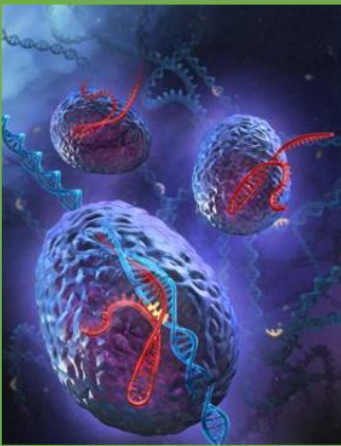


CRISPR Cas9 Technology "Swiss army knife of genetic engineering"



Broad Institute. (n.d.). Retrieved November 14, 2016, from <https://www.broadinstitute.org/what-broad/areas-focus/project-spotlight/questions-and-answers-about-crispr>

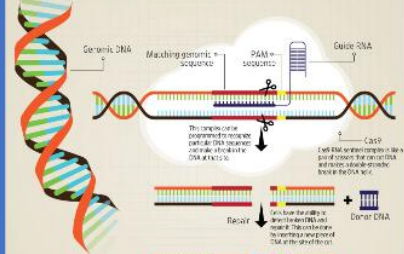
What is CRISPR?

CRISPRs stands for Clustered Regularly Interspaced Short Palindromic Repeats. It is part of the bacterial immune system which consists of repeating sequences of genetic code, interrupted by "spacer" sequences.

Mehta, N. (2016). How genes are edited using CRISPR-Cas9. Retrieved November 14, 2016, from <http://www.livemint.com/Politics/kb7XfBE2Ht95xg74Wola3l/How-genes-are-edited-using-CRISPR-Cas9.html>

HOW CRISPR WORKS

CRISPR-Cas9 allows for a targeted edit to the genome. Cas9 is a protein complex that works as a pair of scissors to cut DNA at a specific location. The Cas9 protein is guided to the target DNA by a guide RNA (gRNA) that is complementary to the target DNA sequence. Once Cas9 has cut the DNA, the DNA is repaired, creating a permanent edit.



Pros and Cons

Pros: Clinical significance, Cost, Target design simplicity, Efficiency, Ability to affect multiple genes

Cons: Unforeseen social consequences, Potential off-site mutations, Mosaicism

Ambiguous: Permanence of effects, Ability to alter germlines



Editing humanity. (2015). Retrieved November 14, 2016, from <http://www.economist.com/news/leaders/21661651-new-technique-manipulating-genes-holds-great-promise-but-rules-are-needed-govern-it>

Additional examples of gene editing include Zinc Fingers Nucleases (ZFNs), Transcription activator-like effector nucleases (TALENs), and Natronobacterium gregoryi Argonaute (NgAgo). NgAgo, which scientists claim only cuts specific target genes, could potentially surpass CRISPR in making the genome editing process more efficient.



Saay, T. H. (2016). Human gene editing research gets green light. Retrieved November 14, 2016, from <https://www.sciencenews.org/article/human-gene-editing-research-gets-green-light>



Many countries have laws and regulations for embryo editing. Other countries have ambiguous regulations, allowing for individual interpretation of the rules. Although patents for products modified by CRISPR have been issued, there is a long-standing patent dispute over the fundamental aspects of the technology, and who has the right to the core CRISPR intellectual property.

C. (2012). Patent Law 101: What's Wrong And Ways To Make It Right. Retrieved November 14, 2016, from <https://techcrunch.com/2012/04/08/patent-law-101-whats-wrong-and-ways-to-make-it-right/>