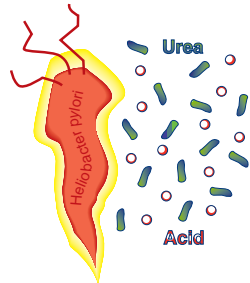


How Does it Work?

Helicobacter pylori breath tests

H pylori diagnostic breath tests rely on a simple chemical reaction which is based on the natural behaviour of the bacteria. Naturally occurring gastric urea is made up of 99% carbon isotope ^{12}C and 1% carbon isotope ^{13}C . The breath test uses urea enriched with ^{13}C (that is, 99%).

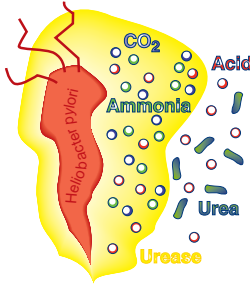


1 Virtually all duodenal ulcers and 80% of gastric ulcers are associated with *Helicobacter pylori* infections¹

Patients first drink a sachet of orange juice or citric acid. This rapidly closes the duodenal sphincter to contain the stomach contents. They are then asked to blow through a straw into a glass tube with a screw cap lid. This provides the baseline sample.

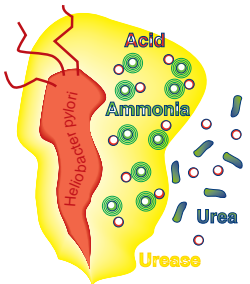
Next, they consume a drink containing ^{13}C enriched urea (about 100 ml) and after 30 minutes repeat the blowing exercise into a second tube. This provides the post-dose sample. Both samples are sent away for carbon dioxide isotope analysis by mass spectrometry (laboratories usually return the results within a few days).

The level of ^{13}C in the baseline sample will be normal. If levels rise in the post-dose sample, this suggests the presence of *H pylori*.



2 *H pylori* survives in gastric acid by excreting large amounts of urease. This enzyme breaks down any urea in the stomach to ammonia and carbon dioxide

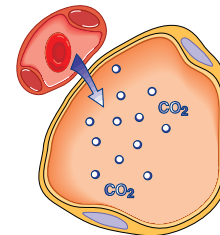
pylori. The enriched urea provided by the testing kit must have been broken down to produce high levels of ^{13}C in the breath and this implies the presence of urease excreting *H pylori* in the stomach.



3 The ammonia neutralises any acid found directly in the vicinity of the bacteria, allowing the bacteria to survive

If the post-dose ^{13}C concentration is 3.5 parts per 1000 more than the baseline sample, the test is considered positive for *H pylori*. The higher the level of ^{13}C , the greater

the extent of the infection. Levels of 30-40 parts per 1000 over the baseline result are typical of *H pylori* infections.



4 The carbon dioxide is absorbed into the blood stream and then released from the lungs

Two back-up tubes are generally also taken at baseline and post-dose stages.

The sensitivity of such diagnostic kits is 96% and the specificity is 100%.

1 Graham DY. *Helicobacter pylori* infection in the pathogenesis of duodenal ulcer and gastric cancer: a model. *Gastroenterology* 1997; 113(6):1983-91

Abi Berger, science editor, BMJ

