Novel 'Nanosized' Drug Carriers Tamp Down HIV in the Brain and other Remote Tissues in Mice

2021-10-04

There are many regions of the body that are difficult to reach with drug treatments, most notably the brain, which is surrounded by the famously impenetrable blood-brain barrier. Now, researchers led by the City of Hope have developed a novel drug-delivery system that they say can carry an anti-HIV drug cargo into the brain and other remote tissues in mice—an advance they believe could ultimately be applied to a range of diseases.

The City of Hope team, in conjunction with Menzies Health Institute Queensland at Griffith University, packaged a protein-based anti-HIV drug into “nanosized” cell fragments called exosomes. When the researchers treated mouse models of HIV with the drug, it tamped down HIV levels in the brain as well as in the bone marrow and spleen, they reported in Nature Communications.

One of the main challenges in treating HIV is that the virus can lay dormant in the body for long periods in “reservoirs” that can later become active. HIV reservoirs in the brain are among the hardest to target because of the blood-brain barrier.

The City of Hope researchers set out to find a way to “block and lock” the expression of HIV, they said in a statement, effectively preventing the virus from reactivating. They created the drug by fusing a particular zinc finger protein to a type of enzyme called a DNA methyl transferase, resulting in a “ZPAMt HIV protein repressor.” They then packaged it into the exosome nanoparticles.

The researchers reported that 10 weeks after treating the mice, they found that the suppression of HIV in brain, bone marrow and spleen was greater in ZPAMt exosome-treated animals than it was in controls.

Although antiretroviral treatments have revolutionized the treatment of HIV, the drugs haven't proven effective at targeting virus reservoirs. Several research teams are investigating alternatives. Engineered cell therapies that target HIV reservoirs, for example, are being developed by scientists at the Albert Einstein College of Medicine and the University of Pittsburgh, the University of California, Los Angeles and the University of North Carolina.

The City of Hope and Menzies researchers see potential for their ZPAMt exosomes well beyond HIV. Engineered exosomes could carry several different types of cargo, they said, including drugs that treat infectious diseases or gene therapies that could cripple pathogens. And, because they can penetrate the brain, they could ultimately prove useful in treating Alzheimer's, Parkinson's and other neurological disorders, they said.

Read the original article on Fierce Biotech.