

Nanoscale Biotechnology Enhancement of Research Activities to Address Major Soybean Diseases

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Enhancement our current research efforts at the Center is anticipated by initiating a pilot program to promote nanotechnology-based innovations for soybean disease problems. Expected outcomes are: i) development of a seminar series and hands-on workshop in the CNST / MNTL clean rooms to promote active learning; ii) construction of a White Paper that will reveal the current understanding of nanoscale technology applications in agricultural research with an emphasis on soybean diseases and pathogens; and iii) identification of future high priority nanoscale research objectives regarding key soybean pathogen problems.

The Center will collaborate with researchers in the Micro and Nanotechnology Laboratory (MNTL) and the Center for Nanoscale Science and Technology (CNST) located at the University of Illinois to facilitate an active learning process that will include several seminars, workshops with hands-on learning in the 'clean rooms' at the CNST, and integration of ideas and cross-disciplinary research applications to address current agricultural disease problems. Leading experts in nanotechnology from around the world will be invited to speak at the Bionanotechnology seminars, exchange ideas with Center researchers, and explore possibilities for bionanotechnology collaborations. These activities will create an awareness of the potential and implications of nanoscale research for soybean disease problems.

A Bionanotechnology White Paper will be created that will define the potential opportunities for nanoscale research to contribute to advances in soybean disease technology. This White Paper will be constructed with the goal of accelerating the pace of fundamental soybean disease biotechnology research, and will define advances in, but not be limited to, bioinformatics and genomics, biosensors for early disease detection, quantum dots and nanoparticles as biological markers, nanotubes for grain identification and traceability, high throughput robotic screening, functionalized sensors to study plant cell development, molecular beacon devices, single nanotube spectroscopy for label and identification of biological materials, chemical sensing, and micro- and nano electro-mechanical systems (bioMEMS and bioNEMS) to study pathogen pathways.

Multi- and cross-disciplinary collaborations will be established to identify and design soybean disease research objectives and to exploit the new physical, chemical, and biological 'tools' available from nanoscale technologies. These endeavors are likely to answer fundamental questions about biological phenomena associated with soybean diseases. Resulting from these pioneer research efforts, agricultural biotechnology researchers will be able to leverage their novel outcomes and findings and respond to future public and private requests for research in nanoscale science applied to agriculture.