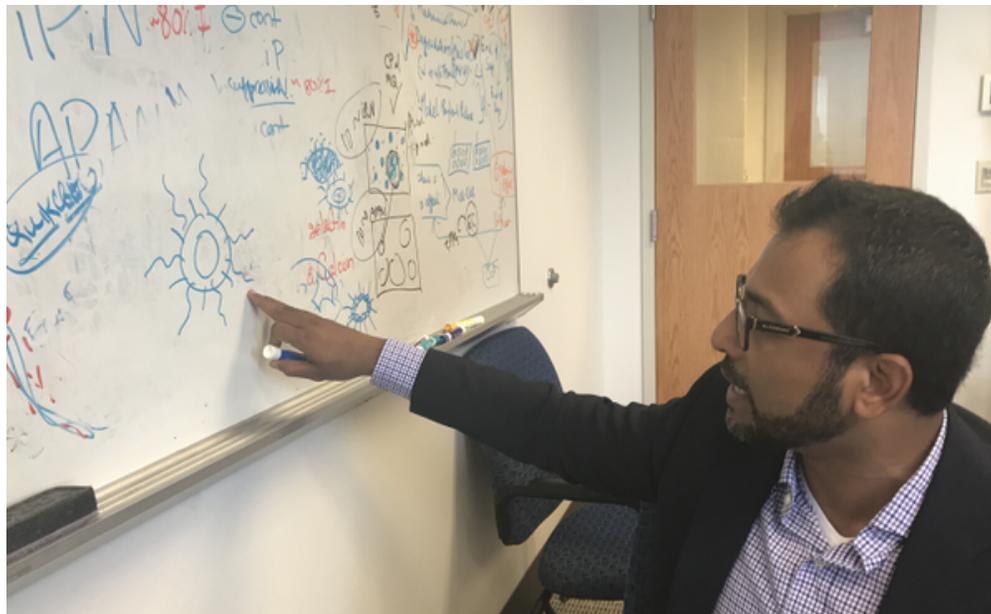


HEALTH AND FITNESS

## New CWRU, Haima Therapeutics' blood-clotting platelet simulators could save lives

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Anirban Sen Gupta, a CWRU professor of biomedical engineering and co-founder of Haima Therapeutics, draws a sketch explaining how the company's artificial platelets work. (Julie E. Washington)

**By Julie Washington, The Plain Dealer, [jwashington@plaind.com](mailto:jwashington@plaind.com)**

CLEVELAND, Ohio -- A car traveling on an icy highway skids into a semi, resulting in victims with major injuries and uncontrolled bleeding. There's little that first responders can do to help broken blood vessels clot.

Every minute of profuse bleeding brings the victims closer to death.

What if EMS workers carried synthetic platelets -- the blood's clotting agent - that they could inject to help the victims' blood clot, increasing the likelihood of them reaching a hospital alive?

That's the question that Case Western Reserve University scientists answered by developing SynthoPlate, very tiny nanoparticles that, when injected into the bloodstream, mimic how platelets cluster to stop uncontrolled bleeding from various kinds of major trauma.

Case Western Reserve University and its spin-off, Haima Therapeutics, have agreed that Haima can license SynthoPlate, an artificial platelet product. Haima Therapeutics has attracted interest from the U.S. military, which provided funding to help bring this technology to market.

"Hopefully it gets into humans and saves lives," said Anirban Sen Gupta, a CWRU professor of biomedical engineering and co-founder and chief scientific advisor at Haima Therapeutics. The startup, founded in 2016, has offices in the BioEnterprise building in Cleveland's HealthTech Corridor.

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Haima Therapeutics co-founder and chief science officer Christa Pawlowski joined Sen Gupta's lab in 2009 while she was an undergraduate at CWRU. As a biomedical engineer, she was fascinated with how platelets function, and the idea that scientists could build something to mimic them.

"It's amazing how complex the clotting process is," said Pawlowski, who earned a Phd from CWRU in 2015.

Pawlowski has spent much of her career studying platelets, part of the body's rapid defense force that swings into action when the body suffers anything from a paper cut to a severed leg.

These cell fragments, shaped like Mentos mints, are manufactured in the bone marrow. When they find a damaged blood vessel, natural platelets bind to each other and signal other platelets to congregate at that spot.

In cases of uncontrolled bleeding, death can happen in minutes or hours if victims are not treated quickly with a transfusion to replace platelets and other blood cells. Often, that treatment must wait until the patient reaches a Level 1 trauma center. EMS ambulances do not carry platelets because they must be kept chilled. Most hospitals have a limited supply of platelets due to their short shelf life.

[MetroHealth System](#) and University Hospitals are the only Level I Adult trauma centers in Northeast Ohio.

"Chances of the patient dying at roadside increases," Sen Gupta said. Artificial platelets have a longer shelf life, allowing first-responders and more hospitals could keep them on hand.

Decades of prior research into artificial-blood products helped Sen Gupta and Pawlowski invent artificial platelets that are made of a lipid, or fatty, core with a peptide coating. The peptide coating allows the nanoparticles to stick to a wound and recruit nearby platelets - both natural and artificial - to help form a clot, Pawlowski explained.

A layer of polymers between the lipid core and the peptide coating acts like an invisibility cloak. It prevents white blood cells, which defend the body against foreign substances, from detecting them.

"We put a Harry Potter (invisibility) cloak on them," Sen Gupta said with a grin. Artificial platelets remain in the bloodstream for two to three days. Without the coating, white blood cells would destroy them in less than half an hour, he said.

Currently, Haima Therapeutics is overseeing large-animal tests at CWRU and the University of Pittsburgh. The startup needs to raise more funding to get from animal to human testing, Sen Gupta said. It will be about three more years before SynthoPlates can be marketed to hospitals.

Sen Gupta envisions a future where all hospitals and first responders have artificial platelets as standard equipment.

"We can save a lot of lives on the roadside, both in the civilian and military sector," he said. "Wars are not going away. Car accidents are not going away. This could cut down preventable deaths by trauma to as low a number as possible."

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