October 30, 2013

The Life of a Genetically Modified Organism:
From the laboratory to your dinner table

Introduction:
GMOs have been making headlines recently, but what exactly is a genetically modified organism? This lecture will start by covering GMOs in the laboratory - how they’re made and how that compares to traditional methods of genetic alteration like selective breeding. We’ll then talk about GMOs on your dinner table - what foods are currently available as GMOs, what traits they have that make them desirable, and what effect their presence has on us and the world around us. Finally, we will delve into the future of GMOs, looking ahead to the demands of a growing world and considering how GMOs may help stabilize food supply and combat tropical diseases like malaria.

Speakers:
Natalie Moroz grew up in Wisconsin and received her Bachelors of Science degree in Neuroscience from Brown University. She is currently a PhD candidate in Dr. Keith Blackwell’s lab in the Genetics Department at Harvard University. Her current research uses the model organism C. elegans to look at how dietary restriction regulates key nutrient and stress signaling pathways, how these pathways regulate one another, and in effect how dietary restriction extends lifespan and healthspan. Outside the lab, Natalie enjoys reading, running, yoga and salsa dancing.

Steph Guerra is a second year PhD candidate in Dr. Karen Cichowski’s lab where she studies cancer cell signaling. Her current research focuses on how signaling networks are regulated in the context of melanoma. Outside of lab, Steph enjoys running, mentoring students interested in scientific careers, going to concerts, and watching the final season of How I Met Your Mother.

Sharon Hung grew up in Hong Kong and received her Bachelor of Science degree in Genetics at the University of Wisconsin-Madison. She is currently a PhD candidate at Harvard Medical School working in the laboratory of Daniel Finley at Cell Biology Department. She is interested in how mis-regulation in the ubiquitin proteasome pathways would lead to human diseases. Outside of science, Sharon enjoys running, hiking, and cooking.
Glossary of Important Terms

**GMO:** An organism in which the genetic material (DNA) has been altered in a way that does not occur naturally.

**Gene:** A unit of DNA that instructs for production of a protein.

**Protein:** A biological molecule that functions as a tool within cells, performing a certain function.

**Mutation:** A change in DNA that may cause a change in the protein produced.

**Recombinant DNA:** A DNA sequence that is combined from two or more organisms or from DNA that is synthetically created and whose sequence does not occur in nature.

**Vector:** A double-stranded small circular DNA commonly used to replicate recombinant DNA.

**Substantial Equivalence:** The concept that a new GM food is considered safe for consumption if its composition is found to be generally equivalent to an existing food or food component already on the market. It is the starting point for the safety testing of GM foods that is used by national and international agencies.

**Trait:** A distinguishing quality or characteristic. Genetic modification may introduce a new trait by introducing a different protein or enzyme into the organism. Example: Introduction of Bt toxin into corn gives corn inherent resistance to pests.

**Bt toxin:** A protein produced by the bacteria *Bacillus thuringiensis* that is toxic to a narrow range of insects. Its specificity is based on the fact that only gut cells in certain organisms are able to recognize its shape. It has been used as an environmentally friendly pesticide since the 1920s.

**Enzyme:** A protein found in cells that is able to carry out chemical reactions to convert one type of molecule to another.

**Beta-carotene:** A strongly colored orange-red pigment abundant in fruits and vegetables. It is a precursor to vitamin A and thus, consumption of beta-carotene is vital to vitamin A-rich diet.

**Drought-tolerant rice:** Genetically modified rice that has the ability to withstand heat waves and extreme temperature in drought condition by continuously producing the important plant hormone, Abscisic Acid (ABA), and improving root extension into the soil.

**Salt-tolerant tomato:** Genetically modified tomato that contains a salt transporter to pump salt from the soil into root cells. Salt is then stored inside the leaves of the tomato plants.

**Aquadvantage® salmon:** Genetically modified salmon with growth promoting genes inserted from other fish species to promote growth and meat production.

**Anti-malarial mosquito:** Genetically modified mosquito that retains parasites in its gut instead of its salivary gland, thereby lowering the transmission rate of infectious malaria parasite into humans through mosquito bites.

** Banana vaccine:** Genetically modified banana that produces vaccine as it grows. It could serves as an edible vaccine especially for impoverished regions where people have little access to vaccinations.

**Resources to learn more**


**Buzz Off! (GMO mosquito) SITN Flash Article:** [http://sitn.hms.harvard.edu/flash/2010/issue82/](http://sitn.hms.harvard.edu/flash/2010/issue82/)

**Upcoming SITN Events**

**November 6:** Big Data in the Postgenome Era: What can the human genomics sequence do for you?

**November 11:** Science by the Pint with Dr. Richard Losick “Are We More Microbial than Human?”

**November 13:** Math in Nature: Finding order in chaos

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