

Although the United States has among the safest and most abundant supplies of food, feed, and fiber, agricultural and food products are vulnerable to introduced pests and pathogens. Microbes as weapons are not a new topic in the United States. Many Americans recall the 2001 cases involving the mailing of anthrax spores through the U.S. mail. Molecular epidemiology has been used for years to trace outbreaks of microbial diseases, such as the recent *E.coli* 0157-H7 contamination of spinach. Although these cases did not involve plant pathogens, the protocols and technologies developed in these incidents may be adapted for use with pathogens of crops and other plant resources, should the need arise. In answer to a national need for enhanced capability in safeguarding our foods from the field to the table, Oklahoma State University has established the National Institute for Microbial Forensics and Food and Agricultural Biosecurity.

NIMFFAB, which is strongly supported by the Division of Agricultural Sciences and Natural Resources, will conduct research, address policy issues, provide education and training programs, and contribute to Extension programs related to forensic investigations and agricultural biosecurity.

The mission of NIMFFAB is to support national and regional biosecurity and law enforcement communities and the U.S. agricultural enterprise by identifying, prioritizing, and addressing issues of agricultural biosecurity and forensic capabilities.

The goals of NIMFFAB include:

- Assess current national capabilities related to plant pathogens and food safety.
- Provide strategic planning and prioritization of needs and resources.



- Advocate for targeted funding programs in high-priority research and technology development.
- Establish a coalition of national and state investigators for conducting research on crop and food biosecurity and forensics issues.
- Provide a framework to attract qualified professionals and to garner funding.
- Serve as the hub for collaborative efforts related to crop and food biosecurity and microbial forensics.
- Develop educational and training opportunities for students and stakeholders, in cooperation with other state and national agencies and entities.
- Work in conjunction with local and national microbial forensics and food and agricultural biosecurity programs related to animal and human pathogens.

Relationship to OSU's mission and anticipated benefits to the university and the State of Oklahoma:

- Response to an area of emerging national and local need.
- Recognition of Oklahoma and OSU as national leaders in agricultural biosecurity.
- Commercial application/production in Oklahoma as potential offshoots.
- Training for professionals, including faculty, post-doctoral students, graduate students, and first detectors, from within Oklahoma and out-of-state.
- Outreach/Extension components through the Oklahoma Cooperative Extension Service.
- Application of forensics related research and technology, developed through the Oklahoma Agricultural Experiment Station, to plant disease outbreaks.

NIMFFAB will operate as an OSU core facility consisting of faculty, staff, and students engaged in research, teaching, and Cooperative Extension activities. Serving as a resource base and an administrative framework, utilizing OSU's agricultural strengths and national recognition, the institute will ensure high quality output and benefit to both Oklahoma and the nation.

Forensic analyses include the use of tools for sampling, packaging, shipping, storage, microbial identification and discrimination, chemical analyses, epidemiological modeling, bioinformatics, and other considerations. A forensic investigation involving a plant pathogen may require use of methodologies that address different questions and/or have higher resolution than those normally used in disease diagnosis and plant pathogen identification.

A critical first question with respect to a plant disease outbreak is whether a crime has occurred. An intentional introduction of a plant pathogen as a biocrime or bioterrorist event might not be recognized as such. Thus, tools for better pathogen resolution, more relevant background information, and more robust surveillance mechanisms are needed to better evaluate whether a disease is natural or human-incited. On the positive side, crop producers and plant pathologists are already poised to move quickly to apply management strategies to control disease. Therefore, rapid determination of whether criminal activity has occurred is crucial so that responders know if the event should be handled as a crime, with appropriate steps for attribution, or solely as a containment effort. Forensic science (and plant epidemiology) can assist in this endeavor.





To stem threats to the nation's agriculture by possible acts of agricultural biocrime or bioterrorism, NIMFFAB will focus on the methods, strategies, and procedures for obtaining forensic data from sites of suspected intentional introductions. Although such activities resemble the normal work of a plant pathologist, their application to forensic investigation requires that they are sufficiently robust, validated, and standardized that they will hold up to exacting scrutiny, not only of scientists, but also of law enforcement and the judicial process.

As the nascent discipline of plant pathogen forensics develops, standard crime scene processing and evidence handling protocols must be validated and adapted to plant pathogen forensics applications. It may be appropriate to develop some new technologies specific for crime scenes involving crops, forests, nurseries, orchards, or rangelands. As plant pathogen forensics becomes established as a separate sub-discipline of forensic science, a major early area of opportunity will be to critically assess, select, and shepherd existing methods, standard operating procedures, and protocols through an appropriate process so that "sets" of validated "tools" are available and defensible should a crop bioterrorism event occur.

The application of forensic methods to a plant disease outbreak requires specific steps of forensic microbiology. Mistakes made during early stages of this process, i.e., during disease characterization and sampling, cannot be corrected at later stages of the investigation. The steps include:

- 1) Careful documentation of disease characteristics.
- 2) Sampling the potential crime scene.

- 3) Identification of the pathogen to the race, strain, isolate, or isolate mixture.
- 4) Selection of appropriate mitigation response measures.
- 5) Further characterization of the pathogen to identify likely sources.
- 6) Attribution or exclusion of pathogens.

NIMFFAB, in conjunction with OSU will build on, partner with, and contribute to existing local, state, and national programs to assure the protection of our crops and foods from intentional pathogen and pest introductions, and to enhance our ability to bring perpetrators to justice.

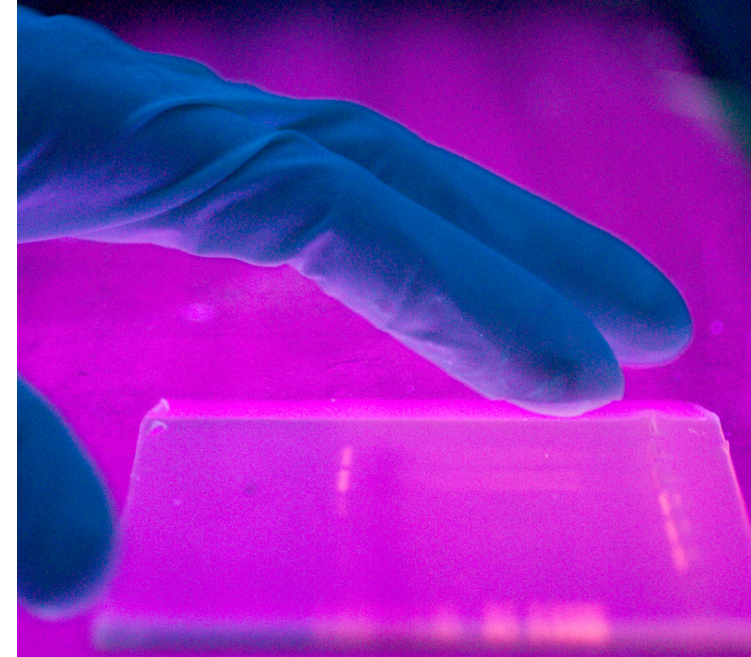


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PMI:

Plant Microbial Institute



National Institute
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