[Amazing Samples: Progenitor Cells](http://blog.fisherbioservices.com/amazing-samples-progenitor-cells)

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Of all the advances medicine has been making in recent years, regenerative medicine is perhaps the most intriguing. One of the most important cells involved in regenerative medicine is the progenitor cell. These cells are able to differentiate into more functional cells, making our understanding of them and their mechanisms crucial to regenerative medicine and cell therapies.

Last time in our Amazing Samples blog series my colleague, Jaydeb Mukherjee, discussed the research potential of [saliva and phlegm](http://blog.fisherbioservices.com/amazing-samples-spit-spat-sputum). This time, let’s discuss more on how progenitor cells are an Amazing Sample.

**Differences with Stem Cells**

To begin, you must first understand the differences between stem cells and progenitor cells. The difference is two-fold and revolve around cell potency and their proximity to fully differentiated, functional cells.

Cell potency is a familiar concept for anyone well-versed in stem cell biology. Different stages of stem cells have the potential to differentiate into different ranges of functional cells, from pluripotent (any differentiation possible, typically embryonic) to multipotent (able to differentiate into a given class of cell, typically adult). Progenitor cells are the intermediate between stem cells and fully differentiated cells, not yet developed for full functionality, but either oligopotent (only a few differentiations available) or unipotent (the capacity to differentiate into only one cell type).

Indeed, the topic of nomenclature is rather controversial, with some insisting that any differences are semantic, and that all such cells should be described with the blanket term “stem cells”. Please refer to [this article](http://ntp.neuroscience.wisc.edu/neuro670/reqreading/StemProgenitor.pdf) for a more in-depth argument for the case of maintaining separate terminology, including the differences in capacity for self-renewal.

**Progenitor Cells and Blood**

Two of the most common progenitor cells employeed in both basic research and cell therapy development involve blood derived progenitors: endothelial progenitor cells and hematopoietic progenitor cells. There is an ever increasing number of such treatments being developed, such as [Northern Therapeutics’ tested solution for pulmonary hypertension](http://www.northernther.com/pages/2/index.htm), or [Allocord’s cord approved blood transplantation to treat a wide number of indications](http://www.fda.gov/BiologicsBloodVaccines/CellularGeneTherapyProducts/ApprovedProducts/ucm354689.htm).

This predominance makes sense both from a sourcing angle and a delivery angle. Sourcing-wise, blood based progenitors are relatively easily obtained, given the ease and painlessness of donation. Cord blood banks are an excellent example of the accessibility of this material. Additionally, due to these progenitor cells’ specific potentiality, the delivery method is usually a simple intravenous injection. Even so, the necessary processing in between acquisition and administration is far from simple, and the cells themselves can be [very difficult to isolate and study](http://www.nature.com/pr/journal/v59/n4s/full/pr2006123a.html).

**Satellite Cells**

Satellite cells are an interesting type of progenitor cell found in skeletal muscle tissue – in fact, they’re thought to compose [as much as 7% of the nucleic cells in muscle fiber](http://www.nature.com/mt/journal/v15/n5/full/6300145a.html). When activated by a muscle’s stress (i.e. exercise or injury), they produce myoblasts that repair the tissue, which leads to muscle’s remarkable relative regenerative ability. Especially interesting, and complicating, is the fact that satellite cells can migrate from one muscle fiber to another, meaning that they spend time in the interstitial region. However, there are several difficulties in testing interestitial contents, so the extent to which they occupy the region is still not well-documented.

Nevertheless, just in discovering and studying the mechanisms of satellite cells, researchers are rapidly expanding our knowledge of muscular regeneration. Even disregarding any therapies being developed that utilize satellite cells, mechanistic knowledge improves the treatment of muscular injuries, from occupational health and safety to sports medicine. For a deep dive into the specifics of satellite cells, [here’s an extensive review](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4073943/).

Technically, any stem cell therapy also uses progenitor cells, by virtue of being the necessary step before terminal differentiation. However, not only are many therapies becoming available that directly utilize progenitor cells, but studying them is of significant benefit to the discipline of physiology as a whole. Truly, progenitor cells can be Amazing Samples.