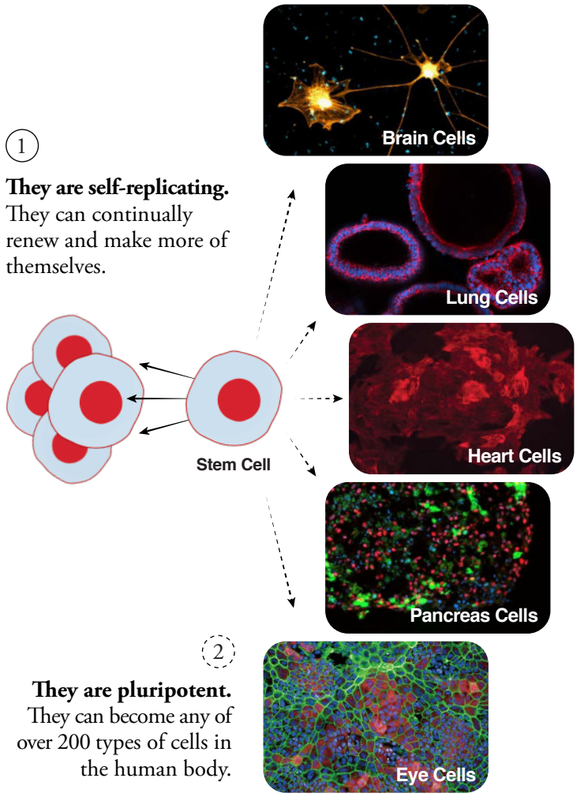
What are stem cells?

Our bodies are made of many types of cells, each with a specific purpose. For example, red blood cells carry oxygen, pancreas cells produce insulin, liver cells break down fat, and so on. Early on in human development, however, cells haven't been assigned a "purpose" yet. These are stem cells.

Stem cells are the building blocks of the body and are unique because:



1

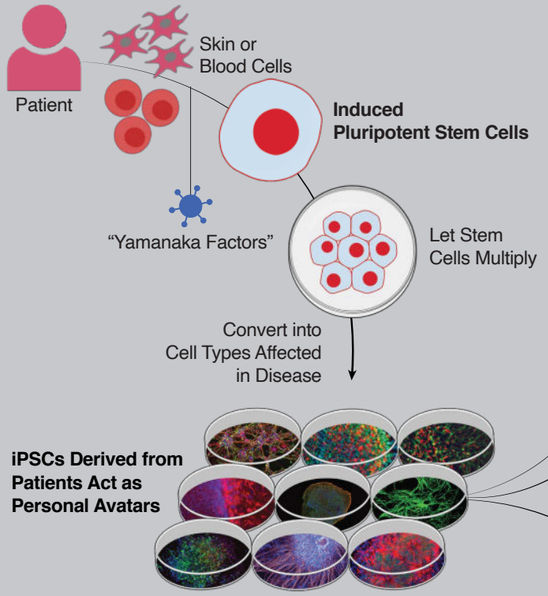
They are self-replicating. They can continually renew and make more of themselves.

2

They are pluripotent. They can become any of over 200 types of cells in the human body.

What are induced pluripotent stem cells (iPSCs)?

Induced pluripotent stem cells (iPSCs) can be created from anyone's skin or blood samples through a process that reverts them into an 'embryonic' state capable of becoming any type of cell in the body. The process to make iPSCs was discovered in 2006 by Dr. Shinya Yamanaka, earning him a Nobel Prize in Medicine.



iPSCs keep the DNA of their donor. So, if a person is affected by a disease, their stem cells will reflect their individual disease characteristics, helping scientists to understand how disease varies across patients and advance personalized medicine.

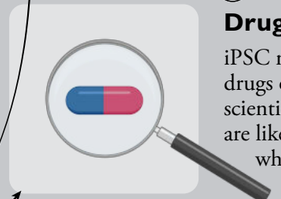
What are iPSCs used for?

iPSCs from patients can be made into any of the cell types affected in disease, and used in three major ways:

1

Disease Research

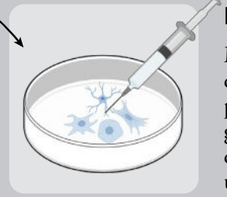
iPSCs allow scientists to study how the actual human cells affected by a disease develop and dysfunction, and how that might vary from individual to individual.



2

Drug Discovery

iPSC models can also be used to test drugs on cells in a dish. This helps scientists to determine which drugs are likely to be safe and effective in which groups of patients, and to identify the most promising candidates to advance to clinical trials.



3

Regenerative Medicine

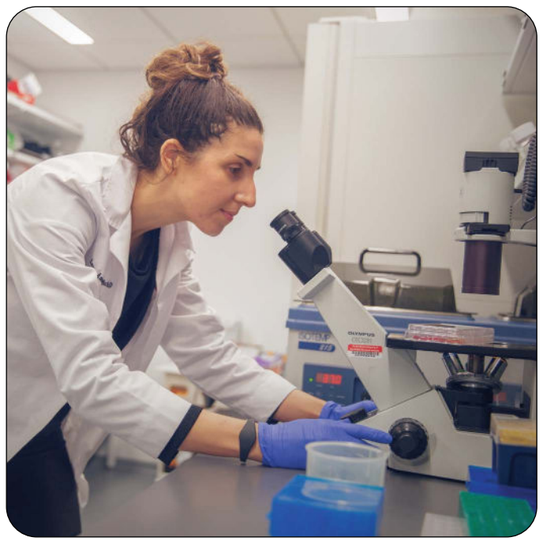
Many diseases result from a dysfunction or loss of cells in a certain part of the body. Using iPSCs, we can generate the cell types implicated in a disease, correct their dysfunction, and use these new cells to replace the diseased ones in patients.

How does NYSCF use stem cells in disease research?

At NYSCF, we use the **NYSCF Global Stem Cell Array®**, an automated robotic system, to create standardized, high-quality iPSCs that we then turn into other cell types. Our scientists can create iPSCs from hundreds of skin or blood samples at a time, helping researchers capture how diseases affect genetically diverse patient populations. We then use these cells to pursue research and treatments on an unprecedented scale.

For example, using stem cells, our scientists can make all the different cell types in the brain. Typically, it is hard to study the human brain because we cannot simply reach into it to take out cells. Generating different types of brain cells from stem cells is allowing our teams to study how diseases like Alzheimer's, multiple sclerosis, and Parkinson's affect actual human cells, pointing to new targets for intervention and illuminating previously unknown roles of certain cells in disease.

The New York Stem Cell Foundation Research Institute is an independent, privately funded research institute, dedicated to finding new treatments and cures for the diseases of our time through stem cell research.



Since our founding in 2005, NYSCF has advanced research in over 80 disease areas, built a global community of over 200 scientists, and now collaborates with over 100 leading academic and medical research institutions worldwide.

Follow us and learn more! /nyscf

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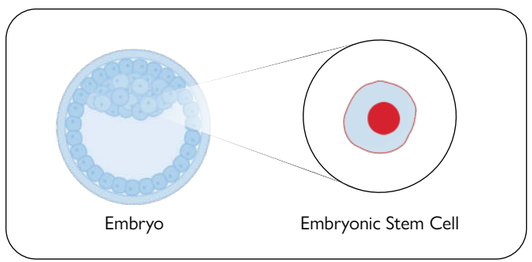
NYSCF The New York Stem Cell Foundation Research Institute

What are embryonic stem cells?

Before iPSCs, scientists would use embryonic stem cells, which are pluripotent stem cells derived from 5-to-7-day-old embryos that were left over from *in vitro* fertilization treatments and would otherwise be discarded. They are the early-stage cells in the body that give rise to all of our cells. While embryonic stem cells were initially the only means of performing stem cell research, most studies are now done using induced pluripotent stem cells (iPSCs). However, embryonic stem cells still serve as a critical reference point for the field.



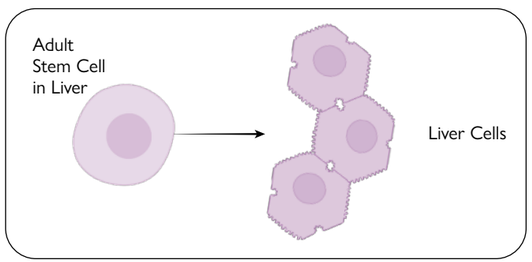
What is Somatic Cell Nuclear Transfer (SCNT)?

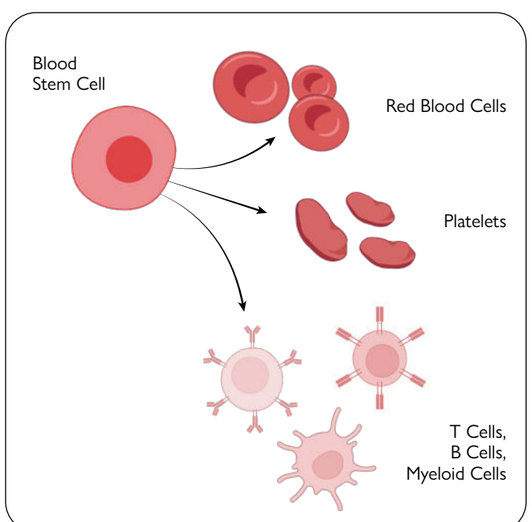
SCNT is a method for generating patient-specific embryonic stem cells pioneered by NYSCF.

In this technique, the nucleus of an egg cell is removed and replaced with the nucleus of an adult cell, like a skin or blood cell, from a patient. This technique allowed NYSCF to create the first personalized embryonic stem cell models of disease.

What is an adult stem cell?

Adult stem cells are tissue-specialized stem cells that exist in our bodies for our entire lives and act as an internal repair system. Adult stem cells are excellent for studying and potentially repairing specific tissues, but they can only make the limited types of cells found in the tissue in which they reside. For example, adult stem cells from the liver normally only make more liver cells.





STEM CELLS 101

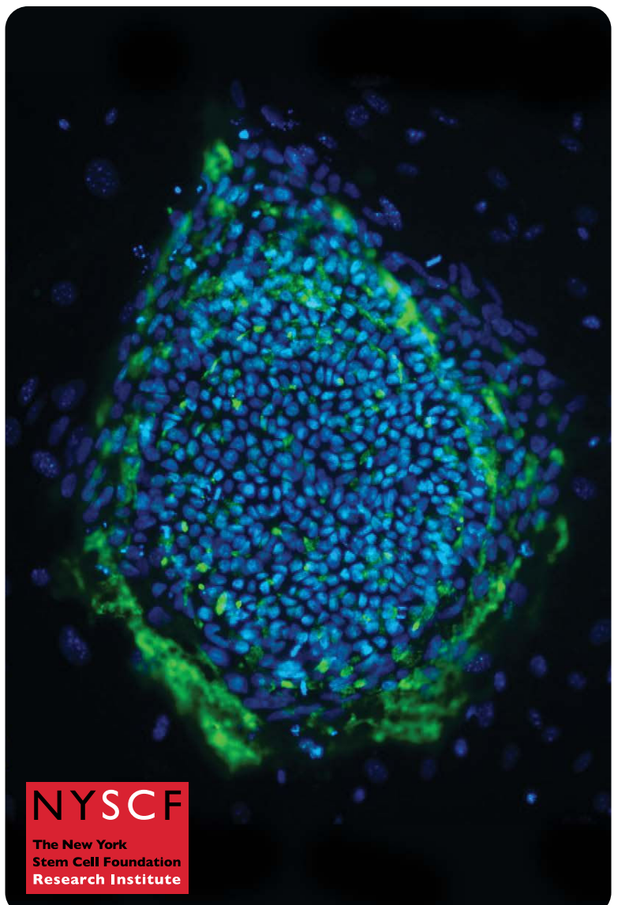


Image: Induced pluripotent stem cells created by NYSCF scientists