Gene-edited foods are GMOs

Genome editing (also called gene editing) is genetic engineering (also called genetic modification) and results in the creation of genetically modified organisms (GMOs).

- Genetic engineering uses artificial techniques in the laboratory to intervene directly in the genome of organisms. **There is no dispute in the global scientific community** that genome editing techniques, such as CRISPR-Cas, are the latest and most powerful genetic engineering techniques. These new techniques are sometimes also referred to as genome engineering.[1]

- Genome editing can be used to replace one DNA sequence with another, or to delete or add a gene sequence or a part of a gene sequence. The techniques share some of **the same methods** as earlier genetic engineering techniques. Of the three steps involved in genome editing – gene delivery, gene editing, and whole plant regeneration in tissue culture – the first and last steps essentially remain the same.[2]

- The new techniques raise many of the **same risk questions** as earlier techniques, and raise the same environmental, social, economic and ethical concerns. The lack of government safety assessments in Canada for many gene-edited foods may enhance the health and environmental risks.

- Products that are **currently labelled as non-GMO** through the popular certifications of the Non-GMO Project and/or the Canadian Organic Standards exclude gene edited products. These standards correctly define gene editing as genetic engineering and accurately understand and respond to the concerns of the public about the use of the technology.

- Consumer opinion polls show a **high level of uncertainty about the safety of gene edited foods** in Canada and the US. Most consumers surveyed are either fearful about the health impacts or did not know how to feel, with a range of 20%-60% of consumers being unwilling to eat gene-edited foods.[3]

- Gene editing may be equally or more controversial than earlier GMOs because most gene-edited plants in Canada are not subject to a government approval process i.e. there are no government safety assessments. **This lack of government oversight may enhance consumer concerns about safety.** Furthermore, companies are not required to notify the government of the market entry of these unregulated gene-edited foods. The lack of mandatory labelling in Canada combined with this lack of mandatory reporting of new gene-edited foods is set to increase consumer confusion in the marketplace and public mistrust.

1 Joy Y. Wang and Jennifer A. Doudna, CRISPR technology: A decade of genome editing is only the beginning. *Science* 379, eadd8643(2023). DOI:10.1126/science.add8643

2 For a discussion see Canadian Biotechnology Action Network, Genome Editing in Food and Farming: Risks and Unexpected Consequences, 2020. https://cban.ca/GenomeEditingReport

3 Vasquez O, Hesseln H, Smyth SJ. Canadian Consumer Preferences Regarding Gene-Edited Food Products. *Frontiers in Genome Editing*. 2022 Apr 11; Cummings, Christopher, Peters, David J. Who Trusts in Gene-Edited Foods? Analysis of a Representative Survey Study Predicting Willingness to Eat- and Purposeful Avoidance of Gene Edited Foods in the United States. *Frontiers in Food Science and Technology*. Volume 2 – 2022.

Gene editing is new genetic engineering

Gene editing is a collection of **new genetic engineering (genetic modification or GM) techniques** that alter the genetic material (usually DNA) of plants, animals and other organisms, to create genetically modified organisms (GMOs). These techniques aim to insert, delete or otherwise change a DNA sequence at a specific, targeted site in the genome. (The genome is the entire set of genetic material in an organism, including DNA.)

How does it work?

Gene editing, generally, uses DNA cutters that are guided to a location in an organism's DNA, to cut the DNA. This cut is then repaired by the cell's own repair mechanism, which creates DNA "edits" that change the organism. The most frequently used gene editing technique is called CRISPR but other techniques follow similar principles.

- Until now, genetic engineering created new DNA sequences by inserting new genes that became a permanent part of the GMO (transgenics). With gene editing, genetic material is inserted to **perform "edits"/ make changes** to the genome (delete DNA, for example) but this genetic material does not need to be incorporated into the final GMO and is often removed. This is why GMOs created through gene editing are genetically engineered but may not have any "foreign DNA" (DNA from other species).
- Gene editing is often said to be more precise than earlier GM techniques because, unlike other techniques that insert genes at random locations in the genome, almost all gene editing techniques insert genetic material that is **guided to a specific target site in the DNA** to perform "edits." However, gene editing is also known to cut at additional "off-target" sites.

CORPORATE SELF-REGULATION OF GENE EDITED GMOS IN CANADA

In 2022/2023, the Canadian government removed government safety assessments for gene edited plants that have no foreign DNA (no remaining DNA from other species). This means that many gene edited plants and foods can enter our food system and environment without any independent science or government oversight, and no notification to farmers or consumers.

Unexpected and unpredictable effects

Gene editing can be imprecise and, just like other genetic engineering techniques, cause unexpected and unpredictable effects.

Gene editing can create genetic errors in the GMO. These effects can lead to unexpected and unpredictable outcomes, such as changes in protein composition.

- The CRISPR system can make unintended edits to the host's DNA at unexpected places, not just the target location.
- Gene editing can cause extensive deletions and complex re-arrangements of DNA.
- Unwanted DNA can unexpectedly integrate into the host organism during the genome editing process.

cban.ca/gene-editing

The Canadian Biotechnology Action Network (CBAN) brings together 15 groups across Canada to research, monitor and raise awareness about issues relating to genetic engineering in food and farming. CBAN is a project on the shared platform of MakeWay Charitable Society.

cban.ca