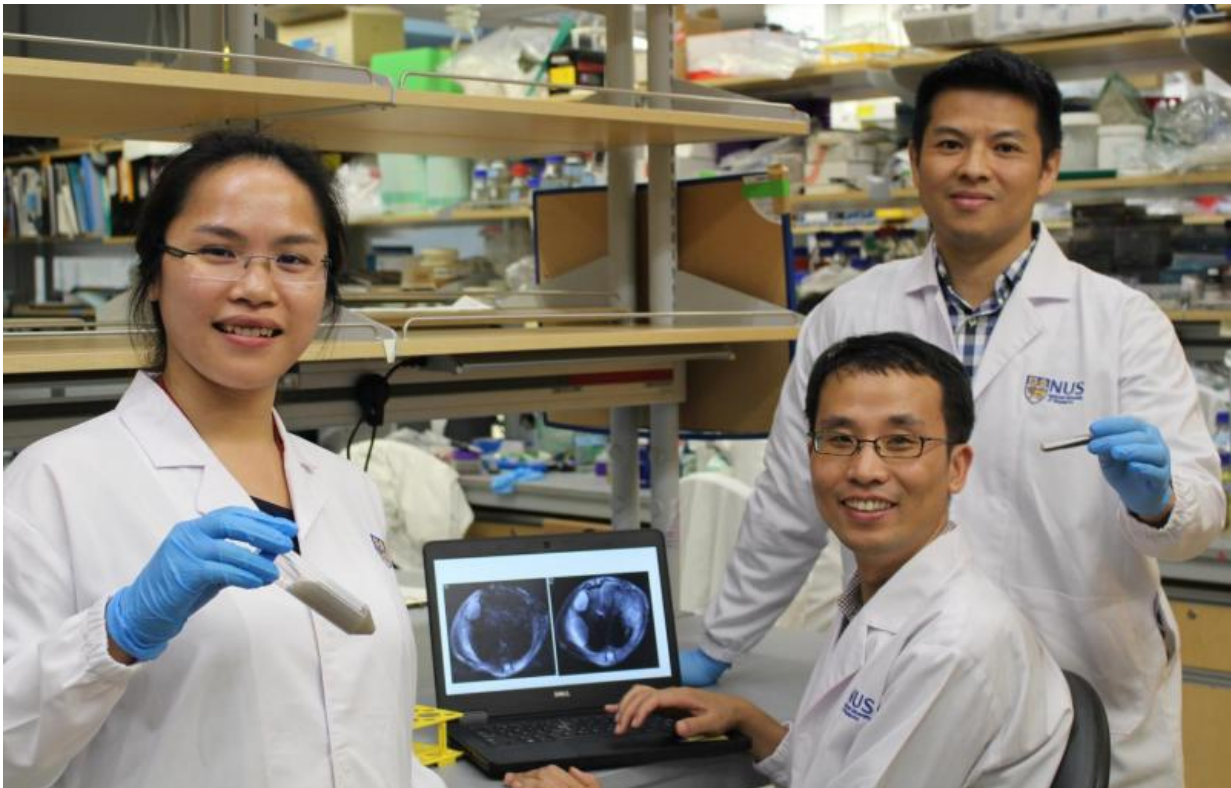


Scientists develop novel chemical 'dye' to improve liver cancer imaging

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A research team led by Assistant Professor Edward Chow (right), Principal Investigator from the Cancer Science Institute of Singapore at NUS and Department of Pharmacology at NUS Yong Loo Lin of Medicine, has developed a novel nanodiamond-based contrast agent – a chemical "dye" used to enhance the visibility of internal body structures in magnetic resonance imaging – that improves visualisation of liver cancer tumours. Credit: National University of Singapore

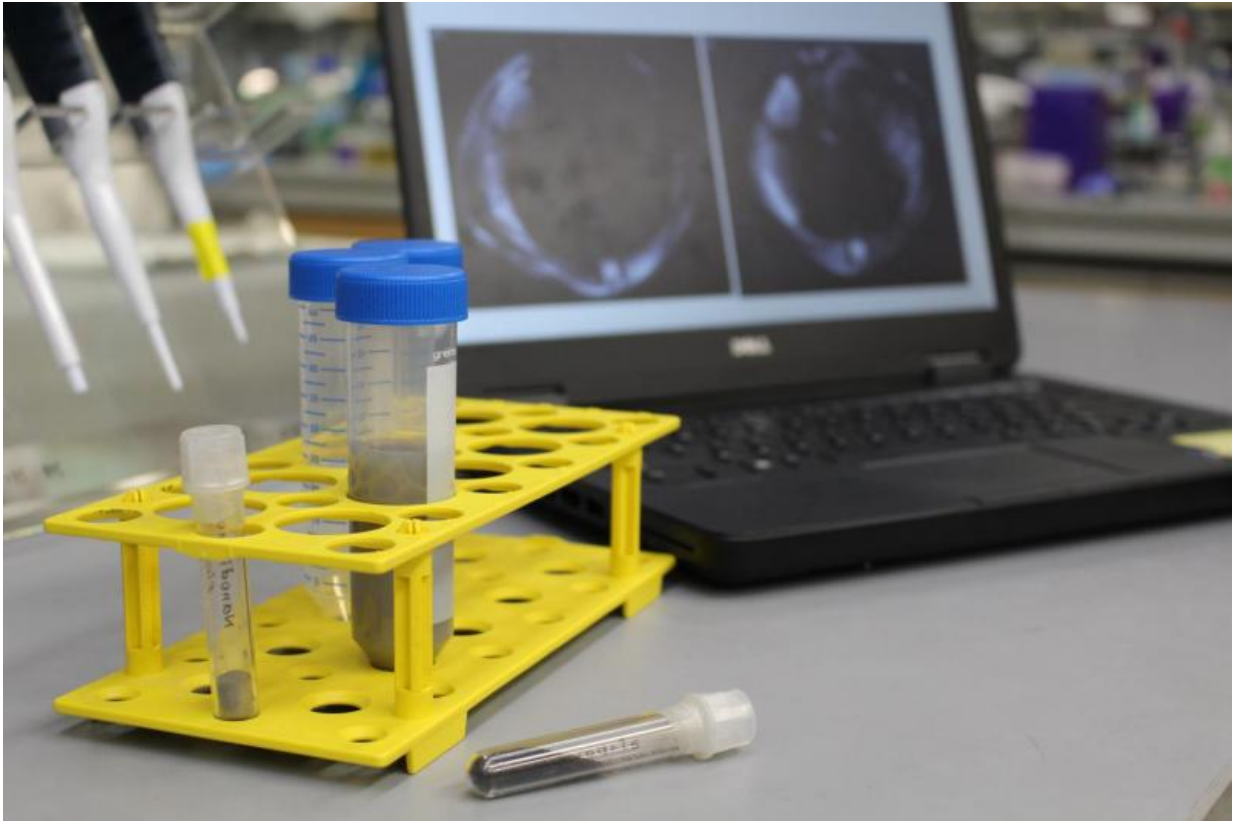
Scientists from the National University of Singapore (NUS) have developed a novel nanodiamond-based contrast agent—a chemical "dye" used to enhance the visibility of internal body structures in magnetic resonance imaging (MRI)—that improves visualisation of liver cancer tumours. Better and more sensitive imaging contributes towards detecting liver cancer and is crucial for planning for treatment.

MRI is a medical imaging technique commonly used for [cancer](#) diagnosis and to track the progress of patients after treatment. Currently, there are two modes of MRI imaging, T1-weighted and T2-weighted imaging, and patients are often given contrast agents to improve imaging quality. However, each imaging mode requires a specific class of contrast agent which cannot be used together. This poses a greater challenge in the diagnosis of [liver](#) cancer, where T2-weighted imaging is still not considered reliable, and both T1- and T2-weighted imaging can be confounded by tumour vascularity.

A research team led by Assistant Professor Edward Chow, Principal Investigator from the Cancer Science Institute of Singapore at NUS and Department of Pharmacology at NUS Yong Loo Lin of Medicine, has developed a dual-mode contrast agent which enables clearer and more accurate [images](#) of tumours to be obtained in both T1- and T2-weighted MRI scans, and with lower dosages of contrast agent.

Better tumour imaging using nanodiamond-based dual-mode contrast agent

The novel dual-mode contrast agent, which was developed using nanodiamonds in combination with a manganese base, provides greater imaging contrast than existing clinical agents which are used to improve quality of MRIs. The team also found that liver tumours that are unable to be visualised without contrast agents become readily visible even at low dosages of the novel compound.



The novel contrast agent (grey solution in larger tube), developed using nanodiamonds in combination with a manganese base, provides clearer and more accurate images of liver tumours at lower dosages. Credit: National University of Singapore

Contrast agents work by altering the magnetic properties of nearby [water molecules](#), which enhances the quality of MR images. Nanodiamonds, which are carbon-based particles of two to eight nanometres in diameter, have unique chemical properties that allow them to attract water molecules. This enables them to promote proton exchange between water molecules and paramagnetic ions (i.e. contrast agents) that accumulate in tissues. As a result, T1 and T2 relaxation is enhanced, giving better quality images. This is unlike existing nanotechnology-

based approaches, where nanomaterials are used to improve delivery of paramagnetic ions to specific tumour sites.

"Our experiments suggest that our dual-mode contrast agent holds great promise in improving imaging for liver cancer. We are hopeful that this advancement in nanomedicine will lead to safer and more accurate diagnosis of [liver cancer](#). Moving forward, we plan to conduct further prepreclinical safety studies for our [contrast](#) agents, with the end goal being clinical implementation. We are also looking into using our [contrast agents](#) to improve imaging for glioma and ovarian cancer," said Asst Prof Chow.

More information: Weixin Hou et al. Nanodiamond–Manganese dual mode MRI contrast agents for enhanced liver tumor detection, *Nanomedicine: Nanotechnology, Biology and Medicine* (2017). [DOI: 10.1016/j.nano.2016.12.013](#)

Provided by National University of Singapore

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