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Better MRI scans of cancers made possible

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Researcher Kristina Djanashvili has developed a substance that enables doctors to get better MRI scans of tumours. On Tuesday 13 January, Djanashvili will be soon awarded a doctorate by TU Delft, Netherlands, for her work in this field.

The medical profession's ability to trace and visualise tumours is increasing all the time. Detection and imaging techniques have improved enormously in recent years. One of the techniques that have come on by leaps and bounds is MRI. Patients who are going to have MRI scans are often injected with a 'contrast agent', which makes it easier to distinguish tumours from surrounding tissues. The quality of the resulting scan depends partly on the ability of this agent to 'search out' the tumour and induce contrast.

At TU Delft, postgraduate researcher Kristina Djanashvili has developed a new contrast agent with enhanced tumour affinity and contrast induction characteristics. In principle, this means that cancers can be picked up sooner and visualised more accurately.

The new agent is a compound incorporating a lanthanide chelate and a phenylboronate group substance. The lanthanide chelate ensures a strong, clear MRI signal, while the phenylboronate group substance 'searches out' cancerous tissue.

The lanthanide chelate influences the behaviour of water molecules, even inside the human body. It is ultimately the behaviour of the hydrogen nuclei in the water molecules that makes MRI possible and determines the quality of the image produced. The stronger the influence of the lanthanide chelate on the neighbouring hydrogen nuclei (the so-called water exchange) and the more hydrogen nuclei affected, the better the MRI signal obtained. Djanashvili has defined the methods for determining the water exchange parameters.

Djanashvili has also provided her contrast agent with enhanced tumour-seeking properties by including a phenylboronate group substance. Phenylboronate has an affinity with certain sugary molecules that tend to concentrate on the surface of tumour cells. What makes the selected phenylboronate-containing agent special is its ability to chemically bond with the surface of a tumour cell.

Finally, Djanashvili has managed to incorporate the compound into so-called thermosensitive liposomes. A thermosensitive liposome forms a sort of protective ball, which opens (releasing the active compound) only when heated to roughly 42 degrees. This means that, by localised heating of a particular part of the body, it is possible to control where the compound is released. The positive results obtained from testing the new agent on mice open the way for further research.

Source: Delft University of Technology

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