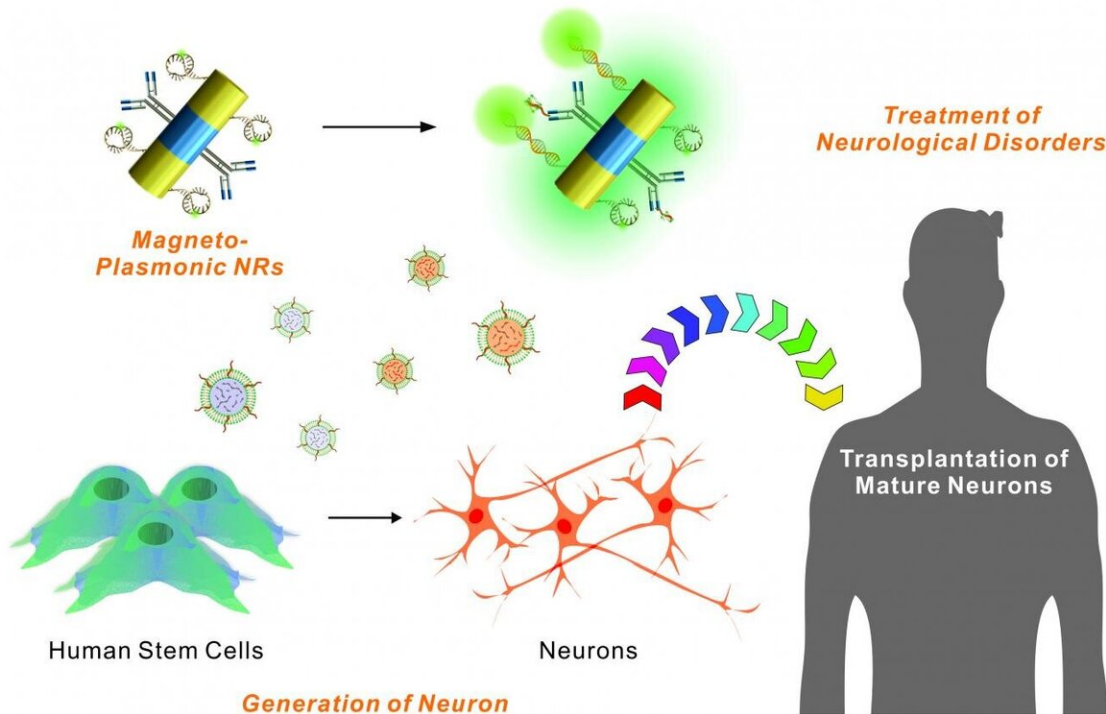


New nanotechnology could aid stem cell transplantation research

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Nondestructive Characterization of Stem Cell Differentiation through Exosomal miRNA detection



Nanotechnology developed at Rutgers University-New Brunswick could boost research on stem cell transplantation, which may help people with Alzheimer's disease, Parkinson's disease, other neurodegenerative diseases and central nervous system injuries. The scientists' nanotechnology platform uses special tiny rods with nickel and gold to detect microRNA inside exosomes. Exosomes - tiny particles released by cells that play a critical role in cell-to-cell communication - are next generation biomarkers. The scientists successfully monitored the generation of neurons from human stem cells by characterizing exosomes without destroying them. The efficient technology can also be used to

characterize heterogeneous brain tissue. Credit: Jin-Ho Lee/Rutgers University-New Brunswick

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The nanotechnology platform, which uses special tiny rods for sensing, allows researchers to confirm the identity of human stem cell fates and their biomarkers, or biological molecules, without destroying them, according to a study in the journal *ACS Nano*. That's been a major issue during pre-[clinical research](#) on stem cells because it limits further analyses and [biomedical applications](#).

"One of the major hurdles in the current cell-based therapies is the destructive nature of the standard cell characterization step. With our technology, we can sensitively and accurately characterize the cells without compromising their viabilities," said senior author KiBum Lee, a professor in the Department of Chemistry and Chemical Biology in the School of Arts and Sciences.

Stem cells can develop into many different types of cells, including neurons that transmit information in the brain. Adult human-induced [pluripotent stem cells](#), which resemble [embryonic stem cells](#), can be used to develop drugs and model diseases, according to the National Institutes of Health. Scientists hope to use them in transplantation medicine.

While stem cells hold great potential for treating neurodegenerative diseases and central nervous system injuries, controlling and characterizing their fate are critical issues that need to be addressed

before their potential use as treatments can be fully realized. Current methods for characterizing stem cell biomarkers destroy cellular activities and functions, which makes it difficult to conduct more definitive research that could lead to biomedical applications.

Using their nanotechnology platform, the scientists successfully monitored the generation of neurons from human [stem cells](#) by characterizing next generation biomarkers called exosomes—tiny particles released by cells that play a critical role in cell-to-cell communication. The scientists will further investigate their technology's versatility in other applications, such as detecting neurons in clinical settings.

More information: Jin-Ho Lee et al, Nondestructive Characterization of Stem Cell Neurogenesis by a Magneto-Plasmonic Nanomaterial-Based Exosomal miRNA Detection, *ACS Nano* (2019). [DOI: 10.1021/acsnano.9b01875](#)

Provided by Rutgers University

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