



PLOEMEUR: An employee of Aquastream company looks at marine worms through a microscope, in Ploemeur, western France.



PLOEMEUR: An employee of Aquastream company presents a marine worm, in Ploemeur, western France. — AFP photos

IN US FIRST, SCIENTISTS EDIT GENES OF HUMAN EMBRYOS

NEW YORK: For the first time in the United States, scientists have edited the genes of human embryos, a controversial step toward someday helping babies avoid inherited diseases. The experiment was just an exercise in science - the embryos were not allowed to develop for more than a few days and were never intended to be implanted into a womb, according to MIT Technology Review, which first reported the news.

Officials at Oregon Health & Science University confirmed Thursday that the work took place there and said results would be published in a journal soon. It is thought to be the first such work in the US; previous experiments like this have been reported from China. How many embryos were created and edited in the experiments has not been revealed. The Oregon scientists reportedly used a technique called CRISPR, which allows specific sections of DNA to be altered or replaced.

Designer babies

It's like using a molecular scissors to cut and paste DNA, and is much more precise than some types of gene therapy that cannot ensure that desired changes will take place exactly where and as intended. With gene editing, these so-called "germline" changes are permanent and would be passed down to any offspring. The approach holds great potential to avoid many genetic diseases, but has raised fears of "designer babies" if done for less lofty reasons, such as producing desirable traits. Last year, Britain said some of its scientists could edit embryo genes to better understand human development.

And earlier this year in the US, the National Academy of Sciences and National Academy of Medicine said in a report that altering the genes of embryos might be OK if done under strict criteria and aimed at preventing serious disease. "This is the kind of research that the report discussed," University of Wisconsin-Madison bioethicist R. Alta Charo said of the news of Oregon's work. She co-led the National Academies panel but was not commenting on its behalf Thursday. "This was purely laboratory-based work that is incredibly valuable for helping us understand how one might make these germline changes in a way that is precise and safe. But it's only a first step," she said. "We still have regulatory barriers in the United States to ever trying this to achieve a pregnancy. The public has plenty of time" to weigh in on whether that should occur, she said. "Any such experiment aimed at a pregnancy would need FDA approval, and the agency is currently not allowed to even consider such a request" because of limits set by Congress.

Germline changes

One prominent genetics expert, Dr. Eric Topol, director of the Scripps Translational Science Institute in La Jolla, California, said gene editing of embryos is "an unstoppable, inevitable science, and this is more proof it can be done." Experiments are in the works now in the US using gene-edited cells to try to treat people with various diseases, but "in order to really have a cure, you want to get this at the embryo stage," he said. "If it isn't done in this country, it will be done elsewhere." There are other ways that some parents who know they carry a problem gene can avoid passing it to their children, he added. They can create embryos through in vitro fertilization, screen them in the lab and implant only ones free of the defect.

Dr. Robert C. Green, a medical geneticist at Harvard Medical School, said the prospect of editing embryos to avoid disease "is inevitable and exciting," and that "with proper controls in place, it's going to lead to huge advances in human health." The need for it is clear, he added: "Our research has suggested that there are far more disease-associated mutations in the general public than was previously suspected." Hank Greely, director of Stanford University's Center for Law and the Biosciences, called CRISPR "the most exciting thing I've seen in biology in the 25 years I've been watching it," with tremendous possibilities to aid human health. "Everybody should calm down" because this is just one of many steps advancing the science, and there are regulatory safeguards already in place. "We've got time to do it carefully," he said. —AP

THE STORY OF HOW A WORM TURNED INTO A BRINGER OF MEDICAL MIRACLES

WORM BLOOD COULD SAVE LIVES, HELP TRANSPLANT PATIENTS

PLOEMEUR, France: For centuries, the only use humans found for the lugworm-dark pink, slimy and inedible-was on the end of a fish hook. But the invertebrates' unappreciated status is about to change. Their blood, say French researchers, has an extraordinary ability to load up with life-giving oxygen. Harnessing it for human needs could transform medicine, providing a blood substitute that could save lives, speed recovery after surgery and help transplant patients, they say.

"The hemoglobin of the lugworm can transport 40 times more oxygen from the lungs to tissues than human hemoglobin," says Gregory Raymond, a biologist at Aquastream, a fish-farming facility on the Brittany coastline. "It also has the advantage of being compatible with all blood types." Raymond and his team, which specializes in fish egg production, joined forces with biotech firm Hemarina in 2015 in the hope of securing a reliable means of lugworm production.

The facility now churns out more than 1.3 million of the creatures each year, each providing tiny amounts of the precious hemoglobin. "We started basically from zero. Since the worm had never been studied, all parameters needed inventing from scratch, from feeding to water temperature," says project researcher Gwen Herault. Medical interest in the lugworm-Arenicola marina-dates back to 2003, when the outbreak of mad-cow disease in Europe and the worldwide HIV epidemic began to affect blood supplies.

The problem was that animal hemoglobin's, as a substitute for the human equivalent, can cause allergic reaction, potentially damaging the kidneys. In lugworms, though, hemoglobin

dissolves in the blood and is not contained within red blood cells as in humans-in other words, blood type is not an issue and its structure is almost the same as human hemoglobin. In 2006, the worm's potential was validated in a major study. Scientists at Roscoff, close to Ploemeur, extracted and purified hemoglobin from local-caught lugworms and tested it on lab mice.

The rodents were fine and showed no sign of the immune response that dogged other animal substitutes. If proven safe for humans, the researchers said, the worms' oxygen-rich blood could tackle septic shock-a crash in blood pressure that can cause fatal multiple organ failure-and help to conserve organs for transplantation. Clinical trials of the blood product began in 2015. Lugworm hemoglobin was used last year in 10 human kidney transplants at a hospital in the western French city of Brest and 60 patients are currently enrolled in tests of the blood product across France.

Male or female?

The secrets of lugworm hemoglobin lie in its ability to survive in extreme conditions, burrowing into sand at the edges of the tide. The worm grows to about 25 centimeters in length and has several bushy external gills along its body. At high tide, submerged in water, the worm builds up stocks of oxygen that, astonishingly, allow it to survive more than eight hours out of the water at low tide. Anyone who has walked along a sandy beach at low tide will see evidence of lugworms, from the tiny coiled casts of sand they throw up from their burrow, 10 cms

below the surface. But, apart from anglers who dig up the creatures for bait, lugworms are rarely seen-and breeding them is a novel challenge. "The main difficulty is working with a small animal that lives its life hidden," explained Raymond. Aquastream struggled at first with basic rearing problems-including how to tell a male lugworm from a female. After nine months of testing, "50 percent of adult worms survived and a good deal of them produced eggs," said Herault.

The larvae start out around 1mm in length and the worms are transported to Hemarina's testing site once they reach 5mm. Aquastream director Nathalie Le Rouilly said that her firm's collaboration with Hemarina could provide the world of medical science with a sustainable supply of the worms. "There is nowhere else in France or the world that has the capacity to produce lugworms in a controlled environment to ensure a supply of their hemoglobin," she says.

Scientists are excited by the potential of lugworm hemoglobin-although they also point to a rigorous testing procedure before the molecule can be certified as safe and effective for humans. "The properties of extracellular hemoglobin extracted from the lugworm could help protect skin grafts, promote bone regeneration and lead to universal blood," says Raymond. If this vision turns real, lugworm blood may also allow donor organs to live longer outside the bodies, potentially helping thousands of recipients each year. And, one day, freeze-dried lugworm blood could be a crucial backup for standard blood supplies-a boon in combat zones or disasters. — AFP

SUGAR NOT SO SWEET FOR MENTAL HEALTH

PARIS: Sugar may be bad not only for your teeth and your waistline, but also your mental health, claimed a study Thursday that was met with skepticism by other experts. Researchers at University College London (UCL) compared the reported sugar intake of more than 8,000 people in a long-term British study, to their mood. The study participants, civil servants, were monitored from 1985-1988, and filled out a questionnaire every few years thereafter. Researchers examined data from that study for an association between sugar intake and "common mental disorders" (CMD) such as anxiety and depression. The UCL team found "an increased likelihood" for men with a higher intake of sweet foods and drinks to develop CMD after five years, and a general "adverse effect" on mental health for both sexes. And they concluded, in a study published in the journal Scientific Reports, that "lower intake of sugar may be associated with better psychological health."

But dietician Catherine Collins, a spokes-

woman for the British Dietetic Association, said this recommendation was "unproven". Problems with the study, she said, included that sugar consumption was self-reported, and that sugar intake from alcohol was not counted. The researchers, she said, appeared to confuse naturally-occurring sugar from foodstuffs such as milk, and "free sugars" added to hot drinks or in sweets. "The dietary analysis makes it impossible to justify the bold claims made by the researchers about sugar and depression in men," Collins said via the Science Media Centre in London. "Reducing intake of free sugars is good for your teeth, and may be good for your weight, too. But as protection against depression? It's not proven." Nutrition expert Tom Sanders agreed the results should be interpreted "with caution". "From a scientific standpoint it is difficult to see how sugar in food would differ from other sources of carbohydrate on mental health as both are broken down to simple sugars in the gut before absorption," he said. — AFP



TOKYO: A humphead wrasse, transported from Japan's southern island of Okinawa, swims with other tropical saltwater fish on display in a tank for the Sony Aquarium 2017 exhibition in Tokyo. — AFP

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