Nanoparticles Unlock Tumor Identity

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(PhysOrg.com) -- Using nanoparticles designed to recognize specific sugar-binding molecules on the surfaces of cells, a team of investigators at Michigan State University has developed a process that uses magnetic resonance imaging (MRI) to unlock the sugar-based code that identifies different types of cancer and normal cells. This work, led by Xuefei Huang, Ph.D., was published in the *Journal of the American Chemical Society*.

The investigators began their study by synthesizing a collection of magnetic nanoparticles, each coated with a different type of sugar. All mammalian cells contain a collection of sugar-binding receptors, known as lectins, on their surfaces, and each lectin has a characteristic affinity for one or more sugars.

By using multiple nanoparticles, each coated with a different sugar, Dr. Huang's team was able to identify a sugar-binding signature that was characteristic of specific types of cells. Because the nanoparticles are strongly magnetic, they are readily imaged using magnetic resonance imaging (MRI), with each nanoparticle generating a well-differentiated MRI signal.

With five different sugar-coated magnetic nanoparticles in hand, the researchers tested their ability to discriminate among 10 different types of cells. Using a mathematical method known as linear discriminant analysis, the investigators showed that they could readily identify all 10 cell types through an analysis of the combined MRI signals produced by each nanoparticle. Not only was this method able to distinguish between

malignant and normal cells, but between closely related cancer cells that are indistinguishable based on a qualitative analysis of their sugar or protein composition.

This work is detailed in a paper titled, "Magnetic Glyco-Nanoparticles: A Tool to Detect, Differentiate, and Unlock the Glyco-Codes of Cancer via Magnetic Resonance Imaging." An abstract of this paper is available at the journal's Web site.

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