Discovery may make it easier to develop life-saving stem cells

July 17 2014

A photograph of a human egg, or oocyte. An MSU team of researchers found that certain genes taken from the oocyte can be key in the making of stem cells. Credit: Jose Cibelli

Not unlike looking for the proverbial needle in a haystack, a team of Michigan State University researchers have found a gene that could be key to the development of stem cells – cells that can potentially save millions of lives by morphing into practically any cell in the body.

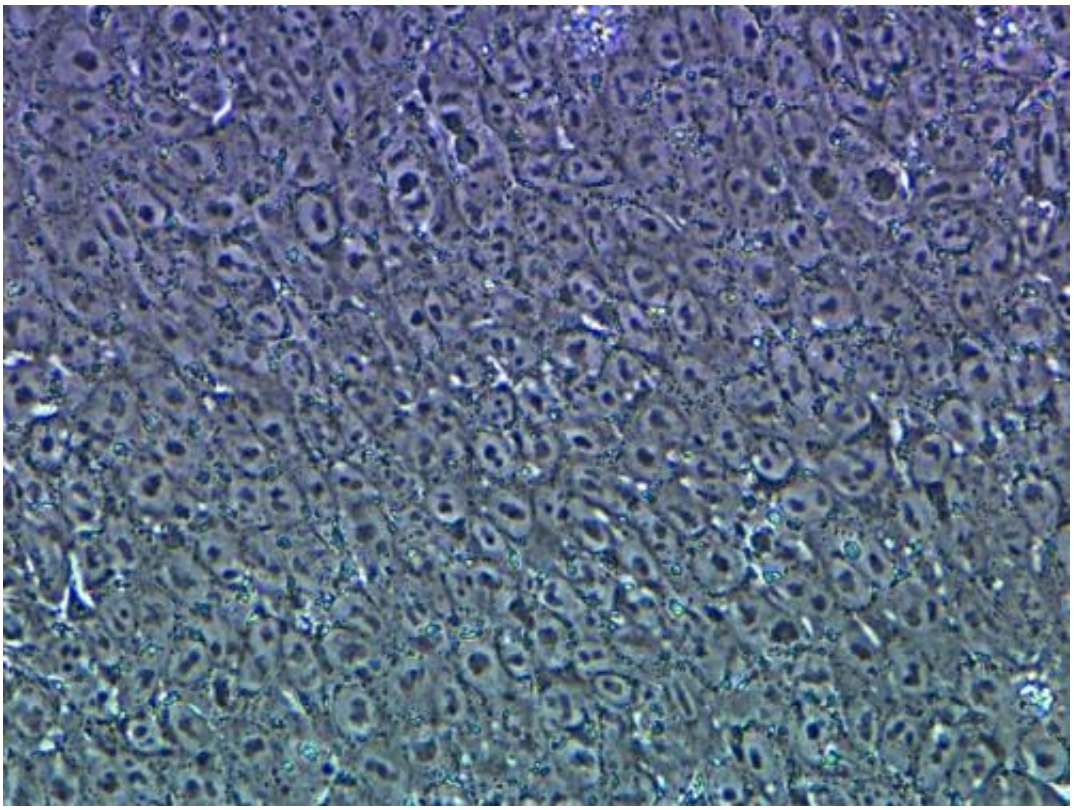
The gene, known as ASF1A, was not discovered by the team. However, it is at least one of the genes responsible for the mechanism of cellular reprogramming, a phenomenon that can turn one cell type into another, which is key to the making of stem cells.

In a paper published in the journal *Science*, the researchers describe how they analyzed more than 5,000 genes from a human egg, or oocyte, before determining that the ASF1A, along with another gene known as OCT4 and a helper soluble molecule, were the ones responsible for the reprogramming.

"This has the potential to be a major breakthrough in the way we look at how stem cells are developed," said Elena Gonzalez-Munoz, a former MSU post-doctoral researcher and first author of the paper. "Researchers are just now figuring out how adult somatic cells such as skin cells can be turned into embryonic stem cells. Hopefully this will be the way to understand more about how that mechanism works."

In 2006, an MSU team identified the thousands of genes that reside in the oocyte. It was from those, they concluded, that they could identify the genes responsible for cellular reprogramming.

In 2007, a team of Japanese researchers found that by introducing four other genes into cells, stem cells could be created without the use of a human egg. These cells are called induced pluripotent stem cells, or iPSCs.



An image of what are known as induced pluripotent stem cells, or iPSCs. The cells are created when certain genes are added to regular somatic cells. Stem cells can potentially save millions of lives as they can differentiate into many other types of cells that can be used therapeutically. Credit: Elena Gonzalez-Munoz

"This is important because the iPSCs are derived directly from adult tissue and can be a perfect genetic match for a patient," said Jose Cibelli, an MSU professor of animal science and a member of the team.

The researchers say that the genes ASF1A and OCT4 work in tandem with a ligand, a hormone-like substance that also is produced in the oocyte called GDF9, to facilitate the reprogramming process.

"We believe that ASF1A and GDF9 are two players among many others that remain to be discovered which are part of the cellular-

reprogramming process," Cibelli said.

"We hope that in the near future, with what we have learned here, we will be able to test new hypotheses that will reveal more secrets the oocyte is hiding from us," he said. "In turn, we will be able to develop new and safer cell-therapy strategies."

More information: "Histone chaperone ASF1A is required for maintenance of pluripotency and cellular reprogramming", www.sciencemag.org/lookup/doi/ … 1126/science.1254745

Provided by Michigan State University