

Nanoparticles increase survival after blood loss

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In an advance that could improve battlefield and trauma care, scientists at Albert Einstein College of Medicine of Yeshiva University have used tiny particles called nanoparticles to improve survival after life-threatening blood loss. Nanoparticles containing nitric oxide (NO) were infused into the bloodstream of hamsters, where they helped maintain blood circulation and protect vital organs. The research was reported in the February 21 online edition of the journal *Resuscitation*.

"The new nanomedicine was developed to address the need for better field treatments for massive human [blood loss](#), which can cause cardiovascular collapse, also known as hemorrhagic shock. This potentially fatal condition is best treated with infusions of refrigerated blood and other fluids. But such treatments are limited to emergency rooms or trauma centers.

"It is highly impractical to pack these supplies for use in rural emergencies, mass-casualty disasters or on the battlefield," said coauthor Joel Friedman, M.D., Ph.D., professor of physiology & medicine and of medicine and the Young Men's Division Chair in Physiology at Einstein. "Our nanoparticle therapy may offer the potential for saving lives in those situations. It's lightweight and compact and doesn't require refrigeration."

The new therapy counters hemorrhagic shock by increasing the body's levels of NO gas, which, among other physiological functions, relaxes blood vessels and regulates blood pressure. The gas was encased in

microscopic-sized particles that were specially designed by the Einstein team. (NO is so short-lived that delivering it in therapeutic amounts requires a method of sustained release.) The therapy is created by adding the NO-containing [nanoparticles](#) to saline solution, which was then infused into the animals. Once in the body, the nanoparticles gradually release a sustained dose of NO to tissues.

The [nanomedicine](#) was successfully tested in hamsters that had lost half their blood volume. "Animals given the nanoparticles exhibited better cardiac stability, stronger blood flow to tissues and other measures of hemorrhagic shock recovery compared to controls receiving saline solution minus the nanoparticles," reported Dr. Friedman.

Previously published studies by Dr. Friedman and colleagues have demonstrated the beneficial effects of NO-containing nanoparticles for healing antibiotic-resistant staph infections and abscess caused by those bacteria and for treating erectile dysfunction.

Provided by Albert Einstein College of Medicine

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