

# Update on gene editing of human embryos—and other organisms

May 22 2015, by Tabitha M. Powledge

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The National Academy of Sciences has confirmed officially that yes, as rumored for weeks, it will hold a meeting to thrash out [issues posed by the new gene editing techniques](#). These will probably be ethical and policy issues mostly. In particular the much-talked-about fallout from the lab method using CRISPR/Cas, especially permanent edits to the H. sap genome that would be inherited by future humans—usually called germline editing.

Time and place for the meeting not yet specified, but probably in the fall. The meeting was prompted by high-profile calls from scientists for a moratorium on gene editing research. I won't recap the background because you can find some of it here at On Science Blogs on April 24 and the rest of it at the On Science Blogs post for March 20.

## **Other species, other kinds of genetic modification**

While we're chewing our fingernails over the prospects for turning people into GMOs, let's not forget that gene-editing can be done on anything with genes. Plants, including crop plants. Animals, including crop animals. Antonio Regalado described latter possibilities—hornless dairy cattle, for instance—at TechReview.

Although the current debate focuses on gene editing methods, we had a reminder only this week that other kinds of genetic engineering can generate potentially big trouble too. Researchers say they are close to giving yeast a group of genes for making morphine, codeine, and other drugs that have been derived from the opium poppy for thousands of years. Biotechnologists could produce industrial quantities of these opioids in giant vats.

There's more to this story than cheaper pain meds, obviously. Robert Service's long post at Science Insider describes the research so far and the impact it's likely to have on [policymakers and the trade in illegal drugs](#). At Talking Back, Gary Stix notes that, once the yeast genetic modifications are complete, "[All that is needed is to feed spoonfuls of sugar to the engineered microbe.](#)"

Stix quotes Stanford bioethicist Hank Greely speculating that incorporating the CRISPR/Cas system into the [genetic modification](#) process "may make it relatively easy for a criminal syndicate to engineer an opiate-producing yeast strain." If regulators are slow to approve the

process, Greely says, "It seems to me entirely possible that the only uses of this discovery will be illicit."



Credit: TeunSpaans

Jeantine Lunshof, a visiting scientist in George Church's cutting-edge genetics lab at Harvard, took to Nature to warn in particular about the potential dangers of gene drives, developed in Church's lab. (Gene drives, a tool to modify entire species swiftly, were discussed here at On Science Blogs last summer.)

Lunshof's point: the "outcry over designer babies and precision [gene therapy](#) should not blind us to a much more pressing problem: the increasing use of CRISPR to edit the genomes of wild animal populations. Unless properly regulated and contained, this research has the potential to rapidly alter ecosystems in irreversible and damaging ways."

## Gene editing and bioethics and capitalism

At the Bioethics.net blog, Craig Klugman trots out the [well-worn Pandora's Box analogy](#). We'll doubtless be hearing a lot about poor Pandora even though her tale is not really relevant to the possibilities for gene editing.

That's because gene editing isn't only about loosing evils upon the world. If it was, deciding to oppose it would take little brain room. But gene editing is not wholly evil, not at all. There is talk about how it can cure some diseases permanently and perhaps also improve the human genetic condition. Which makes gene editing a genuine ethical dilemma—part potentially really good, part potentially really bad.

The recent announcement from the National Institutes of Health that the agency [would not be funding any gene editing on human embryos](#) appears to have struck many in the media as new news. Also, perhaps indirectly, as a declaration that the US government opposed the work.



But there is nothing new about this non-funding policy. As NIH director Francis Collins explained in an interview with Julia Belluz at Vox, in the 1990s "Congress said public federal funds will not be used for research involving derivation on human embryos. That says—no matter what I think—[this type of research will not be supported by NIH.](#)"

Of course it's clear Collins does personally oppose human germline editing. He also pointed out that, even before the recent debates about human uses of gene editing, deliberative bodies around the world declared that modifying the human germline with the intent of producing living humans is a line that should not be crossed.

It may already be too late, though, to consider whether that line should be crossed. *Nature Biotechnology* asked 50 experts (mostly scientists) for their opinions on human germline editing. Most seem to [think it is inevitable](#), although there were many ideas about how it should proceed and what, if anything, can be done to keep watch over it.

The article is not open-access. I hope the journal will change its mind about that. There's a [brief free summary at GenomeWeb](#), which may require registration.

Even if people decide that control of [gene editing](#) uses is necessary, as a practical matter it hardly seems doable. George Church says [a CRISPR lab could be set up for \\$2000](#). Kevin Loria described the process at Business Insider.

And then there are two irresistible economic forces: consumer demand and the demands of capitalism. At *The Mermaid's Tale*, Ken Weiss bends over backward to be both realistic and fair-minded about the dilemma: "Even if the NIH prevents germline [genetic engineering](#), we probably cannot stop other countries and private companies from doing it. Profits are to be made and, to be fair, parents' dreams of normal

children will be catered to, hopefully in a positive way. Generally, it is hard to believe that self-interests will not over-ride ethical interests, as they so often do when money is to be made. Which is not to say that profit is the only motive—there is good to be done, and lives to improve as well."

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