Intro to Biotech

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What is biotech?

General definition of biotech

The integration of natural sciences and engineering sciences in order to achieve the application of organisms, cells, parts thereof and molecular analogues for products and services

General definition of biotech

- Covers a broad range of things from artificial selection to genetic engineering
- How can we use biological systems to make products?
  - Human-derived agriculture
  - Brewing
  - Selective breeding to improve the production of crops and livestock
- According to wikipedia there are "colors" of biotechnology

YC on Biotech

A revolution is happening in life sciences that is reminiscent of what happened in software in the 90's. Now that cost and cycle time have decreased for biotech, it's possible for new startups to do groundbreaking work.

Umbrella term that includes many things such as?

- Food & agriculture
- Energy (biofuels)
- Microbiology (DNA engineering)
- Bioengineering
- Medicine & pharmaceuticals

National relevance & problems

Genetic Information Nondiscrimination Act (GINA 2008)

- Prohibits health insurers from denying coverage to a healthy individual or charging that person higher premiums based solely on a genetic predisposition
- Covers *most* situations

DNA sequencing regulation (23 & Me)

- 23andMe is not a medical provider
  - Doesn't have to follow HIPAA
  - GINA does not extend to discrimination based on genetic information for long-term care or disability-insurance providers
- According to section 8 of the terms of service:

  23andMe is free to preserve and disclose any and all Personal Information to law enforcement agencies or others if required to do so by law or in the good faith belief that such preservation or disclosure is reasonably necessary

GMOs

What are GMOs?

- Genetically Modified Organism
- Modified in a laboratory using genetic engineering or transgenic technology

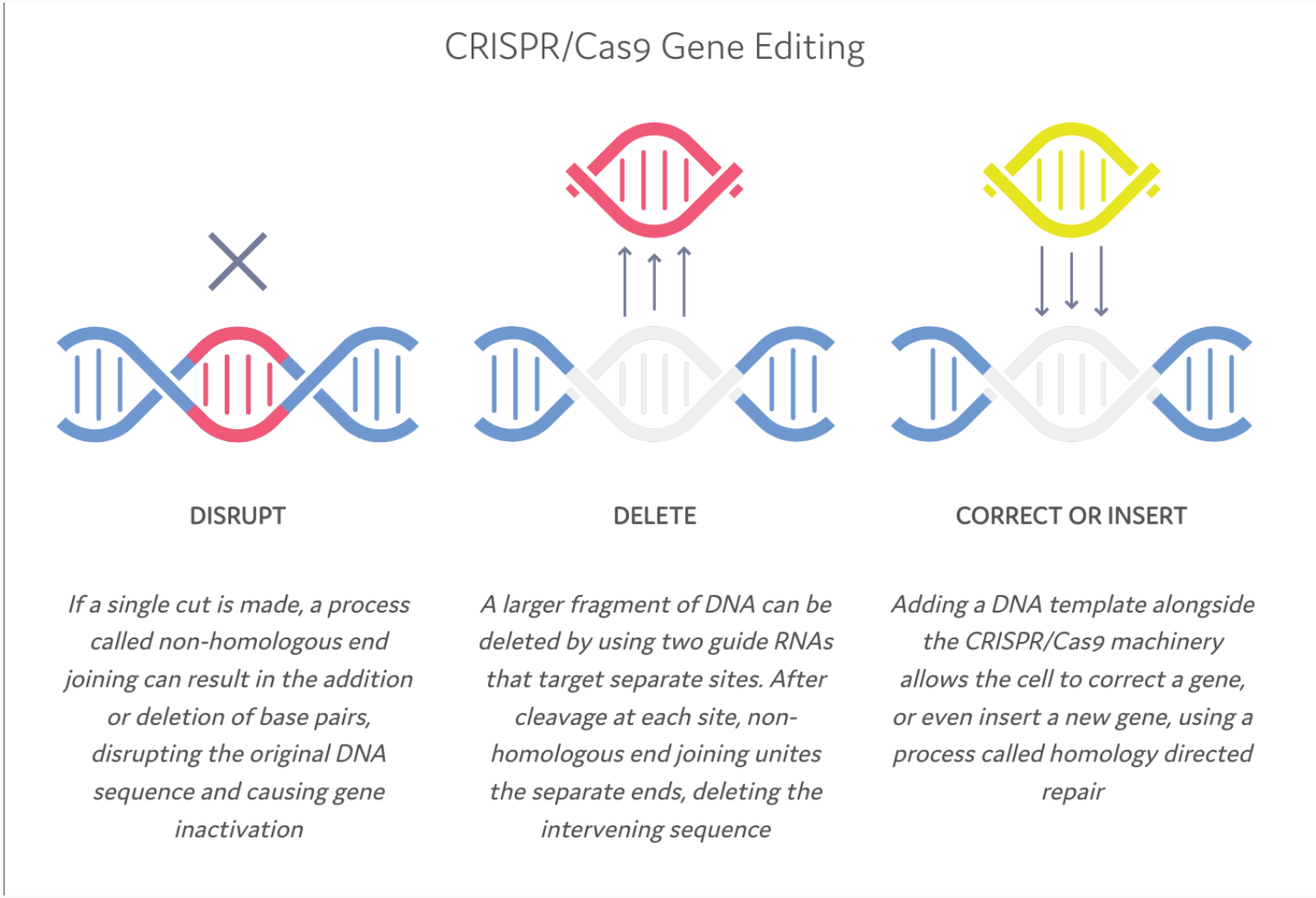
Argument for GMOs

- Have traits such as drought & pest resistant.
- We've been using plant breeding for a long time already, this is just an improved version.
- Plants get infections and genetically modified in nature anyways.
- We need to find solutions to increased food demands as our population grows.

Argument against GMOs

- There is no scientific consensus on the safety of GMOs
- Most of the research used to claim that GMOs are safe has been performed by biotechnology companies. (Conflict of Interest)

CRISPER / Cas9



If scientists can dream of a genetic manipulation, CRISPR can now make it happen

Controversy of CRISPER / Cas9

- Chinese scientist He Jiankui claims to have used CRISPR-Cas9 to create embryos that resulted in twin girls
- It's a great technology with tons of potential, but what are the regulations and ethical questions that need to be answered?
- Accelerated the field before consensus has been achieved on how to use it.

International relevance & problems

Bioweapons

- Common example is anthrax infection caused by the bacterium *Bacillus anthracis*
- Lack of regulations for materials to create a novel bioweapon could lead to domestic terrorism
- COVID-19 response

General Resources

- Biotech | Y Combinator
- Understanding Biotechnology: What is a GMO? - The Non-GMO Project
- CRISPR/Cas9 | CRISPR