
CRISPR
EVERYWHERE

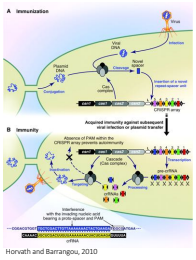

No hunger.
No pollution.
No disease.
TIME
The Gene Machine
The Economist
Editing humanity
The prospect of genetic enhancement


BREAK
http://static6.businessinsider.com

CRISPR

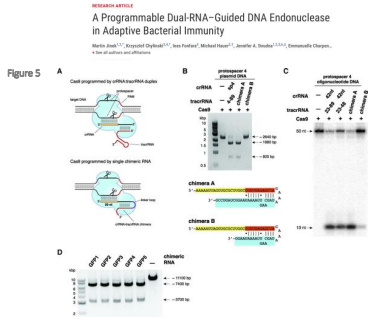
An adaptive immune defense mechanism in archaea and bacteria.

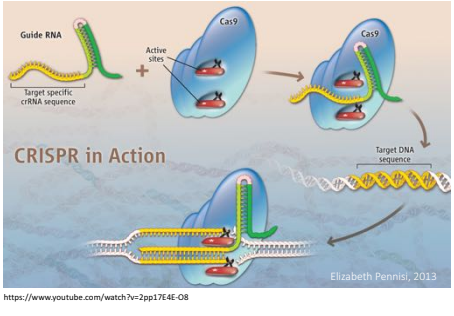
- Uses RNA to direct degradation of foreign genes containing perfect or near perfect identity to a guide sequence (**gRNA, ~20 nt**) within the RNA.
- **Cas9**: the most commonly used nuclease for CRISPR-based genome editing.
- **PAM motif**: A sequence of 5'-NGG-3' just downstream of the target sequence.
- Two possible modes of repair following target cleavage:
  - Non-homology end joining (**NHEJ**) - commonly introduces mutations.
  - Homologous recombination (**HR**) - can be utilized to generate specific mutations, insertions, etc.



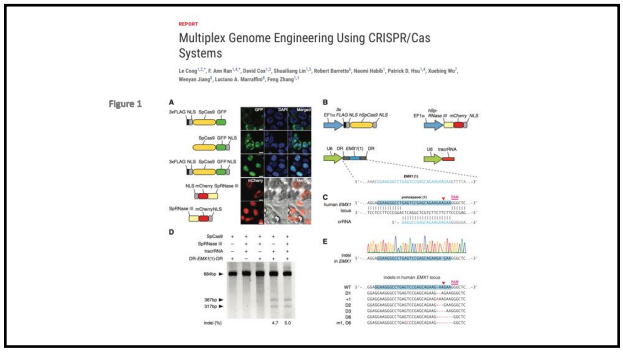
Horvath and Barrangou, 2010

https://www.youtube.com/watch?v=MnYppmstxIs





https://www.youtube.com/watch?v=2pp17E4E-O8

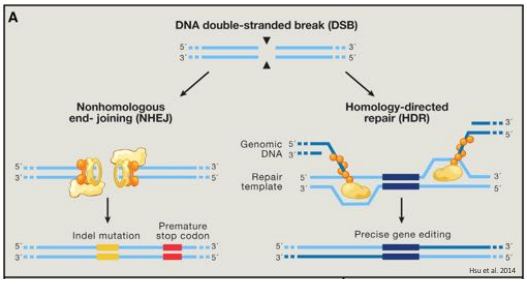


REPORT

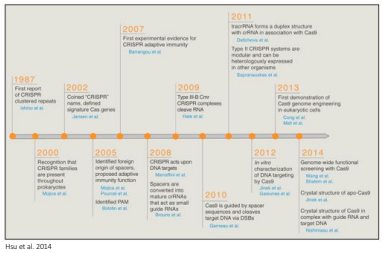
Multiplex Genome Engineering Using CRISPR/Cas Systems

Figure 1

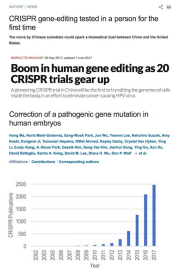
NHEJ vs HDR Following Cas9 DNA Cleavage



CRISPR Discovery Timeline



Hsu et al. 2014



CRISPR gene-editing tested in a person for the first time

Boom In human gene editing as 20 CRISPR trials gear up

Correction of a pathogenic gene mutation in human embryos

Patenting CRISPR

https://www.google.com/patents/US20140068797

https://www.google.com/patents/US8697359

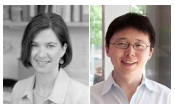
NATURE | NEWS

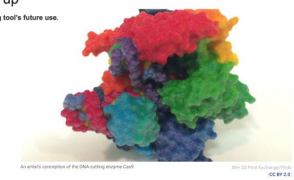
Bitter fight over CRISPR patent heats up

Unusual battle among academic institutions holds key to gene-editing tool's future use.

Heidi Ledford

12 January 2016





An artist's conception of the DNA-cutting enzyme Cas9. NIH 3D Print Exchange/Flickr CC BY 2.0

Ding, ding, ding! CRISPR patent fight enters next round

By Jon Cohen | Jul. 26, 2017, 9:00 AM

CRISPR PATENT DISPUTE HIGHLIGHTS

www.peerscientist.com

https://www.youtube.com/watch?v=IboHEQumDGc

Exercise

Design a guide RNA to mutate the *C. elegans* gene *daf-2*.

1. Examine the sequence of *C. elegans daf-2* on wormbase and select an ~100-200 nt region to target for editing.
2. Use the guide RNA tool at http://crispr.mit.edu to design a guide RNA.
3. Visit addgene to find plasmids for Cas9 and guide RNAs. https://www.addgene.org/crispr/goldstein/