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Control of Fungal Diseases of Maize

What is the purpose of this research project?

Fumonisins are toxic compounds that are produced by the fungus Fusarium verticillioides, a causal agent of maize (corn) ear rot. Contamination of corn by fumonisins can result in several animal diseases, including cancer and neural tube defects and has been linked with esophageal cancer and neural tube defects in humans. This research project focuses on identifying the mechanism involved in Fusarium infections of corn, genetic regulation of mycotoxin production (i.e. toxins produced by molds) , and development of methods for the detection of Fusarium strains known to produce mycotoxins or cause disease.

What problem does it address?

In the US, it is estimated that hundreds of millions of dollars are lost annually as a result of mycotoxin contamination of crops. Even minute quantities of mycotoxin can reduce the marketability of agricultural commodities and necessitate extensive screening to ensure that crops are safe for human and animal consumption. In maize, mycotoxin contamination often occurs in association with plant diseases, such as maize ear and stalk rot, which reduce quality and yield, and can occur in virtually all regions of the US where maize is grown. Reducing crop loss from Fusarium related infections will require a better understanding of the plant-fungus interaction, toxin production, and developing strategies to prevent the infections from occurring.

What makes this research team unique?

The problems we are trying to solve are complex and involve a number of different scientific disciplines. Members of this group have expertise in chemistry, biochemistry, microbiology, genetics and plant pathology. The group has been at the forefront of discovery regarding the characterization of the biology, genetics, chemistry and biochemistry of fumonisin production. The team has developed bioinformatics resources as well as methodologies to characterize fumonisin production.

Who are the potential customers for this technology?

Customers of the information generated from this project will include plant breeders and other scientists in the public and private sectors interested in improving maize ear rot resistance, reducing the levels of mycotoxins in crops, and elucidating the mechanism of toxin production by Fusarium. Other interested parties include regulatory agencies, such as Food and Drug Administration; Grain Inspection, Packers and Stockyards Administration (GIPSA); Federal Grain Inspection Services (FGIS); Food Safety and Inspection Services (FSIS); and companies concerned with grain processing, seed production, agricultural biotechnology, and agrichemical.

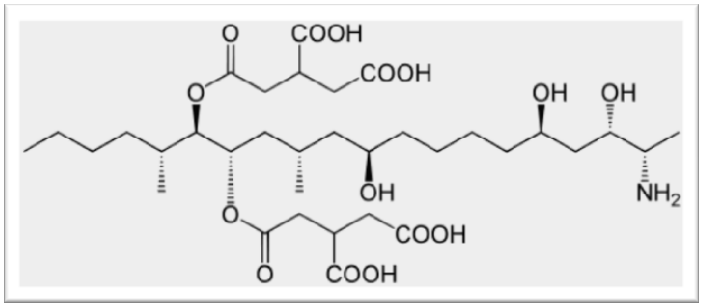
How is this technology transferred?

Technology transfer from this group generally is centered on technologies for studying and understanding the biology and chemistry of the fungus. Nucleotide sequences are routinely deposited in publically available databases, such as the National Center for Biotechnology Information.

The Research Team

Research on this project is conducted by Dr. Robert H. Proctor (Microbiologist), Dr. Daren W. Brown (Molecular Biologist), Dr. Mark Busman (Research Chemist) and Dr. Robert A.E. Butchko (Research Molecular Biologist) and five laboratory technicians. The scientists have nearly 100 years of combined research experience in fungal biology and genetics, chemistry and plant pathology required for addressing the problem of mycotoxin contamination of food and feed worldwide.

Maize ear rot caused by the fungus Fusarium



Fumonisin B1

For more technical information about this project:
http://www.ars.usda.gov/research/projects/projects.htm?accn_no=410216

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