

# Can Education Reduce Fears of Genetic Modification?



By Chuck Dinerstein, MD, MBA — January 27, 2020

*For centuries farmers have tried to bend their crops -- nature's bounty -- to their will to create bigger, more plentiful, perhaps ever-tastier foods. In the past, this genetic editing, known as hybridization, has been luck of the draw. But new genetic technologies have changed that random-luck equation. A new study looks at how your scientific literacy impacts the perception of these changes, and whether knowing more reduces fear.*



Image courtesy of Nick Sweet on Pixabay [1]

Gene editing, using a CRISPR approach to alter single-nucleotide pairs and genetic modification, where entire genetic alterations are incorporated into a plant's DNA through the use of bacterial "messengers," have allowed farmers and scientists to make more intentional, directed changes. No matter where you come down on the use of GMOs, conventional hybridization, gene editing, and genetic modification exist on a spectrum of technologies with the same goal, better crops.

For some individuals, there is little difference between gene editing and hybridization; there are no foreign genes, just simple edits creating essentially the **same product**, with editing more assured than conventional crossbreeding. Other individuals see gene editing and genetic modification as closer together, **manipulating** DNA, whether by SNP or exogenous genes, both methods with uncertain and perhaps more significant risks. Individuals' perceptions of the risk and benefit to

these manipulations vary with their level of education and their exposure to specific information. As an organization that tries to debunk and educate, this is a necessary investigation.

## **The Study**

The study involved citizens of Japan, which has relatively strict regulations of GMOs, participating in a web-based survey. Three populations were recruited, 3000 adults age 20 to 69 representing a variety of education levels, roughly 100 scientists trained in molecular biology, and an additional 100 scientists, whose area of expertise was outside of molecular biology, in areas like physical and social science, health and information technology.

The researchers wanted to discover 1) how attitudes towards these technologies differ among the three groups; and 2) how their scientific literacy influenced changes in attitudes when given additional information on risks, benefits, and value.

The survey determined the scientific literacy of the public sample using a standardized assessment that asked questions like “Antibiotics kill viruses as well as bacteria. True or False?” The lay-public had a correct answer rate of 53.6%, which the researchers indicated was similar to prior studies. Perception of risk and benefit came from another standardized assessment yielding a score for each category. Risk and benefit were assessed before and after information was provided for each of the three means of genetic modification.

## **The Results**

- The perception of benefits was positively correlated with increasing expertise and science literacy.
- The perception of risks was more mixed.
- Experts, that is molecular biologists, perceive the highest benefit and lowest risk to the newer technologies, and their views were unchanged given information. Presumably, information that already had. But they did have a more nuanced view of risk, being more concerned with misuse and bio-ethics of the newer technologies, rather than their safety. The researchers felt that this reflected a picture of “genetic modification” as a product rather than a process.
- The lay public, on the other hand, seems to perceive these technologies as DNA manipulation, a new process. Their perception of benefits and risk changed with more information but primarily for conventional breeding techniques. There was little, if any, change in their opinions for gene editing or modification.
- The more general group of scientists fell in between these poles. They were closer to the public perception of risk and closer to the molecular biologists’ understanding of value.
- Trust in food governance was associated with a greater positive attitudinal change for both gene editing and modification.
- A tendency towards “risk avoidance” in general seems to have no impact.

As a generalization, we might conclude that perception of risk and benefit is not solely due to a “lack of information” or general scientific literacy. Newer technologies that require a greater fundamental understanding of scientific findings may suffer because that information is transmitted more informally, through the media and sound bites, rather than textbooks and tests. Or we might conclude that it is easier to help people identify new benefits. Still, that risk remains a more

subjective, personalized decision – how much abundance is required for “an abundance of caution.”

Scientists seem to perceive outcomes, an orange is an orange, no matter how it is created. The general public, even with additional information, appears to concentrate on how food was produced in determining the benefit, and more so, the risk. Science literacy is not a static process, determined by the science you learned in school; it is a resource that needs to be reinvigorated and supplemented if we are to understand the choices to be made fully. We, and by that I include the American Council on Science and Health, need to find better ways to continue the scientific education of our citizens.

Source: Expert and public perceptions of gene-edited crops: attitude changes in relation to scientific knowledge Nature DOI: 10.1057/s41599-019-0328-4

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