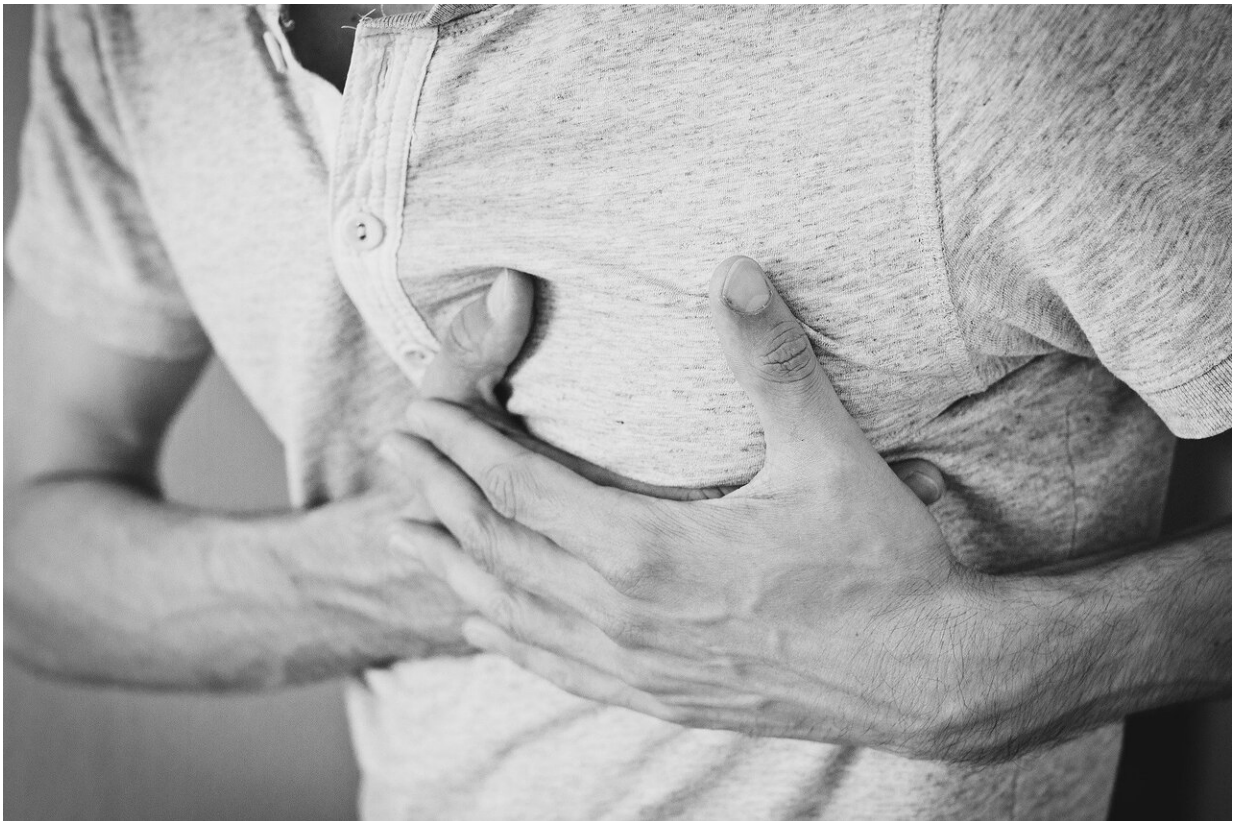


New spray could someday help heal damage after a heart attack

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Heart attack, or myocardial infarction, is one of the leading causes of death worldwide. Although modern surgical techniques, diagnostics and medications have greatly improved early survival from these events,

many patients struggle with the long-term effects of permanently damaged tissue, and the 5-year mortality rate remains high. Now, researchers reporting in *ACS Nano* have developed a minimally invasive exosome spray that helped repair rat hearts after myocardial infarction.

Scientists have explored using [stem cell therapy](#) as a way to regrow tissue after a [heart attack](#). But introducing stem cells directly to the heart can be risky because they could trigger an immune response or grow uncontrollably, resulting in a tumor. Therefore, researchers have tried injecting exosomes—membrane-bound sacs containing proteins, lipids and [nucleic acids](#) secreted by stem cells—into the heart, but they often break down before they can have [therapeutic effects](#). Others have developed cardiac patches, or scaffolds that help implanted exosomes last longer, but they usually must be placed on the heart during open-chest surgery. Yafeng Zhou and colleagues wanted to develop an exosome solution that could be sprayed onto the heart through a tiny incision, avoiding major surgery.

The researchers mixed exosomes from mesenchymal [stem cells](#) with fibrinogen, a protein involved in blood clotting. They added this solution to a tiny, double-barreled syringe that contained a separate solution of another clotting protein called thrombin. When the team sprayed the solutions out of the syringe onto a rat's heart through a small chest incision, the liquids mixed and formed an exosome-containing gel that stuck to the heart. A mini-endoscope, inserted through a second small incision, guided the spray needle. In rats that had recently had a heart attack, the exosome spray lasted longer, healed injuries better and boosted the expression of beneficial proteins more than heart-injected exosomes. In pigs, the spray caused less severe immune reactions and surgical stress than open-chest surgery. The spray is a promising strategy to deliver therapeutic exosomes for heart repair, the researchers say.

More information: Jialu Yao et al, A Minimally Invasive Exosome

Spray Repairs Heart after Myocardial Infarction, *ACS Nano* (2021).
[DOI: 10.1021/acsnano.1c00628](https://doi.org/10.1021/acsnano.1c00628)

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