

The 2013 Homecoming Lecture



Dr. Mark Krieger
Global Leader for Biotechnology
Registration and Operations at
Dow AgroSciences

Mark Krieger is the Global Leader for Biotechnology Registration and Operations at Dow AgroSciences in Indianapolis, IN, a global agricultural company that discovers, develops, and provides innovative crop protection, pest and vegetation management, seed, and agricultural biotechnology solutions to serve the world's growing population.

Mark received a bachelor's degree in Chemistry from the University of North Dakota in 1988, where he conducted research with Steve Hawthorne and Dave Miller at the UND Energy Research Center on supercritical fluid extraction of trace analytes from food and environmental matrices, and on the identification and quantitation of methoxylated phenols as tracers of atmospheric wood smoke pollution. Mark received a doctorate in analytical chemistry from Indiana University in 1993 under the direction of Professor Ron Hites, and then spent a year as a post-doctoral research associate in atmospheric chemistry at the University of California-Irvine under the direction of Professor F. Sherwood Rowland.

Mark joined DowElanco (now Dow AgroSciences) in 1994 as an environmental chemist and served in a number of scientific roles including technical leader for the Environmental Fate and Metabolism group. He has managed several crop protection and agricultural biotechnology products through global regulatory authorization processes, encompassing mammalian toxicology, environmental toxicology, environmental fate, human and ecological risk assessment, plant pest risk assessment, as well as secondary laws and regulations such as the National Environmental Policy Act (NEPA).

He currently serves at the US Regulatory Leader for the Enlist™ family of herbicide-tolerant crops, and is actively involved in a number of projects across the global plant biotechnology industry aimed at solving issues such as creating functioning biosafety regulatory systems in developing countries, defining regulatory frameworks for new technologies, eliminating global trade issues caused by asynchronous regulatory approvals of biotechnology traits in different countries, and creating a framework to facilitate the creation of a marketplace for off-patent biotechnology events while preventing disruptions of US agricultural exports.

Dr. Mark Krieger

Presents:

*“A Global Perspective on Plant Genome Editing
Technologies: Applications and Regulatory Outlook”*

*Friday, October 11, 2013 at 4 PM
Abbott Hall Room 101*

Prior to the lecture a reception will take place at 3:15 in Abbott Hall Room 232.

A Global Perspective on Plant Genome Editing Technologies: Applications and Regulatory Outlook

Over the past decade, new technologies have emerged that enable investigators to perform knowledge based plant genome improvements in a variety of crop species. Technologies such as zinc-finger nucleases (ZFNs), TALENs and CRISPRs allow scientists, for the first time, to make precise genomic mutations and targeted gene insertions in plants which allow new plant varieties to be developed with more knowledge, faster and less expensively than with traditional mutational and conventional breeding methods.

These technologies are based on the use of engineered nucleases composed of sequence-specific DNA binding domains fused to non-specific DNA cleavage modules; they are collectively described as Site Directed Nucleases (SDN). These chimeric nucleases enable precise genetic modifications by inducing targeted DNA double-stranded breaks that stimulate the cellular DNA repair process in plants. The versatility of these technologies is derived from the ability to custom design the sequence-specific DNA binding domain to bind to vertically any unique DNA sequence in the plant genome.

The potential uses of SDNs are innumerable and include removal of allergenic traits, reduction or removal of anti-nutrient compounds, enhancing healthy oil quality in canola and other crops, increasing fruit yield, and increasing resistance to environmental stressors such as drought, disease and flood.

Although these technologies offer essential agronomic and nutritional solutions to a growing world population, the regulatory framework for products developed using these modern technologies remains unclear and uncertain due to differences in global regulatory policies. It has been estimated that the average regulatory cost and time to obtain global regulatory approvals for a new GMO (Genetically Modified Organism) is approximately \$35 million and around six years. An important aspect controlling the adoption of SDN technology, and its application to crop improvement, is whether these techniques will be regulated like GMOs (with the corresponding costs and timelines), or if they will be regulated based on the properties and intrinsic risk of the products themselves.

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