New GE unintentionally leaves traces in cells

CRISPR/Cas gene scissor applications cause changes in gene regulation

18 December 2020 / A new scientific publication shows that CRISPR/Cas gene scissor applications in animals unintentionally leave traces. The findings are not related to unintended changes in the DNA, which have often been described, but to gene regulation, i.e. epigenetics. The effects are heritable and may, for example, result in disruption of embryonic development.

The new scientific publication describes CRISPR/Cas experiments with mice in which their DNA is cut and additional genetic information inserted. Besides intended changes in DNA in the target region, the findings also showed unintended changes in so-called epigenetic markers that control gene regulation. The effects were heritable and could still be identified after ten generations. According to the authors, the effects can also be used to identify CRISPR/Cas gene scissor applications.

The results were specific to some particular gene scissor applications and not observed if no additional genetic information was inserted. Further experiments are necessary to investigate the effects of the epigenetic changes in each specific organism. It is also not known whether the gene scissors may cause changes in other epigenetic markers, or if similar effects might be expected in insects and plants.

Epigenetic effects are often heritable without the DNA itself being changed. Epigenetic factors are, for example, decisive for the embryonic development. In addition, reactions to environmental stressors are also influenced by epigenetics. In this context, epigenetic markers determine which genes are activated or silenced in which cells, thereby controlling gene expression. These epigenetic markers are not mutations in DNA, but biochemical attachments.

The recent findings not only indicate risks for medical applications but also for the environment: for example, gene drive organisms generated by CRISPR/Cas are altered in a way that additional genetic information is inserted in the genome of all offspring. If this process also causes unintended changes in gene regulation, environmental risk assessment is much more complicated.

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Further information: The recent scientific publication [2]
Background and summary (by 'Project Genetic Engineering and the Environment') [3]

Links
[1] mailto:info@testbiotech.org
[2] https://doi.org/10.1186/s12864-020-07233-2
[3] https://fachstelle-gentechnik-umwelt.de/en/detection-of-crispr-mediated-genome-modifications-2/