# Genetically Modified Crops: Is it our savior or a threat?

(by HKUST iGEM 2107)

Ever since the first genetically modified crop, Flavr Savr tomato was approved by the Food and Drug Administration in 1994 to be sold in grocery stores[1], there have been worldwide debates on the safety of consuming genetically engineered crops. A survey targeted to the Hong Kong general public showed that more than 50% of the participants surveyed think that genetically engineered food will negatively affect the ecosystem and human health. Despite the fact that most of the participants had prior education equivalent to a bachelor's degree or above, more than 42% of them have limited knowledge about genetically modified food.

**[Image Credit: intelligencesquaredus.org]**

## Genetic Modification (GM)

Genetic modification is the process of changing a trait of one organism by transferring exogenous DNA within or across species through the use of genetic engineering or molecular biotechnology, in order to cause genetic recombination. The organisms being modified will then express a trait (genotype & phenotype) that does not occur naturally among its species. There are many more techniques involved in genetic modification such as deleting, multiplying and moving gene from its original position. This is often done to solve issues in areas such as food and nutrition, therapeutics, and environmental issues.

Genetic modification often comes with good intention, an example of this is the "Golden Rice" where rice crops were modified to resolve malnutrition in developing countries. "Golden Rice" employs a segment of exogenous DNA into the conventional rice crop to allow it to generate β-carotene on its own. β-Carotene is utilized to synthesize vitamin A inside the human body. which can subsequently prevent night blindness and developmental disorders. This project indeed helped save thousands of children from blindness or death due to Vitamin A deficiency.[2]

[1] http://www.rosebudmag.com/truth-squad/gmo-timeline-a-history-of-genetically-modified-foods

[2] http://www.goldenrice.org/Content4-Info/info.php

## An analytical mind towards GM food

Despite the benefits that GM crops have brought to humankind, there are more than 200 organizations campaigning against genetically engineered food worldwide. GM food became a big issue in 2012, when Gilles-Eric Seralini affair published an article stating that genetically modified corn was found to cause tumours in mice. Seralini's article stated that mice which consumed "herbicide-resistant corn" for two years developed tumours and organ failures at a rate double to triple more than that of normal mice.

Paying special attention to the issue, the European Food Safety Authority was commissioned by the European Commission to reevaluate the research results. It was found that the experiment had serious errors: 1) the experimental design did not meet scientific standards; there was only one control group to compare the results with (10 samples), and the mice used were of a cancer-prone strain, which cannot fully show the relationship between tumor formation and genetically modified food; 2) the experimental results lack persuasiveness; there was no prior examination of organ function for the mice used in the experiment. Therefore, the European Commission's final conclusion was: Since the experiment did not "adhere to accepted scientific standards", the experimental results were not convincing, and the genetically modified corn was deemed safe.

As far as the public is concerned, there will always be two sides to this story. How can we decide whether the genetically modified food on the market is safe? Would GM food consumption affect human's health?

According to the World Health Organization, genetically modified food has to pass through different systems of rigorous evaluations by national authorities prior to the marketing of these products. Safety assessments of these food include: (a) direct health effects (toxicity), (b) potential to provoke allergic reaction (allergenicity); (c) specific components thought to have nutritional(what?) or toxic properties; (d) the stability of the inserted gene; (e) nutritional effects associated with genetic modification; and (f) any unintended effects which could result from the gene insertion.[3] As a result, GM food currently available in the international market is unlikely to pose risks for human health as they have passed the safety assessments. Furthermore, there have been no records on negative effects of GM food consumption upon human health in countries where GM food is approved.

With numerous sources online where authors may have different intentions, information that the public receives can sometimes be misleading. It is therefore important for readers to have a general knowledge on different scientific standards where results from research have been acknowledged by the authority. To prevent the public from getting into an unfounded fear, it is also important for researchers to perform experiments in a more transparent manner to emphasise (decide if we want british or american spelling) the accountability of the results.

After all, consumers have the right to select which kinds of food they would like to consume, whether it's GM or organic food. So please make sure you have gathered enough sources before you decide!

[3] http://www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en/