First China, Now Russia To Create Gene-Edited Babies

The cat is out of the bag with human genetic engineering. Once the human germline is modified, those changes will be permanently inherited by future generations, mixing with other DNA to produce unknown results. TN Editor

A Russian scientist says he wants to create more genetically modified babies, flouting international objections that such a step would be premature, unethical and irresponsible.

Denis Rebrikov, a molecular biologist who heads a gene-editing lab at the Kulakov National Medical Research Center for Obstetrics, Gynecology and Perinatology in Moscow, claims he has developed a safe — and therefore acceptable — way to create gene-edited babies.

“How it can be unethical if we will make [a] healthy baby instead of diseased?” Rebrikov told NPR during his first broadcast interview. “Why? Why [is it] unethical?”

Rebrikov wants to create babies from embryos whose DNA he would edit to protect the resulting children from HIV. Rebrikov would edit a gene called CCR5 to replicate a naturally occurring variation that protects people from HIV.

“The rationale is to guarantee that the baby will be HIV-negative — that’s it,” Rebrikov says.

It’s the same rationale given by a Chinese scientist, He Jiankui, when he created the world’s first gene-edited babies. The birth of the gene-modified twin Chinese girls last year triggered an international firestorm, as well as calls for a global moratorium on creating gene-edited babies until doing so can be demonstrated to be safe and necessary.

Rebrikov says his research has shown that it’s possible to make precise genetic changes in embryos using the gene-editing technique CRISPR. He claims to have verified the safety by comparing the DNA of edited embryos with the unedited DNA of the couples used to create them.

“My experiments show that, yes, it’s safe. We demonstrated it’s safe to use,” says Rebrikov, who is also a researcher at the Pirogov Russian National Research Medical University in Moscow.

The babies created by the Chinese scientist had a father who was HIV-positive. Rebrikov says preventing infection in babies born to HIV-positive women is more justifiable when a woman doesn’t respond to antiviral drugs. Those children are at high risk of becoming infected.

Rebrikov says he plans to confirm his research with additional experiments before proceeding and would move forward only if he won government approval. Rebrikov says he has already identified two HIV-positive women who would be interested in trying to have gene-edited babies, and he plans to apply for approval within months.

Rebrikov’s plans were first reported in the journal Nature. He says he may also try to use his technique to create gene-edited babies for other reasons, such as preventing inherited forms of deafness.

But Sergey Kutsev, the chief geneticist and ethicist at the Russian Ministry of Health, told NPR that he doubts the government would authorize Rebrikov's experiment.

"I am confident that Denis Rebrikov doesn't have any chances to get approval from the Ministry of Health as of today," Kutsev told NPR. He says the safety and usefulness of the technology needs to be proved first.

One concern, Kutsev says, is inadvertently creating mutations that may later lead to cancer or other diseases — changes that also can be passed down through future generations. "Therefore, this is certainly unacceptable at present," he says.

Other scientists are also deeply skeptical of Rebrikov's claims.

"The data are weak," says Shoukhrat Mitalipov, an Oregon Health & Science University scientist who was the first to precisely use CRISPR to edit genes in human embryos.

"The technology is not ready," agrees Dieter Egli, a Columbia University scientist trying to find safe ways to edit DNA in human embryos.

Many scientists and bioethicists argue that to do what Rebrikov proposes would be unethical and unnecessary because there are other ways to prevent HIV infection, as well as most genetic disorders.

"This is irresponsible," says R. Alta Charo, a bioethicist at the University of Wisconsin—Madison, who is helping the World Health Organization try to police gene editing. "My biggest worry is that he's going to bring about the birth of children who are going to suffer because he wanted to play around."

Someday it may be deemed safe and appropriate to use gene-edited embryos to prevent rare but devastating genetic disorders in babies, Charo and others say.

But it's far too premature to try that before the science has been tested much more thoroughly and before broad societal debates have been conducted about the ethics and morality, she says.

Read full story here…

Eugenics: Will Gene Editing Make Rich People ‘Superior’

Rich transhumans, many of whom are associated with Silicon Valley and Big Tech, fully expect that gene editing will take over the process of evolution, allowing them to design humanity 2.0. They are wrong, but that won’t hinder their efforts. TN Editor

At a time when new technology such as gene editing offers unprecedented control over our own biology, the latest wave of medical advances, including powerful DNA-editing technology like CRISPR/Cas9, is a source of excitement and optimism.

CRISPR works like a genetic scalpel to cut a patient’s DNA, targeting and repairing genes at risk of disease.

This method of gene editing may one day make certain diseases – including Alzheimer's, sickle cell disease, and some forms of cancer – a thing of the past.

While traditional treatments for chronic illnesses generally address the symptoms, this offers the potential of a permanent cure by attacking the disease at the source. Once genetic mutations are removed from a patient's cells, the cells can resume normal function for the rest of the patient's life.

What are the ethical concerns surrounding gene editing?

Gene editing technologies are not without controversy – from ethics to whether it will become a plaything of the super-rich.

One main issue of CRISPR lies in its simplicity, which means it is easier for unauthorised persons to experiment with the technology.

Already, CRISPR has become a favorite of amateur 'biohackers', with one man injecting himself with a homemade cocktail in a misguided attempt to boost his biceps. Another tried (and failed) to cure himself of AIDS.

And in late 2018, headlines blared that an ambitious researcher conducted secret gene editing trials in China, making mutations in human embryos to protect against HIV and then apparently turning those embryos into twin babies.

Researchers were aghast at the shoddy science and the premature use of CRISPR in human patients.

While scientists, ethicists, and regulators have called for a ban on gene editing research in human embryos until the risks are better understood, it may be impossible to prevent willing patients and unscrupulous researchers from experimenting with gene editing in humans.

Especially because when cutting-edge therapies do receive official regulatory approval, they often carry eye-popping price tags.

How much will gene editing cost?

Spark Therapeutics plans to charge US patients $850,000 for a gene therapy that treats a rare form of genetic blindness in children.

By some estimates, that’s a bargain: analysts expected a list price as high as $1 million per patient, or a half million dollars per eyeball.

There’s little reason to expect that the next approved genetic therapy will be much cheaper.

In a time when new technology offers unprecedented control over our own biology while global one per cent-ers seem to be the only ones who can afford access, is humanity at a crossroads?

Are we headed for a future where those with the means will be able to purchase genetic superiority, leaving the rest of us behind?

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Scientists: Human-Chimp DNA Hybrids Are Possible?

Dr. Barash's goal is to convince the world that humans are no different that animals and in particular, monkeys. He thinks it would be good for scientists to use CRISPR and create Chimera 'Humanzees'. His book's subtitle says it all: 'Using science to see our species as it really is.' □ TN Editor

Our future offspring may be part-human, part-chimp.

At least that's the nightmarish vision of self-proclaimed expert, David Barash, a professor of psychology emeritus at the University of Washington.

Dr Barash says that not only is the creation of 'humanzees' possible using gene editing, but producing such creatures would be a 'terrific idea'.

He believes it would force humans to acknowledge we are no different to animals and help stop the 'grotesque abuse' of the planet's creatures.

Dr Barash's remarkable comments – which could lead to a situation resembling Planet of the Apes – were made in his new book titled: 'Through a glass brightly: Using science to see our species as it really is'.

They follow recent claims by evolutionary psychologist, Gordon Gallup, that a 'humanzee' was born in an American lab nearly 100 years ago before being killed by panicked doctors

Dr Gallup claims that humans can be crossbred with other apes and not just chimpanzees. Above is a file image of the 1968 movie Planet Of The Apes showing two members of the species kissing one another

In an extract from his book which appears in the magazine Nautilus, Dr Barash describes the belief that we are discontinuous from the natural world as possibly 'the most hurtful theologically-driven myth of all

times’.

Dr Barash believes CRISPR technology could be used to add or delete targeted genes as desired.

This means it might be possible to make precise edits in DNA and ‘silence’ certain genes that are different between the species.

‘It is unclear whether my own imagined chimphuman will be a hybrid (produced by cross-fertilising human and non-human gametes), or a chimera, created in a laboratory via techniques of genetic manipulation. I’m betting on the latter’, wrote Dr Barash.

Creating a hybrid animal would stop people thinking of themselves as apart from the natural world, Dr Barash argues.

‘Such an individual would not be an exact equal-parts-of-each combination, but would be neither human nor chimp: rather, something in between’, he said.

Creating a hybrid animal would stop people thinking of themselves as apart from the natural world, Dr Barash argues. Pictured is a clip from the 2011 film Rise of the Planet Of The Apes

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Transgenic: Chinese Scientists Put Human Gene Into Monkeys

Technocrat scientists view humans as an animal species that is on the same level as monkeys – just containers of atoms and molecules – so there is no ethical problem with inserting human genes into them. TN Editor

Researchers from China and the United States have created transgenic monkeys carrying a human gene that is important for brain development, and the monkeys showed human-like brain development.

Scientists have identified several genes that are linked to primate brain size. MCPH1 is a gene that is expressed during fetal brain development. Mutations in MCPH1 can lead to microcephaly, a developmental disorder characterized by a small brain.

In the study published in the Beijing-based National Science Review, researchers from the Kunming Institute of Zoology, Chinese Academy of

Sciences, the University of North Carolina in the United States and other research institutions reported that they successfully created 11 transgenic rhesus monkeys (eight first-generation and three second-generation) carrying human copies of MCPH1.

According to the research article, brain imaging and tissue section analysis showed an altered pattern of neuron differentiation and a delayed maturation of the neural system, which is similar to the developmental delay (neoteny) in humans.

Neoteny in humans is the retention of juvenile features into adulthood. One key difference between humans and nonhuman primates is that humans require a much longer time to shape their neuro-networks during development, greatly elongating childhood, which is the so-called "neoteny."

The study also found that the transgenic monkeys exhibited better short-term memory and shorter reaction time compared to wild rhesus monkeys in the control group.

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GMO Cooking Oil Quietly Arrives In Restaurants

Flipping logic upside-down, the Technocrats at Calyxt state: “At Calyxt, we believe it is unethical NOT to use our technologies to address these issues head-on.” In reality, GMO is not equivalent to traditional plant husbandry. TN Editor

Somewhere in the Midwest, a restaurant is frying foods with oil made from gene-edited soybeans. That’s according to the company making the oil, which says it’s the first commercial use of a gene-edited food in the U.S.

Calyxt said it can’t reveal its first customer for competitive reasons, but CEO Jim Blome said the oil is “in use and being eaten.”

The Minnesota-based company is hoping the announcement will encourage the food industry’s interest in the oil, which it says has no trans fats and a longer shelf life than other soybean oils. Whether demand builds remains to be seen, but the oil’s transition into the food supply signals gene editing’s potential to alter foods without the

controversy of conventional GMOs, or genetically modified organisms.

Among the other gene-edited crops being explored: Mushrooms that don't brown, wheat with more fiber, better-producing tomatoes, herbicide-tolerant canola and rice that doesn't absorb soil pollution as it grows.

Unlike conventional GMOs, which are made by injecting DNA from other organisms, gene editing lets scientists alter traits by snipping out or adding specific genes in a lab. Startups including Calyxt say their crops do not qualify as GMOs because what they're doing could theoretically be achieved with traditional crossbreeding.

So far, U.S. regulators have agreed and said several gene-edited crops in development do not require special oversight. It's partly why companies see big potential for gene-edited crops.

"They've been spurred on by the regulatory decisions by this administration," said Greg Jaffe of the Center for Science in the Public Interest, a health watchdog group.

But given the many ways gene editing can be used, Jaydee Hanson of the Center for Food Safety said regulators should consider the potential implications of each new crop. He cited the example of produce gene-edited to not brown.

"You've designed it to sit around longer. Are there problems with that?" he said.

Already, most corn and soy grown in the U.S. are herbicide-tolerant GMOs. Just last week, regulators cleared a hurdle for salmon genetically modified to grow faster. The fish is the first genetically modified animal approved for human consumption in the U.S.

Though regulators say GMOs are safe, health and environmental worries have persisted, and companies will soon have to disclose when products have "bioengineered" ingredients.

Calyxt says its oil does not qualify as a GMO. The oil is made from

soybeans with two inactivated genes to produce more heart-healthy fats and no trans fats. The company says the oil also has a longer shelf life, which could reduce costs for food makers or result in longer-lasting products.

Soybean oils took a hit when regulators moved to ban oils with trans fats. Other trans fat-free soybean oils have become available in the years since, but the industry has found it difficult to win back food makers that already switched to different oils, said John Motter, former chair of the United Soybean Board.

Calyxt said the first customer is a company in the Midwest with multiple restaurant and foodservice locations, such as building cafeterias. It said the customer is using it in dressings and sauces and for frying, but didn't specify if the oil's benefits are being communicated to diners.

Calyxt is working on other gene-edited crops that it says are faster to develop than conventional GMOs, which require regulatory studies. But Tom Adams, CEO of biotech company Pairwise, said oversight of gene-edited foods could become stricter if public attitude changes.

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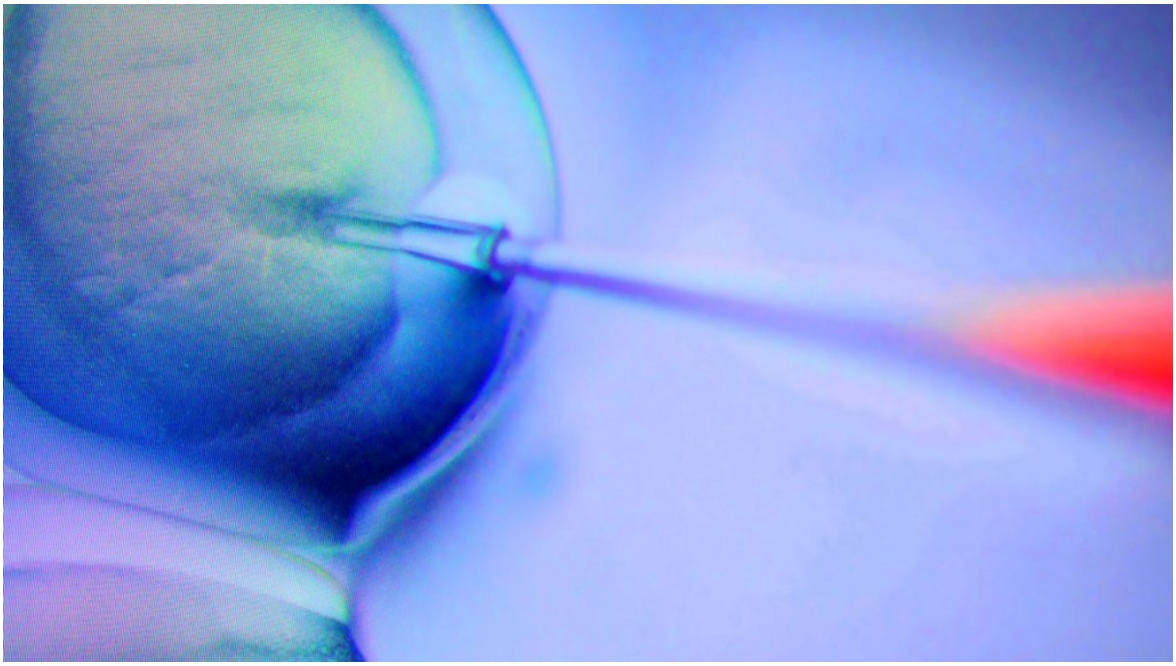

CRISPR Scientists Call For Global Moratorium On Heritable Gene Editing

There are non-Technocrats who see that science must be used responsibly., but once Pandora's Box has been opened, it is impossible to shut. Rogue scientists will continue to ignore the warnings. TN Editor

Some of the biggest names in gene editing want to stop anyone from playing around with cells that pass on changes to the next generation.

After the first International Summit on Human Gene Editing in December 2015, a statement was released. The organizers were unanimous in agreeing that the creation of genetically modified children was "irresponsible" unless we knew for sure it was safe.

Well, a fat lot of good that did. As MIT Technology Review revealed in November last year, Chinese scientist He Jiankui edited embryos to create two genetically engineered babies. Other groups are now actively looking to use the technology to enhance humans.

This has prompted some of the biggest names in gene editing (some of whom signed the 2015 statement) to call for a global moratorium on all human germline editing—editing sperm or egg cells so that the changes are hereditary.

In an open letter in Nature this week, major players in CRISPR's development, including Emmanuelle Charpentier, Eric Lander, and Feng Zhang, have been joined by colleagues from seven different countries to call for a total ban on human germline editing until an international framework has been agreed on how it should be treated. They suggest five years "might be appropriate." The US National Institutes of Health has also backed the call.

The signatories hope a voluntary global moratorium will stop the next He Jiankui from suddenly springing another unwelcome surprise.

The group says that this moratorium period will allow time to discuss the "technical, scientific, medical, societal, ethical, and moral issues that must be considered" before the technique can be used. Countries that decide to go ahead and allow germline editing should do so only after notifying the public of the plan, engaging in international consultation "about the wisdom of doing so," and making sure that there is a "broad societal consensus" in the country for starting on that path, they say.

"The world might conclude that the clinical use of germline editing is a line that should not be crossed for any purpose whatsoever," the group says. "Alternatively, some societies might support genetic correction for couples with no other way to have biologically related children, but draw a line at all forms of genetic enhancement. Or, societies could one day endorse limited or widespread use of enhancement."

The letter's signatories suggest that germline research should be allowed so long as there is no intention to implant embryos and produce children. Using CRISPR to treat diseases in non-reproductive somatic cells (where the changes would not be heritable) should also be fine so long as any adults participating have given their informed consent. Genetic enhancement should not be allowed at this time, and no clinical application carried out unless its "long-term biological consequences are sufficiently understood—both for individuals and for the human species," they write.

We still don't know what the majority of our genes do, so the risks of unintended consequences or so-called off-target effects—good or bad—are huge. The loss of the CCR5 gene that He was targeting to protect children from HIV, for example, has been implicated in increased complications and death from some viral infections.

Read full story here…

China’s CRISPR Twins Might Have Brain-Enhanced Intelligence

The renegade scientist who edited the gene of twin girls said it was for HIV resistance, but now it is learned that the same gene is directly related to enhanced cognition. This may have been the real goal from the beginning. TN Editor

New research suggests that a controversial gene-editing experiment to make children resistant to HIV may also have enhanced their ability to learn and form memories.

he brains of two genetically edited girls born in China last year may have been changed in ways that enhance cognition and memory, scientists say.

The twins, called Lulu and Nana, reportedly had their genes modified before birth by a Chinese scientific team using the new editing tool CRISPR. The goal was to make the girls immune to infection by HIV, the virus that causes AIDS.

Now, new research shows that the same alteration introduced into the girls' DNA, deletion of a gene called CCR5, not only makes mice smarter but also improves human brain recovery after stroke, and could be linked to greater success in school.

"The answer is likely yes, it did affect their brains," says Alcino J. Silva, a neurobiologist at the University of California, Los Angeles, whose lab uncovered a major new role for the CCR5 gene in memory and the brain's ability to form new connections.

"The simplest interpretation is that those mutations will probably have an impact on cognitive function in the twins," says Silva. He says the exact effect on the girls' cognition is impossible to predict, and "that is why it should not be done."

The Chinese team, led by He Jiankui of the Southern University of Science and Technology in Shenzhen, claimed it used CRISPR to delete CCR5 from human embryos, some of which were later used to create pregnancies. HIV requires the CCR5 gene to enter human blood cells.

The experiment has been widely condemned as irresponsible, and He is under investigation in China. News of the first gene-edited babies also inflamed speculation about whether CRISPR technology could one day be used to create super-intelligent humans, perhaps as part of a biotechnology race between the US and China.

There is no evidence that He actually set out to modify the twins' intelligence. MIT Technology Review contacted scientists studying the effects of CCR5 on cognition, and they say the Chinese scientist never reached out to them, as he did to others from whom he hoped to get scientific advice or support.

"As far as I know, we never heard from him," says Miou Zhou, a professor at the Western University of Health Sciences in California.

Although He never consulted the brain researchers, the Chinese scientist was certainly aware of the link between CCR5 and cognition. It was first shown in 2016 by Zhou and Silva, who found that removing the gene from mice significantly improved their memory. The team had

looked at more than 140 different genetic alterations to find which made mice smarter.

Read full story here…

Biodiversity? Scientists Want To Wipe Out Entire Species

This is the Technocrat mindset that science can solve any problem. Problem: Mosquitos make people sick. Solution: Kill all mosquitos. This is a slippery slope that will lead to tampering with other species. TN Editor

The villagers of Bana in Burkina Faso survive by working the land. Yet recently they have been paid to sit still for six hours while a fellow villager hovers close by on the look out for mosquitoes. When one lands on their neighbour they catch it, alive and intact, before it bites and then hand it over to researchers.

This is one small stage in a painstakingly slow process of research into the local mosquito population, led by scientists at Imperial College, London.

They hope that one day Burkina Faso will be the testbed for a technology that many hope will lead to the eradication of malaria, the mosquito-borne disease that is the biggest killer of children under five in Africa.

The researchers have developed a genetically-modified mosquito in their laboratory that can kill off its own species by spreading a faulty gene.

If it works in the wild, the technology – called gene drive – could help eliminate malaria where decades of efforts involving bed nets, repellents and insecticides have failed.

But as the scientists edge closer to releasing gene drive mosquitoes into the wild for the first time – by 2024 in Burkina Faso – environmental and human rights groups and others are desperate to slow the process down.

Playing God in this way, they warn, could do infinitely more harm than good.

"Gene drives are a complete unknown," says Tom Wakeford, UK spokesperson for ETC, a global campaign group monitoring the impact of emerging technologies on biodiversity, agriculture and human rights.

"It's a huge risk when we know that other approaches [to eradicating malaria] exist," he adds.

Target Malaria, the name of the Imperial College-led research consortium, is just one of many projects exploring ways to engineer mosquitoes so that they stop spreading disease.

But unlike so-called 'self-limiting' genetic modification of mosquitoes – which, for example, renders them infertile or produce infertile offspring – gene drive works by unleashing a mutated gene that spreads rapidly through the species.

Once it is released it can't be stopped.

“If it works, it will eliminate a whole species,” says Dr Wakeford, a biologist at the University of Exeter.

Target Malaria’s work in Burkina Faso, Mali and Uganda, involves just one of more than 3,000 species of mosquito, the Anopheles gambiae.

But environmentalists warn that removing even one species could disrupt the whole ecosystem in unforeseeable ways. Anopheles gambiae could be an important food source and pollinator without which the flora and fauna where it lives could change dramatically.

“There are agrarian communities [where gene drive research is taking place]. If their crops are affected, that’s their livelihoods, their health, everything,” says Dr Wakeford.

Dr Ify Aniebo, a molecular geneticist from Nigeria, asks what the impact could be on the disease itself. In an article published by campaign group GMwatch he wrote: “Will the engineered organism upset the delicate balance of ecosystems, thereby causing new diseases to emerge or prompting already existing illnesses to spread?”

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CRISPR Gene Editing Toolbox Is Expanding

There is an arms race of sorts as genetic scientists 'scour the planet' for alternatives to standard CRISPR technology. As it gathers steam, editing the human genome will prove to be the scourge of humanity. TN Editor

The gene-editing tool that has revolutionized biology is becoming even more powerful.

CRISPR, as the system is known, allows scientists to target and snip a specific sequence of letters on a strand of DNA with unprecedented precision. That has opened up new possibilities for treating genetic diseases, helping plants adapt to global warming and even preventing mosquitoes from spreading malaria.

CRISPR is made up of two basic components. The first is a piece of RNA that locates a predetermined sequence of DNA in an organism's genome that scientists want to alter. The second is a type of protein called an enzyme that attaches itself to the target section of DNA and splices it.

Cas9 has been the workhorse enzyme because it executes a neat, blunt cut. But in the last few years, scientists have started to search for — and find — alternative CRISPR systems that cut with enzymes other than Cas9.

"Cas9 is a powerful tool, but it has limitations," said CRISPR pioneer Feng Zhang, a bioengineer at MIT and the Broad Institute. "Each of these proteins has shortcomings and strengths, and together they help us create a much more versatile box of tools."

Some of the new Cas enzymes cut DNA in different ways that make certain edits more likely to work. Other enzymes are smaller, allowing scientists to more easily insert them into cells.

"The diversity of CRISPR proteins is exceptionally broad," said Benjamin Oakes, an entrepreneurial fellow at the Innovative Genomics Institute, a joint project of the University of California, Berkeley and the University of California, San Francisco. "They have been evolving over millennia

and nature has developed hundreds, if not thousands, that can work."

In nature, bacteria use this technology as a defense mechanism to find and destroy attacking viruses.

Bacteria store sequences of viral DNA within their own DNA, bookended by a repeating sequence of letters. Hence the system's name CRISPR, which stands for Clustered Regularly Interspaced Short Palindromic Repeats. (The first CRISPR systems discovered were indeed partly palindromic, however scientists later found that that this is not universally true.)

CRISPR-Cas9 has already proved to be an exceedingly useful tool for a wide variety of genetic tinkering, including turning genes on and off, disabling them entirely, introducing new DNA into a genome, and deleting DNA you don't want.

But scientists wondered what other CRISPR enzymes might bring to the genetic editing table.

CRISPR-Cas12a was the first system after CRISPR-Cas9 to be used for gene editing in the lab. A recent study on Cas12a's cousin Cas12b demonstrated that this variant could edit the human genome as well, giving scientists yet another tool to tackle genetic diseases.

Other work has shed light on a suite of additional promising CRISPR enzymes, including Cas13, Cas14 and CasY. The latest candidate, CasX, was described in detail Monday in a study by Oakes and others in the journal Nature.

Comparing CRISPR systems is a bit like comparing fruits, Zhang said. If Cas9 enzymes are apples, then Cas12 enzymes might be plums — still edible and delicious, but also totally different.

And like fruit, these different systems have variations within them. Just like there are subspecies of plums, there is also a wide variety of Cas12 enzymes.

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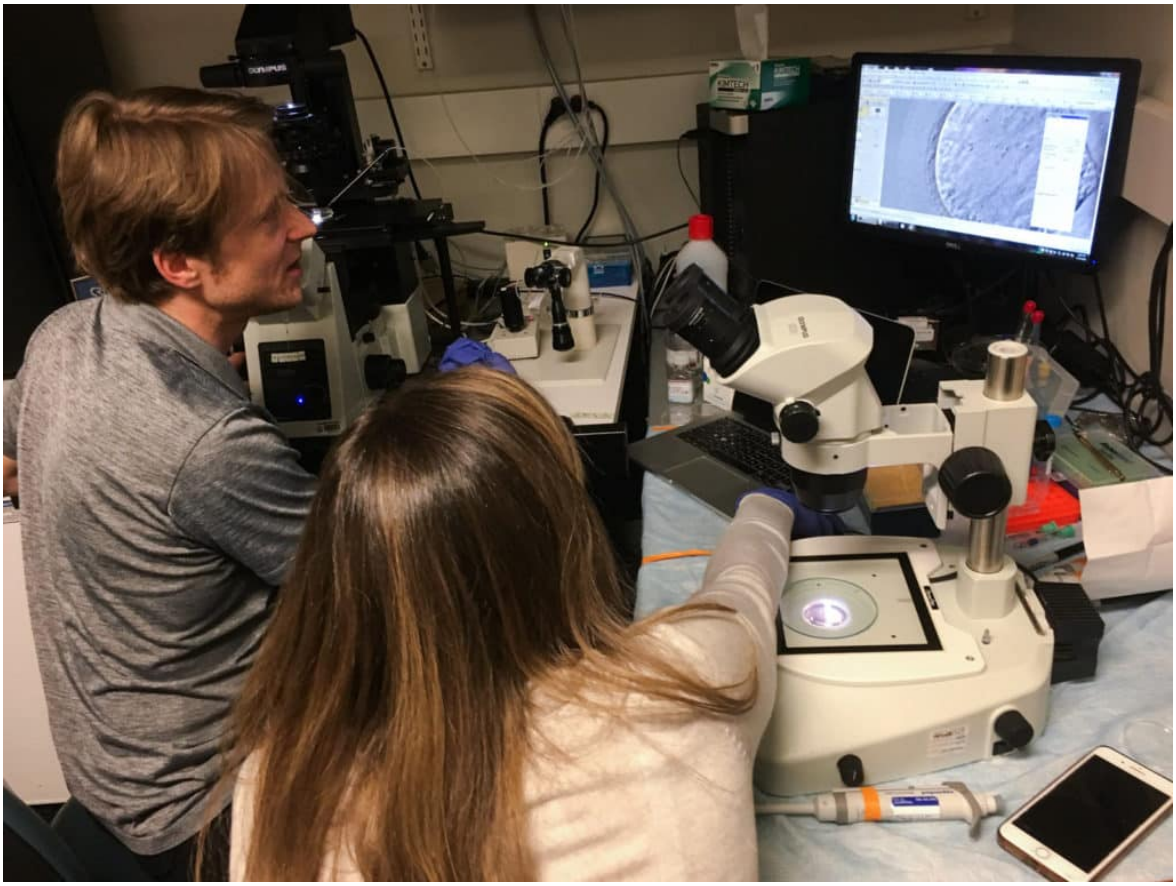

New U.S. Experiments Aim To Create Gene-Edited Human Embryos

Technocrat scientists at Columbia University are following China's lead in editing human embryos with CRISPR technology. One lead scientists says, "Right now we are not trying to make babies", indicating that they fully intend to make GMO babies later TN Editor

A scientist in New York is conducting experiments designed to modify DNA in human embryos as a step toward someday preventing inherited diseases, NPR has learned.

For now, the work is confined to a laboratory. But the research, if successful, would mark another step toward turning CRISPR, a powerful form of gene editing, into a tool for medical treatment.

A Chinese scientist sparked international outrage in November when he announced that he had used the same technique to create the world's first gene-edited human babies. He said his goal was to protect them from infection with HIV, a claim that was criticized because there are safe, effective and far less controversial ways of achieving that goal.

In contrast, Dieter Egli, a developmental biologist at Columbia University, says he is conducting his experiments "for research purposes." He wants to determine whether CRISPR can safely repair mutations in human embryos to prevent genetic diseases from being passed down for generations.

So far, Egli has stopped any modified embryos from developing beyond one day so he can study them.

"Right now we are not trying to make babies. None of these cells will go into the womb of a person," he says.

But if the approach is successful, Egli would likely allow edited embryos to develop further to continue his research.

Egli hopes doctors will someday be able edit embryonic human DNA to prevent many congenital illnesses, such as Tay-Sachs disease, cystic fibrosis and Huntington's disease.

In the lab, Egli is trying to fix one of the genetic defects that cause retinitis pigmentosa, an inherited form of blindness. If it works, the hope is that the approach could help blind people carrying the mutation have genetically related children whose vision is normal.

"Preventing inherited forms of blindness would be wonderful — very important for affected families," Egli says.

But that is likely to take years of additional research to demonstrate that the technique is both effective and safe.

Nevertheless, even this kind of basic research is controversial.

"This is really disturbing," says Fyodor Urnov, associate director of the Altius Institute for Biomedical Sciences in Seattle. He worries such

experiments could encourage more irresponsible scientists to misuse gene-editing technologies.

“As we’ve learned from the events in China, it is no longer a hypothetical that somebody will just go ahead and go rogue and do something dangerous, reckless, unethical,” Urnov says.

Egli’s research is reviewed in advance and overseen by a panel of other scientists and bioethicists at Columbia.

While the debate over research like Egli’s continues, the U.S. National Academies of Science, Engineering and Medicine, the World Health Organization and others are trying to develop detailed standards for how scientists should safely and ethically edit human embryos.

Some bioethicists and scientists are calling for an explicit global moratorium on creating any more gene-edited babies. Others, like Urnov, would like to see a hiatus in even basic research.

The U.S. government prohibits the use of federal funding for research involving human embryos. But gene editing of human embryos can be done using private funding. The Food and Drug Administration is barred from considering any studies that would involve using genetically modified human embryos to create a pregnancy. But laws that govern the creation of genetically modified babies vary widely internationally.

Egli is well aware that his work may be controversial to some people. To try to be completely transparent about his experiments, Egli recently invited NPR to his laboratory for an exclusive look at his research.

“We can’t just do the editing and then hope everything goes right and implant that into a womb. That’s not responsible,” Egli says. “We have to first do the basic research studies to see what happens. That’s what we’re doing here.”

To show NPR what he is doing, early one morning Egli pushes open the door of a tiny windowless room on the sixth floor of one of Columbia’s research towers in Upper Manhattan. The lab is jammed with scientific equipment, including two microscopes.

Egli snaps on blue rubber gloves and opens a frosty metal cylinder holding frozen human eggs.

“I’m going to wear gloves because we want to keep things clean,” he tells me.

To begin his experiment, Egli starts the long, slow process of thawing the frozen human eggs that were donated for research. After several hours of careful work and waiting, Egli has readied 15 eggs for his experiment.

After setting up a large microscope, Egli slides a round glass dish under the lens. The dish contains sperm from a blind man who carries the mutation that Egli is trying to fix. It also holds the CRISPR gene-editing tool.

“I’m starting with just one egg,” he says as he gently places the first thawed egg into the dish.

“It’s a beautiful cell,” Egli says, pointing to a magnified image of the egg on a computer monitor. “I would say it’s one of the most beautiful cells.”

Egli maneuvers a tiny glass needle protruding into the side of the microscope dish toward one of the sperm. “So you can see a moving sperm over here,” he says. “Now I’m picking it up. The sperm is in the needle. Now I’m dipping it in the CRISPR tool.”

Once the sperm is inside the needle with the CRISPR gene-editing tool, Egli points the needle’s tip at the egg. “Oh no!” he exclaims with a sigh. “The sperm is swimming away.”

He searches the dish for the errant sperm.

“Oh, here it is,” he says as he pulls the sperm back into the needle.

Next, Egli gently pierces the egg with the needle. “The membrane is broken — breached. There we go,” Egli says as he injects the sperm and CRISPR tool into the egg. He breathes a sigh of relief.

Read full story here…