
Fourth FGU video: CRISPR/Cas - inherent risks

The Project Genetic Engineering and the Environment explains why the risks need to be examined in detail

18 June 2021 / The *Project Genetic Engineering and the Environment* (FGU) is today publishing its fourth explainer video on CRISPR/Cas gene scissors. The basics of the technology, its possibilities and risks are presented in a series of four videos in total. They focus, in particular, on explaining gene scissor applications in plants. The FGU explainer videos aim to encourage and support informed public dialogue on new genetic engineering methods, including their potentials and risks. The FGU will also be publishing background papers on the individual topics with further information and references to scientific articles on its website.

The video and background paper released today describe risks associated with gene scissor technology. CRISPR/Cas applications involve a multi-step process in which various unintended changes can occur that are specific to both old and new genetic engineering. Older genetic engineering techniques, which are the most common way of introducing gene scissors DNA into plant cells, can cause additional DNA fragments to be inserted into the genome and lead to the restructuring of DNA regions. New genetic engineering techniques can effect in various ways that DNA fragments are additionally inserted into the genome (on-target effects) and that other DNA sequences are changed in addition to the target sequence (off-target effects). Both types of effects can lead to unintended gene knockouts or to the formation of new gene products.

The potential of gene scissors plays an important role in the analysis of the risks inherent in the technology:

If an off-target region is present multiple times in a plant genome, several or all the genes containing this DNA sequence can be unintentionally altered. Where, for example, an off-target region is found in one gene of a gene family, the gene scissors may unintentionally affect several or all the genes in this gene family at the same time.

CRISPR/Cas can also affect parts of the genome where changes are very unlikely to occur naturally. This means there can be unintended effects in areas that are, for example, protected by the cell's own repair mechanisms or that are difficult to access.

In addition, several different, rather than just one and the same, new gene product can be formed at each individual altered target sequence.

The FGU has been conducting continuous 'Horizon Scanning' in the field of new biotechnologies since March 2020. It also evaluates the scientific literature. The aim is to identify and analyze new technical developments, their applications in the field of biotechnology and possible environmental impacts in the context of the precautionary principle. FGU findings have already been published several times in peer-reviewed scientific journals. The project is funded by the Federal Agency for Nature Conservation, the project coordinator is Testbiotech.

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Further information: [The FGU explainer video](#) [2]

[The FGU background papers](#) [3]

[The FGU Horizon Scanning process](#) [4]

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