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Hong Kong develops novel RNA nanoparticle for atherosclerosis treatment

06 October 2022 | News

In Hong Kong, heart disease has been the third-leading cause of death since the 1960s

A team of researchers at The Chinese University of Hong Kong (CUHK) has developed a novel RNA nanoparticle to offer a potentially safe, effective treatment for atherosclerosis. The blockage of blood vessels caused by atherosclerosis is a major cause of stroke and ischemic heart disease.

Research has shown that this RNA nanoparticle can naturally target receptors of plaque cells for delivering genes to atherosclerotic plaques, while alleviating atherosclerosis by modulating genes related to atherogenesis, consequently reducing and stabilising plaque without inducing severe toxicity. It paves the way for the use of nucleic acid nanotechnology to treat cardiovascular diseases.

Existing treatments for atherosclerosis include surgical procedures such as balloon angioplasty and endarterectomy, but they are invasive and inefficient in reducing multiple plaque sites. Another treatment is administration of lipid-lowering drugs such as statins, but they can only slow down disease progression.

Gene regulation is an emerging therapeutic approach to atherosclerosis, but current technology for gene delivery to plaque remains inefficient. Existing atherosclerosis nanomedicines mostly employ cationic carriers to complex gene cargoes through electrostatic interactions for gene delivery into plaque cells. Yet, these nanomedicines are often bulky, larger than 100 nm, meaning they can be rapidly filtered by the liver and spleen following an intravenous injection before they reach the plaque; and they are cationic which may induce cytotoxicity in the body.

Bypassing this bottleneck in gene delivery, CUHK team has applied nucleic acid nanotechnology to develop a new RNA nanoparticle for plaque delivery.

According to the researchers, “The findings suggest that this RNA nanoparticle is a safe, effective agent to treat atherosclerosis, and it is now possible to design nucleic acid nanomedicines that are dual plaque targeting and therapeutic agents.”