Sticky nanoparticles fight heart disease (w/ video)

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Clemson University researchers have developed nanoparticles that can deliver drugs targeting damaged arteries, a non-invasive method to fight heart disease.

Heart disease is the leading cause of death in the U.S., according to the Centers for Disease Control and Prevention. One of the standard ways to treat clogged and damaged arteries currently is to implant vascular stents, which hold the vessels open and release such drugs as paclitaxel.

The researchers, led by Clemson bioengineering professor Naren Vyavahare, hope their advanced nanoparticles could be used alongside stents or in lieu of them.

"Healthy arteries have elastic fibers that provide elasticity. They are like rubber bands in the tissue that allow expansion and recoil during blood flow," Vyavahare said. "In most cardiovascular diseases, elastic fibers in arteries get damaged, creating hooks that can be used to target drugs."

The nanoparticles, coated with a sticky protein, latch onto damaged arteries and can deliver a drug to the site in slow release fashion. These nanoparticles can be engineered to deliver an array of drugs to the damaged or clogged artery, a common example being paclitaxel, which inhibits cell division and helps prevent growth of scar tissue that can clog arteries. These particles also have unique surfaces that allow prolonged circulation time, providing more opportunities for these particles to accumulate at the damage site.

"We developed nanoparticles that have antibodies on the surface that attach to diseased sites like Velcro," said Vyavahare. "Interestingly, these newly created nanoparticles only accumulate at the damaged artery, not in the healthy arteries, enabling site-specific drug delivery."

"These nanoparticles can be delivered intravenously to target injured areas and can administer drugs over longer periods of time, thus avoiding repeated surgical interventions at the disease site," said Aditi Sinha, a Clemson graduate student and lead author on a paper soon to be published in journal *Nanomedicine: Nanotechnolgy, Biology and Medicine*.

The work is a promising step toward new treatments for cardiovascular and other diseases. The research team is testing the nanoparticles to determine the most effective drug dosage for vascular tissue repair. This technology can have variety of applications in other diseases, such as chronic obstructive pulmonary disease, Marfan syndrome and elastic fiber-related disorders, such as aortic aneurysms.

Provided by Clemson University