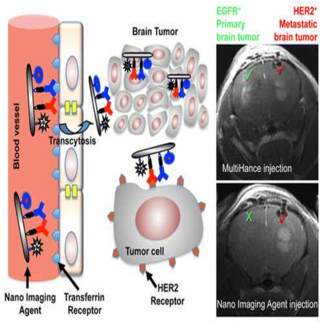
MRI 'Virtual Biopsy' of Brain Tumour



A novel tiny drug-delivery system — so far tested in mice — can identify cancer cell types in the brain through “virtual biopsies” and then attack the molecular structure of the disease, according to researchers from Cedars-Sinai. If results are confirmed in human studies, the system could be used to deliver nanoscale drugs that can distinguish and fight tumour cells in the brain without needing surgery.

“Our nanodrug can be engineered to carry a variety of drugs, proteins and genetic materials to attack tumours on several fronts from within the brain,” explains Julia Ljubimova, MD, PhD, professor of neurosurgery and biomedical sciences at Cedars-Sinai and a lead author of the study reported in the American Chemical Society’s journal *ACS Nano*.

The nanodrug is about 20 to 30 nanometres in size — a fraction of a human hair, which is 80,000 to 100,000 nanometres wide. The new delivery system can diagnose brain tumours by identifying cells that have spread to the brain from other organs. Researchers can determine tumour type by attaching a tracer visible on an MRI. If the tracer accumulates in the tumour, it will be visible on MRI. With the cancer’s molecular makeup identified through this virtual biopsy, researchers can load the nano delivery system with cancer-targeting components that specifically attack the molecular structure.

To show that the virtual biopsies could distinguish one cancer cell type from another, the Cedars-Sinai team implanted different kinds of lung and breast cancers into laboratory mice to represent metastatic disease — with one type of cancer implanted on each side of the brain. Breast and lung cancers are those that most often spread to the brain.

The researchers used the drug-delivery system to identify and attack the cancers. Lab test results showed that animals receiving treatment lived significantly longer than those in control groups.

Another lead author, Keith Black, MD, chair of the Department of Neurosurgery at Cedars-Sinai, says: “Several drugs are quite effective in treating different types of breast cancer, lung cancer, lymphoma and other cancers at their original sites, but they are ineffective against cancers that spread to the brain because they are not able to cross the blood-brain barrier that protects the brain from toxins in the blood.”

In contrast, the nanodrug is designed "to cross this barrier with its payload intact, so drugs that are effective outside the brain may be effective inside as well,” adds Dr. Black, who is also the Ruth and Lawrence Harvey Chair in Neuroscience.

The Cedars-Sinai team has received a $2.5 million grant from the National Institutes of Health to continue the research.

Source: Cedars-Sinai Medical Center
Image credit: ACS Nano

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