Developing A National Virtual Biosecurity for Bioenergy Corps Center

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Background/Objectives. The development of resilient and sustainable bioenergy crops is an important part of the US Government's strategy to transition to a net-zero economy. An important consideration in developing the US bioeconomy is the biosecurity of crops grown for bioenergy production. The most likely biosecurity threats to bioenergy crops are either known pests or pathogens that emerge in new areas, possibly driven by climate change; or new pests or pathogens that are genetically related to known ones. A robust biosecurity capability optimized to respond rapidly to biothreats to bioenergy crops requires an integrated and versatile platform that delivers timely and accurate detection and targeted sampling, propagation prediction, and characterization of the interaction between a pest or pathogen and the bioenergy crop that is needed to underpin the development of controls and solutions. Here we report on a new pilot study funded by the Department of Energy (DOE) to develop a roadmap for a National Virtual Biosecurity for Bioenergy Crops Center (NVBBCC) organized around four interconnected modules: detection and sampling, biomolecular characterization, assessment, and mitigation.

Approach/Activities. We will use a series of community workshops and experimental work on a known disease in Sorghum to develop a roadmap for the development of NVBBCC. The roadmap workshops, conducted within the first 6 months, will identify partnerships within and outside DOE necessary to establish the full capability required for an end-to-end biosecurity platform and develop a network of experts and facilities the center can draw upon once faced with a biothreat. A study on a fungal disease that affects Sorghum, a leading energy crop, will be used to develop material, experimental, and data workflows as well as guide future investments.

Informed by lessons learned from DOE's National Virtual Biotechnology Laboratory, we will make several targeted research infrastructure investments in experimental, observational, and computational areas to establish an initial, integrated prototype NVBBCC virtual platform. Its backbone is an integrated and flexible computational science software and hardware system to support persistent data storage; advanced AI/ML-enabled data analysis; data fusion; data sharing; and near real-time visualizations of the geographic localization of disease as well as computational simulations and predictions.

Results/Lessons Learned. The presentation will be a status review of the pilot study and a preliminary assessment of what systems and procedures are currently available and where NVBBCC can add value. A mature NVBBCC is envisioned to be a distributed, virtual center with multiple DOE-labs at its core to maximize the use of unique facilities and expertise across the DOE complex. NVBBCC will support community-driven plant pathology research as well as broader BER-relevant plant biology research.