Bio-bites!

Report on GE crops published

In May 2016, The National Academy of Sciences published a report titled “Genetically Engineered Crops: Experiences and Prospects.” The study committee found no substantiated evidence of a difference in risks to human health between currently commercialized genetically engineered (GE) crops and conventionally bred crops, nor did it find conclusive cause-and-effect evidence of environmental problems from the GE crops. The committee examined almost 900 research and related publications on the development, use, and effects of genetically engineered characteristics in maize (corn), soybean, and cotton, which account for almost all commercial GE crops to date. The committee carefully searched all available research studies for persuasive evidence of adverse health effects directly attributable to consumption of foods derived from GE crops but found none. Studies with animals and research on the chemical composition of GE foods currently on the market reveal no differences that would implicate a higher risk to human health and safety than from eating their non-GE counterparts.

Genetically Engineered Crops: Experiences and Prospects (2016). Committee on Genetically Engineered Crops: Past Experience and Future Prospects; Board on Agriculture and Natural Resources; Division on Earth and Life Studies; National Academies of Sciences, Engineering, and Medicine. ISBNs: Prepublication: 978-0-309-43735-6; Paperback (forthcoming): 978-0-309-43738-7. http://dx.doi.org/10.17226/23395. Available from http://www.nap.edu/catalog/23395/genetically-engineered-crops-experiences-and-prospects.

Engineered bacterial symbionts deliver RNAi to insects

Insects and arthropods are of enormous significance as agricultural or stored product pests and vectors of disease, as well as many species being beneficial such as pollinators. In a recent publication, a novel way to exploit the association between culturable symbiotic gut bacteria and their hosts is described.

The authors demonstrate symbiont-mediated RNAi in 2 insect species: one a tropical disease vector, the second a globally invasive agricultural pest. Using synthetic biology, they engineered 2 dsRNA expression cassettes suitable for diverse applications in a Gram-positive actinobacterium and a Gram-negative gamma proteobacterium that are symbionts of the haematophagous R. prolixus and the phytophagous F. occidentalis, respectively. These cassettes are designed for insertion of sequences to target expression of any gene via RNAi. Introduction of these cassettes into bacteria deficient in synthesis of RNaseIII permits stable synthesis of specific dsRNA molecules that can be absorbed by the insect gut and induce systemic RNAi, presumably after bacterial cell death and lysis in insects.

Miranda M. A. Whitten, Paul D. Facey, Ricardo Del Sol, Lorena T. Fernández-Martínez, Meirwyn C. Evans, Jacob J. Mitchell, Owen G. Bodger, Paul J. Dyson. Symbiont-mediated RNA interference in insects. Proc. R. Soc. B 2016 283 20160042; http://dx.doi.org/10.1098/rspb.2016.0042.

Nobel laureates speak up in support of GMOs

More than 100 Nobel laureates and more than 5,700 scientists have signed a letter urging Greenpeace to end its opposition to genetically modified organisms (GMOs). The letter asks Greenpeace to cease its efforts
to block introduction of a genetically engineered strain of rice (known as “Golden Rice”) that supporters say could reduce Vitamin-A deficiencies causing blindness and death in children in the developing world. This letter campaign was organized by Richard J Roberts, chief scientific officer of New England Biolabs and, with Phillip Sharp, the winner of the 1993 Nobel Prize in physiology or medicine for the discovery of genetic sequences known as introns.

The letter, which is available online, states that:

Scientific and regulatory agencies around the world have repeatedly and consistently found crops and foods improved through biotechnology to be as safe as, if not safer than those derived from any other method of production. There has never been a single confirmed case of a negative health outcome for humans or animals resulting from their consumption. Their environmental impacts have been shown repeatedly to be less damaging to the environment, and a boon to global biodiversity.

Support Precision Agriculture. Available from http://supportprecisionagriculture.org/index.html.

107 Nobel laureates sign letter blasting Greenpeace over GMOs. The Washington Post; Joel Achenbach, 30 June 2016. Available from https://www.washingtonpost.com/news/speaking-of-science/wp/2016/06/29/more-than-100-nobel-laureates-take-on-greenpeace-over-gmo-stance/.

**Engineered bacteria to fight cancer**

In a recent publication in Nature, researchers have described a synthetic genetic circuit that mimics the quorum-sensing systems used by bacterial populations to coordinate gene expression and enables bacteria to deliver drugs to mouse tumors in repeated and synchronized cycles.

A strain of *Salmonella typhimurium* was engineered to lyse synchronously at a threshold population density and to release a genetically encoded cargo. Following quorum lysis, a small number of surviving bacteria will reseed the growing population, thus leading to pulsatile delivery cycles.

A combination of 3 different engineered strains with a common clinical chemotherapy of 5-fluorouracil (5-FU) led to roughly a 50% increase in the mean survival time for animals with incurable colorectal metastases.

According to the authors, this approach establishes a methodology for leveraging the tools of synthetic biology to exploit the natural propensity for certain bacteria to colonize disease sites.

Din MO, T Danino, A Prindle, M Skalak, J Selimkhanov, K Allen, E Julio, EAtolia, LS. Tsimring, SN. Bhatia, and J Hasty. Synchronized cycles of bacterial lysis for in vivo delivery. Nature 2016; 536:81–85. http://dx.doi.org/10.1038/nature18930.

Zhou S. Synthetic biology: Bacteria synchronized for drug delivery. Nature 2016; 536:33–34. http://dx.doi.org/10.1038/nature18915

Azvolinsky A. Arming Synthetic Bacteria Against Cancer. The Scientist 2016. Available from: http://www.the-scientist.com/?articles.view/articleNo/46595/title/Arming-Synthetic-Bacteria-Against-Cancer/andutm_campaign=NEWSLETTER_TS_The-Scientist-Daily_2016andutm_source=emailandutm_medium=emailandutm_content=31930409and_hsmi=31930409.