# **Vibrio and Aeromonas Species (Curved/Waterborne GramNegative Rods)**

**About Vibrio:**

* Curved, motile Gram-negative rods, often associated with salt water.
* Key pathogens:
  + **Vibrio cholerae** (cholera),
  + **Vibrio parahaemolyticus** (gastroenteritis from seafood)
  + **Vibrio vulnificus** (severe wound infections and sepsis from seawater exposure or raw oysters)
* Vibrio species are **oxidase positive**, fermentative (unlike Pseud/Burk but like Enterobacteriacae, but usually tested on special media), and most are **halophilic** (salt-requiring) except *V. cholerae* and *V. mimicus*.
* They typically have a single polar flagellum (giving a “shooting star” darting motility in liquid).

**About Aeromonas:**

* Straight Gram-negative rods found in fresh water,
* cause diarrhea and wound infections (especially leech therapy wounds).
* **oxidase positive**, indole positive, fermentative, non-halophilic, beta haemolytic, and motile by polar flagella (often amphitrichous or a tuft).
* CIP or SXT.

***Plesiomonas*** causes gastroenteritis typically in travelers or imported food. CIP or SXT.

**Key Identification:**

* **Oxidase Test:** Both Vibrio and Aeromonas are **oxidase positive** (important to separate from Enterobacteriaceae in stool).
* **Gram stain morphology:** *Vibrio* are often **curved rods** (comma-shaped), especially in initial isolates. *Aeromonas* are **straight rods** (can be coccobacillary).
* **Salt Tolerance:** - Vibrio (other than cholerae and mimicus) usually require salt: e.g., *V. parahaemolyticus, V. vulnificus* need about 1% NaCl to grow well. *V. cholerae* can grow without added salt. Aeromonas do not require salt and typically do not grow in high salt conditions (6% NaCl).
* **Selective Media for Vibrio:** **TCBS agar (Thiosulfate Citrate Bile Salts Sucrose):** Vibrio grows well; *V. cholerae* ferments sucrose and produces **yellow colonies** on TCBS, whereas *V. parahaemolyticus* and *V. vulnificus* do not ferment sucrose and form **green colonies**. *Aeromonas* generally does not grow on TCBS (the high pH and bile inhibit it).
* **String Test:** Emulsify bacteria in 0.5% sodium deoxycholate – **Vibrio** cells lyse and release DNA, forming a mucoid “string” when lifted with a loop (especially *V. cholerae* positive string test). Aeromonas typically does not form a string.
* **O/129 Vibriostatic Disk:** Vibrio is **sensitive to O/129 (150 μg)**, whereas Aeromonas is resistant.
  + Vibrio cholerae: sensitive (zone) to both 10 μg and 150 μg O/129.
  + Vibrio parahaemolyticus: resistant to 10 ug and sensitive to 150 μg (or intermediate).
  + Aeromonas: resistant to both concentrations.
* **Fermentation of sugars:** Both Vibrio and Aeromonas ferment glucose (they are not strict non-fermenters). But in a typical lab algorithm, you’d rely on differential media and simpler tests rather than full biochemical panels for screening.
* **Hemolysis and special tests:** *V. parahaemolyticus* often shows β-hemolysis on human blood agar (Wagatsuma agar), called the **Kanagawa phenomenon** (associated with virulent strains causing diarrhea). *Aeromonas hydrophila* is often beta-hemolytic on blood agar.
* **Indole:** *Aeromonas* are usually **indole positive** (especially A. hydrophila). Many Vibrio are also indole positive (like *V. vulnificus*, *V. cholerae*).
* **Decarboxylase tests:** *Vibrio cholerae* is arginine dihydrolase negative, lysine and ornithine positive. *V. parahaemolyticus* is arginine negative, ornithine negative, lysine positive. *Aeromonas* typically arginine positive, lysine negative, ornithine negative (varies by species). These are used in ID kits if needed.

**Lab Identification Summary:**

1. **oxidase-positive Gram-negative rod from stool**
2. If it grows on TCBS: suspect Vibrio.
   1. yellow = cholerae,
   2. green = parahemolyticus/ vulnificus group.
   3. Aeromanas won’t grow
3. Test in 0% NaCl vs 6% NaCl nutrient broth:
   1. Growth in 0% and 6% = *V. cholerae* (nonhalophile).
   2. Growth only in 6% salt = halophilic Vibrio (like *V. parahaemolyticus*).
4. Do a **string test**: a positive string supports Vibrio (particularly cholerae).

*Plesiomonas shigelloides:* Another oxidase-positive rod (actually now reclassified in Enterobacteriaceae) that causes diarrhea. It is **oxidase positive, motile (lophotrichous flagella), fermentative** and notably **sensitive to O/129 (both conc.)** like Vibrio cholerae, but it does **not require salt** (no growth on high salt). It ferments inositol (differentiating it on Inositol Brilliant Green agar). Plesiomonas can be thought of as a third player in oxidase-positive diarrhea-causing rods (along with Vibrio and Aeromonas).

**Vibrio cholerae specifics:**

* Serogrouping is done for cholerae O1 and O139 cause epidemics. Lab can do a slide agglutination for O1 antigen. *V. cholerae* O1 further has biotypes (Classical, El Tor) and serotypes (Inaba, Ogawa, Hikojima) identified in reference labs.

**Vibrio vulnificus specifics:** Highly virulent (50% fatality in septic cases). It ferments lactose (may appear as LF on MacConkey!). It is usually isolated from wound cultures or blood of patients with wound exposure to seawater or after eating raw oysters (especially in those with liver disease). It’s a halophile (no growth in 0% NaCl). Labs suspect it in these cases and identify by biochemical tests and requiring salt.

**Aeromonas** often identified by automated systems now, but exam might ask: “oxidase-positive, betahemolytic gram-negative rod from wound of someone injured in fresh water” – answer likely *Aeromonas hydrophila*. For diarrhea after freshwater exposure, could be Aeromonas (or Plesiomonas if from tropics).