

## Green For Danger

Published in *New Scientist* 20 February 1999  
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Glowing yeast cells could soon tell drugs and water companies if there are potential carcinogens in their products. The genetically modified cells are part of a new type of sensor that could revolutionise the detection and identification of pollutants.

With the help of a gene from a jellyfish, researchers in Britain created yeast cells that fluoresce bright green when exposed to substances that damage DNA. "The more damage, the brighter the glow," says Richard Walmsley, head of the team that developed the device at the University of Manchester Institute of Science and Technology. The monitor could spell the end for the Ames test, the standard procedure for identifying substances that alter DNA and thus might be carcinogenic.

Walmsley and his colleagues expect water utilities to use their device as a pollution sensor. For the first time, impending legislation in the European Union will force all water companies to monitor supplies for cancer-causing pollutants. And drugs firms could use the monitor to weed out drugs that might later cause tumours. The monitor was designed to overcome the limitations of the Ames test, developed in 1973 by Bruce Ames, a biochemist at the University of California at Berkeley. His test relies on strains of the *Salmonella typhimurium* bacteria that multiply and form colonies when exposed to DNA mutagens. But the Ames test is slow: it takes a whole day for test colonies to grow. Also, the test works only if a mutation survives all attempts by bacterial cells to repair their DNA. This means that the test misses subtle damage to DNA that is repaired and so does not show up as a "positive". The new invention gives a result in as little as four hours and relies on yeast cells, which are more closely related to mammalian cells. The yeast test also shows up subtle but repairable damage to DNA. The researchers equipped the yeast with a gene for a green fluorescent protein from the jellyfish *Aequorea victoria*.

The protein glows bright green when bathed in blue laser light. They engineered the yeast so that the jellyfish gene would be turned on at the same time as RAD54, a gene switched on whenever yeast DNA needs repairing.

In this way, the brightness of the green light reflects the amount of repair under way in the yeast cells. The brightness, as measured by a fluorescence detector, rises rapidly above background levels when the yeast cells are exposed to a mutagen. To test the system, Walmsley and his colleagues exposed the cells to methyl methane sulphonate, a known mutagen. The amount of fluorescence doubled in just four hours.

Walmsley's team, which reports its work in *Measurement Science and Technology* (vol 10, p 211), is confident of cutting the response time to just one hour. "You get brightness per yeast cell very simply, without having to be a biochemist," he says.

