



Lecture (3) Cholera

Objectives:

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WERE NOT GIVEN

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Very important

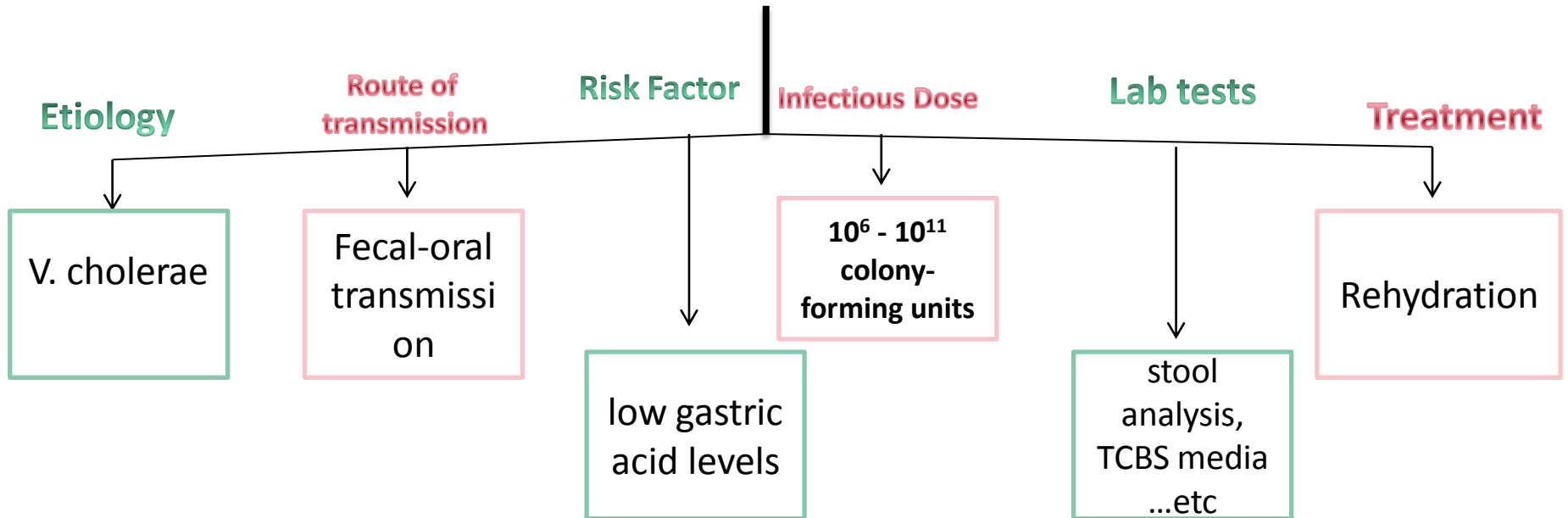
Additional information

Male doctor's notes

Female doctor's notes

MIND MAP

(Cholera)



Introduction:

- ❖ A life-threatening **secretory diarrhea** induced by **enterotoxin** secreted by **Vibrio cholera**
- ❖ **Water-borne** illness caused by ingesting water/food contaminated by copepods infected by **V. cholerae**.
- ❖ An **enterotoxic** enteropathy (**a non-invasive diarrheal disease**). Means that the bacteria don't go to the blood
- ❖ A major epidemic disease.
- ❖ Cause Intestinal infection "**small intestine**", No Pain and with Severe "**watery**" diarrhea.
- ❖ Cholera Gravis: More severe symptoms:
Rapid loss of body fluids → 6 liters/hour → Rapidly lose **more than 10%** of bodyweight → Dehydration and shock
Death within 12 hours or less.
- ❖ No clinical manifestations help distinguish cholera from other causes of severe diarrhea "Differential diagnoses of severe diarrhea: Enterotoxigenic e.coli, Viral gastroenteritis and Bacterial food poisoning.

Vibrio cholerae

- ❖ Grows in salt and fresh water.
- ❖ Can survive and multiply in brackish water by infecting copepods.
- ❖ Transmitted by **fecal-oral route**
- ❖ Endemic in areas of poor sanitation (India and Bangladesh).
- ❖ May persist in shellfish or plankton.
- ❖ Proliferate in summer.



Cholera

Etiology	<ul style="list-style-type: none">▪ V.cholerae. Gram-negative “comma shaped” rods. Highly motile; polar flagellum.▪ Pathogenicity is due to cholera enterotoxins produced by the organism.▪ Has over 150 identified serotypes based on O-antigen.▪ Only O1 and O139 are toxigenic and cause Cholera disease.▪ Two major biotypes of O1:<ul style="list-style-type: none">1/Classical: responsible for the first 6 pandemics.2/El Tor: the 7th pandemic.
Epidemiology	<ul style="list-style-type: none">▪ Responsible for seven global pandemics over the past two centuries.▪ Common in India, Sub-Saharan Africa, Southern Asia.▪ Very rare in industrialized countries.
Transmission	Fecal-oral transmission: Contaminated food or water by feces of affected individuals.
Risk Factors	<ul style="list-style-type: none">▪ Children, Elderly.▪ People with low gastric acid levels “Antiacidic drugs & PPIs”.▪ Blood group type . O >> B > A > AB

Cholera

Infectious Dose	10⁶ - 10¹¹ colony-forming units "Large number!" because the bacteria need to pass the high acidity of the stomach and bile salts in intestine.
Incubation period	Ranges from a few hours to 5 days. Depends on the present of risk factors <ul style="list-style-type: none"> • Low acidity in the stomach "High PH". • consumption of high dosage of cholera. } Lead to short IP
Signs & Symptoms	<ul style="list-style-type: none"> ▪ Usually mild, or no symptoms at all, 75% asymptomatic. 20% mild disease. 2-5% severe. ▪ No pain & fever ▪ (Sunken eyes, decreased skin turgor, Hypokalemia, almost no urine production) all are signs of dehydration. ▪ Vomiting. ▪ No RBC, lipids in the feces. ▪ Cramps. ▪ Watery diarrhea "rice water diarrhea".
Complications	Duo to sever dehydration: <ul style="list-style-type: none"> • Sunken eyes, decreased skin turgor • Cardiac and renal failure • Hypovolmic shock Death Severe metabolic acidosis Hypokalemia Almost no urine production



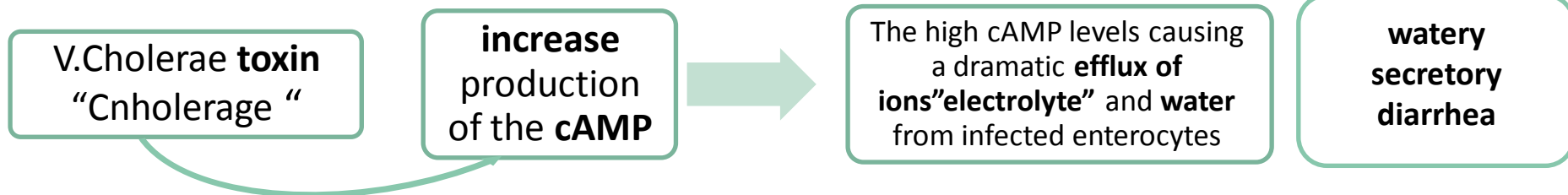
Cholera

Diagnosis/ lab tests

- **History of the patient and clinical presentation.**
 - **stool analysis**
- Visualization by dark field or phase microscopy.** Look like **shooting star** "Darting (rapid) **motility** of *V.cholerae*".
- you may mix a specific **antisera** with the patient's stool **to stop** the movement of the Bacteria. "**Cholera immobilization test**"
- Gram Stain: **Red, curved "comma"** rods of bacteria
 - Culture: **TCBS** media "Thiosulfate-citrate-bile salts-sucrose" **Yellow colonies** form.

In the intestinal mucosa

Pathogenesis:



- Bacteria penetrate the mucous layer and establish contact with the epithelial cell layer.
- Cholera enterotoxin is a protein molecule composed of 5 B subunits and 2 A subunits
- B subunit binds to the receptor
- A subunit lead to high amount of cAMP → ↑ Pump Cl⁻ into the intestinal contents → Loss H₂O, Na⁺ and other electrolytes due to the osmotic and electrical gradients
- The lost H₂O and electrolytes in mucosal cells are replaced from the blood → diarrhea, loss of electrolytes, and dehydration

Cholera

Treatment	<p>Treatment depends on severity of dehydration:</p> <ul style="list-style-type: none">▪ Oral rehydration: Use when less than 10% of bodyweight lost in dehydration▪ Intravenous rehydration "Ringer's Lactate": Used when patients have lost more than 10% bodyweight from dehydration, or when a patient is unable to drink due to vomiting.▪ Antimicrobial therapy "Tetracycline, Doxycycline" : to prevent the spread of the pathogen. "Decrease communicability".
Prevention	<ul style="list-style-type: none">▪ Boil or treat water with chlorine or iodine.▪ Cook everything.▪ Wash hands frequently.▪ Vaccines: Not recommended, 1/ killed. 2/alive: may induce mild diarrhea.

Cholera Gravis

- More severe symptoms
- Rapid loss of body fluids +10% of bodyweight
- Dehydration and shock
- Death within 12 hours or less



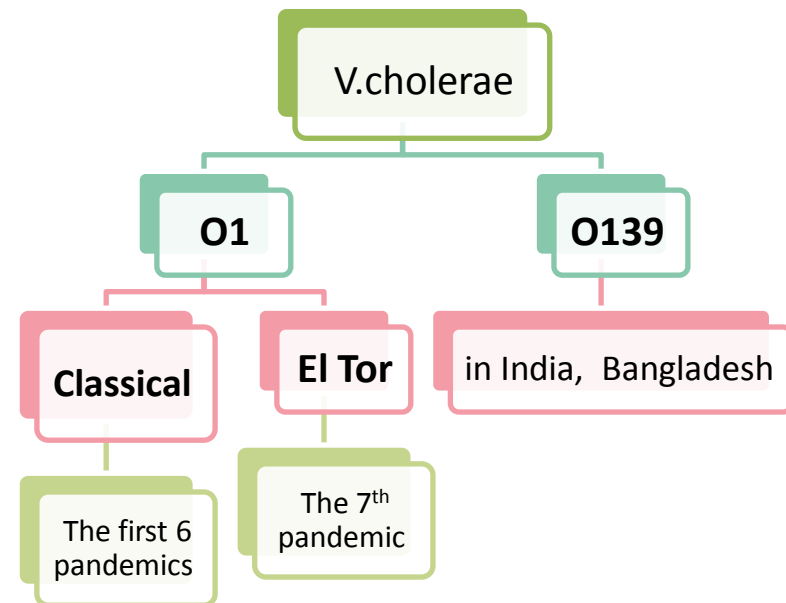
SUMMARY:

- Cholera connected to water, you get the disease by consuming **contaminated water** or food. “Contamination comes from **fecal** material from infected individuals”.
- Gastroenteritis disease. It’s caused by an organism. “Gram **–** bacteria called V.Cholerae”. **Comma** -shaped “**curved**” **bacilli**. **Flagellated** “in on pole” and **very motile** “**darting movement**”.
- Oxides test: **+**. all other enterobacteriaceae are oxides **–** .
- It causes a **secretory diarrhea**, mainly by production of **toxins** “cholera toxin” which affect the mucosa of small intestine causing the **increase production of the camp**, which lead to **increase the excretion of the electrolyte** (cl “mainly”,k,na and then water will go out) “watery diarrhea”. So, if you take a biopsy from the small intestine and see it under the microscope “histology” you will NOT find any lesion “no histological lesion”**. Only **biochemical lesion**.
- Signs & symptoms: very sever diarrhea (**rice-water diarrhea**). **Infected people die in few hours to days** “i’ve seen people dying in 12 and 6 hours” prof. Kampal said. Why? Duo to the excessive loss of body fluid, which **lead to hypovolemic shock** and then death eventually.
- Treatment: **Re-hydration** “main treatment”, antibiotics “to eradicate the pathogen” . Water & fluid to save the patient, **Antibiotics to save the community**.



SUMMARY:

- The disease is transmitted by **water supply**, in the past, there was no separation between the sources of drinking water & sewage water “مياه المجاري”.
- There are many serotypes of V.cholerae. Only 2 of them are pathogenic (they produce toxins) **1/ O1** **2/ O139**
- Diagnosis: patient’s history and complains.
Dark field microscopy: You can see the rapid “**darting**” movement of the bacteria. (**Shooting star motility**).
- Clinical presentation: Sunken eyes, decreased skin turgor.
- Investigations: **Stool analysis**. Under the microscope, you may add flagellum antibody **antisera** to stop the movement of bacteria.
culture, **TCBS** media shows **yellow colonies**.
alkaline peptone water. It’s need alkaline media.





QUESTIONS

1/ what's the most important treatment of cholera?

Doxycycline

- a. Vancomycine
- b. Ceftriaxone
- c. Ampicillin
- d. Rehydration.

2/ What's the gram stain of cholera?

- a. curved gram-negative bacilli, oxidase +.
- b. Gram negative facultative anaerobic bacilli
- c. Gram positive cocci
- d. Gram Positive bacilli

3/ What's the pathogenesis of cholera?

toxins in the small intestine → increase cAMP → increase excretion of water & electrolyte .

4/ what part of the gut is affected by cholera?

- a. Large intestine
- b. Stomach
- c. Small intestine.
- d. Liver

5/ How do the v.cholerae look on the TCBS?

yellow colonies.

Q1:d

Q2:a

Q4:c

FOR ANY SUGGESTIONS AND PROBLEMS PLEASE CONTACT:

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