# CRISPR: Gene scissors cause chaos in the genome

Experiments using human embryos end up with loss of whole chromosomes

11 November 2020 / A new publication has described experiments using CRISPR/Cas9 gene scissors on human embryos. The aim of the experiments conducted in the US was to correct a mutated DNA sequence that causes a genetic disorder. This disorder can result in blindness (Retinitis pigmentosa). The gene scissors were supposed to cut the faulty gene sequence – and the expectation was that the fault in the genome would then be corrected via cell repair mechanisms. This aim was not accomplished. Instead, either large parts or the whole of chromosome 6, where the gene is located, were lost. In addition, there were further unintended mutations in the target gene sequence.

As expected, the gene scissors cut both strands of the DNA at the target site. However, some of the cells were unable to repair the 'double-strand break' correctly by re-joining the strands of DNA. In some embryos, either large parts of the chromosome or the whole chromosome, were lost during subsequent cell divisions.

In addition, unintended effects were caused in another gene that is similar to the target gene but located on a different chromosome. Such unexpected activity of the gene scissors also led to some embryos losing this chromosome.

Loss of chromosomal regions can severely impact the development of embryos: cancer as well as organ malfunction may be the result, and in many cases the embryos will die before birth.

According to Testbiotech, there is currently a tendency to ethically questionable experiments being carried out with gene scissors that 'use up' human embryos. At the same time, it is becoming clearer that applications of CRISPR/Cas9 are not as precise and safe as claimed. Several publications show that gene scissor applications in plants, animals and humans are flawed: the introduction of double strand breaks very often facilitates the occurrence of unintended effects, e.g. the insertion of additional DNA sequences or genomic rearrangements at the target site. The target gene is also frequently mistaken for similar genes. Even the loss of larger chromosomal regions has been reported several times.

In 2020, the inventors of the gene scissor CRISPR/Cas were selected for the Nobel Prize for Chemistry, despite a multitude of unanswered questions regarding risks and ethical problems associated with gene scissor applications. Currently, the evidence is mounting that the most frequently used gene scissor applications are not suitable for really precise and safe interventions in the genome.

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**Further information:** The recent publication: Zuccaro et al. (2020) [2]

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[1] mailto:info@testbiotech.org [2] https://doi.org/10.1016/j.cell.2020.10.025

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