

1. **Research Title:** Biomolecular Interaction of Engineered Nanomaterials

2. **Individual Sponsor:**

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RH 15-5

3. **Academic Area/Field and Education Level**

Chemical, Biological Sciences and/or Materials Engineering (MS or Ph.D. level)

4. **Objectives:**

- Characterization of Nanomaterials in biological system. Determine their uptake and translocation into various parts of cells
- The understanding of how engineered nanoparticles of different geometries interact with cells
- Molecular events involved in nanoparticle– membrane receptor binding, endocytosis and subsequent signaling activation.

5. **Description:** Engineered nanomaterials (NM), in the range of 1-100 nm, possess novel physical and chemical properties and are being used or have been proposed to be used in the creation of nanoscale devices. The unique quantum characteristics of nanomaterials confer novel physico-chemical properties to create electrical, optical and magnetic attributes, which are not present in the corresponding bulk materials. These nano scale prepared materials are useful for military applications such as highly sensitive, rapid, and portable battlefield remote monitoring devices which can aid in the detection of a variety of analytes. Physical parameters of synthesized nanoparticles can affect these attributes and influence biological interactions such as uptake in cells and induction of cellular responses. However, it remains unclear how specific engineered nanomaterials with different size, structure, shape and geometries interact with cells, their components, or cause any molecular events involved in membrane receptor binding, general endocytosis and subsequent signaling activation. The main focus of this research is to elucidate the mechanism of nanomaterial interactions with biological systems in order to provide fundamental knowledge for the creation of molecular devices and to ensure that there are no risks associated with these materials.

6. **Research Classification/Restrictions:** N/A

7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided



**DAGSI** (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati) NOTE: Topics submitted to DAGSI must be approved for public release. PA Approval # 88ABW-2014-2960, 711 HPW/XPO 17 June 2014



**AFIT (only)**



**USAFA (only)**

If you are submitting a topic for the USAFA, indicate if you are also interested in sponsoring a USAF Cadet in summer 2015 (Average cost for USAF Cadet for 33 days is \$5000)

Yes

No