

# Sushi parasite inspires worm test for cancer

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[Dogs do it](#). Rats do it. Even some people seem to be able to sniff out cancer and other diseases. Now we can add the humble roundworm to the list of super-smellers.

Japanese researchers have discovered that *Caenorhabditis elegans* worms can detect cancer in people's urine. They are working with technology companies Hitachi and Johnan to turn the finding into a diagnostic test that can be used to catch the disease in its early stages.

"In existing tests, people must have different examinations according to the type of cancer they have", says [Takaaki Hirotsu](#) from Kyushu University in Fukuoka, Japan, who co-led the work. "Our odour-based test detected all nine types of cancer we tested."

## Scent of a tumour

Hirotsu and his colleague, Hideto Sonada, decided to investigate roundworms' cancer detecting abilities after Sonada encountered a 63-year-old man with *Anisakis* larvae in his digestive system. This roundworm can be picked up by eating infected raw fish.

The [parasites had attached themselves to a small lesion in the man's stomach that turned out to be the early stages of gastric cancer](#). The case is one of 29 recorded since 1970 of roundworms attaching themselves to cancers, 62 per cent of which were when the cancer was still in its early stages.

Hirotsu and Sonada's team wondered if the odour of the cancer lesion was attracting the roundworms. To find out, they put droplets of culture medium that cancer cells had grown in on one side of petri dishes. On the other side they put drops of fresh culture medium. When they added *C. elegans* to the dishes, the worms moved towards the cancer medium.

They grew other kinds of cells in the medium, such as human skin cells, but these induced no such attraction in the worms. The researchers also knocked out the olfactory sense neurons in some of the worms. This stopped them moving towards the cancer side of the dish, suggesting that the worms are indeed attracted by smell.

## Sensitive sniffers

To see if they could diagnose cancer, the worms were placed in the vicinity of spots of urine from people with and without cancer. Sure enough, the worms were attracted only to the samples of the people with cancer. With samples taken from 242 people, 24 of whom had a cancer diagnosis, the worms made the correct diagnosis 96 per cent of the time, a success rate that the researchers say is better than any blood test.

The participants had various different types of cancer, and Hirotsu says the worms successfully identified cancer in all nine they were exposed to - stomach, colorectal, colon, oesophageal, pancreas, bile duct, prostate, breast and lung cancer.

The team are now investigating whether different cancer types release different odours, and whether this has an effect on

the worms. They hope to have a commercial product ready by 2019. The idea would be that users send a urine sample to the company and get the results back the next day, says Hirotsu.

"It's very surprising that the nematodes exhibited such a strong binary response to 'cancer' versus 'no cancer' urine," says Michael Phillips at [Menssana Research](#), a New Jersey-based company developing diagnostic tests based on people's breath. He says the complexity of the tumours and the environment in which the samples are collected can contribute to confusing results. "We ought to suspend judgement on the test until it has been replicated in other labs using very careful controls," he says.

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