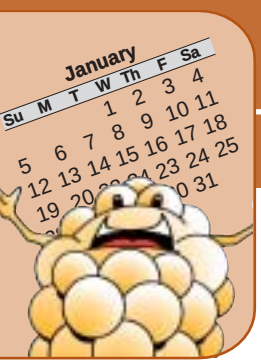

Harnessing *Helicobacter pylori*

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With the discovery of *Helicobacter pylori*, the cause of most peptic ulcer disease became known. January's Bug of the Month focuses on the diagnosis and treatment of *H. pylori*.

What is H. pylori*?*

Helicobacter pylori (H. pylori) is a small, gram-negative, highly motile, curved rod. It has adapted itself to live within the mucous layer overlying the lining of the stomach. It is protected from the stomach acid by the mucous lining; however, it produces:

- a urease, which converts urea into bicarbonate and
- ammonia, which neutralizes acid around itself.

How does H. pylori *arise?*

H. pylori has been identified in populations from around the world. The actual reservoir is unknown, but *H. pylori* is presumed to be almost exclusive to humans, as it has not been identified in food, the environment or water. Fecal-oral transmission is speculated based on epidemiologic association between the high prevalence of *H. pylori* infections in those from developing countries and in situations where sanitation is poor.

It is believed that *H. pylori* infection is acquired during childhood and remains silent until later, manifesting with peptic ulcer disease.

Sometimes children can present with symptomatic *H. pylori*-associated gastritis.

Which conditions are associated with H. pylori*?*

H. pylori has been associated with a number of gastrointestinal disorders, specifically:

- duodenal ulceration,
- gastric ulceration,
- gastric carcinoma and
- gastric lymphoma (mucosa-associated lymphoid tumours [MALToma]).

These conditions result from long-standing exposure to *H. pylori*. In particular, with MALTomas, colonization is strongly correlated with these neoplasms and eradication of *H. pylori* helps resolve the neoplasia.

How is H. pylori *infection diagnosed?*

Urea breath tests, serology and endoscopy with biopsy are the currently available techniques.

Breath tests

The urea breath tests take advantage of *H. pylori*'s urease activity. After a six-hour fast, the patient ingests ^{13}C or ^{14}C-urea or water containing ^{14}C urea. Over the ensuing hour, the patient's breath is examined for $^{13}CO_2$ or $^{14}C0_2$.

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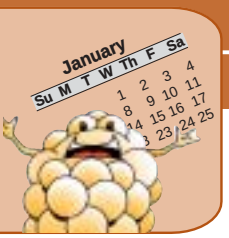

This test is very accurate, but false negative results may occur, particularly if anti-*H. pylori* therapy has recently been taken and the organism is suppressed, as the level of radiolabeled CO_2 corresponds with the number of *H. pylori* organisms.

Serology

Humans develop a serum immunoglobulin G (IgG) response after infection/colonization with *H. pylori*. The antibody levels will eventually decline over time once treatment has occurred.

Endoscopy and biopsy

This is the most invasive of the currently available diagnostic techniques but it is the most accurate. The biopsy specimen can be cultured and/or analyzed histologically to determine whether the characteristic comma-shaped bacteria can be detected. A variety of deoxyribonucleic acid (DNA) probes and polymerase chain reaction assays exist.

Why should H. pylori *be treated?*

If *H. pylori* is identified in a patient with peptic ulcer disease, antimicrobial therapy is necessary to eradicate the infection. Therapies that only reduce gastric acidity will heal the ulcer, but risk its recurrence once the acid neutralization is discontinued.

Individuals with duodenal and gastric ulcers associated with *H. pylori*, should be treated to hasten ulcer resolution. In patients with MALTomas, antimicrobial therapy directed against *H. pylori* can cause tumour regression. Asymptomatic persons should not be screened for *H. pylori* colonization or infection. If this has, however, been undertaken, some argue that all persons found to be colonized or infected with *H. pylori* warrant therapy, as the World Health Organization deemed it a carcinogen.

What's the treatment plan?

The successful treatment of *H. pylori* depends on combination therapy, as acid-suppressing agents inhibit the organism, but do not kill it. *H. pylori* is resistant to a multitude of antimicrobial agents.

It is essential that a histamine (H_2) blocker or proton pump inhibitor (PPI) be used in combination with an antibiotic regimen. The PPIs are particularly helpful as they inhibit *H. pylori* and the activity of the urease.

The optimal therapeutic regimen has not been established, however, the most frequently used oral regimens for treatment of duodenal or gastric ulcer disease associated with *H. pylori* include:

- a PPI taken twice daily (omeprazole, 20 mg; rabeprazole, 20 mg; lansoprazole, 30 mg; pantoprazole, 40 mg; esomeprazole, 40 mg) in conjunction with twice daily amoxicillin, 1 g, and clarithromycin, 500 mg; or
- a PPI twice daily in conjunction with twice daily metronidazole, 500 mg, and clarithromycin 250 mg, for one week; or
- a PPI twice daily in conjunction with four times daily Pepto-Bismol®, two tablets, and four times daily metronidazole, 250 mg, and tetracycline, 500 mg.

Since there is a high rate of metronidazole resistance among *H. pylori* strains, the regimen consisting of the PPI, amoxicillin and clarithromycin is the most desirable approach.

All three regimens, however, have approximately 80% to 90% efficacy. Regimens used for 10 or 14 days generally have higher reponse rates than those used for seven.

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