



Understanding Biotechnology: New GMOs

THE NON-GMO PROJECT: BUILDING SOURCES OF NON-GMO PRODUCTS

The Non-GMO Project Product Verification Program allows participants to submit products to be evaluated against the [Non-GMO Project Standard](#).

Please review [Understanding Biotechnology: What is a GMO?](#) for GMO basics.

THE EMERGENCE OF NEW GMOS

For the past 25 years, genetically modified organisms have been largely limited to transgenic crops and animals: organisms that have been genetically modified by combining the DNA from two or more different species. This is beginning to change. GMOs are now being created with newer genetic engineering techniques, some of which do not involve transgenic technologies. The Non-GMO Project is committed to preventing these new GMOs from entering the non-GMO supply chain. At present, several factors are making this difficult.

CHALLENGES WITH NEW GMOS

Testing for GMOs depends on the commercial availability of such tests. There currently are no tests commercially available for new GMOs or their derivatives. This means that tracking them relies heavily on affidavits and other documentation rather than tests.

Additionally, GMO regulations have not caught up with new GMOs. GMOs are regulated under the Coordinated Framework for Regulation of Biotechnology in the United States. This law has not been effectively updated since 1986 and does not reflect the current state of biotechnology. The more recent National Bioengineered Food Disclosure Standard, a labeling law, does not address these new techniques.

There is also some degree of confusion about whether products of new genetic engineering techniques are GMOs. Some of these new GMOs have been marketed as non-GMO. To be clear, all products of new genetic engineering techniques are GMOs.

NEW TECHNIQUES

Many techniques are being used to genetically modify living organisms. Some of the more prevalent or noteworthy techniques include:

New Genetic Engineering Techniques

ODM - Oligonucleotide-directed mutagenesis involves the insertion of new DNA that mimics a portion of the plant's genome and is incorporated via the cell's own repair function.

RNAi - RNA interference is a process whereby RNA molecules inhibit gene expression via translation blocking or degradation. This prevents a specific portion of DNA from being read or degrades it so that it does not function.

ZFN - Zinc finger nucleases create double-strand breaks or cuts in DNA using DNA binding proteins. ZFN is older and more expensive than TALEN and CRISPR.

TALEN - Transcription activator-like effector nucleases create double-strand breaks or cuts in DNA using engineered restriction enzymes.

CRISPR - Clustered regularly interspaced short palindromic repeats create double-strand breaks or cuts in DNA using an endonuclease (Cas9) and synthetic guide RNA.

NEW PRODUCTS

New genetic engineering techniques are being used to develop novel products and ingredients. While many of these products are still in the research and development stages, some are commercially available now. As the Non-GMO Project understands it, these commercially available new GMOs include non-browning potatoes, non-browning apples, high-oleic acid soybeans, herbicide-tolerant canola, and many products of genetically engineered microbes.

Products of New Genetic Engineering Techniques

New crops (e.g., non-browning potato and apple, high oleic acid soy, and new herbicide-tolerant canola)

Animals (e.g., hornless cows)

Flavorings (e.g., vanilla, citrus, ginger)

Animal proteins identical to those found in milk and eggs

Heme

Cosmetic product inputs (e.g., collagen)

Fragrances (e.g., patchouli, sandalwood, and citrus)

Dyes and inks

Leather and textiles (e.g., spider silk)

Opiates and cannabinoids (e.g., THC, CBD)

Probiotics

Vitamins

As products of new genetic engineering techniques continue to enter the marketplace, the Non-GMO Project remains committed to keeping these new GMOs out of the non-GMO food supply.