

Opportunity Title: Nanotechnology Implications for Chemical and Biological Warfare Safeguards

Opportunity Reference Code: ICPD-2022-45



Organization Office of the Director of National Intelligence (ODNI)

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How to Apply

Create and release your Profile on Zintellect – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at:
<https://orise.orau.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/28/2022 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Nanotechnology involves the manipulation and engineering of nanoscale materials to exploit special properties and enable new applications. While such applications may be of benefit in delivering new solutions to global healthcare, agriculture, manufacturing, and environmental challenges, there is a possibility of nanotechnology also expanding the pool of biological and chemical agents of concern. Some applications of nanomaterials may generate new threat agents, improve agent delivery methods or increase the threat from known agents. These new or redesigned threats will require proactive development of new countermeasures and new detection, identification and monitoring systems.

Applicants should approach the topic with the intent of including literature review and analysis of nanotechnology applications and trends with respect to potential chemical or biological warfare impacts.

Example Approaches:

Research proposals could approach this issue from a variety of disciplines, or as a cross-disciplinary effort. The problem touches on aspects of chemistry, engineering, applied science, innovation policy, and pharmacology. Proposals could consider the both the potential utility of nanotechnology to enhance or change chemical warfare and biological warfare agents, and ways to monitor and mitigate nanomaterial enabled threats:

- themselves as highly toxic chemical and biological warfare agents;
- to enhance or change the delivery or effects of chemical and biological warfare agents;
- to enhance or reduce the effectiveness of detection, protection or medical countermeasures against chemical and biological warfare agents; and
- to encapsulate chemical agents in order to enhance their environmental persistence, facilitate transportation or to regulate their delivery or effects.

Other avenues of investigation include:

- alternative pathways to converge existing Chemical Biological Warfare threats with nanotechnology;
- the development and proliferation of tools with which to manipulate, utilize and produce nanotechnology;
- coverage of nanotechnology by current arms control treaties such as the Chemical Weapons Convention and the Biological Weapons Convention;
- deficiencies or potential gaps in current domestic and international policy surrounding nanotechnology in

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- relation to research & development that could encroach on the CBW threat environment; and
- potential applications of nanotechnology in terms of detection, protection or medical countermeasures against chemical and biological warfare agents.

Relevance to the Intelligence Community:

The incorporation of synthetic biological monomers e.g. nucleotides and amino acids into biological products and microorganisms may present a biosecurity risk, as the incorporation can impart structural and functional changes which in turn could lead to a different physiological effects. In addition, detection technologies developed for naturally occurring biological organisms and molecules may not recognize semi-synthetic versions, allowing their use to go undetected. In order to mitigate this risk, additional information is needed to characterize the changes that occur to the function of biological materials when synthetic components are incorporated, the types of physiological effects these can cause and the detection requirements to identify their use.

Nanotechnology is a potentially disruptive (emergent and convergent) technology with the capacity to generate new threat agents, or increase the threat from current agents. The combination of technological advances in this field, coupled with the limited regulations associated with nanotechnology, could result in proliferation of nanotechnology-enabled Weapons of Mass Destruction or Weapons of Mass Effect. A greater understanding of the latest technological improvements in nanotechnology, the potential applications of nanotechnology to CBW, and the prospects of technologies to protect/defend against nanotech applications, are critical to informing warnings, indicators and reliable monitoring for the intelligence community.

Information relevant to the intelligence community could be prioritized as follows (according to technology maturity):

1. Nanotechnology to enhance delivery or effects of CBW agents (including encapsulation of agents). The dual-use nature of drug delivery technology advancements and potential impacts on chemical and biological warfare.
2. Nanotechnology as stand-alone, highly toxic or highly deliverable CBW agents; the relative toxicity of nanoparticles.
3. Designer nanotechnology: insight into bespoke or fit-for-purpose design of 'nano-agents' for military use; designed to reduce effectiveness of detection, protection and medical countermeasures.

Understanding these technological priorities will lay a foundation to provide analysts and policy makers with the information necessary to address risks associated with the field in terms of national security and global proliferation.

Key Words: Chemical, Biological, Warfare, CBW, Nanotechnology, Emerging Threats, Nano-engineering, Pharmacology, Countermeasures, Proliferation

Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens





- Eligibility**
- **Citizenship:** U.S. Citizen Only

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Requirements

- **Degree:** Doctoral Degree.
- **Discipline(s):**
 - **Chemistry and Materials Sciences** (12 )
 - **Communications and Graphics Design** (2 )
 - **Computer, Information, and Data Sciences** (16 )
 - **Earth and Geosciences** (21 )
 - **Engineering** (27 )
 - **Environmental and Marine Sciences** (14 )
 - **Life Health and Medical Sciences** (45 )
 - **Mathematics and Statistics** (10 )
 - **Other Non-Science & Engineering** (2 )
 - **Physics** (16 )
 - **Science & Engineering-related** (1 )
 - **Social and Behavioral Sciences** (27 )