Training on Management of Cholera - Short Course

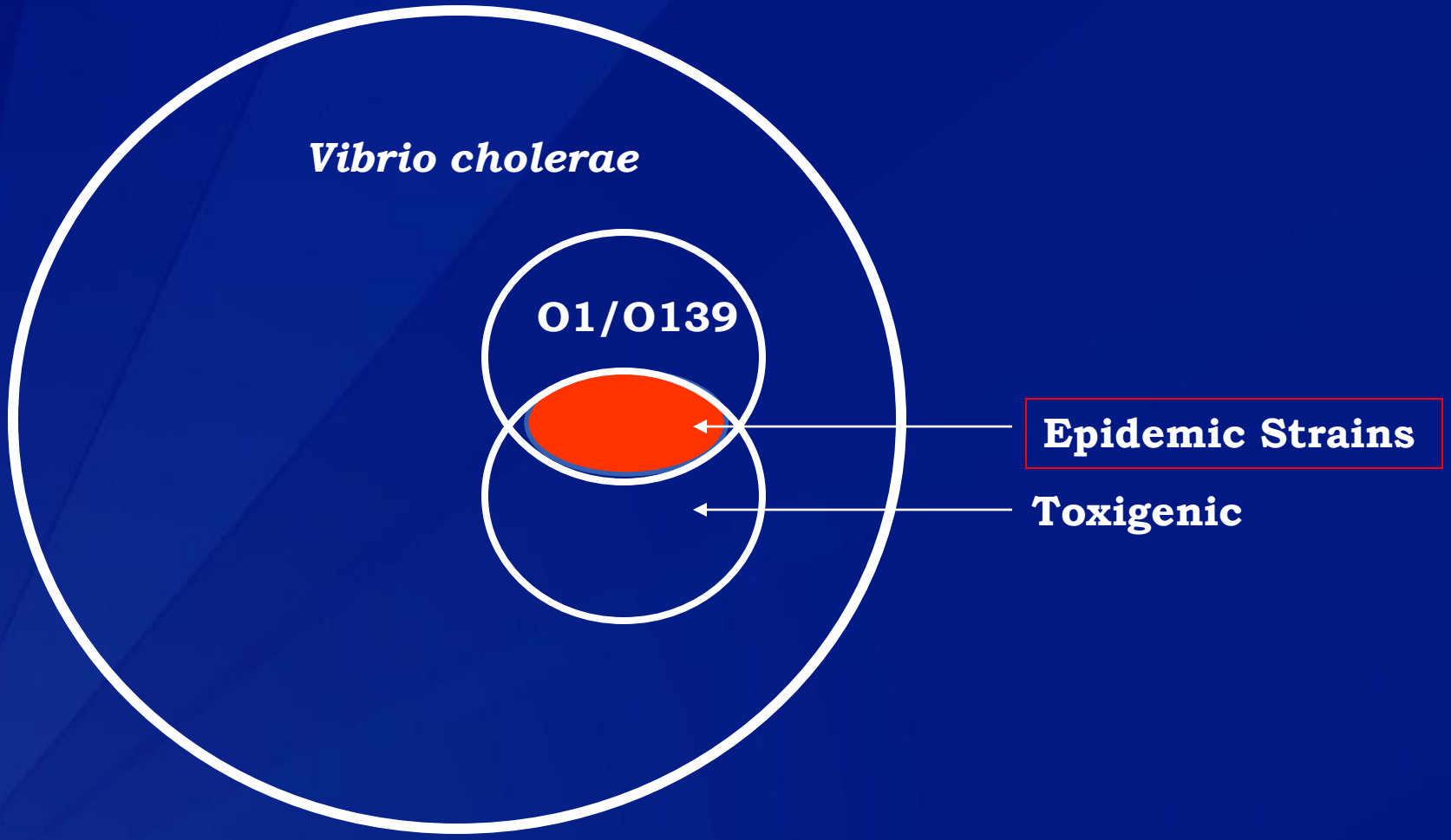
November, 2010

Departments, Haiti

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Vibrio cholerae O1

Cholera – The Epidemic Microorganism



Clinical Presentation

- **Dehydrating diarrheal illness with loss of fluid and electrolytes**

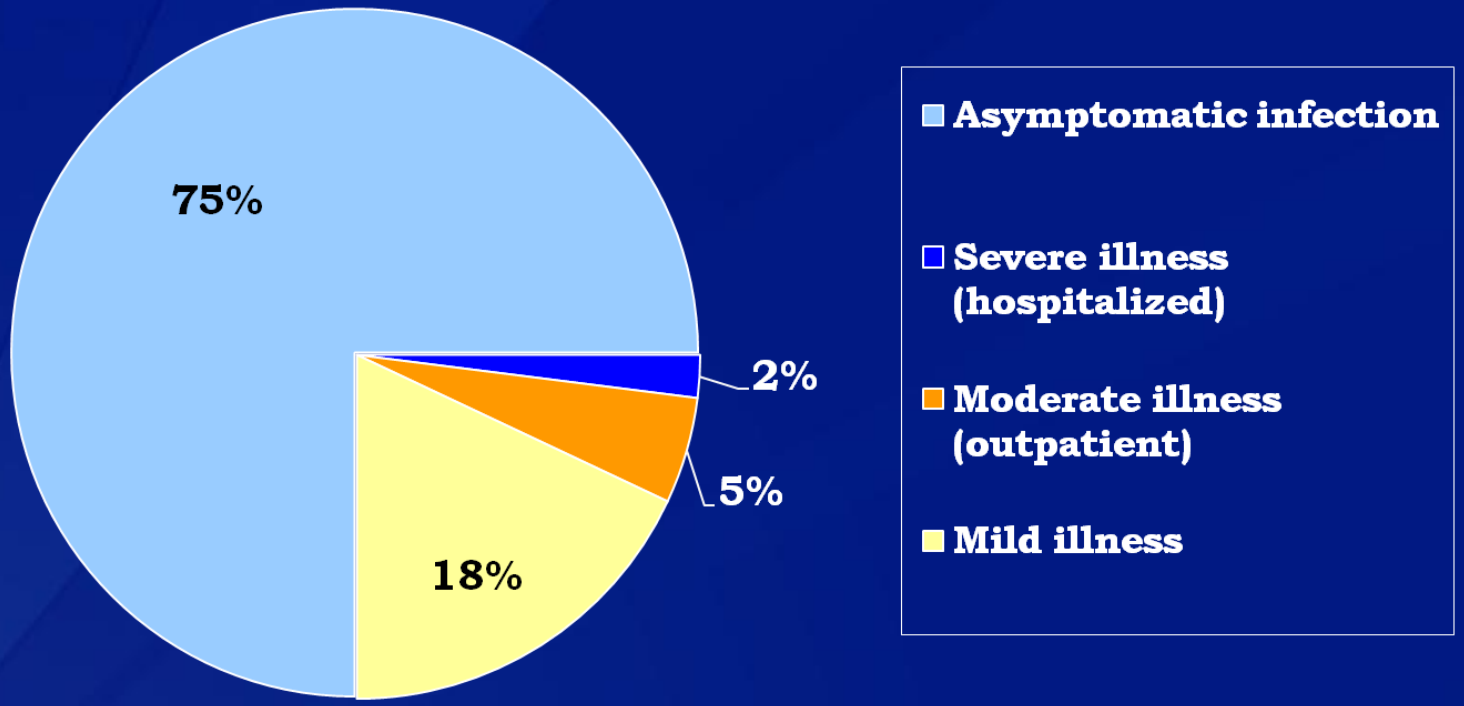
- **Severe or moderate case**
  - Profuse watery diarrhea
  - Vomiting
  - Leg cramps (hypokalemia)

- **Symptoms range from asymptomatic infection through mild diarrhea, to severe hypovolemic shock**

Electrolyte Composition of Cholera Stools and of Fluids Recommended for Treatment of Cholera, in mmol/L

	NA^+	K^+	Cl^-	Base*	Glucose
Cholera stools	135	15	105	45	0
WHO ORS	90	20	80	10	111
Ringers lactate	130	4	109	28	0
Normal saline	154	0	154	0	0

Spectrum of Illness in Persons Infected with *Vibrio cholerae* O1, Biotype El Tor



Moderate Dehydration

- Loss of 5-10% of body weight
- Normal blood pressure
- Normal or rapid pulse
- Restless, irritable
- Sunken eyes
- Dry mouth and tongue
- Increased thirst, drinks eagerly
- Skin goes back slowly after skin pinch
- An infant: decreased tears, depressed fontanel

Severe Dehydration

- **Loss of ≥10% of body weight**
- **Hypovolemic shock**
  - Low blood pressure
  - Rapid, weak or undetectable peripheral pulse
  - Minimal or no urine
- **Skin has lost normal turgor (“tenting”)**
- **Mouth and tongue are very dry**
- **Sunken eyes**
- **Mental status is dulled**

Treatment According to Dehydration Status

EXAMINE		
Well, alert Sunken eyes: No Drinks normally Skin pinch goes back quickly	Restless, irritable Sunken eyes: Yes Thirsty, drinks eagerly Skin pinch goes back slowly	Lethargic or unconscious Sunken eyes: Yes Not able to drink Skin pinch goes back very slowly
ASSESS		
No dehydration	Moderate dehydration	Severe dehydration
TREAT		
Maintain hydration	Oral rehydration	IV and oral rehydration

Rehydration Therapy

- **Can reduce mortality to less than 1%**
- **Oral therapy:**
  - Oral rehydration salts (ORS) are recommended
  - 80-90% of patients can be treated with ORS
  - Patients requiring IV can soon switch to ORS
- **Intravenous therapy:**
  - Ringers lactate is the recommended IV fluid
  - Normal or ½ normal saline are less effective, but can be used
  - D5W is ineffective, and should not be used

Oral Rehydration Therapy

- Replace estimated losses for older children and adults at 100ml/5 min
- Replace ongoing losses plus 1 liter water daily
- Reassess every 1-2 hours
- May need > 5 liters: Give it!

Treatment When There is No Dehydration

Age	Amount of ORS after each loose stool	ORS quantity needed
< 24 months	100 ml	~ 500 ml/day (1 sachet)*
2 to 9 years	200 ml	~ 1000 ml/day (1 sachet)*
≥ 10 years	As much as wanted	~ 2000 ml/day (2 sachets)*

Treatment of Moderate Dehydration

- **Provide ORS immediately, according to weight and age (see handout)**
- **Monitor every hour for first 2 hours**
  - Fluid input:
    - Ensure adequate intake of ORS
    - Count number of cups drunk
    - Re-administer 10 minutes after patient vomits
  - Fluid output:
    - Number and nature of stools
    - Vomitus
- **Reassess hydration status after 4 hours and treat accordingly (no, moderate, severe)**
- **Can administer ORS by nasogastric tube**

Treatment of Severe Dehydration

- **Give intravenous (IV) fluid rapidly until blood pressure normal (3-6 hours)**
  - Hang infusion bag high
  - Use 2 intravenous lines if necessary
  - For adults, give a liter in the first 15 minutes
  - Remember, Ringers lactate solution is the best option
  - Use a new IV set for every patient
- **Give ORS if patient can drink**
  - Only if conscious
  - Do not use oral or nasogastric route if severely hypovolemic or unconscious

Intravenous (IV) Rehydration Therapy of Severe Dehydration

Give IV fluid rapidly until blood pressure normal

> 1 year old

- First 30 mins: 30 ml/kg
- Next 2.5 hours: 70 ml/kg

≤ 1 year old

- First 60 mins: 30 ml/kg
- Next 5 hours: 70 ml/kg

200 ml/kg or more may be needed in first 24 hours

Intravenous Rehydration Therapy

- Monitor pulse and stay with patient until strong radial pulse
- Reassess hydration status at 30 minutes, then every 1-2 hours until rehydration is complete
- Check for rapid respiratory rate, a sign of possible overhydration
- Add oral solution as soon as possible
- Discontinue and remove IV when patient is stable and drinking ORS

IV Rehydration: Fluid Management

- **Input**
  - Record liters of IV fluids and cups of ORS administered
  - Mark quantity per hour on each bag
  - Ensure cup and ORS are within reach
  - ORS consumption is easier sitting up, if able
- **Output**
  - Record volume and nature of stool
  - Record presence of urine

Signs of Adequate Rehydration

- Skin goes back normally when pinched
- Thirst has subsided
- Urine has been passed
- Pulse is strong

Antimicrobial Therapy

- **Antimicrobial therapy reduces**
  - Fluid losses
  - Duration of illness
  - Duration of carriage
- **Recommended for moderately and severely ill patients, particularly those passing large volumes of stools and all hospitalized patients**
- **Resistance pattern can change over time**
- **Not recommended for prophylaxis**

Zinc Supplementation in Children

- Reduces the severity and duration of most childhood diarrhea caused by infection
- Reduces severity and duration of cholera in children by ~10%
- Zinc supplementation (10-20 mg zinc by mouth per day) should be started immediately, if available

Summary of Treatment

- **No dehydration**
  - ORS to maintain hydration
- **Moderate dehydration**
  - ORS to replace losses
  - Consider antibiotics (if hospitalized or still passing large volumes of stool)
- **Severe dehydration**
  - IV Fluids (Ringers lactate)
  - Switch to ORS when tolerated
  - Antibiotics
- **Monitor for treatment complications**
- **Zinc supplementation**
  - All children with diarrhea

Cholera in a Severely Malnourished Child: Key Principles

- **Typical signs of dehydration are often unreliable**
- **Children with severe malnutrition are at high risk of complications due heart, kidney, and electrolyte abnormalities**
  - Oral rehydration is preferred method
  - IV hydration should be avoided unless shock is present because of a high risk of fluid overload
- **Severely malnourished children should be sent to a specialized malnutrition center as soon as they have been stabilized**

Assess for Malnutrition

- Is weight-for-height Z-score more than 3 standard deviations below expected?
- Is mid-upper arm circumference <115 mm?
- Is there bilateral edema of legs/feet?
- Are the ribs prominent?
- Is there visible wasting, particularly of gluteal muscles?

Assessment for Dehydration and Shock among Severely Malnourished Children

- **Dehydration is difficult to assess**
  - At baseline, children with marasmus may have poor skin turgor and sunken eyes
  - Children with kwashiorkor may have turgid skin due to edema

Suspect dehydration if:

- Current or recent diarrhea
- Thirst (restlessness in an infant)
- Recent appearance of sunken eyes
- Decreased urine output

Suspect shock if:

- Child is unresponsive
- Pulses are weak or thready
- Feet or hands are cold
- Urine production has stopped

Treatment of Shock in Severely Malnourished Children

- **IV fluid rate: 10 mL/kg/h for 2 hours**
- **Solution type:**
  - Preferred :
    - Lactated Ringer's with 5% glucose
    - Half-normal saline with 5% glucose
  - Acceptable :
    - Lactated Ringer's
- **Every 10 minutes, check for heavy or labored breathing and reassess hydration:**

If worse	no improvement	If improvement
• **STOP** IV infusion • Refer to physician immediately	• Transfuse whole blood or packed red cells at 10mL/kg over 3 hours • Feed F-75	• Continue IV at 5 mL/kg/h until rehydrated And/Or • Begin oral rehydration when child can drink

Oral Rehydration Solutions for Severely Malnourished Children

- **ReSoMal (Rehydration Solution for Malnutrition) differs from low-osmolarity ORS. It has:**
  - Less sodium
  - More glucose and potassium
  - Trace minerals like zinc and magnesium

- **If ReSoMal is not available, low-osmolarity ORS is acceptable**

Oral Rehydration Methods in Severely Malnourished Children

- **For children who can drink adequately**
  - Offer ORS/ReSoMal frequently in small sips or by spoon
  - Breastfed children should continue to breastfeed
  - Children may tire quickly and not take enough fluid

- **For children who are alert but cannot drink adequately**
  - Give ORS/ReSoMal by nasogastric tube

- **ORS / ReSoMal dosing:**
  - Goal: total of 70 – 100 mL/kg over 12 hours. Give as:
    - 5 mL/kg every 30 min for 2 hours, then
    - 5 – 10 mL/kg/hour for 4 - 10 hours as needed to complete rehydration

Assessments during Rehydration in Severely Malnourished Children

- Should be done at least hourly due to high risk for cardiac failure and pulmonary edema and to estimate on-going losses
- Stop oral rehydration if signs of cardiac failure develop (increased respiratory rate, engorged jugular veins, increasing edema)
- Rehydration is complete when child is no longer thirsty, urine production has normalized, and other signs of dehydration have resolved

Maintenance Treatment After Dehydration is Corrected in Severely Malnourished Children

- **Administer ORS / ReSoMal to replace on-going losses**
  - Children < 2 years old: 50 – 100 mL per loose stool
  - Children ≥2 years old: 100 – 200 mL per loose stool
- **Administer F-75 formula per WHO recommendations to meet basal fluid and nutritional needs**
  - If F-75 is unavailable, feed age-appropriate foods until child can be taken to a specialized center
- **If child is breastfed, continue breastfeeding**

Assess for and Treat Infection in Severely Malnourished Children

- Concomitant infections are common among severely malnourished children with diarrhea

- While starting rehydration therapies, assess for fever, respiratory compromise, hypothermia, hypoglycemia, and other signs of infection

Treat quickly!

Other Treatments to Begin Within the First 1-2 Days of Care in Severely Malnourished Children

- **Vitamin A, if not given in the previous month:**
  - Children 6 – 12 months old: 100,000 IU by mouth
  - Children ≥12 months old: 200,000 IU by mouth

- **Zinc:**
  - Children < 6 months old: 10 mg by mouth for 10 – 14 days
  - Children ≥ 6 months old: 20 mg by mouth for 10 – 14 days

Disposition of Severely Malnourished Children

- As soon as possible after child is stable, transfer to center specializing in management of malnutrition

Transmission

- **By water or food contaminated with *V. cholerae* O1 from:**
  - Human feces
  - Environmental reservoir (estuarine environment)

- **<u>NOT</u> by person-to-person contact**

Documented Vehicles of Cholera Transmission

Water:	Seafood:	Others:
Municipal	Raw mussels	Millet gruel
Shallow wells	Raw oysters	Leftover rice, corn porridge, peas
River water	Raw “concha”	Rice with peanut sauce
Bottled water	Raw clams	Airline hors d’oeuvres
Ice	Raw fish	Frozen coconut milk
	Partly dried fish	Raw vegetables
	Undercooked crab	
	Street-vended squid	

Prevention in the Patient's Household

- **Education**
  - Drink and use safe water
  - Wash hands with soap and safe water
  - Use latrines or bury your feces; do not defecate in any body of water
  - Cook food thoroughly
  - Clean up safely in kitchen and bathing areas
  - If diarrhea develops, drink ORS and go to clinic quickly
- **Chemoprophylaxis**
  - Not recommended

Advice for Travelers to Areas Affected by Epidemic Cholera

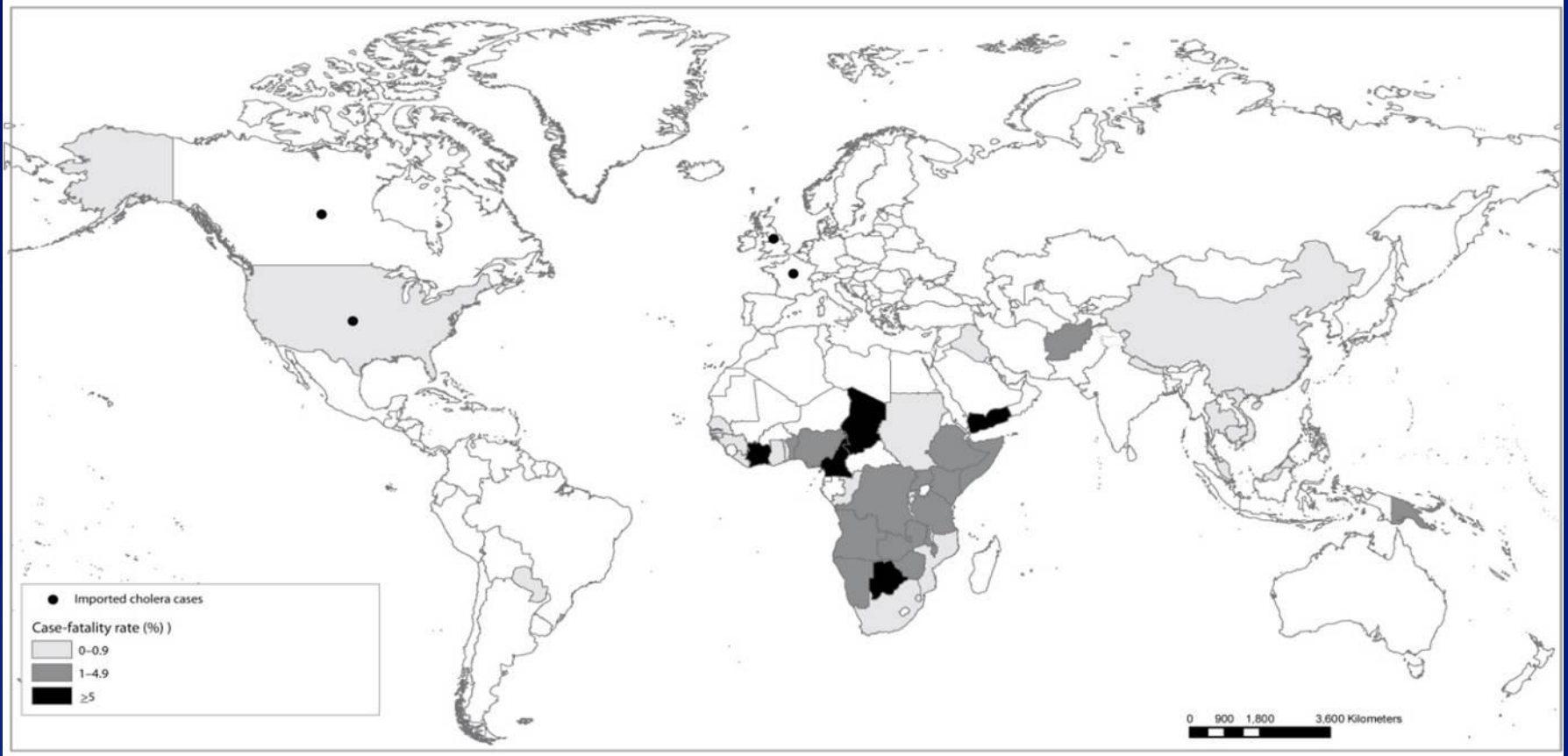
- Do not drink unboiled or untreated water
- Carbonated drinks without ice are safe
- Avoid food and beverages from street vendors
- Avoid raw and undercooked seafood
- Eat foods that are cooked and hot, and fruits you peel yourself

-- Boil it, cook it, peel it, or forget it. --

Cholera Vaccine

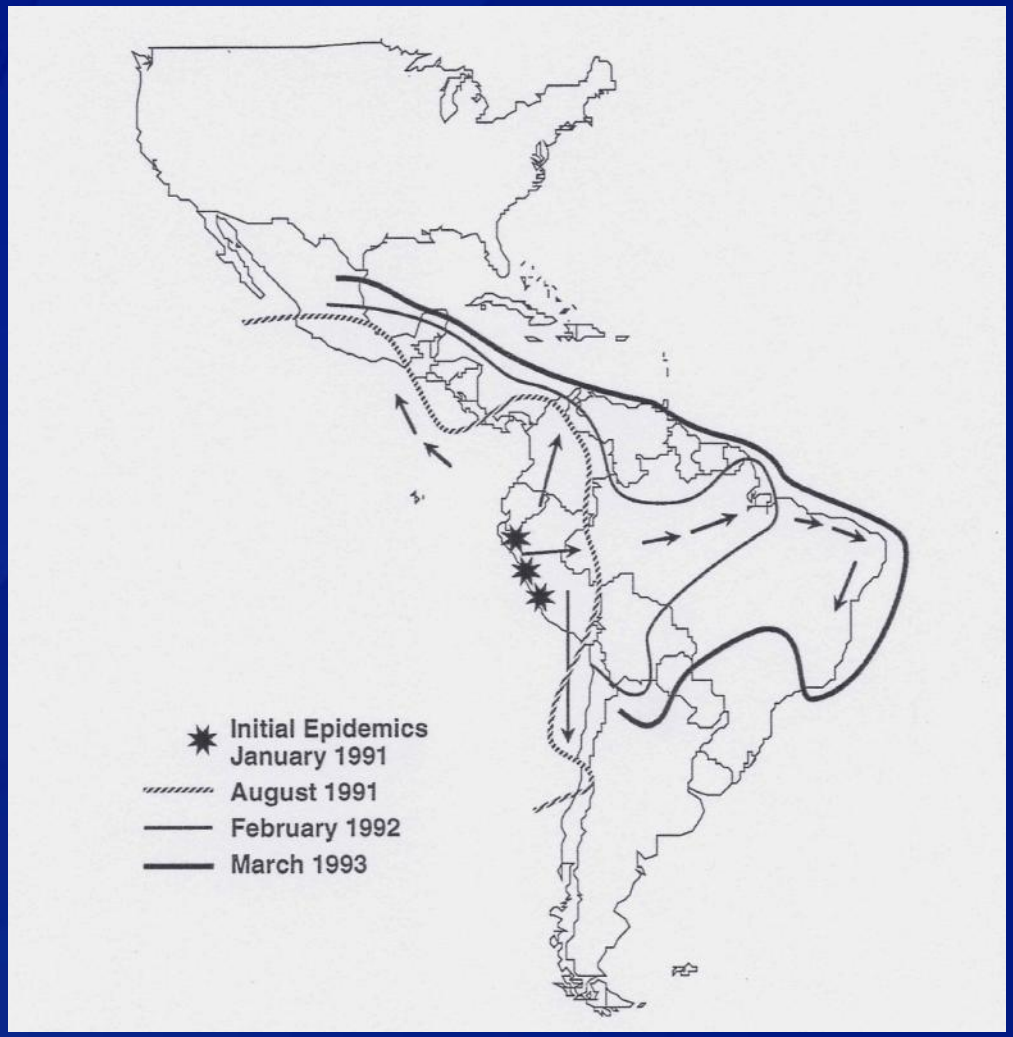
- **Not recommended for epidemic control**
  - Delay in achieving immunity
    - Immunity begins 1 week after second dose
    - 14-21 days after first dose
  - Major logistical challenges, as it requires
    - Dosing the same people twice
    - Cold chain
    - Clean water
    - Personnel and support
- **Does not prevent carriage**
- **Not recommended for travelers or health care workers**

Countries reporting cholera in 2009



World Health Organization

Cholera in the Americas, 1973-1995



Cholera in Latin America: Risk Factors for Transmission

- **Drinking unboiled water**
  - Large municipal water systems
  - Deficient peripheral distribution
  - Home water storage
  - Water contamination in the home
  - Ice made from untreated water
- **Eating raw and undercooked shellfish**
  - Shrimp, concha, oysters, crabs
- **Eating foods and drinking beverages from street vendors**
- **Eating rice left out for > 3 hours**

Cholera in the Americas: Control Measures

- **Short term: Emergency Interventions**
  - Improve diagnosis, treatment, and surveillance
  - Chlorinate water supplies
  - Educate public
  - Boil water, avoid raw shellfish
  - Identify other control measures by epidemiologic investigations
- **Mid term: Sustainable, cheap control measures**
  - Home water storage vessels
  - Home chlorination of water
- **Long term: "Sanitary Reform"**
  - Maintain and upgrade water systems
  - Build sewage treatment systems
  - Implement shellfish sanitation

Uses of Laboratory Diagnosis of Cholera

- To confirm individual cases in a previously unaffected area
- To monitor antimicrobial resistance patterns
- To define the end of an outbreak
- To support epidemiologic investigations

Testing Recommendations for Haiti: Non-affected Areas

- **Test patients with acute watery diarrhea**
  - Inform MSPP/DELR and collect stool specimens from up to 10 patients for Rapid Diagnostic Testing (RDT) who meet these criteria
  - Send samples with positive results to the national laboratory immediately for culture confirmation

- **If one or more specimens from a previously non-affected location are culture-confirmed for cholera, this area will be considered a "cholera confirmed area"**

Testing Recommendations for Haiti: Cholera Confirmed Area

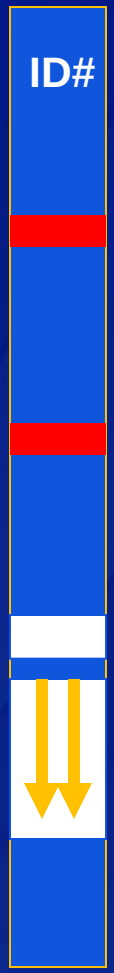
- **Once an outbreak is confirmed, the clinical case definition of acute watery diarrhea is sufficient to diagnose**

- **Only <u>periodic</u> laboratory testing of samples will be needed for antimicrobial sensitivity testing and to confirm when the outbreak has ended**
  - The decision will be made by MSPP as to which departments are affected areas

Microbiological Diagnosis

- **Culture of rectal swab or stool specimen**
  - Transport medium: Cary Blair
  - Selective agar: TCBS
    - **T**hiosulfate
    - **C**itrate
    - **B**ile salts
    - **S**ucrose
  - Takes 2-3 days

Rapid Diagnostic Test (Crystal VC Dipstick)



- **Rapid Diagnostic Test (RDT) for screening**
  - Test fresh stools in the field can be read within 15-20 minutes
  - Early presumptive diagnosis
  - Not definitive

Cholera - Haiti

- October 21, 2010 – toxigenic *Vibrio cholerae* O1, serotype Ogawa, biotype El Tor identified by national lab and confirmed by CDC
- Immunologically naïve and highly vulnerable population
- As of October 27, 2010 - 4,722 confirmed cases and 303 deaths
- Mainly reported from Artibonite Department, but spread to 5 departments including Port-au-Prince
- Preventive measures and appropriate case management is critical to prevent spread and reduce mortality

Case Identification in Haiti

- **A case of cholera should be suspected when:**

  A patient aged 5 years or more develops acute watery diarrhea, with or without vomiting.

- **A case of cholera is confirmed when:**

  Vibrio cholerae O1 is isolated from any patient with diarrhea.

Surveillance Case Definitions: Haiti, 2010

- **Suspect case:** acute watery diarrhea in a non-affected Department
- **Case:** acute watery diarrhea in an affected Department
- **Affected Department:** a Department where one or more cholera cases have been confirmed by laboratory testing (isolation of V. cholerae O1) that have no history of travel to affected departments in the 5 days before onset.
- Designation of affected and non-affected Departments is ultimately determined by MSPP.

Data Collection and Reporting

- **For ALL health facilities:**
  - Maintain records daily on new number of cases and deaths at health facility
  - It is strongly recommended that each health facility record daily the new number of suspect cholera cases and deaths.
  - Please use the institution report form issued by MSPP

Flow of Information

- Health facilities should report surveillance data from the institution report form on acute, watery diarrhea patients to your Unite Communale de Sante or the departmental epidemiologist.

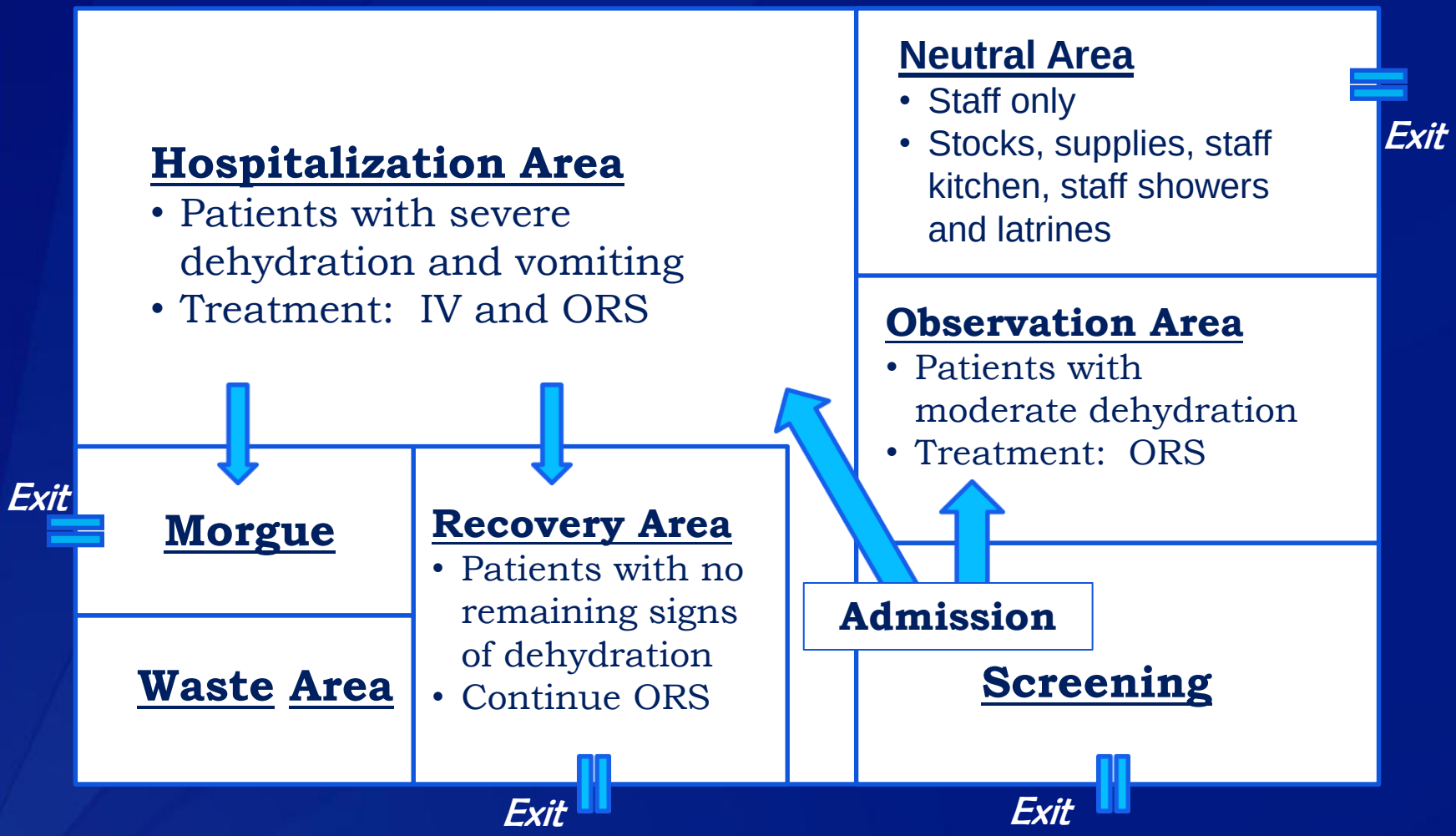
- The Unite Communale de Sante or the departmental epidemiologist will compile the daily number of suspect cases and deaths you have recorded at your CTC and report cumulative numbers of cases and deaths to MSPP.

When to Suspect a Cholera Outbreak

- **Symptoms of moderate or severe cholera:**
  - Profuse, watery diarrhea
  - Vomiting
  - Leg cramps
  - Symptoms of dehydration

- **If there is a local increase in the number of cases with these symptoms, please alert your Unite Communale de Sante or the Departmental epidemiologist immediately.**

CTC Organization



The design may be adapted to the situation, but **four areas** have to be well delimited in order to limit spread of infection

Triage at Treatment Center

- **Triage**
  - **No dehydration**: refer to normal dispensary
  - **Some dehydration = "Moderate Case"**: admit to Observation Area for oral rehydration treatment
  - **Severe dehydration and/or uncontrollable vomiting = "Severe Case"**: admit to Hospitalization Area for immediate IV and oral rehydration.
- **Patients are admitted with no more than 1 attendant (caregiver)**
- **Patients who are admitted are registered (cholera register).**
  - Upon Admission: record patient demographics, presenting signs and symptoms, assessment of dehydration severity, and triage status
  - Upon Exit: record outcome (discharged, died)

One Cholera Kit Provides Treatment for:

- 100 severe cases of cholera: IV fluids, ORS, and antibiotics at the beginning of the treatment and ORS during the recovery phase

  AND

  400 mild or moderate cases of cholera in a CTC or ORP

- Each Kit consists of 4 modules: Basic, ORS, Infusion, and Support

Minimum staff requirements to treat 100 patients/day in a 20-bed CTC:

- Medical Officer: 3
- Nursing staff: 2
- Cleaner: 2
- Health educator: 2
- Cook: 1
- Logistics Officer/Storekeeper: 1
- Sprayer/Watchman: 1

Total minimum staff requirement: 12 persons

CTC Summary

- Cholera patients can easily contaminate the environment: isolation and hygiene are priority rules.
- The design of CTC should follow standard rules in order to control contamination between steps of patient management: screening, admission, observation, hospitalization, and recovery.
- Human resources organization, training and management are key activities, especially in CTCs .
- CTCs must be well-staffed and supplies must be organized in order to avoid any shortage.