GIT

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GIT infections

Bacterial

- ***H.Pylori***
- ***Campylobacter***
- *E.coli*
- *Salmonella*
- *Vibrios*
- *S. Aureus*
- *Bacillus cereus*
- *Clostridium botulinum and perfringens*
- *Shigella*

Viral:

1. ***rotaviruses, adenovirus and others***
2. ***hepatitis***

Parasitic

The scientists who isolated this bacterium

- **In 1982, R.Warren and B. Marshall successfully isolated the bacterium from peptic ulcer patients.**

Barry J. Marshall

J. Robin Warren

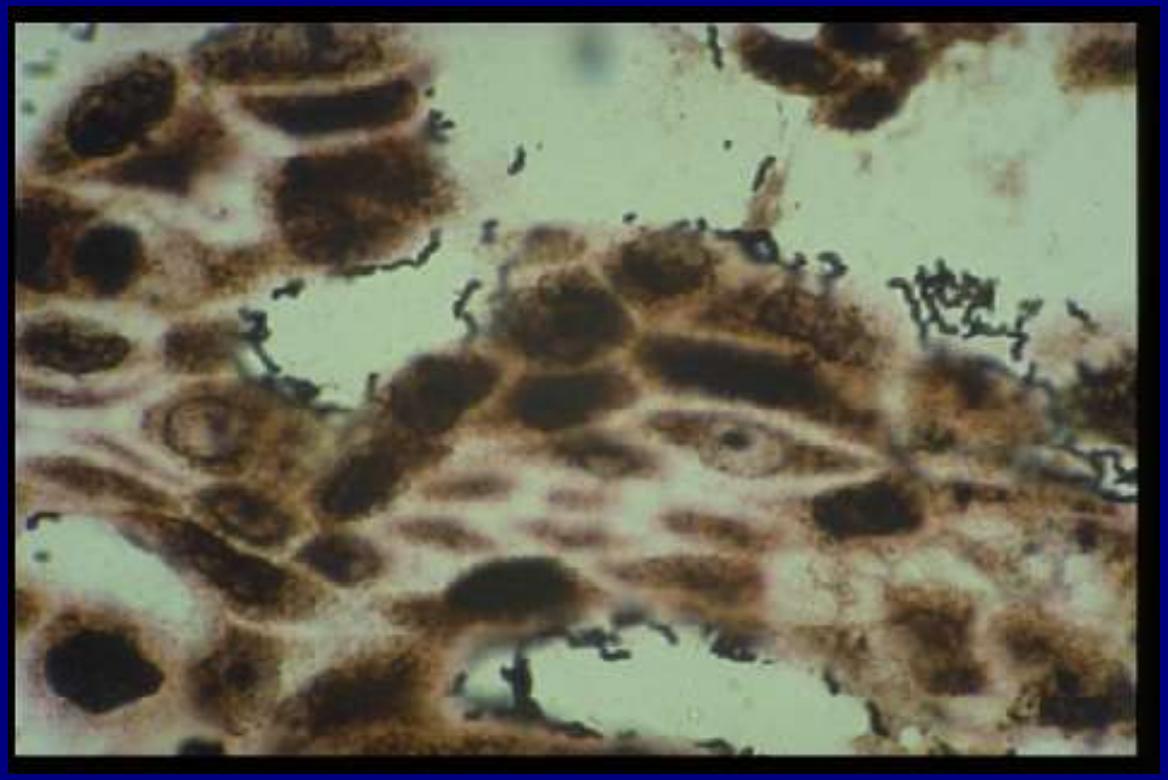
Helicobacter pylori (*H. Pylori)*

- In 2005 Marshal and Warren won Nobel Prize in medicine because of their valuable researches done in 1980's that has led to the discovery of *H. pylori*

- Marshall and Warren cultured organism from human gastric mucosa and showed the association with gastric inflammation and peptic ulcers

H. pylori

H. pylori on gastric mucus-secreting epithelial cells From Dr. Marshall's stomach biopsy taken 8 days after he drank a culture of H. pylori (1985) > stomach acidity is not inhospitable

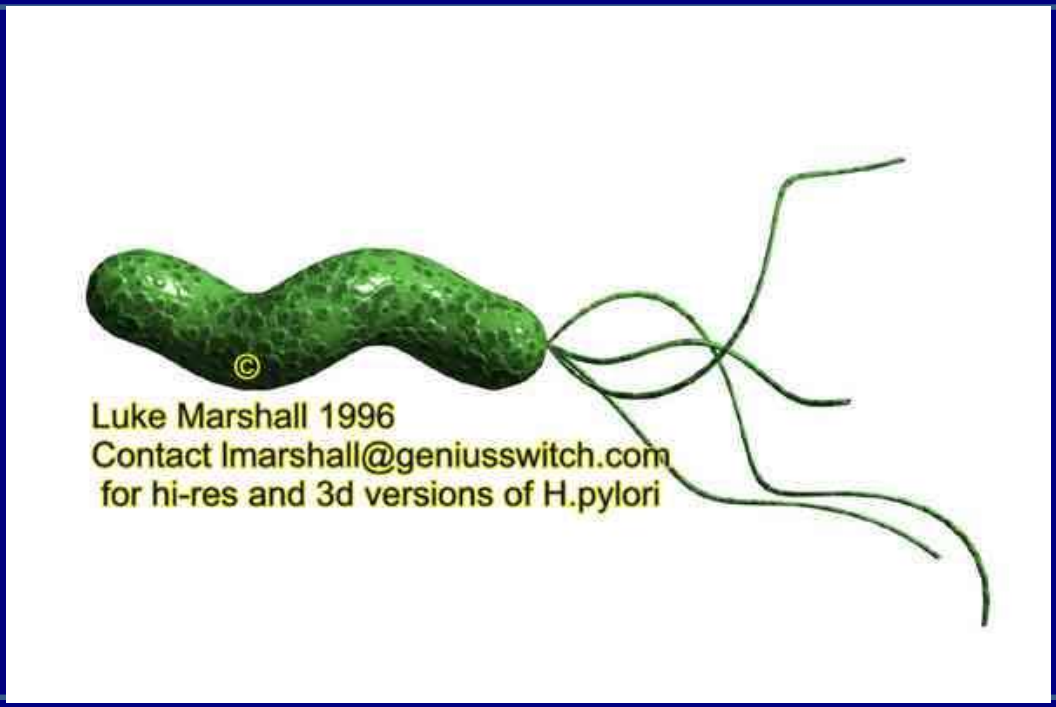


H. Pylori / Properties

- **Gram negative, spiral, flagellated (motile) bacteria**

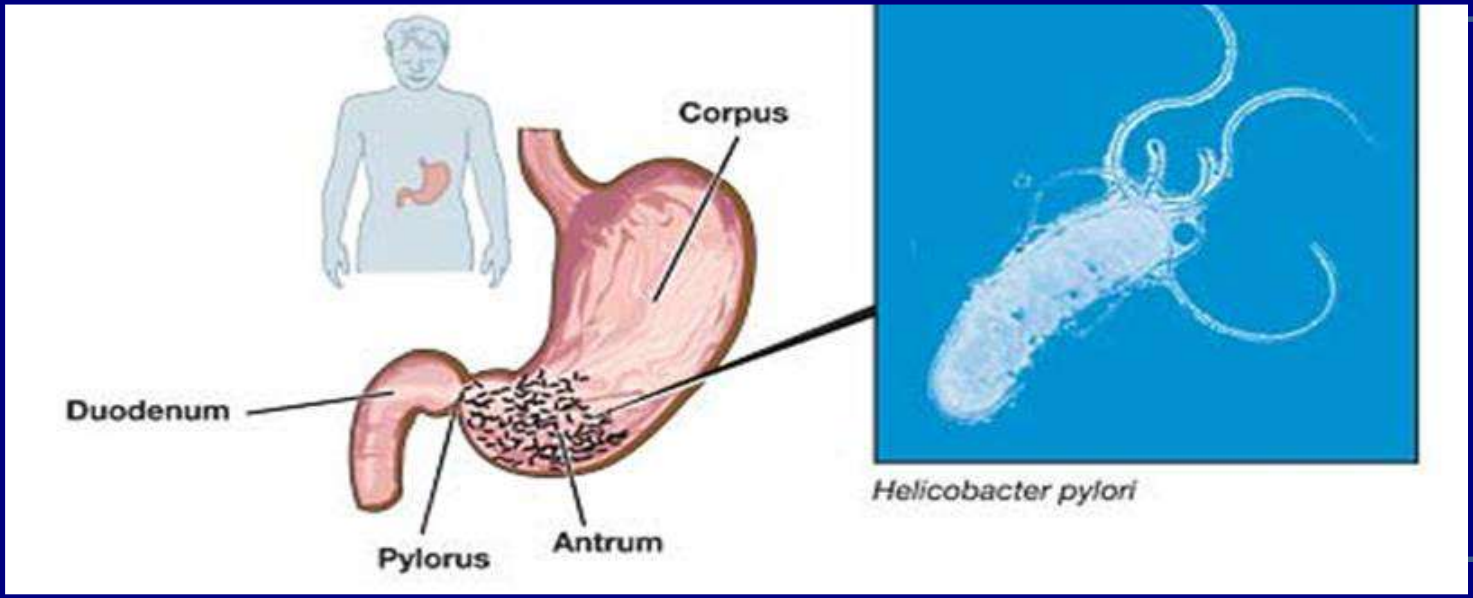
➢ Cells become rod-like and coccoid on prolonged culture

➢ *H. pylori* tuft of 4-6 sheathed flagella attached at one pole



H. Pylori / Properties

- **Proliferates in mucus overlying gastric antral mucosa > non invasive**



H. pylori

- **Culture:**
- On special medium containing vancomycin, polymyxin and trimethoprim (Skirrow's)
- At 37 °C for 3-7 days (slow growing)
- Microaerophilic conditions: (86% N_2, 4% O_2, 5% CO_2 and 5% H_2)

- **Oxidase, catalase positive**
- **urease positive: hydrolyses** gastric urea to liberate ammonia and carbon dioxide, neutralizing the gastric acid and increasing the periplasmic pH to alkaline medium , thus defend *H. pylori* from gastric acid

H. pylori

- **Epidemiology:**
- Man appears to be the sole reservoir and source of *H. pylori*.
- Remarkably, *H. pylori*, colonizes roughly 40-80% of the world's Population

- Transmitted by:
- ✓ Oral-oral or faecal-oral route.
- ✓ Nosocomial infection from inadequately disinfected endoscopes has also occurred

- Infection rates are strongly related to poor living conditions and overcrowding during childhood.

H. Pylori / Virulence and Pathogenesis

- sheathed flagella ‘lophotrichous’> motile
  - enables penetration into viscous environment (mucus)
- Adhesins: Hemagglutinins; Sialic acid binding adhesin
- Mucinase: Degrades gastric mucus; Localized tissue damage
- Urease converts urea (abundant in saliva and gastric juices) into bicarbonate (to CO_2) and ammonia
  - Neutralize the local acid environment
  - Localized tissue damage

H. Pylori / Pathogenesis

- vacuolating toxin (VacA) and cytotoxin (CagA) > Epithelial cell damage

  - ✓ VacA has been associated with pore formation in host cell membranes, the loosening of the tight junctions between epithelial cells (thus affecting mucosal barrier permeability causing vacualation)
  - ✓ CagA affects epithelial cell morphology and induces pro-infflammatory c response

- Protection from phagocytosis & intracellular killing:
  - Superoxide dismutase
  - Catalase

Virulence Factors	Function
Urease	Neutralizes gastric acids; stimulates monocytes and neutrophil chemotaxis; stimulates production of inflammatory cytokines
Heat shock protein (HspB)	Enhances expression of urease
Acid-inhibitory protein	Induces hypochlorhydria during acute infection by blocking acid secretion from parietal cells
Flagella	Allow penetration into gastric mucous layer and protection from acid environment
Adhesins	Mediate binding to host cells; examples of adhesins are hemagglutinins, sialic acid–binding adhesin, Lewis blood group adhesin
Mucinase	Disrupts gastric mucus
Phospholipases	Disrupt gastric mucus
Superoxide dismutase	Prevents phagocytic killing by neutralizing oxygen metabolites
Catalase	Prevents phagocytic killing by neutralizing peroxides
Vacuolating cytotoxin	Induces vacuolation in epithelial cells; stimulates neutrophil migration into mucosa

H. pylori/ Clinically

- ✓ Asymptomatic: Most infections
- ✓ Symptomatic:

1. Acute infection (gastritis):

- Abdominal pain (epigastric), vomiting and fever may exist but no disseminated stage
- Last for 1-2 weeks on average.

- 2. Non-ulcer dyspepsia

H. pylori/ Clinically

3. Gastric (70%) and duodenal ulcers (more than 90%).

- N.b: less than 15% of infected people will have peptic ulcers
- Epigastric pain, heartburns, dysspepsia, halitosis, vomiting...
- Complications: UGIT Haemorrhage, perforation, pyloric stenosis

4. Gastric malignancies.

H. Pylori / Diagnosis

- Diagnosis:
  - Invasive tests and Non invasive tests

- 1- Invasive: Definitive tests for *H. pylori* infection depend on finding the organism in specimens of gastric mucosa obtained by biopsy, i.e invasive test.
- 2- Non invasive: are also commonly used

H. Pylori / Diagnosis – non invasive tests

1. Urea breath test (UBT)

- Detects bacterial urease activity in the stomach by measuring the output of carbon dioxide resulting from the splitting of urea into carbon dioxide and ammonia
- A capsule or juice of urea labelled with carbon-14 or 13 is fed to the patient, and the emission of the isotope in carbon dioxide
- subsequently exhaled in the breath is measured

Urea $\xrightarrow{\text{urease}}$ Ammonia and $^{13}Co2$

1. Patient drinks HN-*C-NH_2.

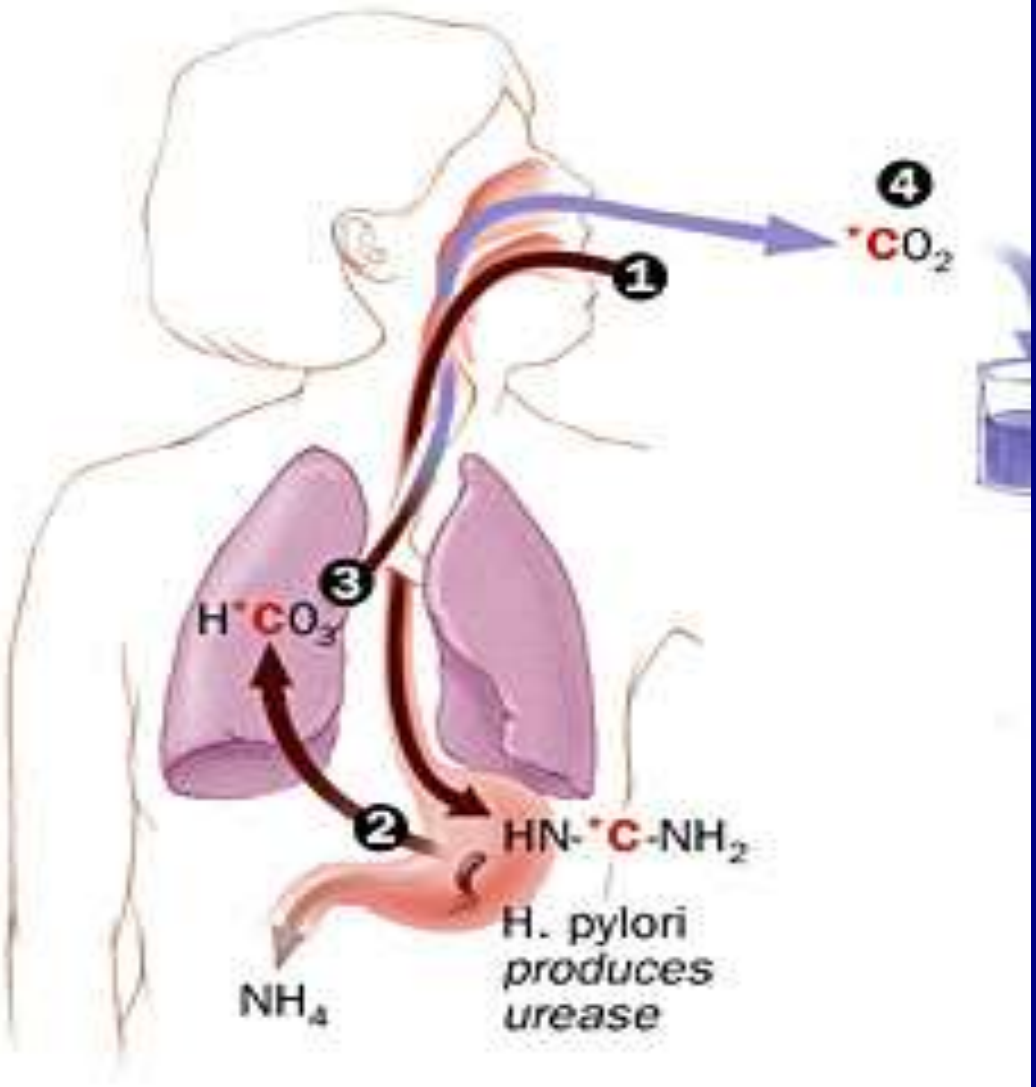
   In the stomach, HN-*C-NH_2 is broken down by urease into H*CO_3 and NH_4.

2. H*CO_3 travels to the lung and is...

3. ...expired...

4. ... as *CO_2 into...

5. ... a 0.5 mM hyamine solution, where a scintillation cocktail is added to test for *C.



H. Pylori / Diagnosis UBTcont'd:

- Carbon-14 is radio-active so it is not used in children and pregnants
- C-13: non radioactive

✓ The breath test is expensive but is becoming increasingly more available.

✓ Other problems include false-negative results: Low urease level: Due to food or presence of coccoid forms of *H pylori* that do not produce as much urease OR intake of antibiotics, bismuth, histamine 2 (H2) blockers, or proton pump inhibitors (should be stopped for 4 weeks).

H. Pylori / Diagnosis

2. Faecal antigen test :

Tests based on the use of monoclonal antibodies and have the potential to supplant serology for routine screening

3. Serology:

- Detect antibodies to *H. pylori*
- less useful for screening children and are unreliable for excluding infection in elderly patients, or as a test for cure in patients who have received treatment (owing to variable persistence of antibody)

H. Pylori / Diagnosis

4. Polymerase chain reaction (PCR):

- DNA probes for the direct detection of *H. pylori* in gastric juice, faeces, dental plaque and water supplies have been developed

- Some can also detect genes expressing antibiotic resistance and presence of the *cagA* pathogenicity island

H. Pylori / Diagnosis

2. Invasive tests (endoscopy guided biopsies):

- Ideally, patients for endoscopy should not have received antibiotics or proton pump inhibitors for 1 month before the test.

- Mucosal biopsy specimens are taken from the gastric antrum and from the body of the stomach

- For maximum sensitivity, duplicate specimens are taken: one for histopathology , the other for culture

> Specimens for culture must be processed as soon as possible, certainly on the same day, or placed in transport medium.

H. Pylori / Diagnosis

2-A Biopsy urease test :

- This is a simple and cheap test that can be done at the bedside.
- A biopsy specimen is placed into a small quantity of urea solution with an indicator that detects alkalinity resulting from the formation of ammonia.

- Most infected patients (70%) give a positive result within 2 h; 90% after 24 h


CLOtest*
Rapid Urease Test
= Positive
= Negative
Kimberly-Clark
Manufactured by:
Ballard Medical Products,
Draper, Utah 84020 USA
• Registered Trademark or Trademark of Kimberly-Clark Worldwide, Inc. or its affiliates.
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H. Pylori / Diagnosis

2. B Histopathology and microscopy :

- Histopathology provides a permanent record of the nature and grading of a patient's gastritis as well as detecting *H. pylori*.

- Organisms can be seen in sections stained with haematoxylin and Eosin stain

H. Pylori / Diagnosis

3. B. Culture

In a neck of a bottle in a microaerophilic conditions

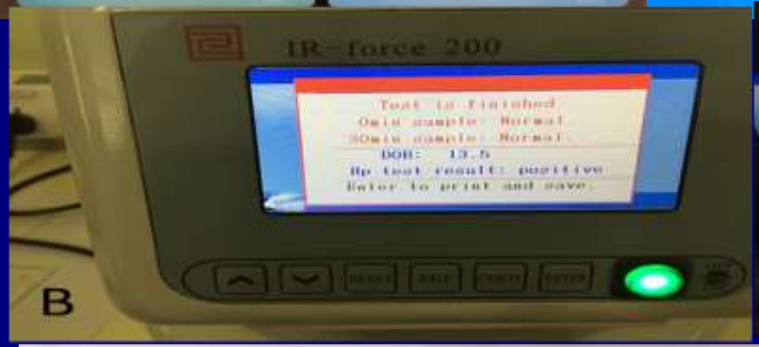
- less sensitive than skilled microscopy of histological sections, but has several advantages:

> isolates can be tested for antimicrobial resistance and typed for epidemiological studies;

> information about the presence of virulence factors can inform clinical outcome

- Plates are left undisturbed for 3 days and incubated for a week before being discarded as negative


30-Minutes
BREATH BAG
00-Minute
BREATH BAG


IR-force 200
Test is finished
0min sample: Normal
30min sample: Normal
DOB: 13.5
Bp test result: positive
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HelicotecUT®Plus
Name
ID
Date
Time
Positive
Negative


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Treatment

Life style:

Ttriple therapies:

- Have reported cure rates from 85-90%.
- Administerd for 10-14 days.
- Some treatment regimens are :

1. PPI, amoxicillin, and clarithromycin / Levofloxacin.
2. PPI, amoxicillin, and clarithromycin (OAC);
3. Bismuth subsalicylate, metronidazole, and tetracycline (BMT)

The End