



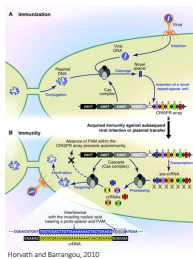




CRISPR

An adaptive immune defense mechanism in archaea and bacteria.

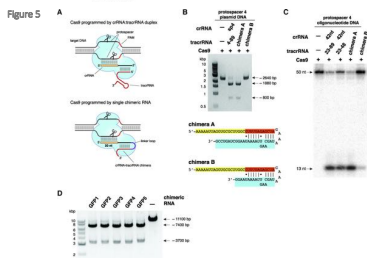
- Uses RNA to direct degradation of foreign genes containing perfect or near perfect identity to a guide sequence (**gRNA**, ~20 nt) within the RNA.
- **Cas9**: the most commonly used nuclease for CRISPR-based genome editing.
- **PAM motif**: A sequence of 5'-NGG-3' just downstream of the target sequence.
- 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.

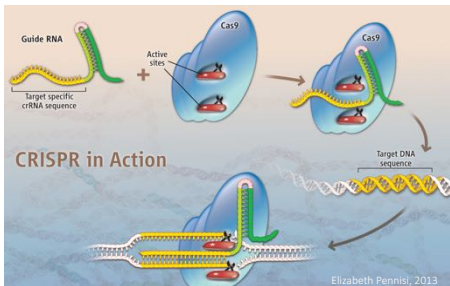


Horvath and Barrangou, 2010
<https://www.youtube.com/watch?v=Mt1fpmstxIs>

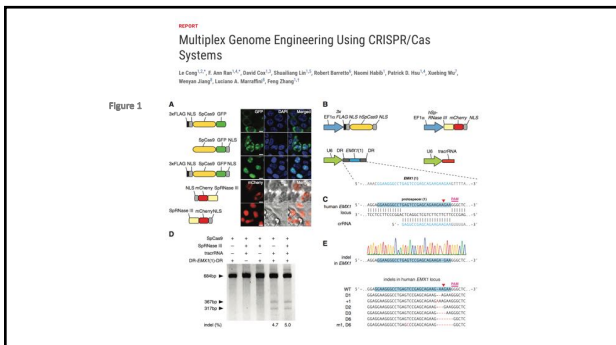
A Programmable Dual-RNA-Guided DNA Endonuclease in Adaptive Bacterial Immunity

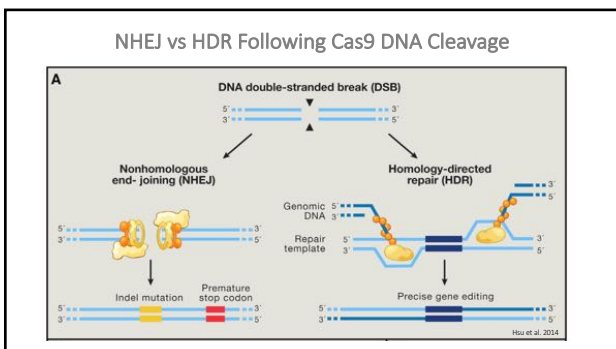
Wenbin Zhou^{1,2}, Alexander Dykxhoorn^{1,2}, Ben Finkler¹, Michael Hsu^{1,2}, Jennifer A. Doudna^{1,2,3}, Jennifer D. Charpentier^{1,2,3}
 1. Harvard Medical School, Boston, MA, USA; 2. Massachusetts General Hospital, Boston, MA, USA; 3. Howard Hughes Medical Institute, Chevy Chase, MD, USA

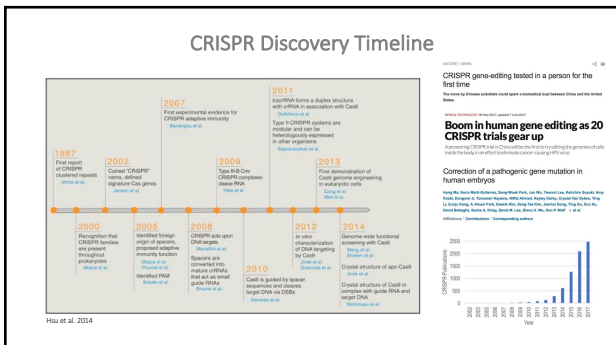




<https://www.youtube.com/watch?v=2pp17E4E-08>










Patenting CRISPR

<https://www.google.com/patents/US20140066797>
<https://www.google.com/patents/US8697359>

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



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

By Jen Cohen | All 25, 2017, 9:00 AM

CRISPR PATENT DISPUTE HIGHLIGHTS

August 2012	December 2012	February 2013	March 2013	16th March 2013	October 2013	April 2014	2014/2015	February 2015	January 2016
<p>Jeon et al. (2012): Doudna and Charpentier's CRISPR-Cas9 paper was published (available online - June 2012)</p> <p>provisional patent filed by Zhang (work began in 2011)</p>	<p>Cong et al. (2013): Zhang's CRISPR-Cas9 paper was published (available online - May 2013)</p> <p>Doudna and Charpentier search for a patent with a priority date - May 2012</p>	<p>file to invent' rule changed to 'first to file' by the AIA</p>	<p>Zhang filed for accelerated examination of a patent for the use of CRISPR-Cas9 in eukaryotic cells, priority date referring to the provisional patent application from December 2012</p>	<p>USPTO granted patent to Zhang</p>	<p>Shunfang Liu's email to Doudna</p> <p>Doudna revised the initial patent application, broadening the claims</p>	<p>patent interference proceedings started</p>			

www.peerscientist.com

https://www.youtube.com/watch?v=1b0HEQumDgc

STATE OF INNOVATION speaker series



Please join us for the **policy and ethics** portion of the State of Innovation speaker series.

Tara A. Nealey, Ph.D.,
 Patented Law, Shenoholde, St. Louis, Missouri

"Game of Unknowns: The CRISPR Patent Landscape"

Estimates are that pioneering CRISPR patents will be worth hundreds of millions of dollars for the patent owners. The patent dispute between the University of California and The Broad Institute/MIT is remarkable in many ways, including the fact that it has not been quietly settled among the parties, and the expensive legal battle continues. We will discuss the background of that battle, the uncertainties in the overall CRISPR patent landscape, the positioning of the competing companies of the leading parties, thoughts on how this patent saga might unfold and what it means for researchers.

Wednesday, October 18, 2017 at 3:00 PM
LSC Cherokee Park Ballroom
 refreshments to follow




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/>
