

# CRISPR-Cas9: The Unintended Consequences of Molecular Makeover

## Christina My and Hannah Baughman\*

CRISPR-Cas9 is the one of the sharpest and most precise gene editing tools discovered. This tool enables a wide variety of DNA modifications such as base substitution, insertion, deletion. Its applications are rapidly expanding, including disease modeling, therapeutic development, and agricultural improvement, showing an increase in a widespread range of applications. However, the CRISPR-Cas9 system can lead to unintended consequences, and a deeper understanding of these consequences is necessary as the usage of CRISPR tools increases. In this review, I discussed the possible unintended consequences of CRISPR-Cas9 followed by the consideration of the tools and how it can be responsibly used. This review focuses on three potential unintended consequences of CRISPR-Cas9: off-target effects, immune response, and induction of chromosome loss. To compile this review, I drew from published, peer-reviewed articles and focused on the most recent and relevant studies that provided valuable insight into the unintended effects of CRISPR-Cas9. By critically analyzing these sources, I aim to provide a balanced overview of the current understanding of the potential risks of CRISPR-Cas9. Off-target effects involve unintended modifications at sites other than the target, which can lead to mutations and genomic instability. In addition, the immune response can be triggered by the introduction of foreign protein, potentially leading to immune-related complications. Lastly, induction of chromosome loss involves a large-scale genomic alteration, which can have severe consequences. An understanding of these unintended consequences is crucial for the future development and application of CRISPR-Cas9, ensuring that it is used safely and effectively.