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# *History of Campylobacter*

- First isolated as *Vibrio fetus* in 1909 from spontaneous abortions in livestock
- ***Campylobacter enteritis*** was not recognized until the mid-1970s when selective isolation media were developed for culturing campylobacters from human feces
- **Most common form of acute infectious diarrhea in developed countries**; Higher incidence than *Salmonella* & *Shigella* combined

## Campylobacter (meaning twisted bacteria)

| spp | host | diseases |
|---|---|---|
| ***C. fetus*** *subspecies venerealis* | Cattle | early embryonic death and temporary infertility |
| *C. fetus subspecies Fetus* | Cattle<br>Sheep and goat | sporadic abortion<br>abortion and stillbirth |
| *C. jejuni* | Sheep<br>chicken<br>human | abortion<br>avian hepatitis<br>Enterocolitis (food born disease) |
| *C.coli* | chicken<br>human | enteritis<br>Enterocolitis (food born disease) |

# *Morphology & Physiology of Campylobacter*

- **Small**, thin (0.2 - 0.5 um X 0.5 - 5.0 um), **helical** (spiral or curved) cells with typical gram-negative cell wall; "Gull-winged" appearance
- thin, comma or S- shape (at the end of the rod it gives spiral or comma)
- flying sea-gull appearance
- 0.2-0.8 µm width and 0.5-5 length
- From broth cultures, chained organisms may appear as elongated forms.
  - Tendency to form coccoid & elongated forms on prolonged culture or when exposed to $O_2$
- **Microaerophilic** & **capnophilic (**5%$O_2$,10%$CO_2$,85%$N_2$)
- **Thermophilic** (42-43C) (except *C. fetus*)
  - Body temperature of natural avian reservoir

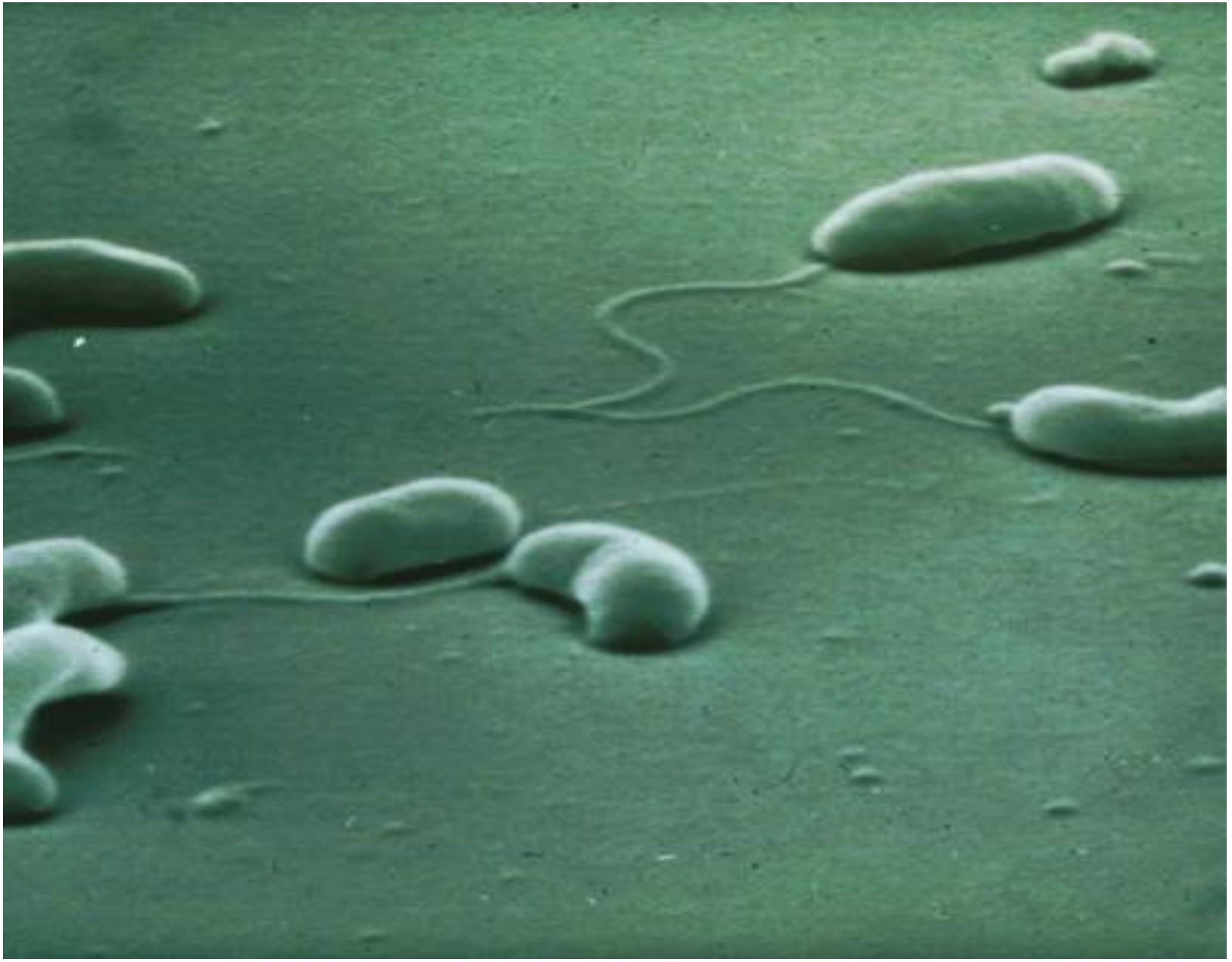
**Motile, with either uni- or bi-polar flagella (flagellar length 2-3 times of the bacterium)**

**Distinctive rapid darting motility**

- **Long sheathed polar flagellum at one (polar) or both (bipolar) ends of the cell**
- **Motility slows quickly in wet mount preparation**

**Motility ( darting or corck screw motion)**

**best seen by dark field or phase contrast microscopy.**



# Cultivation

- Samples:vaginal or preputial washing
- Clark's or thioglycolate broth
- charcoal media or Columbia blood agar with 5% antimicrobial agents
- Microaerophilic

5-10% oxygen-5-10% CO2.

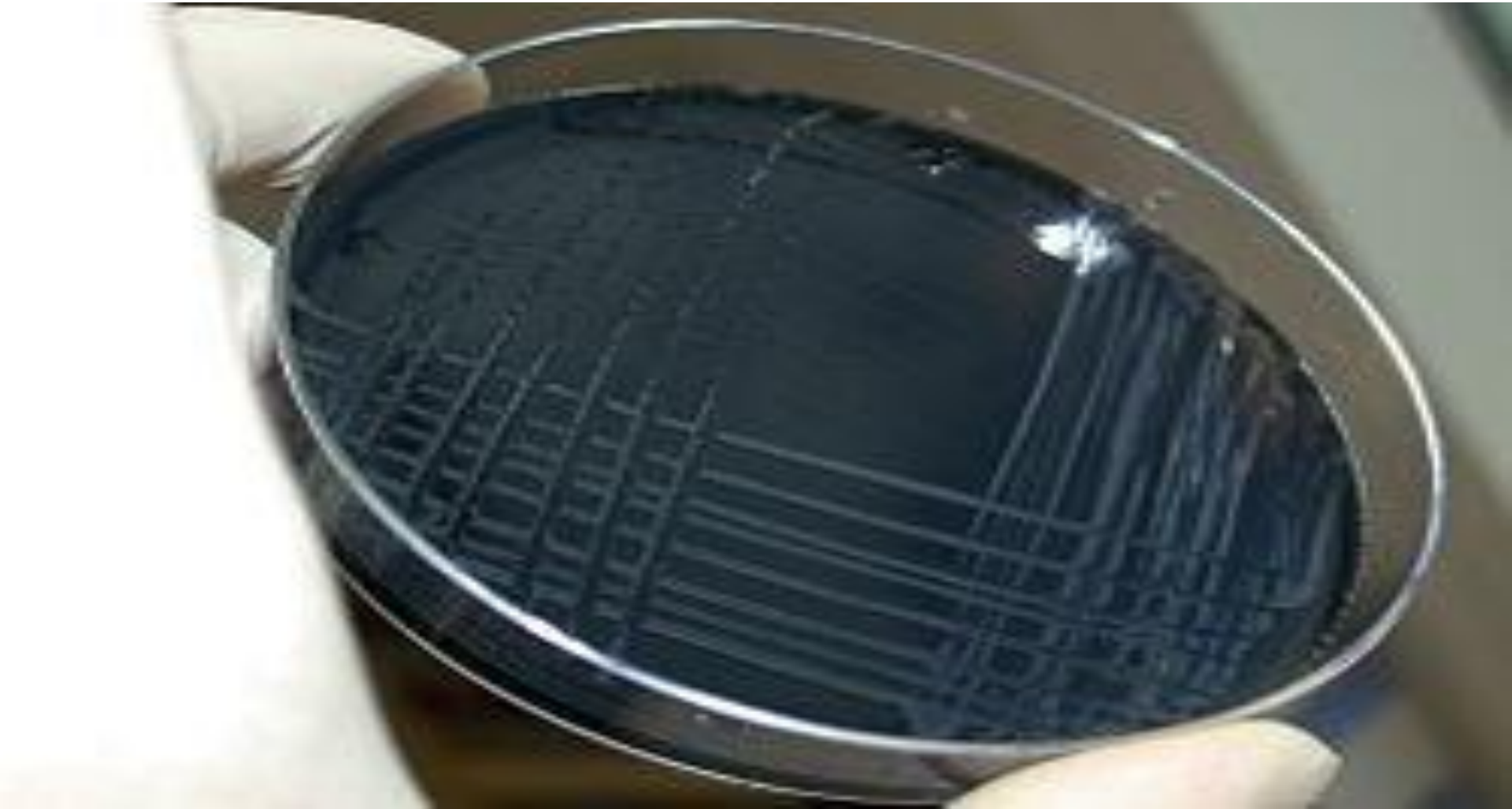
- 2-5 days for growth.
- Umbrella shape in soft agar.

- **Campylobacter fetus subsp. Venerealis and subsp. Fetus have small, round, smooth, and translucent colonies with a dew drop appearance.**

- **Campylobacter jejuni and coli produces small, flat, grey colonies with a spreading, watery appearance and may have a metal sheen**

- Gas Pak system (Microaerophilic)

# Char coal medium



**Biochemical characters:**

**oxidase-positive and have variable catalase reactions.**

**non-fermentative.**

# Laboratory Identification (cont.)

| Characteristics | C. jejuni | C. coli | C. upsaliensis | C. fetus | H. pylori | H. cinaedi | H. fennelliae |
|---|---|---|---|---|---|---|---|
| Oxidase | + | + | + | + | + | + | + |
| Catalase | + | + | −/W | + | + | + | + |
| Nitrate reduction | + | + | + | + | − | + | − |
| Urease | − | − | − | − | + | − | − |
| Hydrolysis of: | | | | | | | |
| Hippurate | + | − | − | − | − | − | − |
| Indoxyl acetate | + | + | + | − | − | − | + |
| Growth at: | | | | | | | |
| 25°C | − | − | − | + | − | − | − |
| 37°C | + | + | + | + | + | + | + |
| 42°C | + | + | + | − | − | − | − |
| Growth in 1% glycine | + | + | V | + | − | + | + |
| Susceptibility to: | | | | | | | |
| Nalidixic acid | S | S | S | V | R | S | S |
| Cephalothin | R | R | S | S | S | I | S |

| Species | Catalase production | Growth at | | Growth in 1% glycine | Production of H2S (lead acetate method) |
|---|---|---|---|---|---|
| | | 25°C | 42°C | | |
| ***C. fetus* subsp. Venerealis** | + | + | - | - | - |
| ***C. fetus* subsp. Fetus** | + | + | - | + | + |
| ***C.* Jejuni** | + | - | + | + | + |
| ***C. coli*** | + | - | + | + | + |

# Virulence factors

- Microcapsule (phagocytosis).
- Heat labile toxin: cholera or *E.coli* toxin.
- Cytotoxin (shiga like toxin).
- Cytolethal distending toxin.
- Hemolysin & Hepatotoxin.
- Mannose resistant adhesin.
- LPS.

**The role of *Campylobacter fetus* subsp. venerealis in infertility in cattle**

**A symptomatic carrier bull ------> Venereal transmission to susceptible heifer or cow ------ > Campylobacters in cervicovaginal mucous ---- > Mild endometritis and salpingitis > Embryonic death and resorption with return to estrus between 28-35 days ------> Transient infertility for up to 5 months ------>**

**Protective immunity mediated by IgA in cervicovaginal mucous and IgG in uterus ------ > Recovery of fertility.**