

September 19, 2017

CRISPR: THE FUTURE OF AGRICULTURE HAS ARRIVED, BUT WHO WILL CONTROL IT FROM HERE

[Agriculture \(/full-blog/category/Agriculture\)](#)

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CRISPR stands for “clustered regularly interspaced short palindromic repeats.”^[i] For those not well versed in science jargon, CRISPR-Cas is a genome-editing technology that allows the user to precisely cut out sections of DNA.^[ii] CRISPR was first discovered in genomes of certain bacteria.^[iii] There it acted as a defense mechanism against invading viruses.^[iv] CRISPR guides Cas (DNA cutting enzyme) to cut out a virus to stop it from replicating.^[v] Scientist took this discovery and reprogrammed CRISPR to identify specific mutations and to cut those mutations out of the genetic code.^[vi] This technology, originally discovered in the 1980’s, really became exciting in 2012 – 2013 and has since hit the science and technology world by storm.^[vii] Everyday tests are being done and CRISPR is being applied to different parts of the genome with huge success.^[viii]

One of the most exciting areas for CRISPR technology is in agriculture. CRISPR has successfully been used to create anti-browning mushrooms that have a prolonged shelf-life.^[ix] It has been used to dehorn dairy cows, protecting the herd and the farmers working with them.^[x] But the most widespread CRISPR editing has been in pigs to eliminate PERV’s disease.^[xi] The possibilities for future uses of CRISPR seem limitless.

There is one big and difficult problem for CRISPR. Technically, any organism that is genetically modified by CRISPR is a GMO (Genetically Modified Organism). All genetically modified organisms are regulated by either the USDA or the FDA.^[xii] Modern GMO’s were introduced in the 1970’s but gained considerable notoriety in the 1990’s with the approval of crops that produced their own insecticides and vegetables that were more reliant.^[xiii] GMO’s are created by introducing foreign DNA into an organism that allows it to perform in some way that it could not before.^[xiv] Since the time of their commercialization, GMO’s have been regulated by the federal government.^[xv] Many proponents of CRISPR argue that it is different than other GMO’s because nothing new is added to the organism.^[xvi] Opponents fear that by genetically altering an organism with CRISPR the modifications are likely to be transferred to the next generation and the consequences of such a transfer are unknown.^[xvii]





<http://cache1.bion.com/tm/UploadFiles/201603/2016031123252693.png>

Not surprisingly, scientific technology is moving faster than the gears of the political process can turn. The FDA and the USDA have realized that CRISPR is coming whether they are ready or not. The regulations for GMO's have gone unchanged since the Reagan administration, until now.[xviii] But the agencies are going different directions on whether to regulate the organisms that undergo CRISPR alterations.[xix] In 2016, the USDA determined that the anti-browning mushrooms modified by CRISPR would not be subject to regulation.[xx] The rationale behind this decision seems to be just what proponents were hoping to convey, that the use of CRISPR does not introduce any foreign DNA and thus does not classify as a traditional GMO.[xxi] This was a huge win for crop development.[xxii] However, the FDA is cautious about letting CRISPR run wild in plants and animals.[xxiii] In January 2017, the FDA released proposed guidelines for regulation of genetically altered animals.[xxiv] The FDA has determined that it can regulate animals that have genetically altered DNA because it is a drug intended to alter the "structure and function of the animal".[xxv]

So, what is CRISPR? How should the government classify it? Who should regulate it? The new administration could have drastic effects on the future of CRISPR depending on how this battle of the administrative agencies pans out. The Trump administration has not stated any strong opinions on CRISPR, and it would take an act of congress to change the current biotech regulations.[xxvi] For now, farmers and scientist alike will dream of the day when CRISPR can be commercialized.

[i] Katie Menally, *The Future of Genome Editing and How it will be Regulated*, Phys.org (Jan. 27, 2017), <https://phys.org/news/2017-01-future-genome.html>.

[ii] Betsy Freese, *How Gene Editing Will Change Agriculture*, Successful Farming (Nov. 22, 2016), <http://www.agriculture.com/technology/how-gene-editing-will-change-agriculture>.

[iii] *Id.*

[iv] *Id.*

[v] *Id.*

[vi] *Radiolab: Update: CRISPR*, Wnyc radio (Feb. 24, 2017), <http://www.radiolab.org/story/update-crispr/>.

[vii] *See* Freese *supra* note ii. (There is an ongoing patent dispute over the discovery and application of CRISPR between University of California, Berkeley and MIT).

[viii] *Radiolab, supra* note vi.

[ix] Chuck Gill, *A CRISPR Mushroom*, Penn State Ag. Science Magazine (Fall/ Winter 2016), <http://agsci.psu.edu/magazine/articles/2016/fall-winter/a-crispr-mushroom>.

[x] Sarah Zhang, *The FDA Wants to Regulate Gene-Editing That Makes Cows Less Horny*, The Atlantic (Jan. 20, 2017), <https://www.theatlantic.com/science/archive/2017/01/the-fda-wants-to-regulate-gene-edited-animals-as-drugs/513686/>.

[xi] Kelly Servick, *CRISPR Slices Virus Genes Out of Pigs, but will it Make Organ Transplants to Humans Safer?* Science (Aug. 10, 2017), <http://www.sciencemag.org/news/2017/08/crispr-slices-virus-genes-out-pigs-will-it-make-organ-transplants-humans-safer>.

[xii] Zhang, *supra* note x.

[xiii] Gabriel Rangel, *From Corgis to Corn: A Brief Look at the Long History of GMO Technology*, Harvard University (Aug. 9, 2015), <http://sitn.hms.harvard.edu/flash/2015/from-corgis-to-corn-a-brief-look-at-the-long-history-of-gmo-technology/>.

[xiv] See Freese *supra* note ii.

[xv] See Rangel *supra* note xiii.

[xvi] Gill *supra* note x.

[xvii] *Id.*

[xviii] Zhang *supra* note x.

[xix] *Id.*

[xx] Gill *supra* note ix.

[xxi] *Id.*

[xxii] *Id.*

[xxiii] Zhang *supra* note x.

[xxiv] *Guidance for Industry: Regulation of Intentionally Altered Genomic DNA in Animals*, Food and Drug Admin.(2017), <https://www.fda.gov/downloads/AnimalVeterinary/GuidanceComplianceEnforcement/GuidanceforIndustry/UCM113903.pdf>.

[xxv] Robert M. Califf & Ritu Nalubola, *FDA's Science-Based Approach to Genome Edited Products*, FDA Voice (Jan. 18, 2017), <https://blogs.fda.gov/fdavoices/index.php/tag/crispr/>

[xxvi] Zhang *supra* note x.

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