

News: Nanomaterials research to protect warfighters against chem-bio threats

Story by [John Davis](#)

FORT BELVOIR, Va. - The nation's military could get a little help ... from a very tiny source ... to protect against chemical and biological weapons.

The Defense Threat Reduction Agency's Chemical and Biological Technologies Department (DTRA CB) is soliciting research proposals for the development of Nanostructured Active Therapeutic Vehicles (NATV). The goal of the research is to develop nanomaterials capable of delivering therapeutic drugs in the body to protect against chemical and biological threats before exposure or symptom.

"It's a call to the scientific community," says Viktoria Greanya, Ph.D., DTRA CB's senior manager for Nanomaterials Research, who is leading the agency's materials program "We want our warfighters to have a focused system to combat chemical and biological threats."

The NATV program is inspired by current nanomedicine research primarily in cancer that is using similar measures to attempt to target only tumor cells and not healthy ones. The difference is that the concerns of the Department of Defense (DoD) Chemical and Biological Defense Program (CBDP) relate to acute insults to the body. Nerve agents or biological pathogens can have extremely short treatment windows where the onset of symptoms is already too late to avoid incapacitation, debilitation or death. For the military's needs active therapeutic vehicles designed for prophylactic or pre-symptomatic application are highly desirable.

NATV materials research will develop nanomaterials designed to circulate in the body, sense exposure to threat, and release their therapeutic payloads. DTRA CB seeks to combine these complex functionalities and more into a complete system aimed at prophylactic or pre-symptomatic chemical and biological medical countermeasures. Greanya says nanomaterials are attractive for drug delivery applications because of the ability to precisely control their physicochemical properties during fabrication. In addition, nanomaterials can be designed to target specific cell, organ or tissue types, and to sense and respond to stimuli, all of which could potentially reduce the exposure of the body unnecessarily to harsh side effects.

"We want to be able to develop a therapeutic carrier, or NATV, to control the location, duration and behavior of the therapeutic once it enters the body," Greanya says.

The NATV program will focus on two specific areas: (1) delivery systems for small-molecule antibiotics to fight against Gram-negative bacterial pathogens and (2) delivery systems for the large-molecule bioscavenger Butyrylcholinesterase (BuChE) to deliver broad spectrum protection against nerve agents. By the conclusion of the 48-month program, researchers will be able to show how they will improve

circulation times by an order of magnitude or better, sense and release therapeutic payloads on trigger, and improve performance compared to current treatments.

If successful, this research will not only demonstrate proof of concept delivery in two areas of high priority chem-bio need but also develop broadly applicable material design and fabrication capabilities. The program is expected to have a wide-ranging impact on in-vivo and in-vitro technologies, such as therapeutics, detection and diagnostics.

“It’s a tremendous challenge,” says Greanya, “but the threats these chem-bio agents pose to our warfighters, as well as civilian law enforcement and first responders, raises the imperative to get this done.”

DTRA CB is currently soliciting innovative multidisciplinary proposals for the NATV program. The NATV solicitations can be found on Amendment 30 to the DTRA-Chemical and Biological Broad Agency Announcement (HDTRA1-12-CHEM-BIO-BAA) on Fedbizopps.gov (for contracts), and Amendment 8 to the DTRA-Fundamental Research Broad Agency Announcement (HDTRA1-09-14-FRCWMD-BAA) on grants.gov (for grants) or via the DTRA-CB Service call (by request). Eligibility requirements for each solicitation differ, please read the solicitation carefully. Questions can be sent to NATV@dtra.mil. NATV is part of the Focused Innovative Technology (FIT) program, designed to look for innovative solutions for chem-bio threats against our Nation. More information and DTRA-funded research opportunities are available at www.DTRA.mil/Research.aspx. DTRA CB serves as the DoD’s Joint Science and Technology Office for Chemical and Biological Defense. Our mission is to fund cutting edge science and technology development targeted to combat chemical and biological threats and takes a multi-faceted approach to tackling this issue.