Student Project Aims to Prevent Blindness in Children Using Bacteria

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Heading off blindness in children, especially in the world's poorer countries, is the goal of a University of Guelph student project that recently won a medal at an international science competition.

The U of G team used genes taken from common soil bacteria that make lots of carotenoids, including beta-carotene, an essential nutrient found in carrots, potatoes and squash that the body converts to vitamin A. Stitching those genes into the gut microbe E. coli causes the latter to produce beta carotene.

Other researchers have modified laboratory strains of E. coli in this way but this is the first time anyone has used microbes found in the human gut, according to team leader David Johnston Monje, a PhD student in the Department of Plant Agriculture.

The team showed their project at a genetic engineering contest this week at the Massachusetts Institute of Technology, capturing the bronze medal. This is the first time a Guelph team entered the annual International Genetically Engineered Machines (iGEM) competition. The contest challenges university students to use biotechnology, including a standard toolkit containing bits of DNA, to make cells with new and unusual properties.

"It's like a science fair for university students in genetics and biology," Johnston Monje said. "It was overwhelming and interesting. People were impressed with our work."

He added the work might lead to an alternative to vitamin pills or foods that are inaccessible to many people in developing countries.

Vitamin A deficiency is the leading cause of preventable blindness in children and increases the risk of infectious disease and death. It's a public health problem especially in Africa and Southeast Asia and particularly for young children and pregnant women in low-income countries. About 250 million preschoolers are vitamin A-deficient, according to World Health Organization statistics.

"Any technology that increases the supply of vitamin A is invaluable," said plant agriculture professor Manish Raizada, who is Johnston Monje's supervisor. "Guelph is a perfect intersection of agriculture, food science, international development and microbiology. We want to develop low-cost technologies for developing countries."

The project demonstrates U of G's strengths in applied plant sciences, says department chair Rene Van Acker. "To have the University of Guelph represented at this event is important."

Besides Johnston Monje, the Guelph team consists of Eddie Ma, a master's student in Computing and Information Science, and undergraduate students Brendan Hussey, Lisa Ledger, Tin Vo, Jennifer Vo and Mufaddal Girnary.

The iGEM contest, which began in 2004, included 85 teams this year from about 20 countries, including

teams from about 10 Canadian universities. Previous teams have turned bacterial cells into computational logic devices, made systems to detect environmental chemicals like arsenic or metals, and modified human cell lines to resist infection.

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