Microbiology -2

Friday, May 5, 2023 3:57 PM

Lec.4

Continue with Enterobacteriaceae

Shigellae :

- cause of shigellosis or bacillary dysentery
- Just human reservoir
- Non motile
- Non lactose fermenters
- Neurotoxic, cytotoxic and enterotoxic
- They do NOT produce H2S
- Negative in Eosin methylene blue (EMB) or MacConkey agar
- **Low numbers are required to cause disease less than 1000**
- Types of Shigellae

- Group A Shigella Dysenteriae : the most potent in producing type 1 shiga toxin
- Group B Shigella flexneri : most common in developing countries and world wide
- Group C Shigella boydii :
- Group D Shigella sonnei : most common in developed countries (the only one has single serotype)

- Transmission mainly by **feco-oral route , food handlers .... Etc** (4 Fs→ Food, Feces, Flies, Fingers)
- Pathogenesis : invasion of the mucosal epithelial cells of GIT and doesn't leaving it even the patient has extra intestinal manifestations (start with watery diarrhea and then bloody diarrhea , abdominal pain, fever and may cause Micro abscesses , tenesmus , ulceration and pseudomembrane)
- **Chromosomal encoding toxins**
- it’s highly communicable

- The immunity last short period (Reinfection less Severe)
- selective media for shigellae (Hektoen enteric agar or Salmonella – Shigella agar)
- Serology is NOT used to diagnose Shigella infections (false positive)
- Treatment : antibiotics but Antispasmodics and Opioids should be avoided in Shigella dysentery

Salmonella :

- They produce H2S
- Non lactose fermenters
- The most common presentation of infection : gastroenteritis or enterocolitis (no antibiotics except for neonate or older patients)
- S.Choleraesuis cause Bacteremia with focal Lesions(**no GI symptoms**) (
- S. Paratyphi risk of infection increase with Sickle cell anemia patients and cause osteomyelitis
- Motile
- S.Enteritidis and S.Typhimurium the most common serotype
-
- Transmission: poultry products , may trans- placental ether in human and cause abortion **or** in chickens to eggs
- Cause bloody diarrhea
- Pathogenesis :

1- invades peyer paches .. eventually .. reaches the thoracic duct (bacteraemia)
2- reticule-endothelial into liver , spleen and cause enteric fever in cases of typhoid and parathyroid (characteristics febrile systemic illness) (**step ladder fever = platuea fever**)

- Incubation period more than Shigellae
- Can cause rose spots at second week of infection but rare (pink spots on abdomen)
- Blood culture :

Enteric fever ---> positive form the first week (Stool positive after second week)
Enterocolitis ---> negative except in immunodeficient persons (stool positive from the

first week)

- can be diagnosed by culture of duodenal drainage (biliary tract)
- Can be identified by slide agglutination tests (known sera and unknown culture)
- The immunity last short period (Reinfection less Severe)
- The antibiotic is important in treatment of enteric fever and Bacteremia with focal Lesions
- cholecystectomy may occurs in cases of colonization in gallbladder with typhoid or Parathyroid
- Vaccination is recommended for travelers to endemic regions
- Typhoid fever is sever systemic disease (associated with Food ,water contaminated with human faeces, vertical transmission (trans- placental))
- complications of enteric fever : intestinal hemorrhage and perforation

Yersinia :

- Non motile
- They grow best at 25 °C
- Transmitted by blood donation
- Yersiniosis is a zoonotic infection
- Types

• Y. pestis causes of plague (through the bite of an infected flea, or inhalation)
• Y. enterocolitica and Y. pseudotuberculosis cause terminal ileitis , mesenteric adenitis * pseudoappendicitis *
(through consumption of raw meat , unpasteurized milk and chocolate-flavored)

- Cause bloody diarrhea (and thy invasive)
- They have type **III** secretion systems
- **CIN agar selective for Yersinia (bull's eye appearance colonization)**
- Serology test may give false positive

- Treatment : electrolytes and water (diarrhea) but **not antibiotics**

- No vaccine

Lec.5

VIBRIOS, CAMPYLOBACTERS, HELICOBACTER

Overview :

- gram-negative rods that are all widely distributed in nature
- all have endotoxin (LPS = antigen O)

Vibrios :

- halotolerant or halophilic

- Found in surface waters

- Cholerae serotu causes of profuse watery diarrhea (dramatic water loss)

Types :
1- V.Cholerae serogroups **O1** and **O139** cause cholera in humans associated with **gastroenteritis** (cause of **outbreak or pandemic**)

2- V.vulnificus the caustive agent of severe sepsis in patients with cirrhosis and primary wound infection

3- V.parahaemolyticus they the most common sea food poisoning associated with gastroenteritis

4- V.alginolyticus occasionally causes eye, ear, and wound infections

- motile with **polar** flagellum (pattern of motility **run reverse**)

- V cholerae is a comma-shaped or S shape

- vibrios grow at a very high pH (8.5–9.5) are rapidly killed by acid (When the vehicle is food, as few as 100-1000 organisms are necessary because of the buffering capacity of food)

- (**TCBS**) agar a selective media for vibrios (produces yellow colonies)

- positive oxidase

- Vibrio species are susceptible to be killed with O/129 compound

- Vibreio cholerae enterotoxin : Chromosomal encoded has two parts A for activating and B for binding .. work on GM1 receptors to increase **cAMP** and eventually cause dramatic water loss

- V.Cholerea also have The toxino regulated pilus (TCP)

- "cholera seasons" associated with high temperatures, heavy rainfall

- the infection with El Tor biotype less severe than the infection with classical biotypes of V.cholerae

- V.cholerae causes of rice watery stool and other symptoms but not fever

- Dark-field or phase contrast microscopy may show the rapidly motile vibrios

- identified by slide agglutination tests using anti-O group 1 or group 139 antisera

- Treatment : the most important electrolytes and fluids supplement while the antibiotics play secondary role like **Oral** tetracycline and doxycycline but **not** in children and pregnant women (erythromycin and furazolidine , for children and pregnant women)

Campylobacters :

- motile with **polar** flagellum (Shotgun or Darting motility)

- Invasive bacteria

- Common in causes enteritis or gastroenteritis

- Cause watery diarrhea then they progress to bloody diarrhea due to the invasion

- Thermophilic (grow at 42°C) and microaerophilic

- comma, S, or “gull wing” shapes

- The infection is acquired by the oral route from food, drink, or contact with infected animals or animal products, especially **poultry**

- Has **enterotoxins** and **cytotoxins**

- Post-infective phenomena of reactive arthritis , Riter syndrome and guillain barre syndrome might be developing Associated with invasive bacteria

Treatment : Fluid and electrolyte but in severe manifestations like high fever and bloody diarrhea the drug of choice is ciprofloxacin

Helicobacter pylori :

- motile (multiple flagella at one pole)
- urease (aids in survive in the acid environment) , oxidase and catalase positive
- microaerophilic and
- Associated with , peptic ulcers, gastric ulcers , pernicious anemia (iron deficiency) ,gastric cancer like adenocarcinoma and MALT lymphomas
- Transmission: fecal oral route
- Virulence factors: cag-positive , type **IV** secretion system, the vacuolating cytotoxin VacA
- Pathogenesis : Polymorphonuclear and mononuclear cell infiltrates are seen within the epithelium and lamina propria (histopathology Diagnostic)
- Helicobacter pylori infection **decrease** the possibility of Barrett and carcinoma of esophagus
- Treatment (Triple therapy) : PPIs + Clarithromycin + Amoxicillin or Metronidazole
- culture is very difficult

Lec.6

The Brucellae, Leptospira and Mycobacterium of the GIT

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Brucellae :

- non motile , unencapsulated , obligate or facultative intracellular, all aerobic except Brucella abortus (microaerophilic)
- Cause **undulant fever or irregular fever**
- Cause musculoskeletal symptoms : myalgia , arthralgia , malaise , **abnormal**

gait , *mono arthritis in children* , low-back pain in elderly patients

- Types:

- Brucella melitensis : infects cattle (the most common infection)
- Brucella suis : infects swine and pigs
- Brucella abortus : infects cattle (cause abortion in cattle no human)
- Brucella canis : infects dogs

- Catalase and oxidase positive

- Transmission:

- **Ingestion** of unpasteurized milk and milk products
- **inhalation** of volatile ones
- **percutaneous** exposure to contaminated needles
- **Accidental** percutaneous injection of the **live attenuated vaccine** strains (available for animals just)

- Zoonotic disease (important to know they found in all body fluids of animals)

- They utilize carbs but don't ferment it

- Cause **Granulomatous caseating (necrosis)**

- One of the hepatosplenomegaly differential diagnosis

- smooth transparent (translucent) convex shaped colony

Serology tests :

- IgM : start to rise during the first week of acute illness, peak at 3 months and stay up to more than two years
- IgG , IgA : rise about 3 weeks after onset of acute disease, peak at 6– 8 weeks

1- Agglutination test : IgG detection

2- Non – agglutination ELISA assays : IgG, IgA, and IgM antibodies detection

- Treatment : doxycycline and streptomycin for 45 days

- Available vaccines target animals but not human

Leptospira :

- Kidney involvement in many animal species is chronic and results in the shedding of large numbers of Leptospirae in the **urine (animal or human urine)** the most implicated animal urine that cause infection and transmission **rats and white rodents** ''Zoonotic ''

- Mostly asymptomatic but may develop Weil’s Syndrome

- Weil’s Syndrome is a **triad**:
  1. Hepatitis
  → diagnosis: 1) elevated liver enzymes 2) hepatomegaly 3) jaundice
  2. Nephritis
  → diagnosis :blood urea nitrogen retention
  3. Hemorage
  →most common hemorage is **pulmonary**
  2 nd most common site is **intra cranial hemorage**

- Nether garam positive nor negative

- tightly coiled forming **question mark** shape

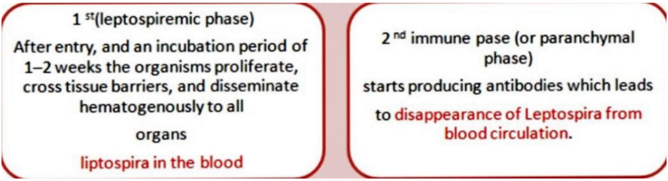
- Aerobic, motile (they possess **two priplasmic** flagella)

- Leptospirae can survive for weeks in water, Particularly at alkaline pH.

- The most common route of transmission: **skin exposure to urine**

- Disease phases:

First phase in blood ' second phase in parenchymatous organs (particularly liver and kidneys) : It manifests itself often as “aseptic meningitis " with pleocytosis of the CSF



1 st(leptospiremic phase)

After entry, and an incubation period of 1–2 weeks the organisms proliferate, cross tissue barriers, and disseminate hematogenously to all organs

liptospira in the blood

2 nd immune pase (or paranchymal phase)

starts producing antibodies which leads to disappearance of Leptospira from blood circulation.

- When you are swimming in pool contaminated with Leptospirae you will develop

1- conjunctivitis without exudates just erythema
2- musculoskeletal symptoms like Myalgia

- Selective agar : Ellinghausen-McCullough-Johnson- Harris EMJH (30°C) 🙃

- Dark-field examination can be used to diagnose Leptospirae

Mycobacterium Tuberculosis (Mtb) :

- Abdominal tuberculosis: mainly by M.bovis (by unpasteurized milk)

- Slowly growing, aerobic , Facultative intracellular ,
  non-motile , Acid fast bacillus

- **casiating granuloma (necrosis)**

- The **most common** extrapulmonary TB form is tuberculous lymphadenitis ,
  followed by pleural TB ,

- Abdominal TB can be in one of 4 sub forms : tuberculous
  1- lymphadenopathy (inside the abdominal cavity)
  2- peritoneal tuberculosis (most common form)
  3- GI tuberculosis
  4- Visceral Tuberculosis involving solid organs

- pulmonary TB or miliary TB spread throughout the body via the bloodstream and lymph nodes into GIT

- tuberculous in fallopian tubes and vertebral column : direct or adjacent spread in GIT

- The main presentation ---> fever in Tuberculosis , Either pulmonary or extrapulmonary
- Abdominal **pain** and **Palpable mass** specifically in abdominal TB

- auramine(new technique) for diagnosing

- Testing : (TSTs) and (IGRAs) show past exposure without indicating time fo this exposure , (TSTs) give false positive if patient is vaccinated or environmental macrobacteria

- Have long course of treatment (cell mediated immunity paly an important role)

- BCG vaccine for Mycobacterium bovis : live attenuated vaccine