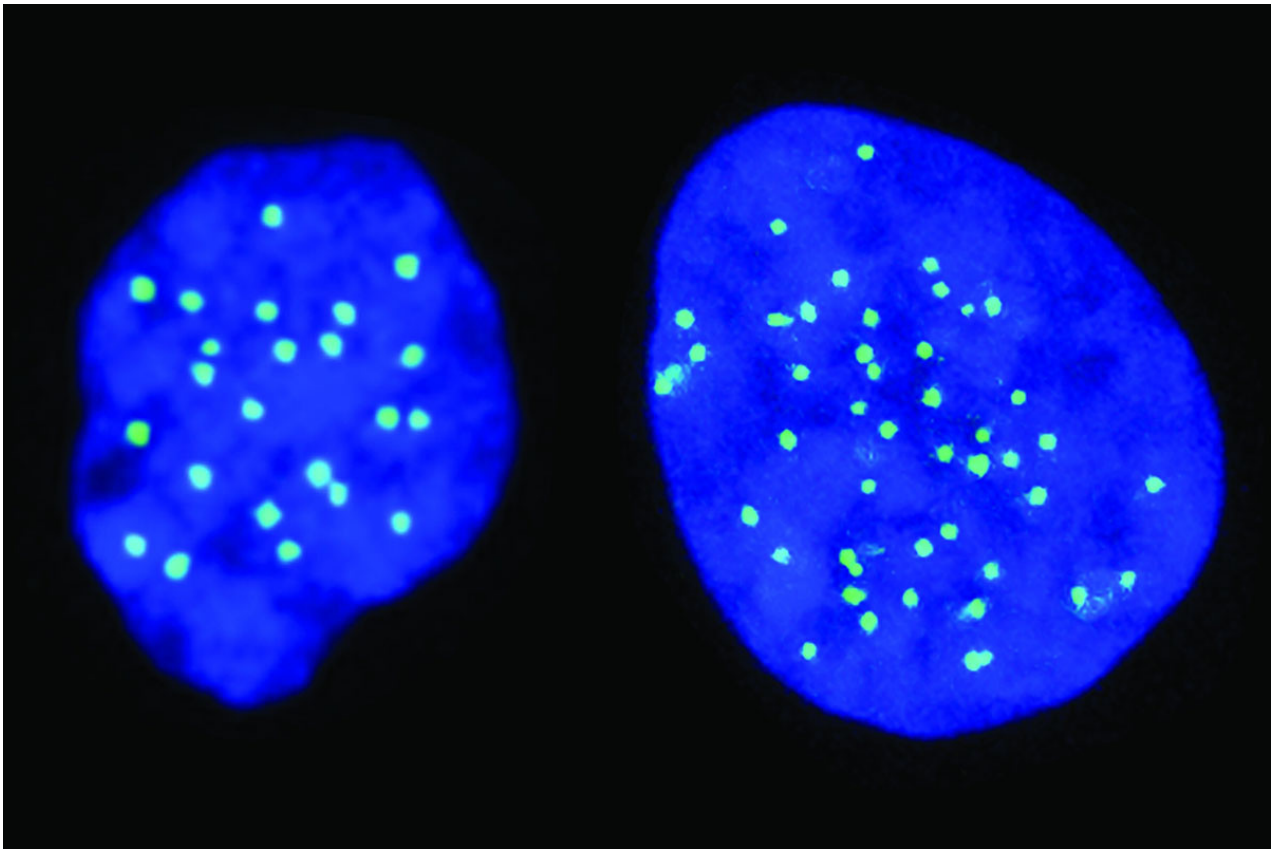
DAILY NEWS 16 March 2016

Human stem cell with half a genome could help infertile couples



A haploid cell with 23 chromosomes (left), and a diploid cell with 46 chromosomes (right)
Columbia University Medical Center/Hebrew University

Sometimes less is more. Scientists have created a new kind of human stem cell that has just half a genome. The cells can be turned into any tissue in the human body, despite only containing one set of chromosomes. The discovery will provide a vital tool for developing therapies to treat a range of conditions, including cancer and infertility, and may even shed light on why we reproduce sexually via two parents rather than one.

Most cells in the body contain information in the form of DNA packaged into two sets of chromosomes – one from each parent. They are called diploid cells. Egg and sperm cells are the exception – they are haploid cells with one set of chromosomes. They can't normally divide by themselves; instead they come together at fertilisation to create diploid cells that eventually form a fetus.

Embryonic stem cells are diploid cells from which all tissues in the body are built. Now, Nissim Benvenisty, director of the Azrieli Center for Stem Cells and Genetic Research at the Hebrew University of Jerusalem, Israel, and his colleagues have generated haploid embryonic stem cells with a single set of chromosomes.

To the surprise of everyone involved, these cells were able to divide and turn into different cells in the body. "Most researchers believed human haploid cells could not

divide and differentiate into different cell types," says Benvenisty. "Since we've shown they can, it poses the interesting question of why we reproduce sexually rather than from a single parent."

Half time

The new embryonic stem cells could potentially be used to create eggs and sperm for infertile couples.

Perhaps the most important aspect of the work though, is its application in genetic screening. Detecting the effect of single genes that mutate in our cells and cause disease is complicated because the second copy of the gene can serve as a healthy backup. Now that we can make haploid versions of any cell in the human body with one set of chromosomes, researchers can easily mutate single genes and immediately see what happens to the behaviour of the cell. Benvenisty and his colleagues will be using their new stem cells to investigate mutations in genes that are involved in tumour development and in resistance to chemotherapies.

A rare find

To create the novel stem cells, Benvenisty's colleague, Dieter Egli from Columbia University Medical Center and the New York Stem Cell Foundation, used electricity and chemicals to force an unfertilised human egg cell to divide. As the egg started to divide, it synthesised another copy of its chromosomes to produce diploid cells. But the team

Having a set of human cells with only one set of chromosomes will help our understanding of how gene mutations affect the behaviour of cells, says Jose Silva, a researcher at the Cambridge Stem Cell Institute in the UK. "This is an exciting tool."

Journal reference: *Nature*, DOI: 10.1038/nature17408