

## Hospital scanner could curb nuclear waste threat

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Medical equipment used for diagnosis of patients with heart disease and cancer could be a key weapon in stopping nuclear waste seeping into the environment, according to new research.

A team of scientists from the Universities of Manchester and Leeds have joined forces with experts in nuclear medicine at Manchester Royal Infirmary, using medical gamma-ray cameras to track radioactive isotopes in <u>soil</u> samples from a US civil nuclear site.

This is the first time the technique, which is used in hospitals for heart, bone and kidney scanning, has been used to study the environmental behaviour of <u>nuclear waste</u> - and its success could help scientists find new ways of using bacteria to control the spread of radioactivity.

Radioactive isotopes of the element technetium (Tc) are produced in bulk by nuclear facilities, while a specific isotope of Tc with a very short life is routinely used as a medical tracer in human bodies.

<u>Nuclear fission</u> of Uranium has released tonnes of Tc from nuclear facilities over the past decades, with the element remaining radioactive for thousands of years.

But although the short lived medical isotope is chemically indistinguishable from that in long lived waste, it can be used safely in tests.



In the study researchers from The University of Manchester, led by Prof Jon Lloyd, took soil samples from the Oak Ridge nuclear facility in the United States and successfully tracked the movement of medical Tc through the soil.

Scientists at The University of Leeds were then asked to verify the observations using a special microscope technique called <u>Transmission</u> <u>electron microscopy</u> (TEM).

With the help of <u>DNA analysis</u> the Manchester team confirmed that certain microbes - and particularly some that use ferric iron for energy can fix Tc in place in soils.

Researchers found that nearly all the Tc remained fixed when ferric iron was present with these 'iron-reducing' bacteria.

This finding itself is not new - Professor Lloyd and his colleagues had previously reported that microbes in laboratory cultures could perform this role in fixing Tc.

But the researchers' success in using the gamma camera could see the technique being used to probe how Tc and ferric iron move together in far more complex soil systems more representative of the 'real world' - helping develop future remediation techniques.

Prof Jon Lloyd from the School of Earth, Atmospheric and Environmental Science (SEAES) at The University of Manchester, said: "Using this medical scanning technique we were able to explore, in real time, the mobility of one of the most problematic and mobile radionuclides in sediments.

"Our success will allow scientists to accurately monitor the success of new biological methods in trapping radioactive elements in sediments



and stopping them spreading further into the natural environment."

The findings coincide with the opening of a new Research Centre for Geological Disposal at The University, supported by a £1.4m endowment from BNFL, while a new <u>Nuclear Medicine</u> Centre recently opened at the Manchester Royal Infirmary, as part of the £500m Central Manchester Hospitals development.

Prof Lloyd added: "Investment in these two diverse but important areas of scientific research has helped bring about interesting and unexpected research findings that could ultimately have great benefit for society."

**More information:** The research was published in a special edition of the American Chemical Society journal *Environmental Science and Technology*. The paper is 'Probing the Biogeochemical Behaviour of Technetium Using a Novel Nuclear Imaging Approach'.

Provided by University of Manchester

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