

Kenyan Cholera Outbreak hits dozens

4 Deaths reported
in July

9 Hospitalized in
various facilities

2 Counties affected
by the outbreak

Nairobi & Garissa
worst hit

Hotel's Outbreak:
Kenya's Valencia &
Nairobi

Health 20 September
2017

WESTON HOTEL

rtv
TONIGHT

100 GUESTS AT A WEDDING HOSPITALISED SUSPECTED FROM CHOLERA
NAIROBI CHOLERA OUTBREAK

More: Wedding host in Nairobi blames 1000 guests for cholera

Cholera outbreak hits Weston Hotel guests



"Rapid diagnostic tests for cholera have been done on the ten and four positive. All are quarantined at the said hospital awaiting confirmatory tests..."

Nairobi Hospital cholera cases hit 58

20 September 2017



THE NAIROBI HOSPITAL

16th August 2017

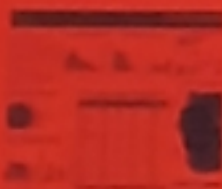
CHOLERA UPDATE

There is an increase of cholera cases in the county of Nairobi.

We have had several cases admitted in our hospital.

Unfortunately we had 8 staff affected. There is no outbreak of cholera in The Nairobi Hospital.

No patient is at risk and we are continuously monitoring.



Cholera situation in Yemen, April 2019

ReliefWeb - 13 Jun 2019

In April 2019, the Ministry of Public Health and Population of Yemen reported a total 118 112 suspected cholera cases including 202 related

[Read more](#)



How we can defeat cholera for good

World Economic Forum (blog) - 6 Jun 2019

When Cyclone Idai ripped through Mozambique, Malawi, and Zimbabwe on the night of March 14, it wrought unimaginable devastation and



Cholera death toll in Tanzania rises to 6

Xinhua - 18 hours ago

DAR ES SALAAM, June 17 (Xinhua) -- Tanzanian authorities said on Monday the number of people killed by a new outbreak of cholera in the

Death toll on cholera outbreak reaches 6, as govt issues new Ebola alert
International - The Citizen Daily - 20 hours ago

The Citizen Daily



Cholera surge stalks Yemen's hungry and displaced

Reuters - 11 Jun 2019

HAJJAH, Yemen (Reuters) - In the last two weeks Dr Asmahan Ahmed has seen a surge in suspected cholera cases arriving at her health



James
MARSHALL

Love in the
Time of
Cholera

Love in the Time of Cholera

Based on the novel by
Nobel Prize-winning
Colombian author
Gabriel Garcia Marquez

How long would you wait
for the one you love?



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Panasonic

HILLARY S

LEARNING OBJECTIVES



- Discuss the disease produced by *Vibrio cholerae* with emphasis on its prevention and diagnosis
- Describe characteristics and importance of microaerophilic members of group *Campylobacter* and *Helicobacter*.
-

VIBRIOS

- Belong to the Family – Vibrionaceae
- Gram-negative curved or comma shaped bacilli
- Highly motile by a single polar flagellum
- Non spore formers
- Non capsulated
- Facultative anaerobes
- Possess both H & O antigens

Identification

- Vibrios are highly motile, gram-negative, curved or comma-shaped rods with a single polar flagellum



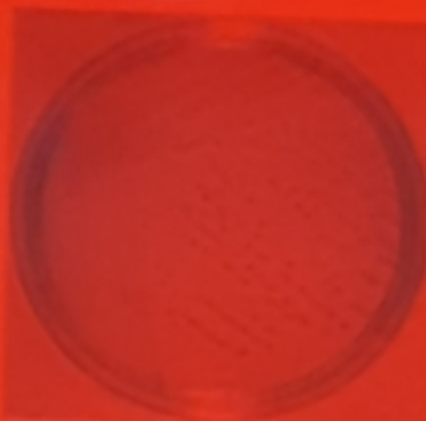
IDENTIFICATION 2

➤ Grow on variety of simple media including:

- MacConkey's agar
- TCBS (Thiosulfate Citrate Bile salts Sucrose) agar

➤ *V. cholerae* grow without salt

- Most other vibrios are halophilic-salt loving



On MacConkey agar *V. cholerae* produces small lactose fermenting colonies.

Pathogenic strains

- *V. cholerae*
- *V. parahaemolyticus*
- *V. vulnificus*

Epidemiology of Vibrio spp.

- All *Vibrio* spp. can survive and replicate in contaminated waters with increased salinity and at temperatures of 10-30°C
- Pathogenic *Vibrio* spp. appear to form symbiotic (?) associations with chitinous shellfish which serve as an important and only recently recognized reservoir
- Asymptomatically infected humans also serve as an important reservoir in regions where cholera is endemic

What is Cholera?

- Intestinal infection
- Severe diarrhea
- Caused by Cholera Toxin of bacterium, *Vibrio cholera*



Introduction

- Causes cholera
- Classified as category B bioterrorism agent-water supply threat (CDC)
- Transmitted by ingestion of contaminated water (sewage contaminated water is the primary source)
- Poor sanitation practices are the source of outbreaks

Epidemiology

- Responsible for seven global pandemics over the past two centuries
- Common in India, Sub-Saharan Africa, Southern Asia
- Very rare in industrialized countries

Strains Causing Epidemics

- 2 main serogroups carry set of virulence genes necessary for pathogenesis
- O1
 - Classical: 1 case per 30-100 infections
 - El Tor: 1 case per 2-4 infections
- O139
 - Contained in India, Bangladesh

V. Cholerae Serological Classification

Toxigenic *V. cholerae*

Divisions into 2 epidemic serotypes

O1

Divisions into 2 biotypes

O139

Classical *El Tor*

Each O1 biotype can have 3 serotypes

inaba

ogawa

hikojima

A & C

A & B

(A little C) Antigens

A, B, C

Transmission

- Contaminated food or water
 - Inadequate sewage treatment
 - Lack of water treatment
 - Improperly cooked shellfish
 - Wash fruits/vegetables with untreated water
- Transmission by casual contact unlikely



Food vendors

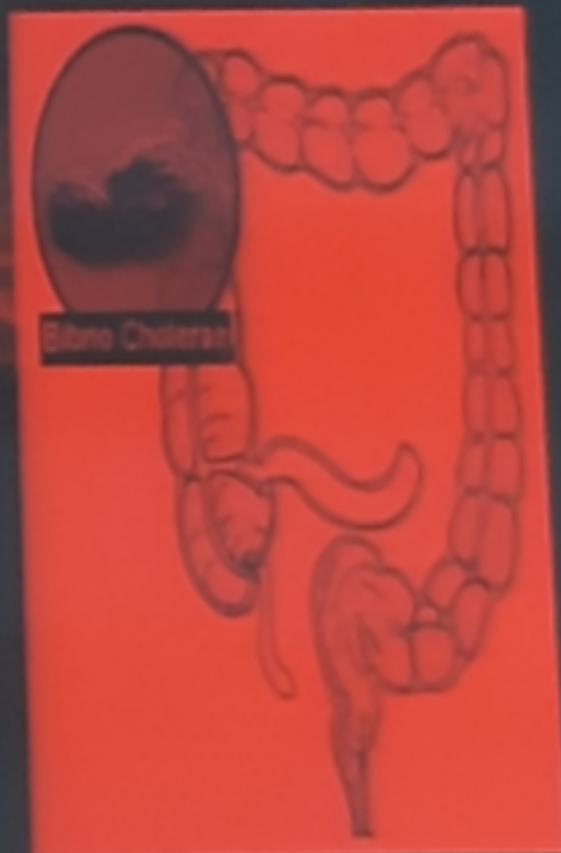


Hanging latrines



Pathogenesis: Overview

- To establish disease, *V. cholerae* must be ingested in contaminated food or water and survive passage through the gastric barrier of the stomach
- On reaching the lumen of the small intestine, penetrates the mucous layer and establish contact with the epithelial cell layer
- High Infectious dose is required to elicit an infection



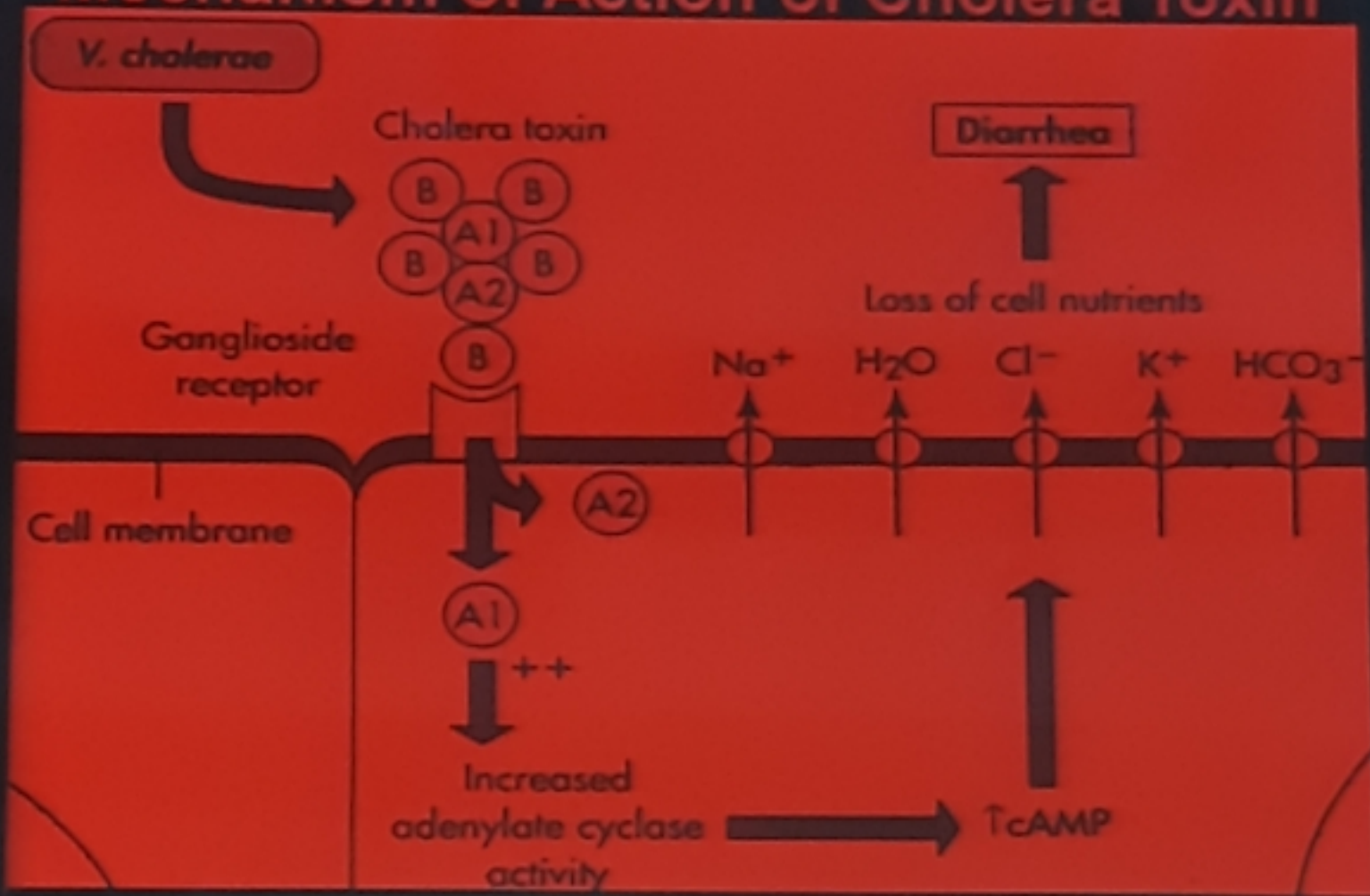
Pathogenesis

- Virulence factors
 - Bacteria adheres to the epithelia cells of gastric intestinal mucosa via pili
 - survive the acidic conditions of the human stomach
 - Production of proteases (mucinase) which dissolves protective glycoprotein coating cells
 - High motility
 - Ability to produce an enterotoxin-cholera toxin (CT)

How Does Cholera Toxin Work?

- Inactivates GTPase function of G-protein coupled receptors in intestinal cells
- G proteins stuck in "On" position
- 100 fold increase in cAMP
- Activation of ion channels
- Ions flow out and water follows

Mechanism of Action of Cholera Toxin



Symptoms of V.cholerae

- Incubation period: 2-3 days
- High infectious dose: $>10^8$ CFU
 - 10^3 - 10^5 CFU with achlorhydria or hypochlorhydria (lack of or reduced stomach acid)
- Abrupt onset of vomiting and life-threatening watery diarrhea (15-20 liters/day)
- As more fluid is lost, feces-streaked stool changes to rice-water stools:
 - Colorless
 - Odorless
 - No protein
 - Speckled with mucus

People Most at Risk

- People with low gastric acid levels
 - Children: 10x more susceptible than adults
 - Elderly
- Blood types
 - O >> B > A > AB (O more susceptible—allows bacteria to adhere to gut lining???)



Diagnosis: Visible Symptoms

- Decreased skin turgor
- Sunken eyes, cheeks
- Almost no urine production
- Dry mucous membranes
- Watery diarrhea consists of:
 - fluid *without* RBC, proteins
 - electrolytes
 - enormous numbers of vibrio cholera (10^7 vibrios/mL)



Outline of laboratory isolation and identification

- Specimen; ??????
- Cary-Blair transport medium
- Microscopy; Wet preparation -darting motility

Enrichment medium - Alkaline peptone water for 4-6hrs

- SubCulture on TCBS (thiosulphate citrate|bile salt sucrose) in air, at 37°C, for 18-24hrs
 - Colonial morphology; yellow colonies
- Gram stain of colony; ????
- Biochemical test; Oxidase positive



Other tests

- Toxin assays
- Dipstick
- PCR



Treatment

Even before identifying cause of disease, rehydration therapy must begin immediately because death can occur within hours

- Oral rehydration
- Intravenous rehydration
- Antimicrobial therapy

Traveling Precautions

- Boil or treat water with chlorine or iodine
- No ice
- Cook everything
- Rule of thumb: "Boil it, cook it, peel it, or forget it."
- Wash hands frequently
- VACCINES



REVIEW

- Antibiotic Resistance in *Vibrio cholerae*
- Cholera vaccine