Vibrio Infections

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Genus *Vibrio*:

- Part of the normal flora in marine habitat
- Many of them were identified as the most serious pathogens in fish and shellfish marine aquaculture worldwide

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Genus *Vibrio*:

- Gram-negative
- Non-spore-forming bacilli
- 0.5–0.8 µm diameter, 1.4–2.6 µm long
- Usually motile by a single polar flagellum
- Facultative, stimulated by NaCl or require it
- Those of interest in connection with human disease seem to have a natural habitat in brackish water and saltwater.

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Vibrio parahaemolyticus

- 50–70% of all cases of diarrhea associated with the consumption of fishery products in China
- 25 outbreaks comprising 613 cases (0 deaths) in the U.S., 1998–2002

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Vibrio parahaemolyticus

- It is estimated 5,122 cases of foodborne vibriosis, other than cholera or *V. vulnificus* infection, in the U.S./year, with 13 deaths (CDC)

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Vibrio parahaemolyticus

- Pathogenic strains are Kanagawa-positive
- Optimum growth in 2–4% NaCl, grows at 8%
- pH 7.5–8.6 optimum
- Temperature >10ºC–42ºC or 44ºC

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Vibrio parahaemolyticus

- Infection probably requires ingestion of $>10^5$ cells
- Incubation 4–30 hr (usually 12–24 hr)
- Watery diarrhea with abdominal cramps, nausea, vomiting, fever, and headache; rarely, dysentery-like illness
- Duration 1–7 days

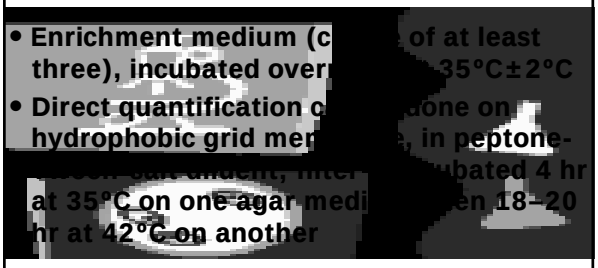
Vibrio parahaemolyticus

- Not communicated person-to-person
- During warm weather, occurs in seawater (normal flora) and seafoods.
- Foods most often associated with human infections are seafoods, both shellfish and finfish

Vibrio parahaemolyticus

- Organism is killed by cooking or by irradiation.
- In China, of a total of 83 shellfish samples, 38 samples were positive
- In Mexico, more than 1230 cases of gastroenteritis were reported with consumption raw or undercooked shrimp

Vibrio parahaemolyticus



Vibrio parahaemolyticus

- *V. parahaemolyticus* colonies are green to blue; others are yellow.
- Serologic classification is based on O (somatic) and K (capsular) antigens.
- Several problems concerning detection of V. *parahaemolyticus* in seafood using culture methods
- It is recommended to use new techniques such as the PCR method

Vibrio cholerae

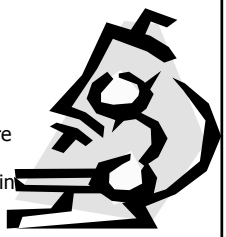
- Causes **cholera**
- Waterborne transmission is widespread in the developing world.
- Most outbreaks in the 19th and first half of the 20th centuries occurred in Asia and involved "classical" *V. cholerae*, serogroup O1; causes pandemics.

Vibrio cholerae

- On the Louisiana and Texas Gulf Coasts in January of 1991, an outbreak due to serogroup O1, biotype El Tor, began in Peru and spread through much of Latin America

Vibrio cholerae

- Grows in the range of 15ºC–42ºC, optimum 30ºC–37ºC.
- pH range for growth is 6–10
- Does not require salt, but will grow in the presence of up 6%
- Serogroups other than O1 and O139 are fairly widespread. There are also O1 strains that do not produce cholera toxin and therefore do not produce the disease



Vibrio cholerae

- Infectious dose is personal
- Incubation period is a few hours to 5 days, usually 2–3 days.
- Sudden onset of profuse, painless, watery diarrhea, occasional vomiting
- In untreated cases, dehydration may lead to circulatory collapse, acidosis, hypoglycemia in children, renal failure, and death

Vibrio cholerae

- Survivors are immune, but not for life, to the same *V. cholerae* type.
- During 1998–2002, CDC recorded 0 food borne cholera outbreaks in the U.S., and no waterborne cholera outbreaks for the years 2003–2004
- CDC estimates 49 cases of food borne cholera in the U.S./year, with no deaths.

Vibrio cholerae

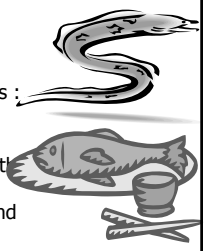
- Diagnosis in humans: isolation of the organism or detection of the toxin (e.g., by ELISA) in patients stools
- Food samples are enriched in alkaline peptone water at 35ºC or 42ºC.
- Detection is by plating on a variety of media, some nonselective.

Vibrio vulnificus

- This organism has been recognized first in 1979
- Because of high lethality, it is now regarded as an important foodborne disease hazard in the U.S., and possibly in other developed countries
- For 1998–2002, CDC reports only one possible outbreak ("*Vibrio*, other"), perhaps because *V. vulnificus* most often causes individual (sporadic) cases.

Vibrio vulnificus

- *Vibrio vulnificus* is an etiologic agent in severe human infection acquired through wounds or contaminated seafood.
- The strains are divided into three biotypes :
  - Biotype 1 strains are pathogenic for humans
  - Biotype 2, appear to be virulent for both humans and eels
  - Biotype 3, causing wound infections and bacteremia



Vibrio vulnificus

- *V. vulnificus* has been detected in coastal and estuarine environments throughout the world.
- Areas with warm seawater temperatures
- Shellfish may constitute one of the most hazardous foods if consumed raw or undercooked.

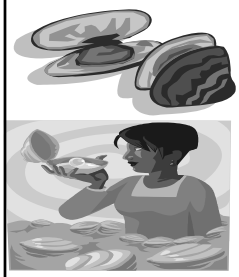
Vibrio vulnificus

- People (usually men >40 years old), chronic liver disease, chronic alcoholism, or immune suppressed, if they eat raw or undercooked seafood (especially oysters)
- They may become dramatically ill after 12 hours to 3 days.

Vibrio vulnificus

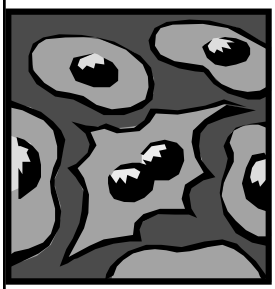
- **In China, an outbreak with high mortality within one week**

Vibrio vulnificus



- Clams and oysters (eastern seacoast, U.S.), fairly common; among positive oysters, average level was 6 104 CFU/g
- Seawater (eastern seacoast, U.S.), when positive, had <10 CFU/ml.

Vibrio vulnificus



- Halophilic (grows in 6% but not 8% NaCl)
- Ferments lactose but less frequently sucrose.
- Detection methods are similar to those for *V. parahaemolyticus*;

Summary

- The genus *Vibrio* comprises species from brackish and marine waters.
- Unlike many foodborne pathogens, these are not necessarily present in food as a result of human fecal contamination.
- At least three of these species are significant human pathogens, associated with seafoods in North America.
- All are easily killed by cooking the seafood.

Summary

- *V. parahaemolyticus* is a worldwide problem with seafood, causes diarrheal illness that is not generally life-threatening.
- *V. cholerae* is usually waterborne elsewhere in the world; cholera is a life threatening disease if not properly treated, and still kills many people worldwide.
- Foodborne *V. vulnificus* kills only a few people who have predisposing conditions; but it kills very quickly if diagnosis and treatment are delayed.