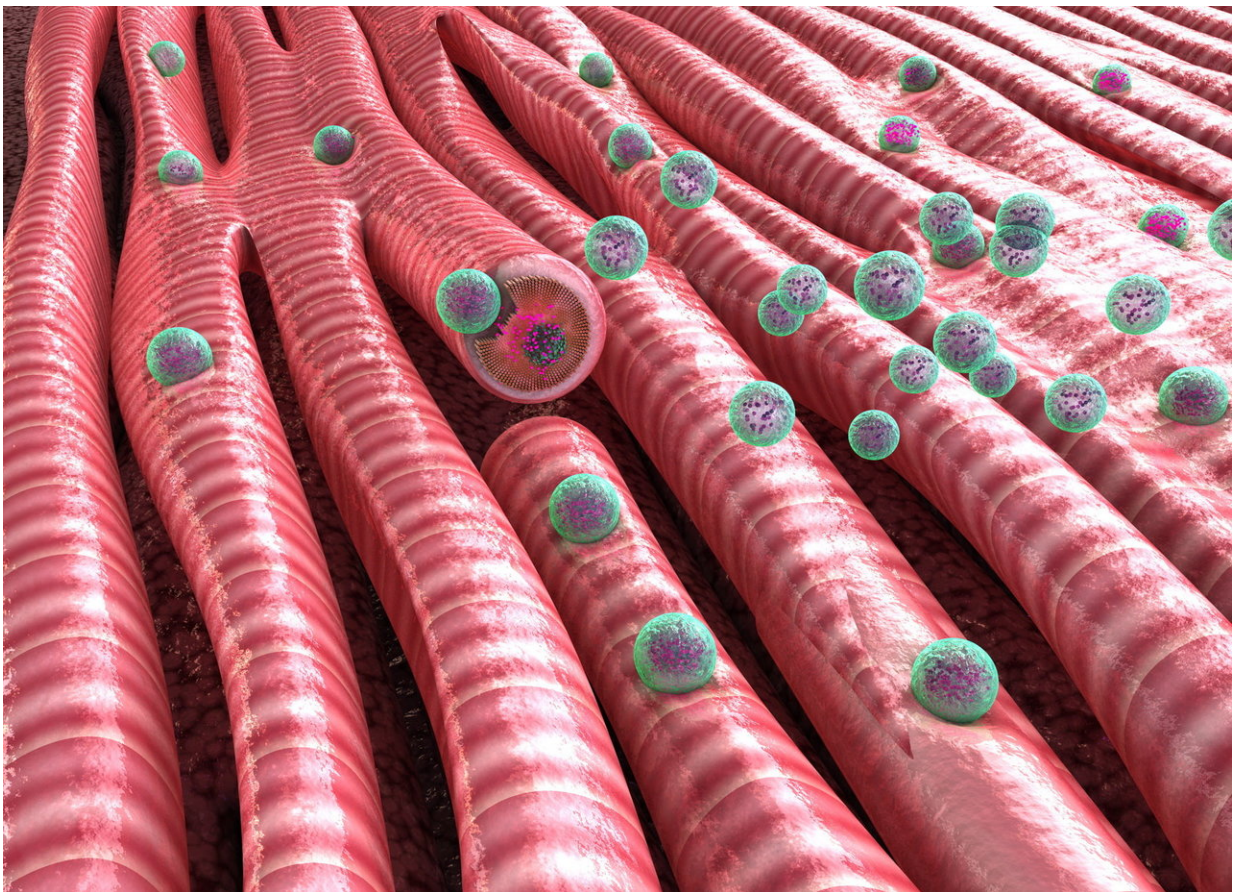


# A nanoparticle inhalant for treating heart disease

January 18 2018, by Bob Yirka

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Artist's rendering of nanoparticles delivering drugs directly to heart muscle fibers after being inhaled. Credit: Ella Maru studio, [scientific-illustrations.com](http://scientific-illustrations.com)

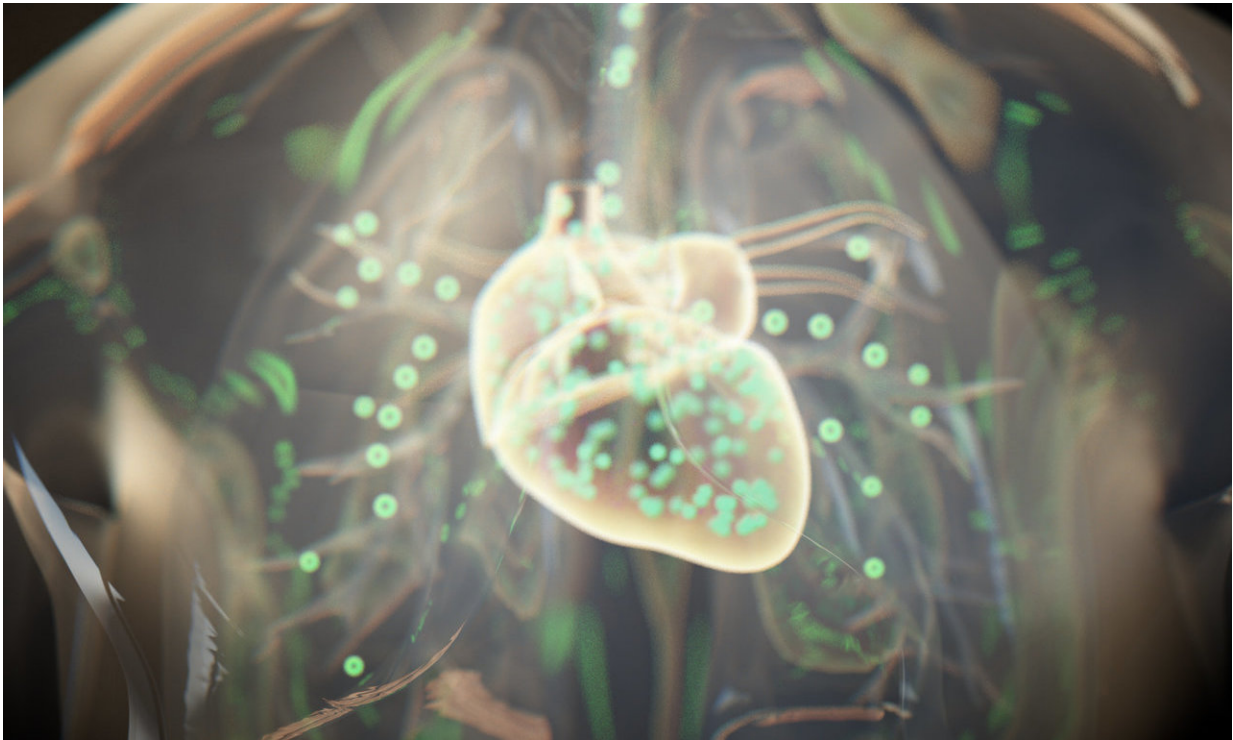
A team of researchers from Italy and Germany has developed a

nanoparticle inhalant for treating people suffering from heart disease. In their paper published in the journal *Science Translational Medicine*, the group describes development of the inhalant, how it was used and how well it worked when tested on lab animals.

In recent years, [nanoparticles](#) have been developed to deliver drugs to specific parts of the body, allowing for direct contact therapy—such remedies are typically administered orally or intravenously, which the researchers with this new effort describe as inefficient for delivery of cardiac medicines. Their approach allows for inhaling the particles, which allows them to reach the heart faster and to be taken up by cardiomyocytes, which results in improved [heart function](#).

The team created their nanoparticles out of material that closely resembles teeth and bone, resulting in calcium phosphate particles small enough to absorb into heart tissue, but big enough to carry medicines to where they are needed. The medicine in this instance was a drug that has been found to repair calcium channels on the surfaces of heart cells—a critical part of restoring normal cardiac electrical activity.

After loading the nanoparticles with the therapy drugs, the team administered them to mice and rats whose hearts had been damaged in a way that mimicked diabetic cardiomyopathy. The team then measured the health of their hearts by noting how much blood was ejected from the [left ventricle](#). They report that prior to administration of the drug treatment, the mice with damaged hearts scored 17 percentage points lower than healthy mice. After treatment, they found measurements rose by an average of 15 percentage points, which they describe as a near complete recovery.



Heart failure patients could someday receive treatments by inhaling drug-loaded nanoparticles. Credit: Ella Maru studio, scientific-illustrations.com

Pleased with their results in rodents, the researchers tested the drug delivery system in pigs (which have a respiratory system more similar to humans), specifically looking to see how quickly it would accumulate in heart tissue—they found it did so rapidly, as expected, offering an improvement over conventional methods.

The team also reports that inhalation of the nanoparticles did not cause any toxicity in [heart tissue](#) in mice or rats. More study will be needed to ensure the delivery system is safe before it can be tested in humans.

**More information:** Michele Miragoli et al. Inhalation of peptide-loaded nanoparticles improves heart failure, *Science Translational*

*Medicine* (2018). [DOI: 10.1126/scitranslmed.aan6205](https://doi.org/10.1126/scitranslmed.aan6205)

## **Abstract**

Peptides are highly selective and efficacious for the treatment of cardiovascular and other diseases. However, it is currently not possible to administer peptides for cardiac-targeting therapy via a noninvasive procedure, thus representing scientific and technological challenges. We demonstrate that inhalation of small (

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