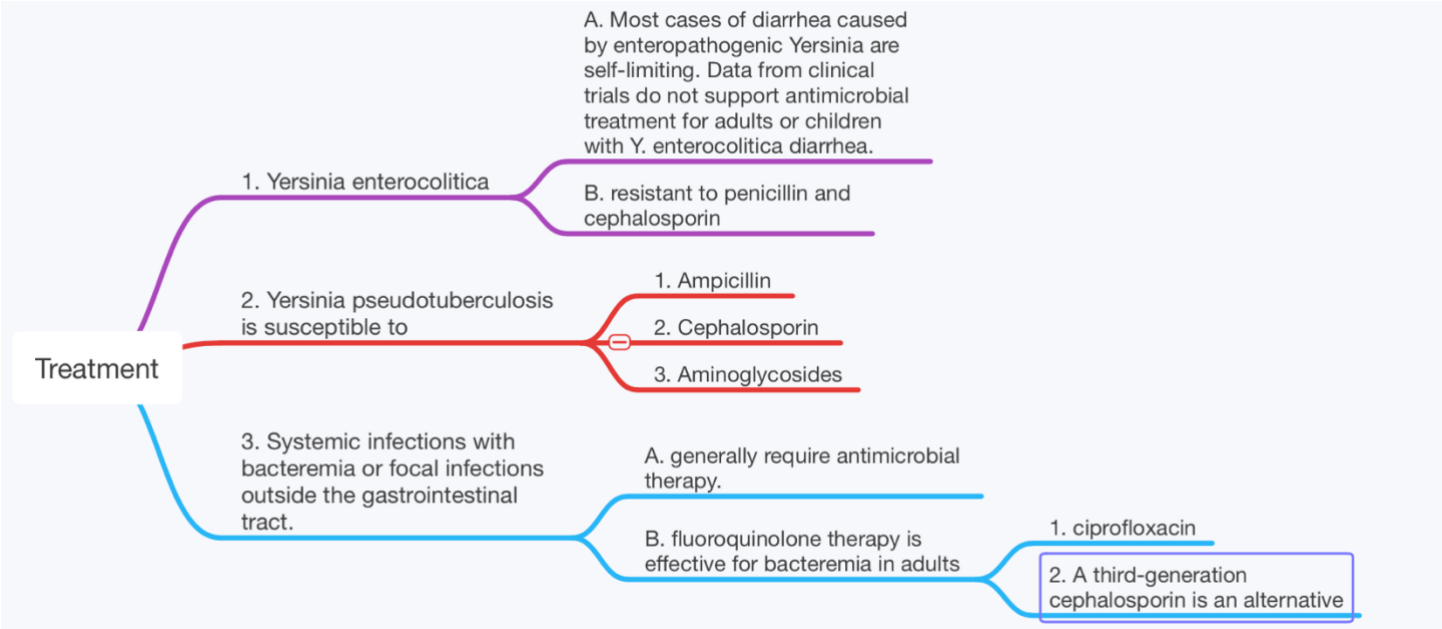
- **How we diagnose Yersenia infection**



Notice the Bull's eye on CIN agar



- **Treatment**



- **Prevention and control**