3050 Spruce Street, St. Louis, MO 63103 USA
Tel: (800) 521-8956 (314) 771-5765 Fax: (800) 325-5052 (314) 771-5757
email: techservice@sial.com sigma-aldrich.com

Product Information

Stemline™ Neural Stem Cell Expansion Medium
without antibiotics or growth factors

Product Code **S3194**
Storage Temperature 2-8°C

Synonyms: NSC Expansion Medium

Product Description

Stemline™ Neural Stem Cell Expansion Medium has been developed to support the optimal expansion of Neural Stem Cells at high viable cell densities. The elimination of serum and all other animal components reduces performance variability in the medium and eliminates safety risks associated with possible adventitious agents.

Intended Use

For R&D use only. Not for drug, household, or other uses.

Introduction

Neural stem cells have become a powerful tool for the study of the regenerative capacity of the human brain. This has become applicable to various fields of study from basic developmental research to the treatment of neurodegenerative diseases. These cells, present through adulthood, have the potential to differentiate into various glial and neuronal phenotypes, based on spatial and temporal cues. Traditionally, these cells have been grown *in vitro* as either clumps of cells, termed neurospheres,[1-2] or as an attached monolayer.[3] They have typically been grown in serum-free medium (such as DME/F-12) supplemented with neural supplements containing animal-derived components (such as N-2) and growth factors (such as epidermal growth factor (EGF), fibroblast growth factor-2 (FGF2), and leukemia inhibitory factor (LIF)).[1-3]

Stemline Neural Stem Cell Expansion Medium is an animal component-free formulation optimized specifically for the expansion of human neural stem cells, which retain their differentiative capacity. Stemline Neural Stem Cell Expansion Medium outperforms standard serum-free media formulations for the generation of neural stem cells, without the use of any animal-derived components or the need for additional supplements, other than growth factors.

Components

Stemline Neural Stem Cell Expansion Medium is a proprietary formulation, which does not contain growth factors, antibiotics, or animal-derived components.

Preparation Instructions

This medium is supplied as a sterile 1X liquid***. Stemline™ Neural Stem Cell Expansion Medium must be supplemented with desired growth factors and/or antibiotics.***

Storage/Stability

This medium is stable, when stored at 2-8 °C and protected from light, until the date indicated on the label.

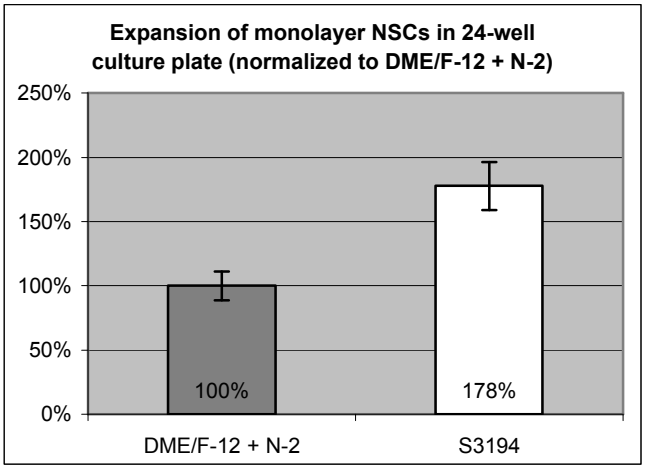
Product Profile

Sigma's Stemline Neural Stem Cell Expansion Medium shows rigorous expansion of human neural stem cells. This product was compared with an accepted serum-free expansion medium (DME/F-12 with N-2 supplements) for its ability to support the expansion of neural stem cells in several formats.

Cells were grown in monolayer format by seeding the cells at 20,000 cells/cm² on poly-L-lysine coated 24-well tissue culture plates. Cells were incubated for 5 days in medium supplemented with EGF (Product Code E9644) and LIF (Product Code L5283; Graph 1).

For neurosphere cultures, cells were prepared using the method of Svendsen *et al.*[2] For these assays the spheres were grown in standard DME/F-12 medium supplemented with 20ng/mL EGF and 1% N-2 supplement prior to being split. Half of the spheres remained in the N-2 supplemented medium and half were placed in S3194 (also supplemented with 20ng/mL EGF; Figure 1). The spheres exhibited a slightly faster growth rate in the S3194 compared to an existing formulation (Graph 2). After several passages, half of each culture was used for BrdU incorporation studies, indicating the overall proliferation in the cultures and half was used for differentiation studies, indicating the potential of the cells to form astrocytes and neurons (Graph 3).

In both neural stem cell systems, Stemline Neural Stem Cell Expansion Medium led to increased proliferation of the cells compared to existing formulations. In the neurosphere cultures, the cells also exhibited the ability to differentiate into the appropriate lineages when presented with the appropriate cues. The medium has the added benefit of generating a higher percentage of β-3 tubulin positive neurons than the standard formulation.



Graph 1. Neural stem cells expanded as monolayers in Stemline Neural Stem Cell Expansion Medium proliferate faster than cells grown in a standard N-2 supplemented DME/F-12 medium.

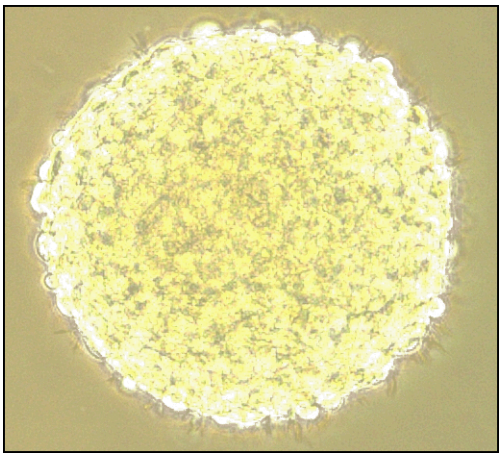
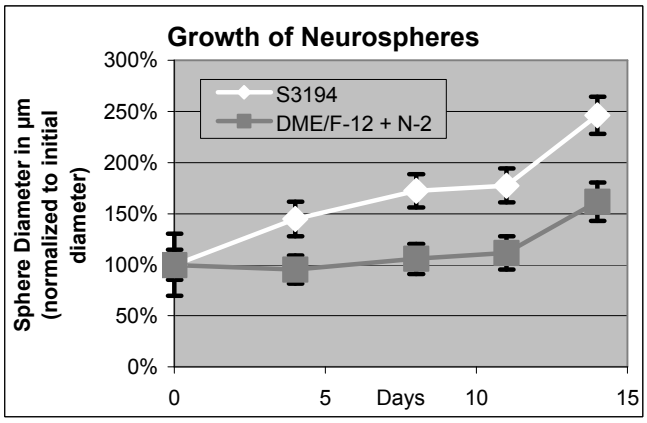
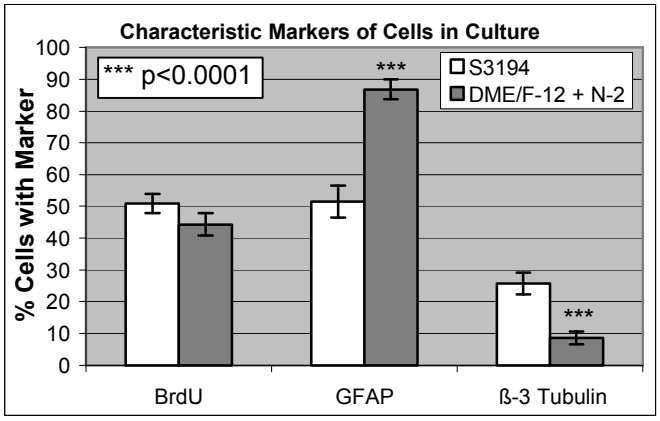


Figure 1. Neural stem cells expanded as neurospheres in Stemline Neural Stem Cell Expansion Medium exhibit morphology typical of neurospheres grown in standard growth medium.[1-2]



Graph 2. Neural stem cells expanded as neurospheres in Stemline Neural Stem Cell Expansion Medium proliferate faster than cells grown in a standard N-2 supplemented DME/F-12 medium.



Graph 3. The neurospheres expanded in Stemline Neural Stem Cell Expansion Medium show optimal levels of BrdU incorporation, indicating the presence of proliferating cells, as well as phenotypic markers of differentiation such as glial fibrillary acidic protein (GFAP) for astrocytes and β-3 tubulin for neurons.

References

1. Svendsen, C.N., Caldwell, M.A., Ostenfeld, T., Human Neural Stem Cells: Isolation, Expansion and Transplantation. Brain Pathology, **9**, 499-513 (1999).
2. Svendsen, C.N., ter Borg, M.G., Armstrong, J.E., Rosser, A.E., Chandran, S., Ostenfeld, T., Caldwell, M.A., A new method for the rapid and long term growth of human neural precursor cells. Journal of Neuroscience Methods, **85**, 141-153 (1998).
3. Johe, K.K., Hazel, T.G., Muller, T., Dugich-Djordjevic, M.M., McKay, R.D., Single factors direct the differentiation of stem cells from the fetal and adult central nervous system. Genes and Development, **10**, 3129-3140 (1996).
4. Wright, L.S., Li, J., Caldwell, M.A., Wallace, K., Johnson, J.A., Svendsen, C.N., Gene expression in human neural stem cells: effects of leukemia inhibitory factor. Journal of Neurochemistry, **86**, 179-195 (2003).

Precautions and Disclaimer
MSDS is available upon request or at www.sigma-aldrich.com.

May 2006