Fluorine chemistry that helps find disease

Cutting-edge fluorochemistry from the University of Oxford is not just a major academic achievement – it could help radiologists spot diseases like Parkinson's too.

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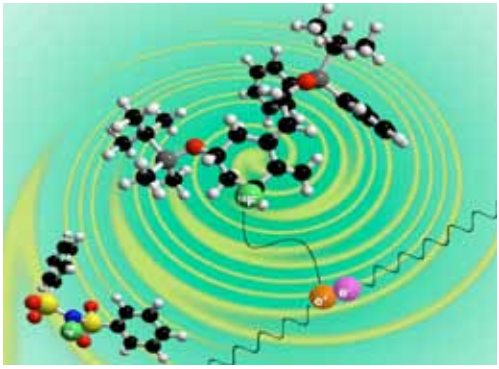

Fluorine is an often-overlooked aspect of chemistry – perhaps because of a misconception that its only use is as part of dental care as fluoride – but the University of Oxford's Gouverneur Group know better, which is why they dedicate their time to studying the organic chemistry of fluorine.

The group develops new ways of creating medical tracers for use in positron emission tomography (PET) scans: medical imaging that relies on radioactive isotopes to produce 3D images of the body's functions. If a patient is injected with sugar molecules tagged with radioactive flourine, a PET scan will show which parts of the body are consuming sugar.

These radioisotopes can be incorporated into any compound used by the body, or into molecules that bind to receptors. The challenge, however, lies in making stable molecules that are metabolised in the right way. If the fluorine isotope lies in the wrong place, it might be broken down before it is able to reach its intended target, making the whole process pointless. That is why the the Gouverneur Group develop new ways of attaching fluorine radioisotopes to organic molecules, to ensure they're always in the right place.

In 2007 the team joined forces with medical imaging experts from the Department of Engineering Science to open the Siemens Oxford Molecular Imaging Laboratory. Using new flourochemistry techniques, they have been able to tag L-DOPA – a compound taken up by parts of the brain in sufferers of Parkinson's disease – with radioactive fluorine. The technology is in its infancy, but if successful it could revolutionize the face of Parkinson's diagnosis and treatment by allowing radiologists to spot the disease far sooner.

The group's more recent interactions in the Oxford Cancer Imaging Centre are spurring its current work: investigating new ways of directly replacing hydrogen atoms with fluorine isotopes in organic compounds. Current methods use elaborate systems of reactions, and the Gouverneur Group believe they can improve medical practice by simplifying the process. Impressive, for something most people think is just good for their teeth.

'The Gouverneur Group's research uniquely combines the development of modern fluorination chemistry with its application in molecular imaging. Not only could her group make major advances in the field of synthetic chemistry, but it has also succeeded in bridging a gap between fundamental science and applied medical research.'

Tobias Ritter, Professor of Chemical Biology at Harvard University

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