

# Food Security: Plant Pathogen Research

## Background

Wheat blast is a potential threat to wheat production worldwide. With implications for food security in developing nations and economic stability in developed nations, rapid response capabilities and effective mitigation measures are needed. This threatening plant pathogen is causing serious reductions in wheat production in South America. Even greater concern arose during the 2015-2016 crop season when wheat blast was observed in Bangladesh, the first time it was found outside of South America. The risk of the disease spreading to the United States has suddenly become very real.

## Description

Wheat blast is caused by the plant pathogenic fungus, *Magnaporthe oryzae*. Yield loss to this disease can be greater than 75 percent in severely affected fields. It is spread naturally from plant to plant within a field and from field to field within a region through the forces of wind and rain. *M. oryzae* can also be spread as a result of human activities, including the movement of farm machinery, grain or seeds infected/infested with the wheat blast pathogen. Wheat blast could be introduced into the U.S. as a result of increased trade and travel between the U.S. and Brazil.

Wheat blast could also emerge in the U.S. as a result of the evolution and establishment of new strains of *M. oryzae* from indigenous populations on wild and cultivated grass species, e.g., ryegrass. Wheat blast pathogens may have already emerged in the U.S. on other hosts but environmental factors have not yet favored outbreaks/epidemics.

Research with live pathogen cultures and with infected plant tissues are conducted within biosafety level 3, or BSL-3 biocontainment laboratories at the U.S. Department of Agriculture's ARS laboratories at Fort Detrick, Maryland, and at the Biosecurity Research Institute or BRI. The BRI, at Pat Roberts Hall, is equipped and capable of meeting the challenge of expanding education, training and research in plant pathogen diseases. This state-of-the-art facility is comprised of 14 BSL-3/3Ag research laboratories, an ACL/BSL-3 insectary suite, a mosquito rearing room, an ABSL-3 vivarium small animal area, a pathogen storage room rated a BSL-3E, as well as education, training and administrative spaces. Laboratory space of 31,000 square feet within the BRI supports diverse and multidisciplinary research and training opportunities, with the capability for research on plant pathogens and foreign animal diseases. Within the BRI, two core facilities in molecular virology and applied immunology support education and research. Basic and applied research, such as pathogen detection, diagnostics and vaccine development, is ongoing on numerous pathogens.

Training of the next generation of plant pathogen researchers is critical to worldwide food security. The BRI training laboratory provides hands-on activities in a pathogen-free training area. Students gain foundational skills in a realistic



work environment without the risk of biosafety concerns or biocontainment breaches. The BRI also includes world-class high-definition video capture and streaming technology allowing the training suite and research areas to broadcast live video or serve as filming studios. Using this technology, annual, weeklong Plant Biosecurity short courses have been conducted at the BRI and recorded to enable educational outreach.

## Relevance

A comprehensive wheat blast preparedness plan that includes effective surveillance, accurate diagnostics, a reliable forecasting system, resistant wheat cultivars, and an effective fungicide management strategy is under development. Ongoing research at the BRI will expand knowledge about wheat blast and provide support to the nation should an outbreak occur in the United States.

## Agency Contact Information

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