Strategic Development of Neural Stem & Progenitor Cell Products

Description:

Neurogenesis is the process by which neurons are created. This process is most active during pre-natal development when neurogenesis is responsible for populating the growing brain.

Neural stem cells (NSCs) are the self-renewing, multipotent cells that differentiate into the main phenotypes of the nervous system. These cell types include neurons, astrocytes, and oligodendrocytes. Neural progenitor cells (NPCs) are the progeny of stem cell division that normally undergo a limited number of replication cycles in vivo.

The terms neuronal and neural also need to be defined. Technically speaking, “neuronal” means “pertaining to neurons,” and “neural” means “pertaining to nerves, which are the cordlike bundles of fibers made up of neurons.” Since both terms are descriptive of neurons, the scientific community uses the terms “neuronal” and “neural” relatively interchangeably. The complexity of this issue is explored from a strategic perspective within this report, with emphasis on how to name neural stem cell products and therapies for optimal online and offline exposure.

In summary, an understanding of neural stem cell language and terminology can substantially improve product naming, strategic positioning, and the effectiveness of marketing communications.

Background of Neural Stem Cells

In 1992, Reynolds and Weiss were the first to isolate neural stem cells from the striatal tissue of adult mice brain tissue, including the subventricular zone, which is a neurogenic area. Since then, neural progenitor and stem cells have been isolated from various areas of the adult brain, including non-neurogenic areas like the spinal cord, and from other species, including humans.

During the development of the nervous system, neural progenitor cells can either stay in the pool of proliferating undifferentiated cells or exit the cell cycle and differentiate. The past twenty years have seen great advances in neural stem cell research and applications. Researchers have isolated NSCs, which have demonstrated pluripotency and the ability to differentiate into many different immune system cell types.

In addition, NSCs can be regulated both in vitro and in vivo, which represent different commercial product opportunities. Neural stem cells have also become of profound interest to the research community due to their potential to be used in drug discovery and delivery applications, as well as for tools of neural toxicology assessment.

NSC transplantation also represents a ground-breaking approach for treating a range of chronic neurological diseases and acute CNS injuries, including Parkinson's, Alzheimer's and spinal cord injury, among other conditions.

Furthermore, neural stem and progenitor cells offer the potential to safely carry out pharmacology assessment for drugs designed to impact brain function or physiology. As tests on human cells become increasingly feasible, the potential grows for companies to develop disease-specific cell assays by producing recombinant stem cell lines expressing a therapeutic target.

As novel drug delivery agents, neural stem cells also show promise in killing gliomas and other cancers. Finally, viable therapies for treating disease through neural stem cell transplantation are also on the horizon for forward-thinking researchers.

Market Overview for Neural Stem Cell Products

To facilitate research resulting from these advances, a large and diverse market has emerged for neural stem cell products, services, and therapies. In total, the neural stem cell product marketplace is comprised of the total annual sales from all of these items, on a global basis.

One thriving component of the neural stem cell marketplace is the segment that sells neural stem cell research products to scientists. Termed “research supply companies” or “research product companies,” large
companies that dominate in this area include Thermo Fisher Scientific, STEMCELL Technologies, and EMD Millipore, as well as more than 40 other suppliers that range in size from multinational corporations to small specialty companies. Together, these research supply companies represent a substantial annual percentage of NSC product sales.

Currently, EMD Millipore, known as Merck Millipore outside of the United States and Canada, is the leader in neural stem cell product development for the scientific community. A Canadian company, STEMCELL Technologies, is a close second in the area of NSC product development for scientists.

While development of therapies that involve embryonic stem cells (ESCs), induced pluripotent stem cells (iPSCs), and mesenchymal stem cells (MSCs) continue to expand, development of neural stem cell therapies has been more substantially affected by barriers to entry, including patent restrictions, the dominance of current competitors, and the complexity of neural stem cell applications. Currently, in the area of neural stem cell therapy development, there are currently three dominant competitors, which are Neural Stem, NeuroNova AB, and NeuroGeneration. In addition to these companies, there are more than a dozen other companies actively developing neural stem cells therapies for use in the treatment of human injury and disease.

Importance of Neural Stem Cell Products to the Pharmaceutical Industry

Pharmaceutical companies have intense interest in neural stem cell product development. Because of their plasticity, ability to develop into the main phenotypes of the nervous system, and unlimited capacity for self-renewal, NSCs have been proposed for use in a variety of pharmaceutical applications.

These pharmaceutical applications include:

- Neurotoxicity testing
- Cellular therapies to treat central nervous system (CNS) conditions
- Neural tissue engineering and repair
- Drug target validation and testing
- Personalized medicine

For this reason, development of neural stem cell products by the pharmaceutical sector represents a thriving segment of the global marketplace. Of particular interest to this community is the potential to use neural stem cells to heal tissues that have a naturally limited capacity for renewal, such as the human brain and spinal cord tissue.

Furthermore, development of new drugs is extremely costly and the success rate of bringing new compounds to the market is unpredictable. Therefore, it is crucial that pharmaceutical companies minimize late-stage product failures, including unexpected neurotoxic effects, that can arise when candidate drugs enter the clinical testing stages. Therefore, it is desirable to test candidate drugs using in vitro assays of high human relevance as early as possible. Because neural stem cells have the potential to differentiate into nearly all of the main phenotypes of the nervous system, they represent an ideal cell type from which to design such neural screening assays.


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