_Plurrr_ipotent Stem Cells for Cats?

Advances in Feline Regenerative Medicine

by Melanie Dibbell

In a groundbreaking leap for feline regenerative medicine, researchers have successfully created embryonic stem cell (ESC) lines for cats; a first for veterinary medicine that could revolutionize how we treat chronic feline diseases. To understand why this is such a big deal, we first need to discuss what it means to be a stem cell, how ESCs differ from other commonly used stem cell types like iPSCs, and MSCs, and the limitations of current feline regenerative medicine. Only then can you truly appreciate just how game-changing the creation of feline ESC lines really is.

Stem cells are special because they can do two key things: they can make copies of themselves (a process called self-renewal), and they can turn into other types of cells with specific functions, like nerve, liver, or blood cells. This ability to become specialized is known as differentiation. Stem cells are important because we need to constantly replenish our cells as old cells die off, and they also help with tissue repair when we get injured. ESCs and adult stem cells are the two main categories of naturally occurring stem cells. ESCs come from the group of cells in an embryo before organ development begins, called the inner cell mass. These cells are pluripotent, which means they have the potential to differentiate into any kind of cell in the body (Figure 1).

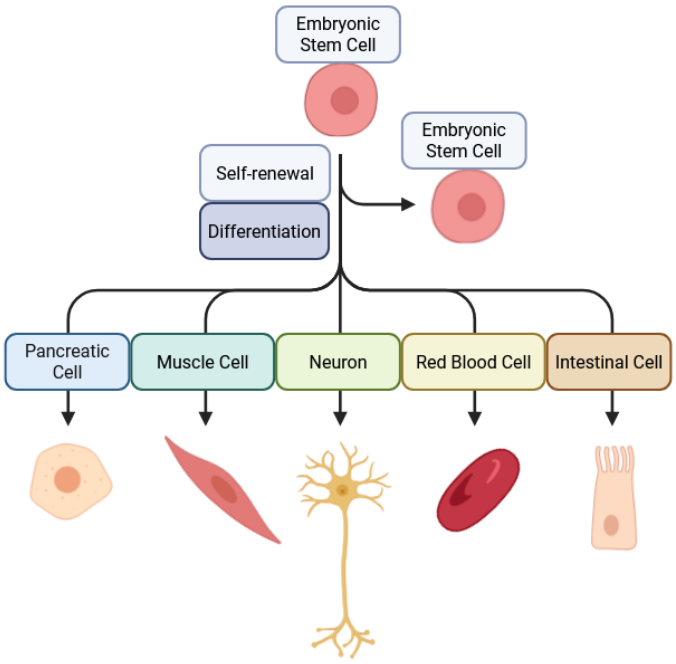

Figure 1. Embryonic stem cells can self-renew or differentiate into any type of cell in the body.

In contrast, adult stem cells are multipotent, meaning they can only develop into cell types related to the specific tissue or organ where they are found. For example, hematopoietic stem

cells are adult stem cells that reside in the bone marrow and that can differentiate into all the different types of blood cells, including white blood cell types and red blood cells (Figure 2).

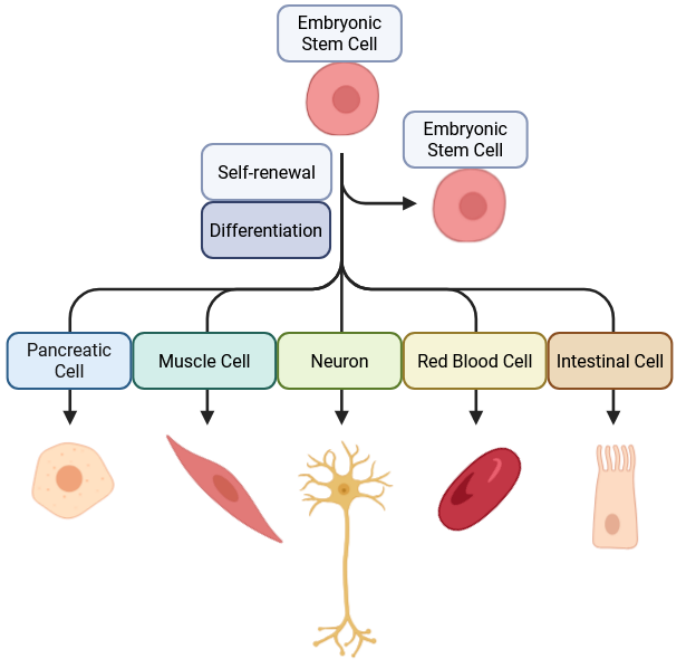

Figure 2. Hematopoietic stem cells are an example of an adult stem cell. They can self-renew or differentiate into any type of cell within its own cell line. Hematopoietic stem cells can make lymphoid progenitor cells that go on to differentiate into immune cells. Hematopoietic stem cells can also make myeloid progenitor cells that can go on to differentiate into each kind of white and red blood cell.

Stem cells have great potential for regenerative medicine. Scientists are actually able to create pluripotent stem cells that mimic ESCs from fully differentiated cells in the laboratory. Scientists can induce plurpotency by using reprogramming factors—molecules that can change a cell's gene expression. This process turns regular adult cells into induced pluripotent stem cells, or iPSCs.

Another type of widely used cell type in regenerative medicine is the mesenchymal stem cell (MSC). MSCs are a type of adult stem cell found in several tissues, most commonly in bone marrow, but also in fat tissue, umbilical cord blood, and other locations. MSCs are known for secreting factors that reduce inflammation and promote healing, which is why they're often used in regenerative medicine and clinical trials for conditions like arthritis, heart disease, and autoimmune disorders. It is estimated that there are over 1,000 clinical trials using MSCs currently. Despite their name, MSCs are not true stem cells in the strictest sense because their ability to self-renew and differentiate is more limited compared to embryonic stem cells or iPSCs. Some scientists now prefer terms like "mesenchymal stromal cells" to reflect this more accurately.

However, humans aren't the only ones benefitting from stem cell technology. Regenerative medicine is also being actively explored for for companion animals, like our beloved cats and dogs. For example, a 2016 study evaluated the use of MSCs to treat feline asthma. The researchers found that while MSC treatment took longer to reduce airway inflammation compared to standard treatments like inhalers and oral prednisolone (a steroid), the reduction in inflammation was significant—brining levels close to those seen in healthy cats (Trzil et al., 2016). This was exciting news, as treating asthma in cats is very difficult. As any cat owner with firsthand experience with feline asthma (myself included) can confirm, many cats don't tolerate

inhalers well. The only other treatment option for feline asthma is oral prednisolone, which has negative long term side effects like behavior changes, weight gain, increased risk for infections, and poor wound healing ability. In contrast, MSCs have not shown any significant negative side effects so far(Trzil et al., 2016).

In 2022, a study compared MSC treatment with the standard oral prednisolone treatment for feline inflammatory bowel disease (IBD) and found that MSCs were just as effective (Webb & Webb, 2022). This is an exciting and important finding, especially given the drawbacks of long term prednisolone use.

That same year, another study explored whether MSCs could be used to create insulin-producing cell clusters in the lab. Researchers successfully produced clusters containing three types of pancreatic cells, including cells that produce insulin. This promising result may pave the way for future clinical studies investigating MSC-based treatments for feline diabetes mellitus.

Currently, the standard treatment for diabetes mellitus in cats is daily insulin injections—just like in humans—which can be challenging. It requires precise timing of meals and careful monitoring to determine the correct dosage of insulin (Taguchi et al., 2022).

While MSCs are very useful and hold great promise for treating several feline diseases, ESCs (embryonic stem cells) likely offer even greater potential for long-term treatment efficacy. Unlike MSCs, ESCs are pluripotent—because they can develop into any cell type, researchers can explore treatments for a much wider range of conditions.

Untile recently, researchers had been unable to successfully generate feline ESCs in the lab, unlike with humans. But that changed in March 2025, with exciting news that a group of researchers in Japan finally cracked the code! Yoshida et al. successfully established three ESC lines—an incredible breakthrough that opens the door for future studies, with the potential to discover new treatments and even cures for a wide range of feline diseases (Yoshida et al., 2025). It’s a game-changing moment, and cat lovers around the world couldn’t be more thrilled.

References

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