

# Hematopoietic Cytokines

Hematopoietic cytokines are large family of extracellular ligands that stimulate hematopoietic cells to differentiate into eight principle types of blood cells. Numerous cytokines are involved in the regulation of hematopoiesis within a complex network of positive and negative regulators. Some cytokines have very narrow lineage specificities of their actions, while many others have rather broad and overlapping specificity ranges.<sup>1</sup>

Listed within this section are the cytokines whose predominant action appears to be the stimulation or regulation of hematopoietic cells. This includes GM-CSF, G-CSF, M-CSF, interleukins, EPO and TPO. There are a number of other cytokines that exert profound effects on the formation and maturation of hematopoietic cells, which include stem cell factor (SCF), flt-3/flk-2 ligand (FL) and leukemia inhibitory factor (LIF). Other cytokines or ligands such as jagged-1, transforming growth factor- $\beta$  (TGF- $\beta$ ) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) also play significant roles in modulating hematopoiesis.

Cytokine	Function in hematopoiesis
Erythropoietin (EPO)	Red blood cell production
Flt-3	Stimulation of stem and developing dendritic cells
Granulocyte-macrophage colony stimulating factor (GM-CSF)	Stimulation of diverse set of granulocyte-macrophage colonies
Granulocyte-colony stimulating factor (G-CSF)	granulocytic colony stimulation
Interleukin-2 (IL-2)	T-cell proliferation
Interleukin-3 (IL-3)	Granulocyte, macrophage,

	eosinophil, megakaryocyte and erythroid colony formation
Interleukin-5 (IL-5)	B-cell differentiation and eosinophil regulation
Interleukin-6 (IL-6)	B-cell differentiation
Interleukin-7 (IL-7)	T-lymphocyte induction
Interleukin-11 (IL-11)	Stimulation of megakaryocytes and plasmacytoma cell lines
Leukemia inhibitory factor (LIF)	Differentiation and suppression of clonogenicity of leukemic cells
Macrophage-colony stimulating factor (M-CSF)	Macrophage colony stimulation
Stem cell factor (SCF)	Proliferation of mast cells and stem cells
Thrombopoietin (TPO)	Regulation of platelet production; stimulation of megakaryocytes with IL-3 and SCF

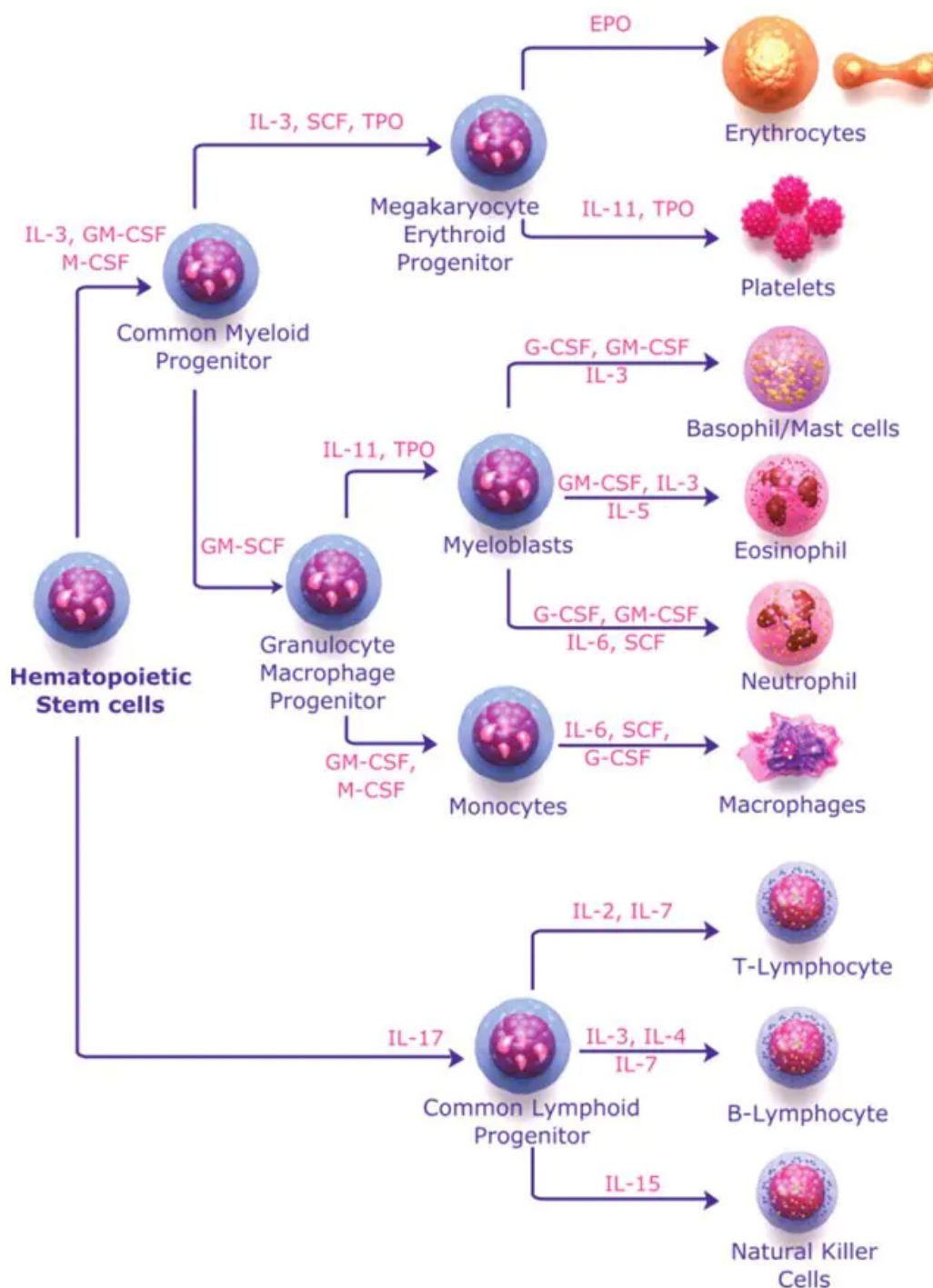
**Table 1** Regulation of Hematopoiesis by Cytokines

Two models were proposed to define the role of growth factors in hematopoietic differentiation.

- Instructive model assigns a direct role to cytokines in cell differentiation; cell fate is determined predominantly by the type of growth factor acting on the cell<sup>2</sup>
- Stochastic model suggests a pre-determined program for cell differentiation; growth factors are required specifically for survival and proliferation of committed progenitor cells<sup>3</sup>.











Both models are based on evidence that growth factors control

survival and proliferation of hematopoietic lineages and also transduce a genuine lineage-determining signal in hematopoiesis<sup>1</sup>. The future studies focusing on elucidation of the unique role of growth factors in a particular situation and/or microenvironment in various disease situations they may prove to be of critical clinical value.










**Figure 1.** Hematopoietic cytokines stimulate hematopoietic cells to differentiate into principle types of blood cells

# Materials

Product No.	Description	SDS	Pricing
SRP3110	<b>M-CSF human</b> Animal-component free, recombinant, expressed in <i>E. coli</i> , ≥98% (SDS-PAGE), ≥98% (HPLC), suitable for cell culture		<a href="#">Expand</a>
E9530	<b>Erythropoietin from mouse</b> recombinant, expressed in NSO cells, ≥90% (SDS-PAGE), lyophilized powder, suitable for cell culture		<a href="#">Expand</a>
H5166	<b>Erythropoietin human</b> EPO, recombinant, expressed in HEK 293 cells, suitable for cell culture		<a href="#">Expand</a>
F9175	<b>Flt-3/Flk-2 Ligand from mouse</b> ≥97% (SDS-PAGE), recombinant, expressed in NSO cells, lyophilized powder, suitable for cell culture		<a href="#">Expand</a>
F3422	<b>Flt-3/Flk-2 ligand human</b> recombinant, expressed in <i>E. coli</i> , lyophilized powder, suitable for cell culture, ≥98% (SDS-PAGE and HPLC)		<a href="#">Expand</a>
G0407	<b>Granulocyte colony-stimulating factor human</b> G-CSF, recombinant, expressed in <i>E. coli</i> , suitable for cell culture		<a href="#">Expand</a>
G5035	<b>Granulocyte-Macrophage Colony-Stimulating Factor human</b> GM-CSF, recombinant, expressed in <i>E. coli</i> , suitable for cell culture		<a href="#">Expand</a>
H5666	<b>Granulocyte-Macrophage Colony-Stimulating Factor human</b> GM-CSF, recombinant, expressed in HEK 293 cells, HumanKine <sup>®</sup> , suitable for cell culture		<a href="#">Expand</a>
SRP9001	<b>Leukemia Inhibitory Factor</b> human, recombinant, expressed in HEK 293 cells		<a href="#">Expand</a>
SRP6287	<b>LIF human</b> recombinant, expressed in HEK 293 cells,		<a href="#">Expand</a>

≥95% (SDS-PAGE)

<b>M6518</b>	<b>Macrophage Colony-Stimulating Factor human</b> M-CSF, recombinant, expressed in <i>E. coli</i> , lyophilized powder, suitable for cell culture		<a href="#">Expand</a>
<b>SRP3152</b>	<b>SCGF-alpha human</b> recombinant, expressed in <i>E. coli</i> , ≥98% (SDS-PAGE), ≥98% (HPLC), suitable for cell culture		<a href="#">Expand</a>
<b>SRP3153</b>	<b>SCGF-beta human</b> recombinant, expressed in <i>E. coli</i> , ≥98% (SDS-PAGE), ≥98% (HPLC), suitable for cell culture		<a href="#">Expand</a>
<b>S7901</b>	<b>Stem Cell Factor human</b> SCF, recombinant, expressed in <i>E. coli</i> , powder, suitable for cell culture		<a href="#">Expand</a>
<b>H8416</b>	<b>Stem Cell Factor human</b> SCF, recombinant, expressed in HEK 293 cells, suitable for cell culture		<a href="#">Expand</a>
<b>T1568</b>	<b>Thrombopoietin human</b> recombinant, expressed in <i>E. coli</i> , lyophilized powder, suitable for cell culture, ≥98% (SDS-PAGE and HPLC)		<a href="#">Expand</a>
<b>SRP3178</b>	<b>TPO human</b> Animal-component free, recombinant, expressed in <i>E. coli</i> , ≥98% (SDS-PAGE), ≥98% (HPLC), suitable for cell culture		<a href="#">Expand</a>

Adapted from Hematopoietic Cytokines by Jennifer Fries, BioFiles 2009, 4.5, 8.

## References

1. Metcalf D. 2008. Hematopoietic cytokines. 111(2):485-491. <http://dx.doi.org/10.1182/blood-2007-03-079681>
2. Borzillo GV, Ashmun RA, Sherr CJ. 1990. Macrophage lineage switching of murine early pre-B lymphoid cells expressing transduced *fms* genes.. *Mol. Cell. Biol.* 10(6):2703-2714. <http://dx.doi.org/10.1128/mcb.10.6.2703>
3. Till JE, McCulloch EA, Siminovitch L. 1964. A STOCHASTIC MODEL OF STEM CELL PROLIFERATION, BASED ON THE GROWTH OF SPLEEN COLONY-FORMING CELLS.*Proceedings of the National Academy of Sciences.* 51(1):29-36. <http://dx.doi.org/10.1073/pnas.51.1.29>

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