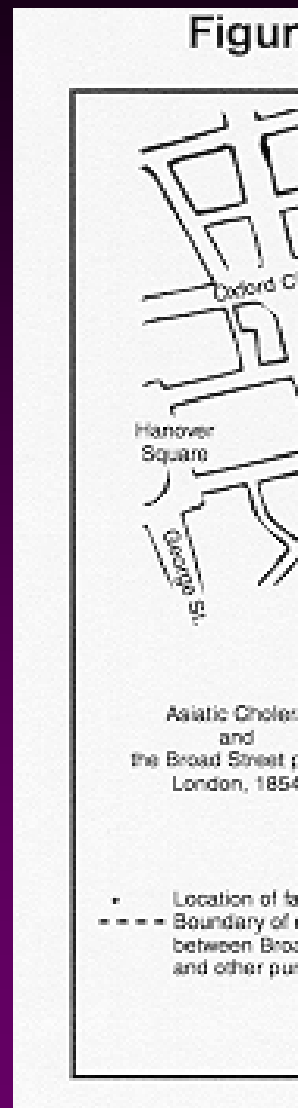


# Vibrios, short curved rods

We are accustomed to characterizing bacteria as **cocci** (spheres), **bacilli** (rod-shaped), or **spirillum** (cork-screw shaped). However, we have noted spirochetes as curved with special motility, now we see that some short rods are curved, the **vibrios** (vibrate or shake) are more like spirilla than bacilli

# Initial studies on Cholera

- Cholera a major problem in London
- John Snow: Court physician to Queen Victoria
  - First epidemiology study
  - Broad St Pump

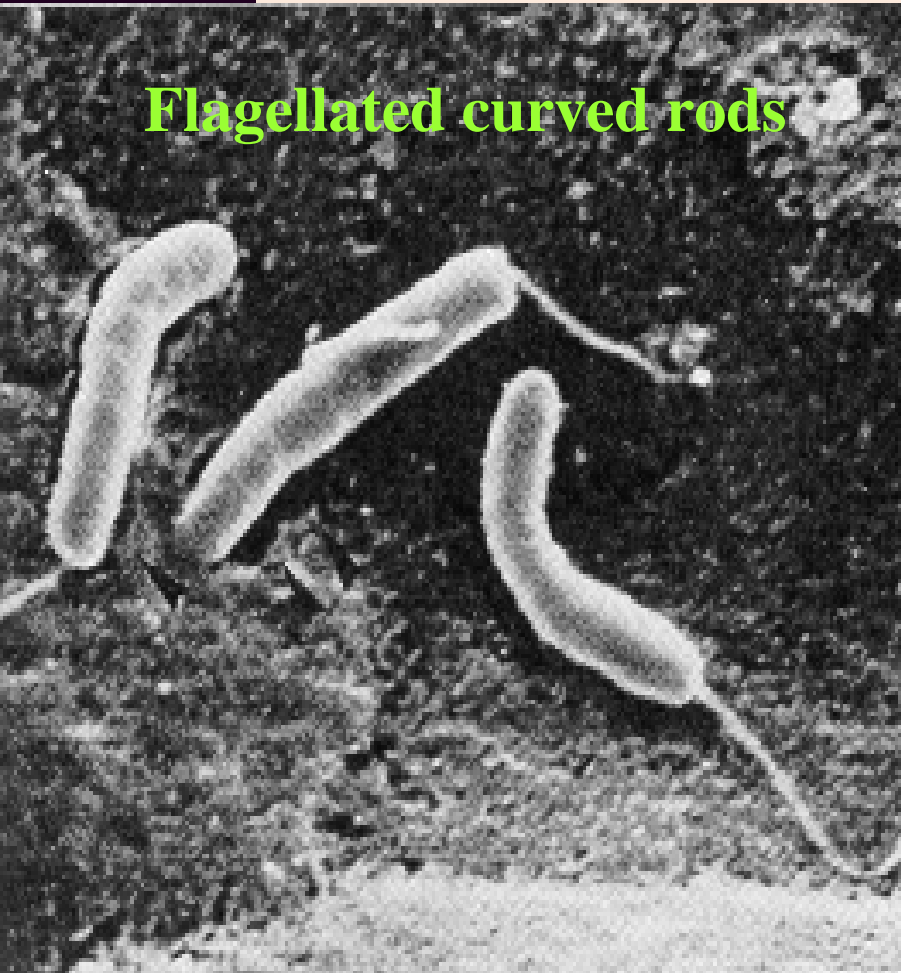


Snow



1866 cholera cartoon

# *Vibrio cholerae*



Gram--rod-shaped curve, with vibrating motility a major historical killer of humans, still a problem

# *Vibrio cholerae*

- The disease cholera is due principally to a classical A/B toxin produced by specific strains of the O-Group of *V. cholerae*.
- A major cause of epidemics and pandemics over human history, but continuously endemic in Bangladesh and West Bangal.
- Presently, we are experiencing a pandemic of cholera that has reached into Mexico
- Many organisms become “dormant”, non-vegetative, associated with copepods, found in natural water sources, bays, etc.

# Epidemiology of Cholera

- Classical water-borne disease
- Vibrios naturally in water, estuaries, marine: also in shellfish, shrimp, crabs, etc(O.T. proscription against eating shellfish?)
- Endemic in India, Bangladesh, etc
- Also person to person transmission



Ancient epicenter of cholera  
Ganges River and pilgrims

**Shell fish, Shrimp  
Crabs, Raw fish**

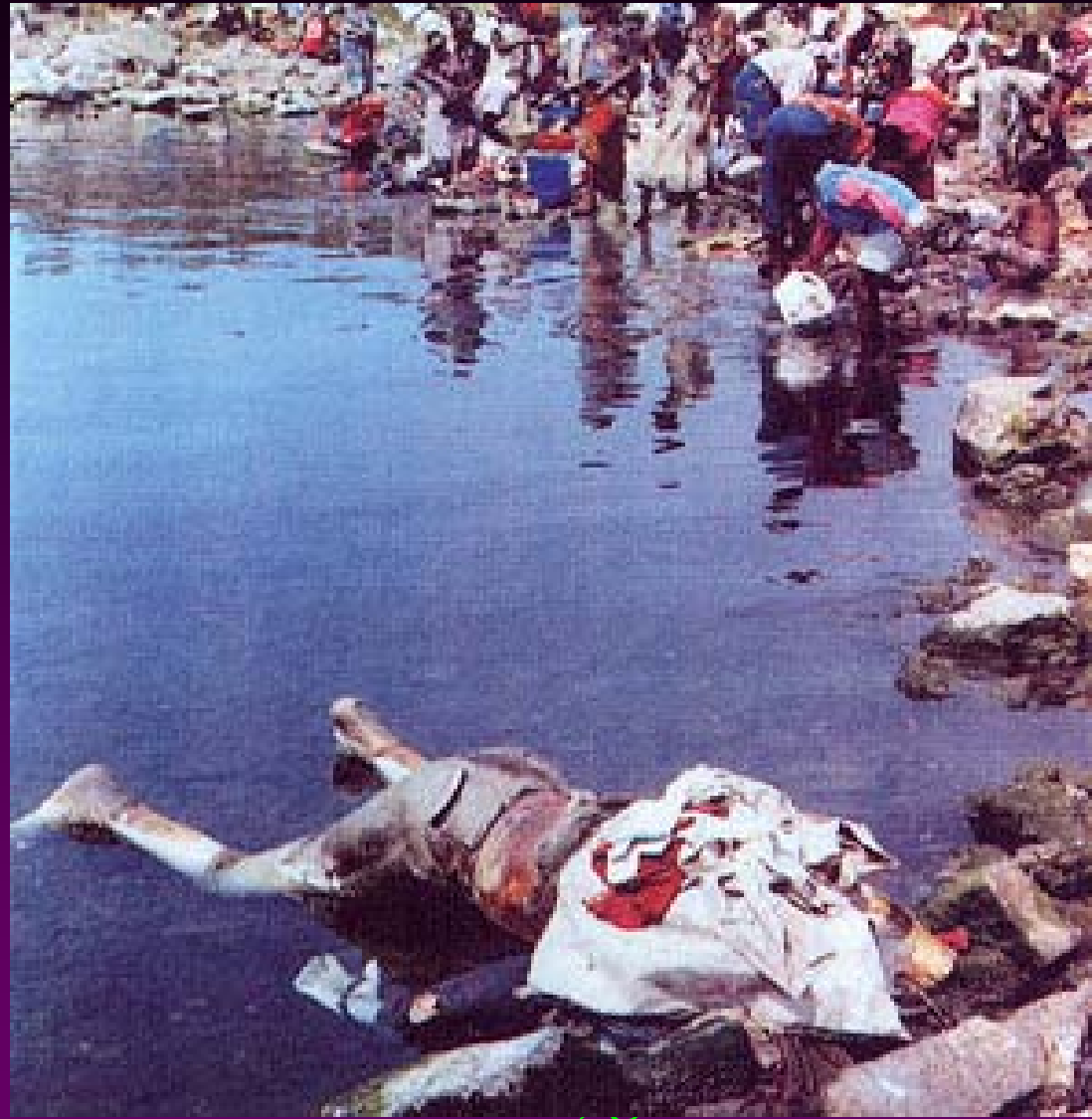


**Feces>water>shell fish, or humans**



# Cholera

- Toxin-induced diarrhea
- (Cholera = Greek for “rain gutter”)
  - severe dehydration
  - circulatory collapse
  - serious mortality
- Prior to 1980s >70% mortality
  - Oral Rehydration Therapy now <1%
- Classical and “El Tor”
  - slower to develop
  - present pandemic is *V.ch.* 0139, a relative of El Tor



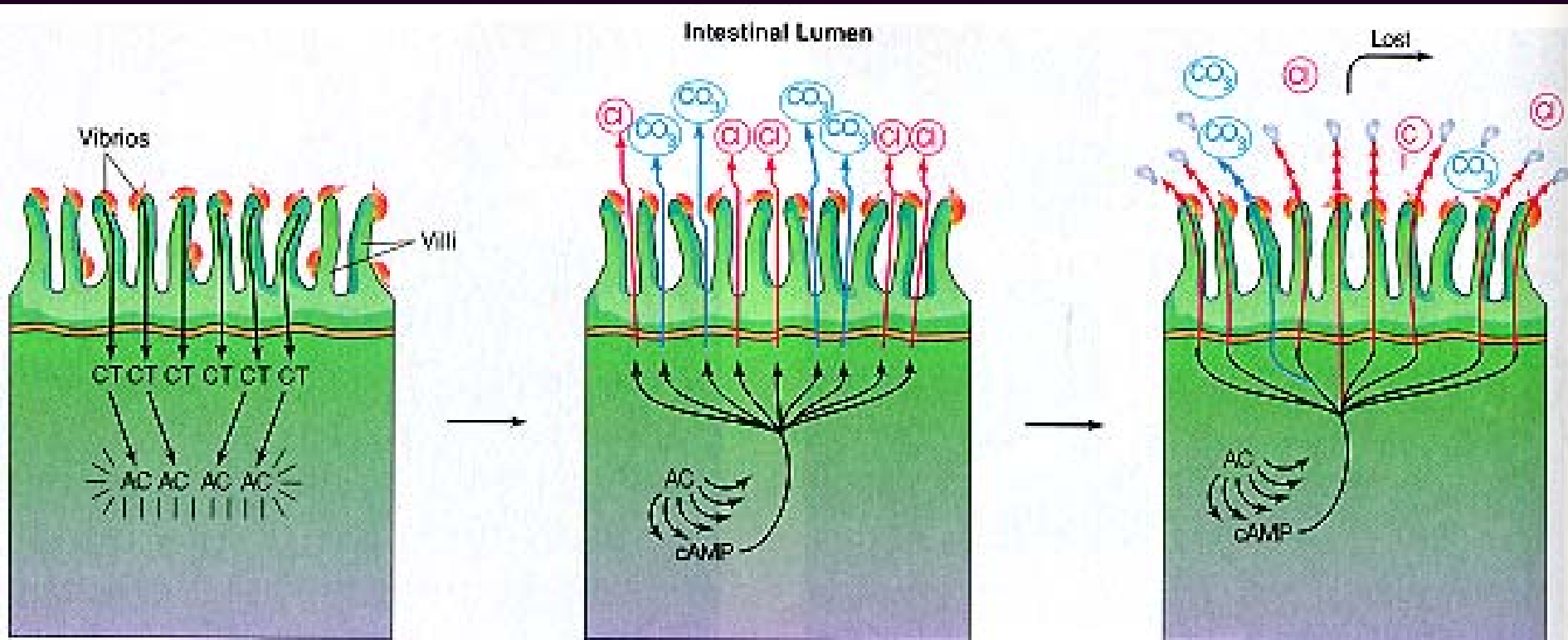
**Rwandan refugees fill water jugs and wash clothes with cholera victim, 1994**

# Pathogenesis of Cholera

- **Cholera toxin (CT)**
  - Classical AB toxin
  - Toxin causes disease without bacteria
  - **B domain** to mucosal brush-border
  - **A domain** reverses ion flow
    - NaCl is not absorbed
    - Cl<sup>-</sup> ions secreted
    - genes from B-phage\*
- Other enterotoxins may be involved
- Cholera toxin may stimulate crypt cells to secrete chloride ions
- “Rice-water” (mucus containing) stools
  - up to 1 liter/hour
  - circulatory collapse??
- 70% mortality without treatment
- <1% fatal with treatment
- Severe diarrhea
  - hypotension & tachycardia
  - generally afebrile



# Pathogenesis of Cholera Toxin:



**Fluid loss can approach 1L/hour; an untreated patient can lose up to 50% of their body weight during the disease. cAMP drives ion pump with loss of electrolytes and water**



“Rice-water stools of Cholera, several liters per day!!



**The “Cholera cot”, just add the bucket ( and oral rehydration solution, antibiotics and wait for cure)**

# Cholera Treatment

- Oral Rehydration Therapy (ORT)
  - NaCl 3.5g/L
  - NaHCO<sub>3</sub> 2.5g/L
  - KCl 1.5g/L
  - Glucose 20.0g/L
- Administer 4-8 oz/hr over 6 hrs.
- Antibiotics clear bacteria from gut
- check for sunken eyes and skin turgor



**Severe cholera dehydration**



**After rehydration**

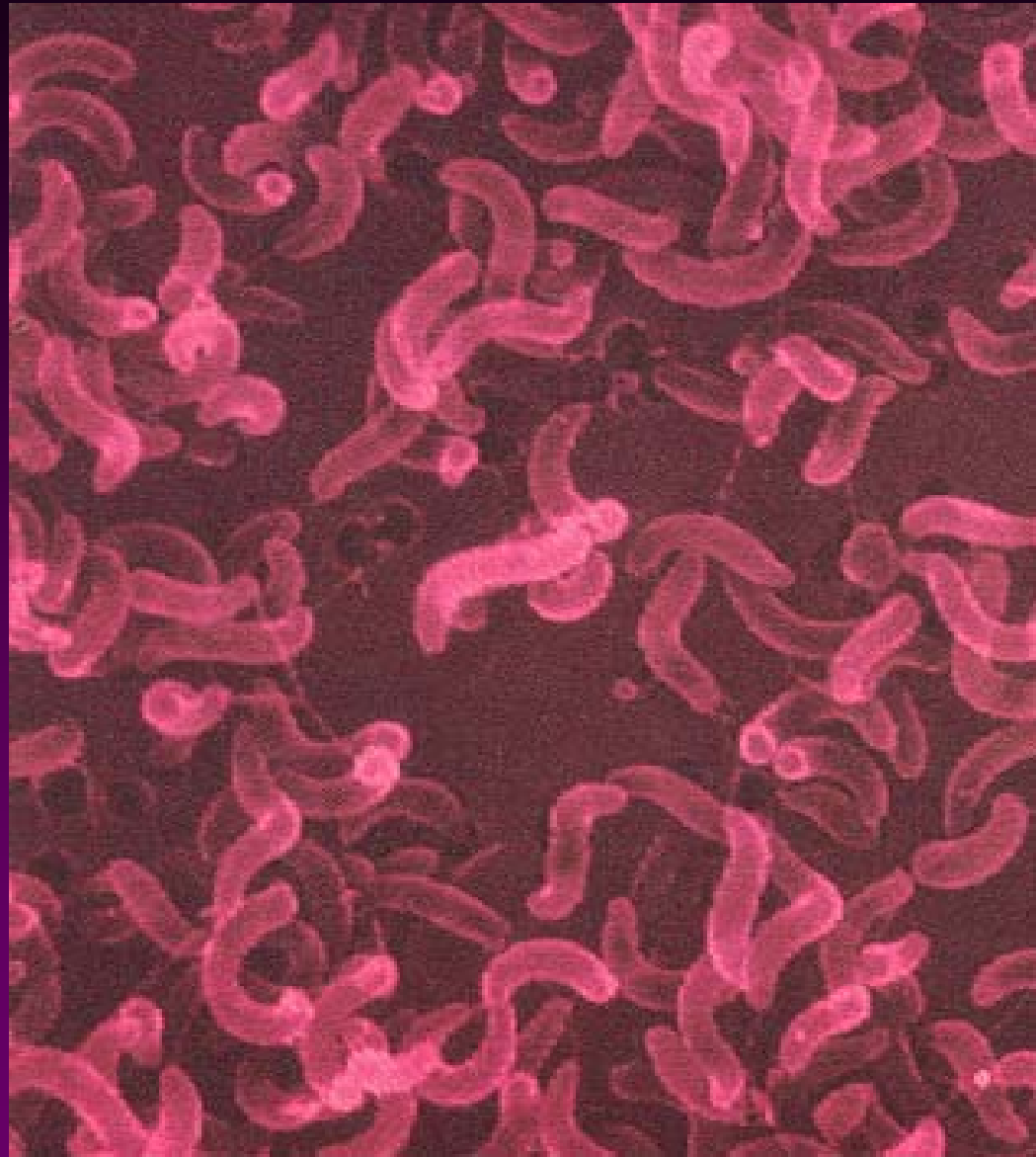
# Campylobacter

Small curved or S-shaped flagellated rods, microaerophilic, a major cause of diarrheal disease worldwide (may be spread by homosexual practices)



# *Campylobacter jejuni*

- Normal flora of animals, especially wild & domestic birds et al.
  - Generally, a zoonosis
  - oral/fecal transmission
  - animal waste contaminated water
  - sick pets (dogs, et al.)
  - unpasteurized milk
  - undercooked poultry
- Travelers beware
  - India, 40% have



*Campylobacter jejuni*



# *% Chickens Contaminated With:*

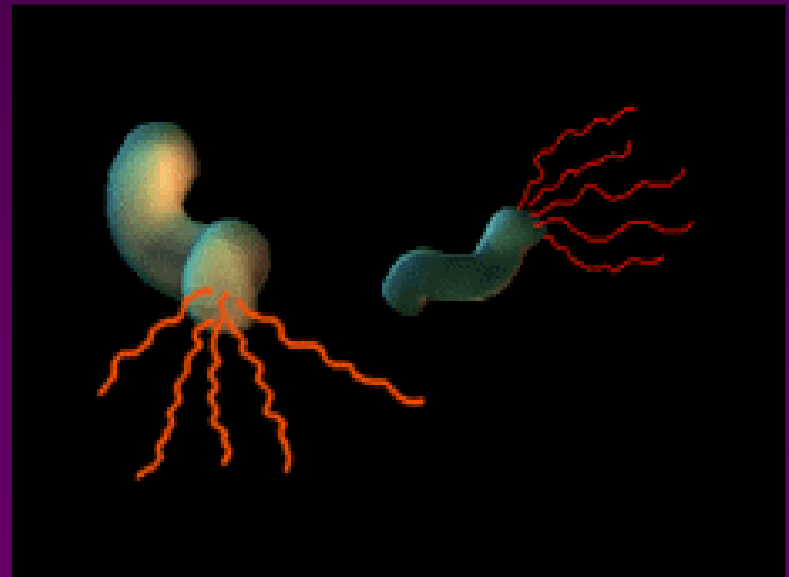
	<i>Salmonella</i>		<i>Campylobacter</i>	
<u>Brand Name</u>	<u>1997</u>	<u>1998</u>	<u>1997</u>	<u>1998</u>
Country Pride	13	8	54	60
Foster Farms	4	11	77	77
Perdue	20	14	62	67
Tyson Holly Farms	13	4	62	80

**Note:** In January of 1988, a new inspection system, The Hazard Analysis and Critical Control Points Program (HAACP), was initiated by USDA.

**Source:** *Consumer Reports*; October, 1998, P 27.

# *Helicobacter pylori*

curved or spiral cell



# *Helicobacter pylori*

- Causes gastritis and implicated in >90% of stomach and duodenal ulcers; also been shown to be an important cofactor in a common stomach cancer (adenocarcinoma).
- First detected by J. Robin Warren in 1979 in stomach biopsies from ulcer patients.
- Occurs in the stomachs of 25% of healthy middle-aged adults and >60% of adults >60.
- Uses 'O' Ag on gastric cells as one receptor (incidence of ulcers in Type O about 2X higher)
- Many other spp have it, but not a zoonosis

# Gastroscopy examination for stomach ulcers



Like the other vibrios, *H. pylori* is a flagellated curved rod

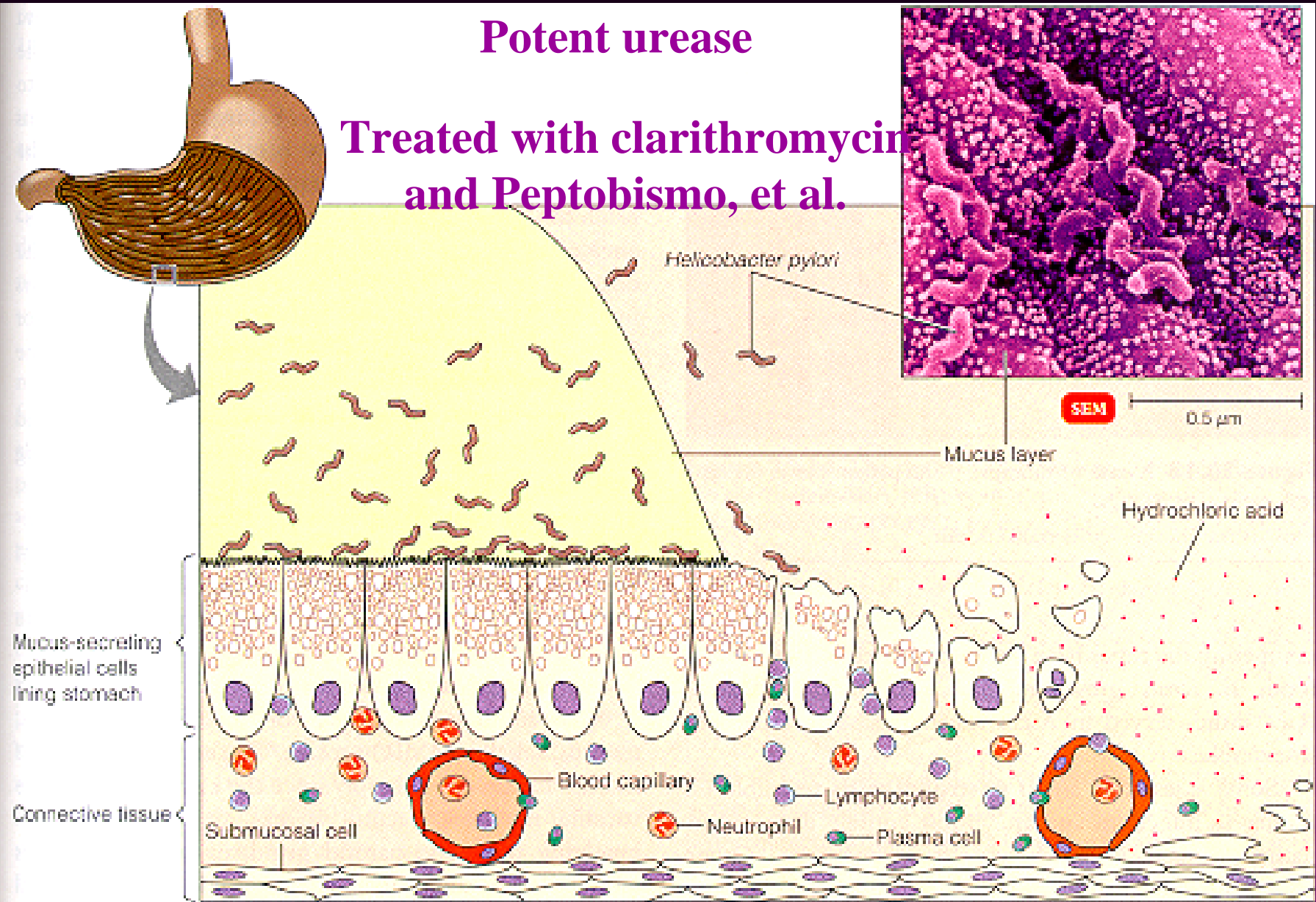


Initially described as a *Campylobacter*, but is not genetically related so a new genus was formed

# *Helicobacter pylori*:

Potent urease

Treated with clarithromycin  
and Peptobismo, et al.





# Epidemiology

- World wide distribution, but more common in developing world where 60-70% of children have before age 10
- Incidence of stomach cancers are up in developing world, but down in USA
- Not related to stress, alcohol or Aspirin
- Linked to at least 3 different cancers in the stomach
  - considered by WHO as a class-1 carcinogen

# Treatment

- In old days Histamine2 blockers (Tagamet, Pepsid AC, etc) could cure but only if taken continuously @\$60-100/mon.
  - with 95% recurrence rate
  - Antibiotic treatment=12% recurrence
- If treated with antibiotics and Pepto-Bismol, the rate is less than 10%
- Antibiotic treatment will often reduce tumor size in stomach cancers!