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'Smart' molecules that selectively target abnormal cell growth in blood vessels may reduce reoccurring blockage

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Artificial "smart" molecules selectively targeted certain blood-vessel cells and prevented abnormal growth while allowing others to heal. This could lead to new stent treatments, according to preliminary research presented at the American Heart Association's Vascular Discovery Scientific Sessions 2019, a premier global exchange of the latest advances in new and emerging scientific research in arteriosclerosis, thrombosis, vascular biology, peripheral vascular disease, vascular surgery and functional genomics.

"Our study suggests safer and more efficacious drugs may be developed for use with drug-eluting stents," said William Thiel, Ph.D., lead author of the study and an assistant professor of internal medicine at the University of Iowa in Iowa City. "These potential drugs would benefit patients receiving stents by alleviating the clinical challenges associated with the current generation of drug-eluting stents."

During a procedure to open narrowed blood vessels, small wire mesh tubes called stents are inserted to keep the vessels open. Drug-eluting stents contain medicines that also help keep blood vessels open, in part, by inhibiting the abnormal growth of certain cells called vascular smooth muscle cells.

These medicines, however, can also impede the healing of the endothelial cells—those that line the inner surfaces of the blood vessel.

Other complications include blood clots and new narrowing of the blood vessel inside the stent. Although these complications can be reduced by using aspirin and other anti-clotting drugs, the medicines can have side effects.

Accordingly, this study, funded by the American Heart Association and the National Heart, Lung, and Blood Institute, tested the ability of artificial molecules to target abnormal vascular smooth muscle cells while sparing endothelial cells, much like weed killers targeting weeds but not grass. In laboratory tests, one of the molecules decreased vascular smooth muscle cell growth, while the other triggered the death of these cells to a greater extent than a drug often used in drug-eluting stents. Neither molecule affected endothelial cells.

The researchers used artificial RNA, or ribonucleic acid, molecules that bind specifically to vascular smooth muscle cells. They tested many variations of the molecules to identify the two that targeted vascular smooth muscle cells without affecting endothelial cells.

A study limitation is that it did not look at how the RNA molecules selectively targeted one type of cell while having no effect on another type. Now, the researchers are studying these mechanisms.

Provided by American Heart Association