

Stemline®

Optimize Your Stem Cell Expansion



Stemline Hematopoietic Stem Cell Expansion Medium I & II

Stemline Neural Stem Cell Expansion Medium

Stemline T-cell Expansion Medium

Stemline Dendritic Cell Maturation Medium

Stemline Mesenchymal Stem Cell Expansion Medium

Stemline Keratinocyte Medium II

3-D Matrices

Culture Stem Cells in 3-Dimensions



MaxGel™ Human ECM and HydroMatrixl™ Hydrogel

Let nature be the architect.




Introducing the first human Extracellular Matrix (ECM), MaxGel and HydroMatrix synthetic peptide. MaxGel and HydroMatrix provide 3-D cell culture environments in which stem cells and other types of cells better resemble and behave like their *in vivo* counterparts.

- Culture cells in a way that resembles their *in vivo* environments
- Promote cell growth and migration to support the proliferation of stem cell and other types of cells
- MaxGel contains reduced amount of growth factors in ECM to promote lot-to-lot consistency
- Human ECM facilitates human stem cell culture

Our Innovation, Your Research — Shaping the Future of Life Science

MaxGel and HydroMatrix are trademarks of Sigma-Aldrich Biotechnology LP and Sigma-Aldrich Co.

Stem Cell Biology Product Line

-  3-D Matrices
-  Stem Cell Media
-  Antibodies
-  Growth Factors
-  iPS Technology

To view our complete 3-D product portfolio, visit sigma-aldrich.com/3dcellculture



Optimize Your Stem Cell Expansion!



Optimize Your Stem Cell Expansion



Proven consistent results and optimized formulations have made Sigma's Stemline Media a must-have for researchers rising to the challenges of adult stem cell expansion and maturation. Along with our broad selection of reagents, supplements, antibodies, and cytokines, Stemline Media ensures optimal expansion of robust cells.

The Stemline® Media family includes

- Stemline Hematopoietic Stem Cell Expansion Medium I and II (page 4-6)
- Stemline Neural Stem Cell Expansion Medium (page 7-8)
- Stemline T-cell Expansion Medium (page 9-10)
- Stemline Dendritic Cell Maturation Medium (page 11)
- Stemline Mesenchymal Stem Cell Expansion Medium (page 12)
- Stemline Keratinocyte Medium II (page 13)



Stemline® Hematopoietic Stem Cell Expansion Media



- Serum free formulation
- Enhanced expansion from cord blood CD34+ cells
- Expands cells from all appropriate hematopoietic lineages in a colony-forming unit
- Tested extensively in 7-day and 14-day growth assays

To request a free evaluation sample of Stemline Hematopoietic Stem Cell Expansion Medium (I or II), visit sigma.com/stemline

Developed to promote the optimal expansion of human hematopoietic stem cells (HSC) from bone marrow, mobilized peripheral blood, and cord blood, Stemline Hematopoietic Stem Cell Expansion Medium demonstrates higher total nucleated cell (TNC) fold increases than other commercially available serum-free media formulations.

The second generation of Sigma's hematopoietic stem cell expansion media family, Stemline II, has been developed to optimize the balance of differentiated and undifferentiated cells while maximizing their expansion. Compatible with hematopoietic stem cells from bone marrow, cord blood, and mobilized peripheral blood, Stemline II has been shown to lead to significant increases in cell expansion from all three sources. Through flow cytometric analysis of clinical-scale expansions, Stemline II has also demonstrated a higher capacity than other commercially available media for the expansion of CD34+/CD38+ late progenitors required for short-term engraftment. Human cord blood cells expanded in Stemline Media demonstrate impressive self-renewal when transplanted into immunodeficient NOC/SCID mice, illustrating Stemline's utility in true functional trial.

Stemline Hematopoietic Stem Cell Expansion Medium is free of serum and all other animal-derived components with the exception of human serum albumin. This exclusion increases performance consistency and eliminates safety risks associated with potential adventitious agents.

Produced in a GMP state-of-the-art facility with an available Device Master File (DMF), Stemline Hematopoietic Stem Cell Expansion Medium is clearly an excellent choice for your HSC applications.

References:

1. Choong, M., *et al.*, MicroRNA expression profiling during human cord blood-derived CD34 cell erythropoiesis. *Experimental Hematology*, **35**, 551-564 (2007).
2. Levay, K., *et al.*, Tescalcin is an essential factor in megakaryocytic differentiation associated with Ets family gene expression. *Journal of Clinical Investigations*, **117**, 2672-2683 (2007).
3. Lu, S., *et al.*, Generation of functional humangioblasts from human embryonic stem cells. *Nature Methods*, **4**, 501-509 (2007).
4. McNiece, I., *et al.*, Delivering cellular therapies: lessons learned from ex vivo culture and clinical applications of hematopoietic cells. *Seminars in Cell & Developmental Biology*, **18**, 839-45 (2007).
5. Stec, M., *et al.*, Expansion and differentiation of CD14+CD16- and CD14++CD16+ human monocyte subsets from cord blood CD34+ hematopoietic progenitors. *Journal of Leukocyte Biology*, **82**, 594-602 (2007).
6. Wulf-Goldenberg, A., *et al.*, Cytokine pre-treatment of CD34+ cord blood stem cells in vitro reduces long-term cell engraftment in NOD/SCID mice. *European Journal of Cell Biology*, **87**, 69-80 (2007).

Ordering Information

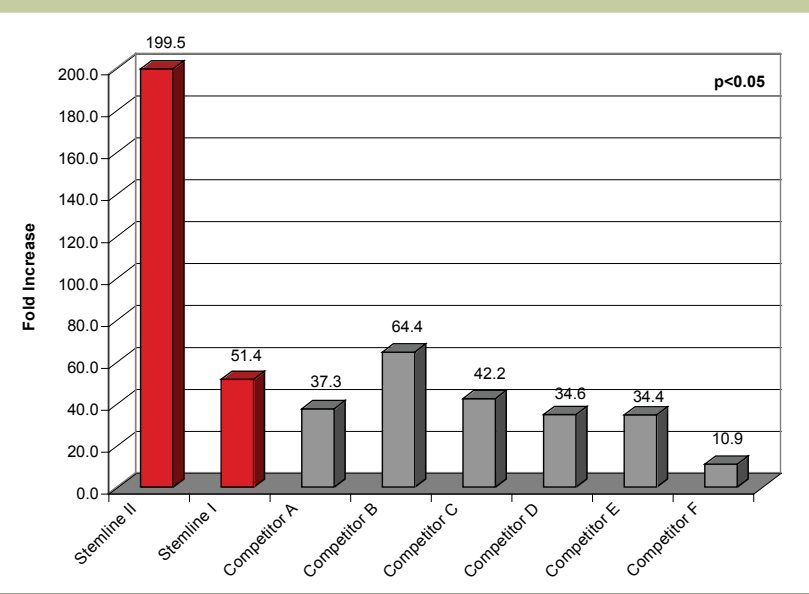
Cat. No.	Product Description	Size
S0189	Stemline Hematopoietic Stem Cell Expansion Medium	500 mL
S0192	Stemline Hematopoietic Stem Cell Expansion Medium	500 mL



Stemline® Hematopoietic Stem Cell Expansion Media



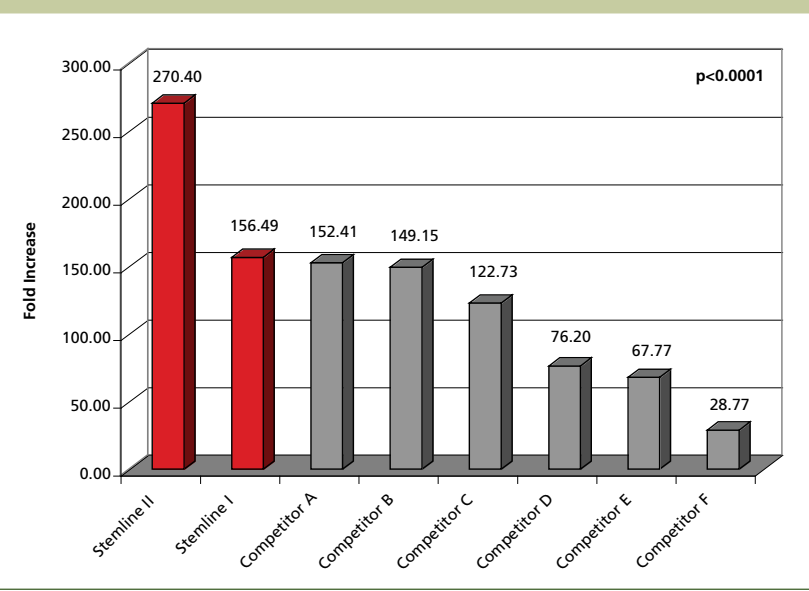
Fold Increase of Total Nucleated Cells from CD34+ Bone Marrow



Stemline demonstrates superior expansion of bone marrow hematopoietic stem cells (HSC).

To test the ability of Stemline II Hematopoietic Stem Cell Expansion Medium to expand CD34+ HSCs, researchers at Sigma Aldrich and the University of Kentucky designed a bench-scale expansion assay. Cells were seeded into the wells of 24-well tissue culture plates. One milliliter of medium was added to each well with the appropriate cytokines to stimulate growth (100 ng/ml each of TPO, SCF, and G-CSF). Each condition was performed in triplicate and seeded with 10,000 cells per ml in each well. The cells were counted on day 14 and the fold increase was determined by $\text{cells}_{\text{final}}/\text{cells}_{\text{initial}}$. HSCs from bone marrow cultured in Stemline and Stemline II demonstrated superior expansion to those grown in other serum-free HSC media.

Fold Increase of Total Nucleated Cells from CD34+ Cord Blood

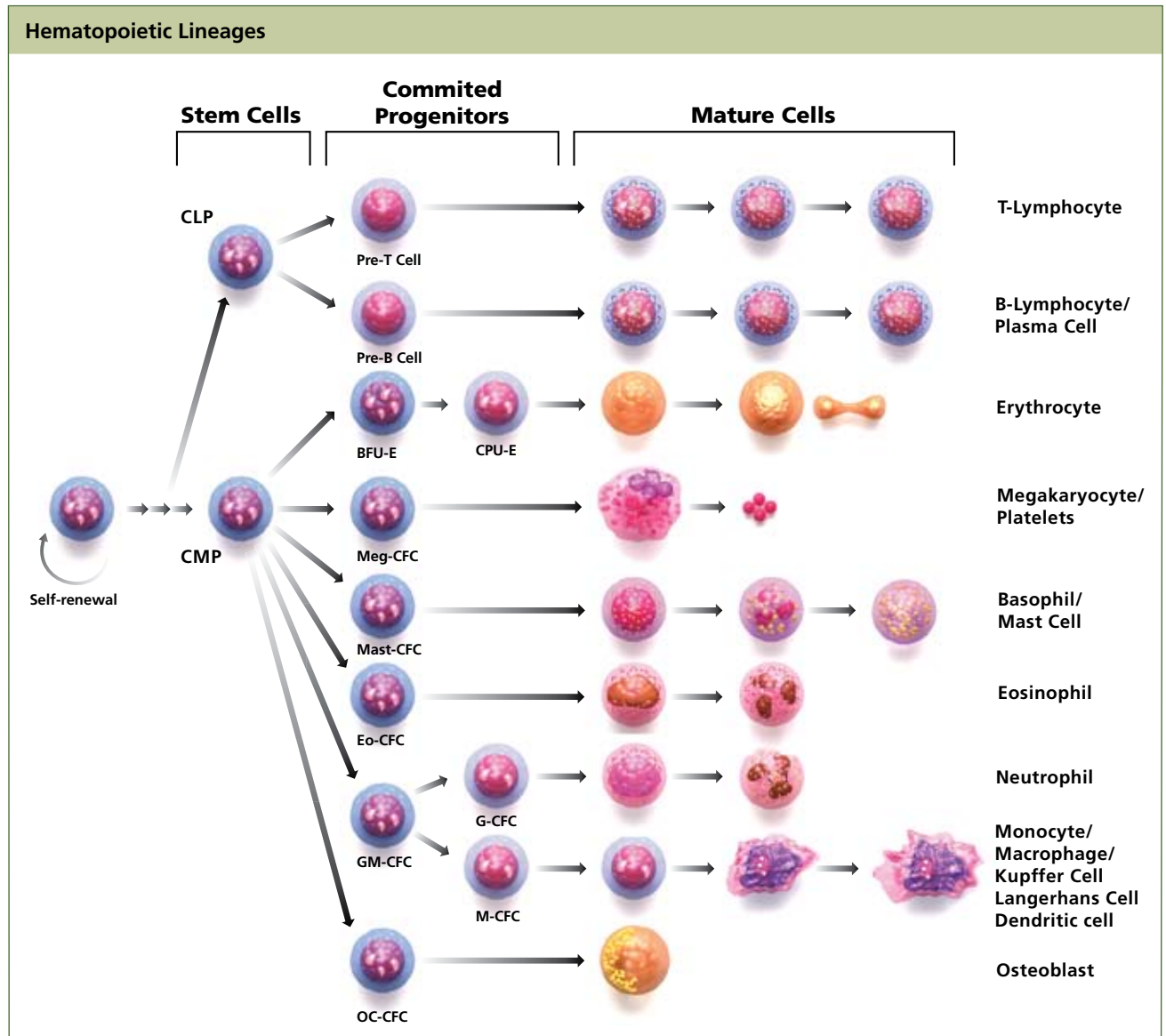


Stemline demonstrates superior expansion of cord blood hematopoietic stem cells (HSC).

To test the ability of Stemline II Hematopoietic Stem Cell Expansion Medium to expand CD34+ HSCs, researchers at Sigma Aldrich and the University of Kentucky designed a bench-scale expansion assay. Cells were seeded into the wells of 24-well tissue culture plates. One milliliter of medium was added to each well with the appropriate cytokines to stimulate growth (100 ng/ml each of TPO, SCF, and G-CSF). Each condition was performed in triplicate and seeded with 10,000 cells per ml in each well. Due to the clinical importance and the donor-to-donor variability typical to the expansion of umbilical cord blood-derived cells, researchers elected to test 15 donors for expansion and surface antigen expression. The cells were counted on day 10 and the fold increase was determined by $\text{cells}_{\text{final}}/\text{cells}_{\text{initial}}$. HSCs from cord blood cultured in Stemline and Stemline II demonstrated superior expansion to those grown in other serum-free HSC media.



Stemline® Hematopoietic Stem Cell Expansion Media



Through the process of hematopoiesis, all cellular blood components are derived from hematopoietic stem cells.



Stemline® Neural Stem Cell Expansion Medium

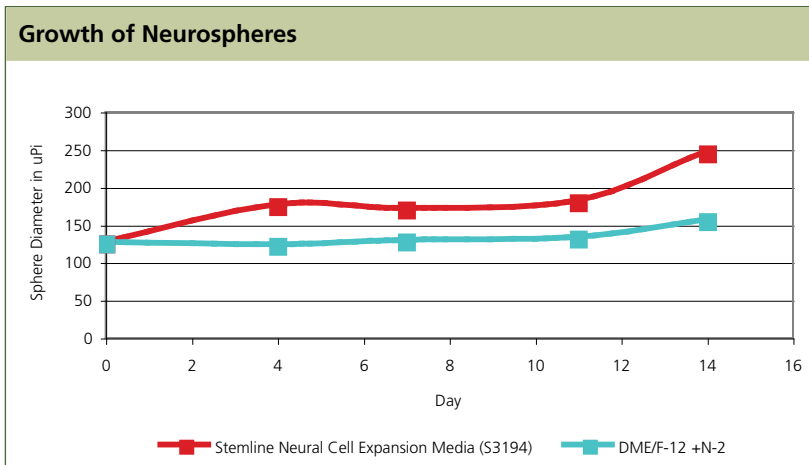


Optimize Your Stem Cell Expansion

Developed to promote the optimal expansion of human neural stem cells (NSC), Stemline Neural Stem Cell Expansion Medium demonstrates rigorous expansion of human neural stem cells in both neurosphere and monolayer cultures.

Stemline Neural Stem Cell Expansion Medium is free of serum and all other animal components; this exclusion increases performance consistency and eliminates safety risks associated with potential adventitious agents.

Produced in a GMP state-of-the-art facility with an available Device Master File (DMF), Stemline Neural Stem Cell Expansion Medium is clearly an excellent choice for your NSC applications.



- Serum free formulation
- For use with neurosphere and monolayer cultures
- Cells retain differentiation capacity
- Superior expansion rates when compared to alternatives

Stemline demonstrates superior expansion of neural stem cell (NSC) neurospheres. To test the ability of Stemline Neural Stem Cell Expansion Medium to expand human NSC neurospheres, researchers at Sigma Aldrich and the University of Wisconsin designed a bench-scale expansion assay. Cells were prepared using the method of Svendsen et al. Spheres were grown in standard DME/F-12 medium supplemented with 20ng/mL EGF and 1% N-2 supplement prior to splitting. Half of the spheres remained in the N-2 supplemented medium and half were placed in Stemline Neural Stem Cell Expansion Medium (also supplemented with 20ng/mL EGF). After several passages, overall proliferation was measured via BrdU incorporation. NSC neurospheres cultured in Stemline demonstrated superior expansion to those grown in other serum-free NSC media.

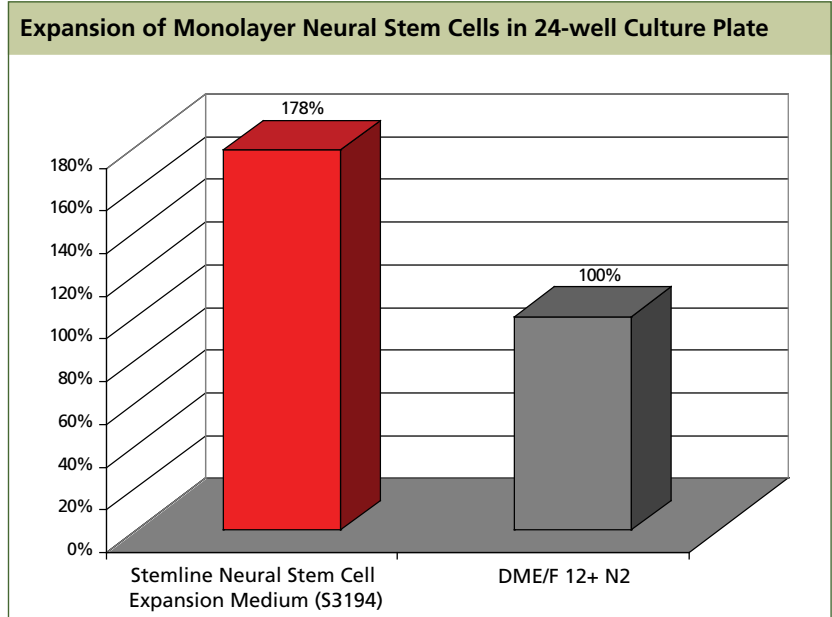
Ordering Information

Cat. No.	Product Description	Size
S3194	Stemline Neural Stem Cell Expansion Medium	500 mL

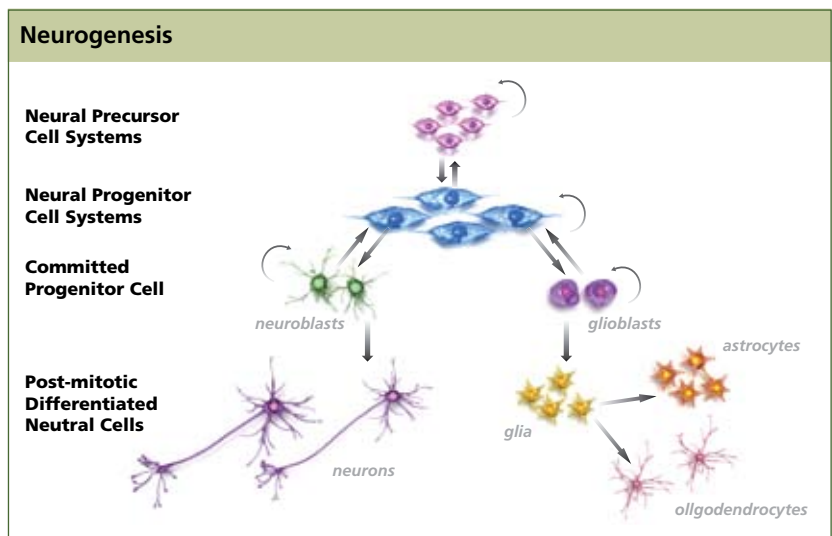


Stemline® Neural Stem Cell Expansion Medium

Stemline demonstrates superior expansion of monolayer neural stem cell (NSC). To test the ability of Stemline Neural Stem Cell Expansion Medium to expand human monolayer NSCs, researchers at Sigma Aldrich and the University of Wisconsin designed a bench-scale expansion assay. Cells were grown in monolayer format by seeding the cells at 20,000 cells/cm on poly-L-lysine coated 24-well tissue culture plates. Cells were incubated for 5 days in medium supplemented with EGF (Sigma Product Code E9644) and LIF (Sigma Product Code L5283). After several passages, overall proliferation was measured. Monolayer NSC cultured in Stemline demonstrated superior expansion to those grown in other serum-free NSC media.



Neural precursor cells give rise to Neural Progenitors, which differentiate into the cells of the nervous system, including neurons, astrocytes, and oligodendrocytes.



To request a free evaluation sample of Stemline Neural Stem Cell Expansion Medium, visit sigma.com/stemline



Stemline® T-Cell Expansion Medium

Developed to promote the optimal expansion of adult human T-cells, Stemline T-Cell Expansion Medium demonstrates significantly greater expansion (55%) when compared to alternative media, and viability greater than 95%. Additionally, flow cytometry confirms that with Stemline, a proper CD4/CD8 ratio is maintained. In an *ex vivo* functional assay (⁵¹Chromium Release Assay), T-cells expanded in Stemline medium proved to be highly functional and possessed cytolytic potential greater than T-cells expanded in serum-containing an alternative medium (RPMI with 10% fetal bovine serum). In an *in vivo* functional assay (GvHD Induction), human T lymphocytes expanded in Stemline medium were injected into NOD/SCIDβ2M mice (n=12). Engraftment, perivascular infiltration, and lethal GvHD were observed by day 15 in 100% of mice, demonstrating excellent *in vivo* expansion and functionality.

Stemline T-Cell Expansion Medium is free of serum and all other animal-derived components with the exceptions of human serum albumin, cholesterol, and transferrin. This exclusion increases performance consistency and eliminates safety risks associated with potential adventitious agents.

Produced in a GMP state-of-the-art facility with an available Device Master File (DMF), Stemline T-Cell Expansion Medium is clearly an excellent choice for your T-cell applications.

References:

1. Nervi, B., *et al.*, Factors affecting human T-cell engraftment, trafficking, and associated xenogenic graft-vs-host disease in NOD/SCID β2mnull mice. *Experimental Hematology*, **35**, 1823-1838.

Ordering Information

Cat. No.	Product Description	Size
S1694	Stemline T-Cell Expansion Medium	500 mL



- Serum free formulation
- Excellent expansion of T-cells of human origin
- Supports high cell densities that exhibit rigorous and consistent growth kinetics
- Maintains the proper CD4/CD8 ratio in flow cytometric analysis
- Maintains functionality, both *ex vivo* and *in vivo*

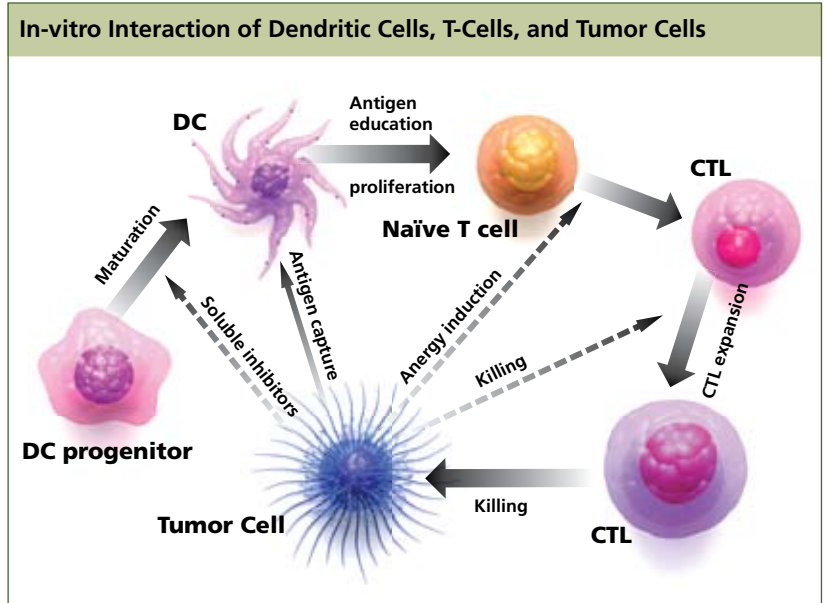
To request a free evaluation sample of Stemline T-Cell Expansion Medium, visit sigma.com/stemline



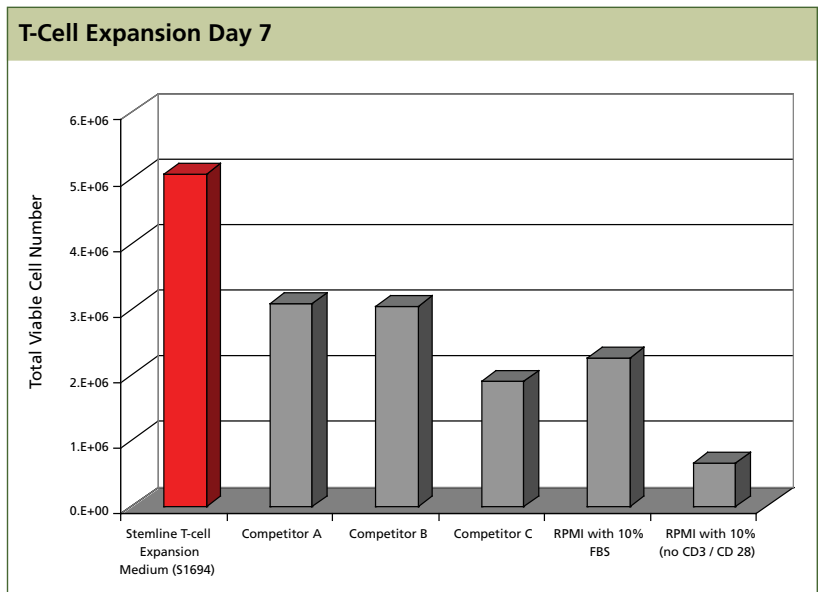


Stemline® T-Cell Expansion Medium

As Dendritic Cells begin to process antigens, they mature and exhibit a more star-shaped appearance. Mature Dendritic Cells process antigen and present it to Cytotoxic T-cells. Activated Cytotoxic T-cells now recognize the tumor and destroy it.



Stemline demonstrates superior expansion of T-cells. When compared with three alternative commercial media and two RPMI formulations, Stemline demonstrated >40% more total viable cells.



To request a free evaluation sample of Stemline T Cell Expansion Medium, visit sigma.com/stemline

Stemline® Dendritic Cell Maturation Medium



Optimize Your Stem Cell Expansion

Developed to promote the optimal propagation of mature Dendritic Cells (DC) from human peripheral blood CD14+ monocytes without serum supplementation, Stemline Dendritic Cell Maturation Medium demonstrates superior numbers of mature dendritic cells when assessed both microscopically and by flow cytometry, when compared to alternative commercially available serum-free media.

Stemline Dendritic Cell Maturation Medium is free of serum and all other animal derived components with the exceptions of human serum albumin, cholesterol, and transferrin. This exclusion increases performance consistency and eliminates safety risks associated with potential adventitious agents.

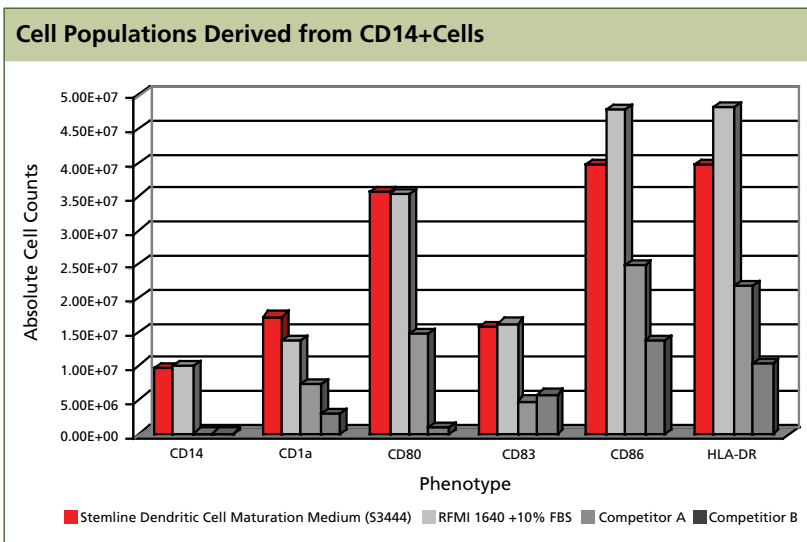
Produced in a GMP state-of-the-art facility with an available Device Master File (DMF), Stemline Dendritic Cell Expansion Medium is clearly an excellent choice for your DC applications.



References:

- Santos, K., et al., Infectivity of herpes simplex virus type-1 (HSV-1) amplicon vectors in dendritic cells is determined by the helper virus strain used for packaging. *Journal of Virological Methods*, **145**, 37-46 (2007).

- Serum free formulation
- Supports high density cultures of mature dendritic cells
- Cultures maintain morphological and phenotypic characteristics
- Promotes maturation of DCs from human CD14+ monocytes



Stemline demonstrates superior maturation of dendritic cells (DC). To test the ability of Stemline Dendritic Cell Maturation Medium to promote maturation of human DCs from CD14+ monocytes, researchers at Sigma Aldrich designed a bench-scale assay. Duplicate cultures at 1,000,000 CD14+ monocytes/ml in a multi-well microplate culture system were incubated for 6 days in Stemline medium, RPMI 1640 + 10% FBS, or alternative media, all containing GM-CSF and IL-4. To obtain mature DCs, the cells were treated for another 48 hours with TNF- α and PGE2. DCs cultured in Stemline demonstrated superior maturation to those grown in other serum-free DC media. When compared to FBS-containing media, Stemline expansion proved equivalent or superior, while absence of serum in Stemline ensured greater consistency and minimized risk of potential adventitious agents.

Ordering Information

Cat. No.	Product Description	Size
S3444	Stemline Dendritic Cell Maturation Medium	1 L

Stemline® Mesenchymal Stem Cell Expansion Medium



- Maximum expansion of CD34+ progenitors
- Supports robust, high density cell populations
- Superior expansion
- Cells retain their differentiation potential at 14 days in culture

Stemline demonstrates superior expansion of mesenchymal stem cells (MSC). To test the ability of Stemline Mesenchymal Stem Cell Expansion Medium to promote expansion of MSCs, researchers at Sigma Aldrich designed a bench-scale assay. Triplicate 2 ml cultures at 5000 MSCs/cm² were grown in a 6-well microplate culture system in Stemline medium or other medium containing FBS. Each well was treated with trypsin/EDTA, tritured, and harvested after a 14-day expansion. MSCs were counted using a hemacytometer and average viable cell count determined for each condition. MSCs cultured in Stemline demonstrated superior expansion to those grown in other MSC media, retained their differentiation potential and were easily passaged routinely.

To request a free evaluation sample of Stemline Mesenchymal Stem Cell Expansion Medium, visit sigma.com/stemline

Developed to promote the optimal expansion of human mesenchymal stem cells (MSC) from bone marrow, Stemline Mesenchymal Stem Cell Expansion Medium demonstrates greater total nucleated cell (TNC) fold increases than other commercially available formulations. Additionally, functional trials clearly demonstrate Stemline's capacity to promote differentiation into adipocytes, chondrocytes, and osteocytes.

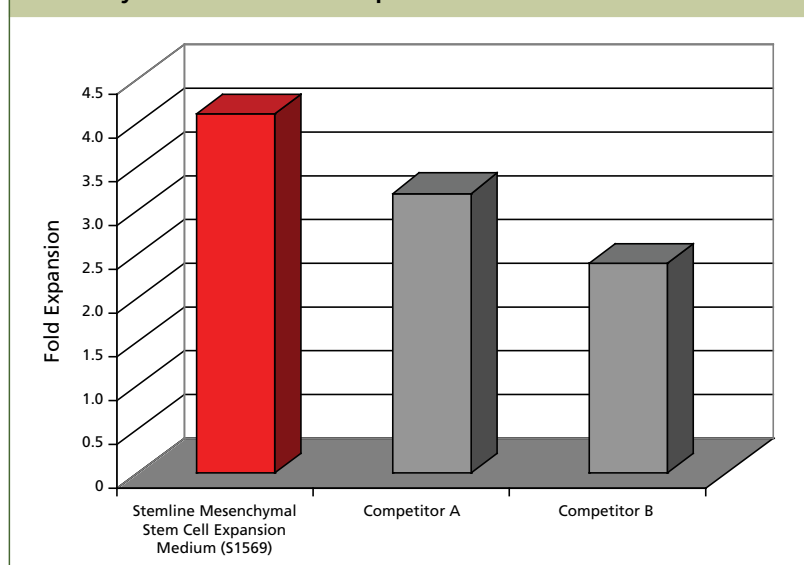
Produced in a GMP state-of-the-art facility with an available Device Master File (DMF), Stemline Mesenchymal Stem Cell Expansion Medium is clearly an excellent choice for your MSC applications.

Stemline Mesenchymal Stem Cell Expansion Medium requires supplementation with antibiotics, cytokines, L-glutamine and fetal bovine serum, as appropriate to individual research protocols. Known to be extremely sensitive during initial isolation and growth ex vivo, MSC proliferation depends highly on the composition of fetal bovine serum (FBS) used to supplement their medium. Pre-screening with FBS is recommended, as the specific FBS components that effect MSC growth have not been fully identified.

References:

1. McNiece, I., *et al.*, Ex vivo expansion of cord blood mononuclear cells on mesenchymal stem cells. *Cytotherapy*, **6**, 311-17 (2004).
2. Moro, J., *et al.*, Generation of gut-homing IgA-secreting B cells by intestinal dendritic cells. *Science*, **314**, 1157 (2006).

Mesenchymal Stem Cell Fold Expansion



Ordering Information

Cat. No.	Product Description	Size
S1569	Stemline Mesenchymal Stem Cell Expansion Medium	1 L



Stemline® Keratinocyte Medium II

Developed to promote the optimal expansion of human epidermal keratinocytes from adult and neonatal sources, Stemline Keratinocyte Medium II performs most effectively when supplemented with either Stemline Keratinocyte Growth Supplement (Sigma S9945) or Keratinocyte Medium Supplement, (Sigma K3136).

Stemline Keratinocyte Medium II is free of serum and all other animal components; this exclusion increases performance consistency and eliminates safety risks associated with potential adventitious agents.

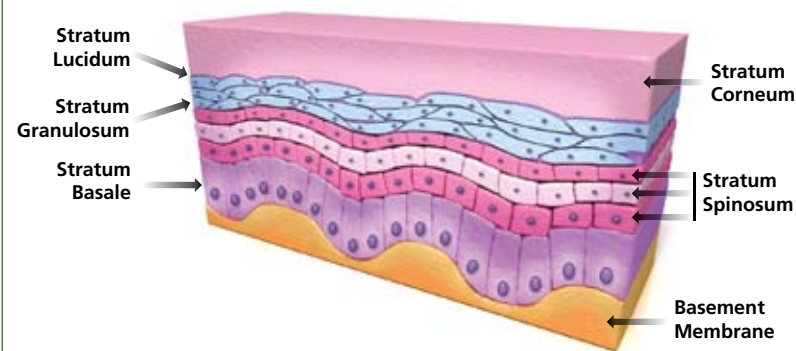
Produced in a GMP state-of-the-art facility, Stemline Keratinocyte Stem Cell Expansion Medium is clearly an excellent choice for your Keratinocyte applications.



- Serum free basal formulation
- Two supplement cocktails
- Regional expansion of NHEK cells

To request a free evaluation sample of Stemline Keratinocyte Grown Medium II, visit sigma.com/stemline

Migration of Keratinocytes



The epidermis is composed of 4 layers of keratinocytes. The stratum basale, the deepest layer, is composed of column-shaped cells that constantly divide and force existing cells into higher layers. As the cells migrate through these layers, they flatten and eventually undergo terminal differentiation, which leads to programmed cell death. The top layer, the stratum corneum, is composed of these dead keratinocytes, which are continuously rubbed off and replaced anew.

Ordering Information

Cat. No.	Product Description	Size
S0196	Stemline Keratinocyte Medium II	500 mL
S9945	Stemline II Keratinocyte Growth Supplement	1 vial
K3136	Keratinocyte Medium Supplement, 100X	5 mL



Stemline® Media Selection Guide

Name	Key Attributes
Stemline I & II Hematopoietic Stem Cell Expansion Medium	<ul style="list-style-type: none"> • Serum free formulation • Enhanced expansion from cord blood CD34+ cells • Expands cells from all appropriate hematopoietic lineages in a colony-forming unit • Tested extensively in development in 7-day and 14-day growth assays • For more information, see page 4-6
Stemline Neural Stem Cell Expansion Medium	<ul style="list-style-type: none"> • Serum free formulation • For use with both neurosphere and monolayer cultures • Cells retain differentiation capacity • Superior expansion rates • For more information, see page 7-8
Stemline T-Cell Expansion Medium	<ul style="list-style-type: none"> • Serum free formulation • Excellent expansion of T-cells of human origin • Supports high cell densities that exhibit rigorous and consistent growth kinetics • Maintains the proper CD4/CD8 ratio in flow cytometric analysis • Maintains functionality, both ex vivo and in vivo • For more information, see page 9-10
Stemline Dendritic Cell Maturation Medium	<ul style="list-style-type: none"> • Serum free formulation • Supports high density cultures of mature dendritic cells • Cultures maintain morphological and phenotypic characteristics • Promotes maturation of DCs from human CD14+ monocytes • For more information, see page 11
Stemline Mesenchymal Stem Cell Expansion Medium	<ul style="list-style-type: none"> • Maximum expansion of CD34+ progenitors • Supports robust, high density cell populations • Superior expansion • Cells retain their differentiation potential at 14 days in culture • For more information, see page 12
Stemline Keratinocyte Medium II	<ul style="list-style-type: none"> • Serum free basal formulation • Two supplement cocktails • Regional expansion of NHEK cells • For more information, see page 13



Animal Components	Required Glutamine Supplementation	Regulatory	Product Code	Package Size
Human serum albumin	None	Manufactured cGMP; DMF on file	S0189 S0192	500 mL 500 mL
None	None	Manufactured cGMP; DMF on file	S3194	500 mL
Human serum albumin, cholesterol, Human transferrin	4 mM	Manufactured cGMP; DMF on file	S1694	500 mL
Human serum albumin, cholesterol, Human transferrin	2 mM	Manufactured cGMP; DMF on file	S3444	1 L
Human transferrin; requires FBS supplementation	4 mM	Manufactured cGMP; DMF on file	S1569	1 L
Requires supplementation with either S9945 or K3136	4 mM	Manufactured cGMP	S0196	500 mL

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