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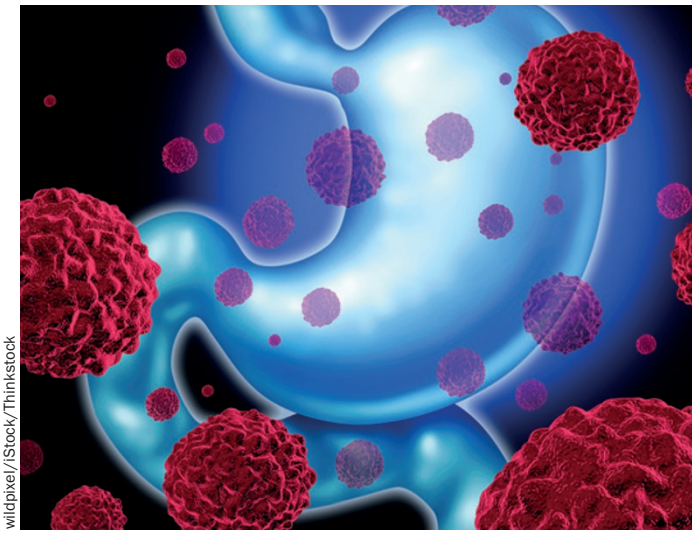
GASTRIC CANCER

Breathing a sigh of relief for noninvasive cancer detection



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Proof-of-concept evidence has been published in *Gut* for the use of two breath tests, which can discriminate between patients with presence or absence of precancerous lesions and patients with gastric cancer. The tests detect volatile organic compounds (VOCs) in exhaled breath. The first test uses gas chromatography linked with mass spectrometry (GCMS) and the second is a nanoarray.

"Our previous research having been performed in patients from China has already demonstrated the possibility of volatile marker testing in diagnosing gastric cancer," explains principle investigator Hossam Haick. He goes on to say that this research assessed the test in a different population and its ability to differentiate various stages of disease.

Two breath samples (one for each test) were taken from 484 white patients. Of these, 99 had gastric cancer, 53 had peptic ulcer disease and seven had dysplasia. The absence or presence, and stage (0–IV) of precancerous lesions were determined in the remaining 325 patients using the operative link on gastric intestinal metaplasia (OLGIM) staging system ($n = 155$ OLGIM 0; $n = 136$ OLGIM I–II; $n = 34$ OLGIM III–IV).

Of the 130 VOCs detected by GCMS, eight were significantly different ($P < 0.017$) between any two groups compared. Seven of the VOCs were lower in the OLGIM groups compared with the samples from patients with gastric cancer. In addition, different combinations of the eight VOCs enabled the researchers to discriminate between the OLGIM subgroups.

"The second method deploys cross-reactive nanoarrays in combination with pattern recognition methods, developed by our research group. This approach provides collective VOC patterns rather than identification and quantification of specific VOCs," says Haick. Unlike GCMS, this method could be a cost-effective method for population-based surveillance as it does not rely on expensive equipment. The parameters of the nanoarray were established using 70% of the patients (the training cohort) and applied to the remaining 30% (the validation cohort). In the validation cohort, patients with gastric cancer and precancerous lesions were successfully stratified with varying degrees of efficacy. Comparing those with cancer and OLGIM 0–IV yielded a sensitivity, specificity and accuracy of 73%, 98% and 92%, respectively. When comparing those with cancer and individual OLGIM subgroups (0, 0–II, III–IV and I–IV), and when comparing OLGIM subgroups, the sensitivity, specificity and accuracy of the test varied (45–90%, 41–87% and 43–90%, respectively). Importantly, no confounding factors such as age or sex, substantially effected the nanoarray results.

The authors aim to further develop and validate the nanoarray with the hope that it can be used in screening programmes for the prevention of gastric cancer. "In addition, the potential evaluation of the method for detecting a number of diseases during the same analysis is an attractive approach that will be addressed," concludes Haick.

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Original article Amal, H. *et al.* Detection of precancerous gastric lesions and gastric cancer through exhaled breath. *Gut* doi:10.1136/gutjnl-2014-308536