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Stem Cells Induced for Conservation

Researchers generate pluripotent stem cells from two endangered species in hopes of learning more about the near-extinct animals.

By Kerry Grens | September 4, 2011

Drill (Mandrillus leucophaeus)
FLICKR, ANGELL WILLIAMS

Using frozen cells stored at the San Diego Zoo, researchers have made induced pluripotent stem cells (iPSCs) from two species teetering on the brink of extinction: an African primate called a drill and the northern white rhinoceros. The study, published today (September 4) in *Nature Methods*, is the first to tap into the potential of iPSCs for the conservation of endangered species.

"It is one means of capturing a genome in a way that is reproducible and will allow you to study tissue development maybe long after the animal is gone," said George Daley, a professor at Children's Hospital Boston and Harvard Medical School, who was not part of this study. "Whether or not this can assist in reproduction is somewhat more speculative, and that may or may not ever pan out."

Induced pluripotent stem cells are created by reprogramming somatic cells. In this case, researchers started with frozen fibroblasts, in storage at the San Diego Zoo's Frozen Zoo, from a now-deceased drill named Loon and a white rhino named Fatu. Though iPSCs have been successfully generated from humans, mice and other animals, working with endangered species, about which little genetic information has been gathered, created a challenge for the scientists.

"Ideally, I would have cloned out the appropriate reprogramming genes from that organism and made vectors using those sequences," said senior author Jeanne Loring, the director of the Center for Regenerative Medicine at Scripps Research Institute. But such reprogramming genes aren't known for these species. Instead, the researchers used reprogramming genes from humans, and they worked.

Northern white rhinoceros (Ceratotherium simum cottoni)
WIKIMEDIA, MISTVAN

Identifying pluripotency-associated gene expression and pluripotency markers that would work for these species was not as straightforward, requiring extensive scanning through PCR primers and antibodies Loring said, but in the end, they found success: the chromosomal characteristics of the stem cells, their expression of pluripotency markers, and the ability to differentiate into different cell types all heralded success in generating iPSCs from both the drill and the rhino.

It's not clear yet how the cells might be used in conservation efforts. Pierre Comizzoli, a reproductive

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physiologist with the Smithsonian Conservation Biology Institute who did not participate in this research, told *The Scientist* that their application is likely a long way off, but stem cells might become useful in the future. “First of all, they could be used for regenerative medicines to maybe help some animals recover functions that are lost because of genetic diseases or metabolic disorders,” he said. “Then later on, there is maybe the possibility of shaping those stem cells into sperm or eggs and having the possibility of recreating embryos from there.”

Such long term ambitions should not distract the public from the immediate needs of these animals, Comizzoli added. Habitat conservation, for instance, is an immediately available method for protecting endangered species.

Loring agreed, saying she hopes that the paper will remind people of the desperate situation for these animals. There are several thousand drills, but just seven northern white rhinos alive. There had been eight rhinos when Loring started the project. “One of them died between the time we submitted and the time we were accepted,” she told *The Scientist*.

“Induced pluripotent stem cells from highly endangered species,” I. F. B.-N., *et al.*, *Nature Methods*, DOI:10.1038/NMETH.1706, 2011.

Tags: conservation, induced pluripotent stem cell, iPSC, pluripotent, primate, reproduction, rhinoceros, stem cells, techniques, zoo

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