

# Cytokines and Growth Factors

**Cytokines** are a category of signalling proteins and glycoproteins that, like hormones and neurotransmitters, are used extensively in cellular communication. While hormones are secreted from specific organs to the blood, and neurotransmitters are related to neural activity, the cytokines are a more diverse class of compounds in terms of origin and purpose. They are produced by a wide variety of hematopoietic and non-hematopoietic cell types and can have autocrine, paracrine and endocrine effects, sometimes strongly dependent on the presence of other chemicals. The cytokine family consists mainly of smaller, water-soluble proteins and glycoproteins with a mass between 8 and 30 kDa.

Cytokines are critical to the development and functioning of both the innate and adaptive immune response. They are often secreted by immune cells that have encountered a pathogen, thereby activating and recruiting further immune cells to increase the system's response to the pathogen. Cytokines are also involved in several developmental processes during embryogenesis.

## Effects

Each cytokine binds to a specific cell-surface receptor. Subsequent cascades of intracellular signalling then alter cell functions. This may include the upregulation and/or downregulation of several genes and their transcription factors, resulting in the production of other cytokines, an increase in the number of surface receptors for other molecules, or the suppression of their own effect by feedback inhibition.

The effect of a particular cytokine on a given cell depends on the cytokine, its extracellular abundance, the presence and abundance of the complementary receptor on the cell surface, and downstream signals activated by receptor binding; these last two factors can vary by cell

type. Cytokines are characterized by considerable "redundancy", in that many cytokines appear to share similar functions.

Generalization of functions is not possible with cytokines. Nonetheless, their actions may be grouped as:

- autocrine, if the cytokine acts on the cell that secretes it.
- paracrine, if the target is restricted to the immediate vicinity of a cytokine's secretion.
- endocrine, if the cytokine diffuses to distant regions of the body (carried by blood or plasma).

It seems to be a paradox that cytokines binding to antibodies have a stronger immune effect than the cytokine alone. This may lead to lower therapeutic doses.

## Classification

### Structural

Structural homology has been able to partially distinguish between cytokines that do not demonstrate a considerable degree of redundancy so that they can be classified into four types:

- The four  $\alpha$ -helix bundle family - Member cytokines have three-dimensional structures with four bundles of  $\alpha$ -helices. This family in turn is divided into three sub-families:
  1. the IL-2 subfamily
  2. the interferon (IFN) subfamily
  3. the IL-10 subfamily.

The first of these three subfamilies is the largest. It contains several non-immunological cytokines including erythropoietin (EPO) and thrombopoietin (THPO). Also, four  $\alpha$ -helix bundle cytokines can be grouped into *long-chain* and *short-chain* cytokines.

- the IL-1 family, which primarily includes IL-1 and IL-18
- the IL-17 family, which has yet to be completely characterized, though member cytokines have a specific effect in promoting proliferation of T-cells that cause cytotoxic effects

## Functional

A classification that proves more useful in clinical and experimental practice divides immunological cytokines into those that enhance cytokine responses, type 1 ( IFN- $\gamma$ , TGF- $\beta$  etc.), and type 2 (IL-4, IL-10, IL-13, etc.), which favor antibody responses.

Cat.No.	Product Name	Product Description	Activity	Package	Price(EUR)
SG002A	hG-CSF	Recombinant Human Granulocyte-Colony Stimulating Factor	6.0x 10 <sup>7</sup> IU/mg	2µg	15
SG002B				10µg	60
SG002C				50µg	160
SG028A	PEG-GCSF	Pegylated Recombinant Human Granulocyte-Colony Stimulating Factor	1.0x 10 <sup>7</sup> IU/mg	2µg	30
SG028B				10µg	120
SG028C				50µg	320
SG003A	hGM-CSF	Recombinant Human Granulocyte Macrophage Colony Stimulating Factor	1.0 x 10 <sup>7</sup> IU/mg	2µg	15
SG003B				10µg	60
SG003C				50µg	160
SG040A	hGM-CSF	Recombinant Human Granulocyte Macrophage Colony Stimulating Factor P. Pichia Derived (Sargramostim)	5.0 x 10 <sup>6</sup> IU/mg	2µg	15
SG040B				10µg	60
SG040C				50µg	160
SG025A	hIFNα-2a	Recombinant Human Interferon-alpha 2a	1.0 x 10 <sup>8</sup> IU/mg	2µg	3
SG025B				10µg	10
SG025C				50µg	30
SG005A	hIFNα-2b	Recombinant Human Interferon-alpha 2b	1.0 x 10 <sup>8</sup> IU/mg	2µg	3
SG005B				10µg	10
SG005C				50µg	30
SG007A	PEG-IFNα2b	Pegylated Recombinant Human Interferon-alpha 2b	1.0 x 10 <sup>6</sup> IU/mg	2µg	30
SG007B				10µg	120
SG007C				50µg	320
SG014A	hIFNγ	Recombinant Human Interferon-gamma	1.5 x 10 <sup>7</sup> IU/mg	2µg	3
SG014B				10µg	10
SG014C				50µg	30
SG008A	hTNFα	Recombinant Human Tumor		2µg	4

SG008B		Necrosis Factor alpha	3.0 x 10 <sup>7</sup> IU/mg	10µg	15
SG008C				50µg	50
SG036A	hTNFα-M	Recombinant Human Tumor Necrosis Factor alpha Mutant (TNFα Mutant)	1.0 x 10 <sup>9</sup> IU/mg	2µg	4
SG036B				10µg	15
SG036C				50µg	50
SG010A	hPTH1-84	Recombinant Human Parathyroid Hormone (PTH1-84)	1.0 x 10 <sup>4</sup> IU/mg	10µg	3
SG010B				50µg	10
SG010C				500µg	30
SG029A	hEGF	Recombinant Human Epidermal Growth Factor (EGF)	5.0 x 10 <sup>5</sup> IU/mg	10µg	3
SG029B				50µg	10
SG029C				500µg	30
SG043A	mFGF-acidic	Recombinant Mouse Fibroblast Growth Factor-acidic	2.0 x 10 <sup>6</sup> IU/mg	2µg	10
SG043B				10µg	40
SG043C				50µg	120
SG044A	mFGF-basic	Recombinant Mouse Fibroblast Growth Factor-basic	2.0 x 10 <sup>6</sup> IU/mg	2µg	10
SG044B				10µg	40
SG044C				50µg	120
SG012A	hBMP2	Recombinant Human Bone Morphogenetic Protein -2	2.0 x 10 <sup>4</sup> IU/mg	2µg	15
SG012B				10µg	65
SG012C				50µg	200
SG017A	hLIF	Recombinant Human Leukemia Inhibitory Factor	1.0 x 10 <sup>8</sup> IU/mg	2µg	30
SG017B				10µg	120
SG017C				50µg	320
SG034A	hSCF	Recombinant Human Stem Cell Factor	5.0 x 10 <sup>5</sup> IU/mg	2µg	15
SG034B				10µg	60
SG034C				50µg	160
SG033A	hIL-1RA	Recombinant Human		2µg	8

SG033B		Interleukin-1 Receptor Antagonist	2.0 x 10 <sup>6</sup> IU/mg	10µg	30
SG033C				50µg	90
SG041A	mIL-1α	Recombinant Mouse Interleukin-1 Alpha	1.0 x 10 <sup>8</sup> IU/mg	2µg	10
SG041B				10µg	40
SG041C				50µg	120
SG042A	mIL-1β	Recombinant Mouse Interleukin-1 Beta	1.0 x 10 <sup>8</sup> IU/mg	2µg	10
SG042B				10µg	40
SG042C				50µg	120
SG013A	hIL-2	Recombinant Human Interleukin-2	1.0 x 10 <sup>7</sup> IU/mg	2µg	5
SG013B				10µg	20
SG013C				50µg	65
SG009A	hIL-6	Recombinant Human Interleukin-6	5.0 x 10 <sup>7</sup> IU/mg	2µg	10
SG009B				10µg	40
SG009C				50µg	120
SG035A	hIL-8 /72	Recombinant Human Interleukin-8 (8-79)	2.0 x 10 <sup>6</sup> IU/mg	2µg	10
SG035B				10µg	40
SG035C				50µg	120
SG037A	hIL-8 /77	Recombinant Human Interleukin-8 (3-79)	5.0 x 10 <sup>5</sup> IU/mg	2µg	10
SG037B				10µg	40
SG037C				50µg	120
SG027A	hIL-10	Recombinant Human Interleukin-10	1.5 x 10 <sup>6</sup> IU/mg	2µg	15
SG027B				10µg	65
SG027C				50µg	200
SG018A	mIL-10	Recombinant Mouse Interleukin-10	5.0 x 10 <sup>5</sup> IU/mg	2µg	15
SG018B				10µg	65
SG018C				50µg	200
SG019A	rIL-10	Recombinant Rat Interleukin-10	5.0 x 10 <sup>5</sup> IU/mg	2µg	15
SG019B				10µg	65
SG019C				50µg	200
SG006A	hIL-11	Recombinant Human		2µg	10

SG006B		Interleukin-11	8.0 x 10 <sup>6</sup> IU/mg	10µg	40
SG006C				50µg	120
SG016A	hIL-15	Recombinant human Interleukin-15	2.0 x 10 <sup>6</sup> IU/mg	2µg	15
SG016B				2µg	65
SG016C				50µg	200
SG045A	hIL-16	Recombinant human Interleukin-16	1.0 x 10 <sup>4</sup> IU/mg	2µg	15
SG045B				10µg	65
SG045C				50µg	200
SG047A	mIL-22	Recombinant Mouse Interleukin-22	2.0 x 10 <sup>6</sup> IU/mg	2µg	15
SG047B				10µg	65
SG047C				50µg	200
SG038A	VEGI	Recombinant Human Vascular Endothelial Growth Inhibitor	2.0 x 10 <sup>2</sup> IU/mg	2µg	15
SG038B				10µg	65
SG038C				50µg	200



**Shanghai ShineGene Molecular Bio-tech Co.,Ltd.**

Add: Floor 2, Building A, 328#, Wuhe Road, Shanghai, 201109, China

Tel: +86-21-54460832

Fax: +86-21-54460831

E-mail: [master@shinegene.org.cn](mailto:master@shinegene.org.cn)

WebSite: [www.synthesisgene.com](http://www.synthesisgene.com)

Add: Floor 2, Building A, 328# Wuhe Road, Shanghai 200233 China

Tel: +86-21-54460832

Fax: +86-21-54460831

Web: [www.synthesisgene.com](http://www.synthesisgene.com)

E-mail: [master@shinegene.org.cn](mailto:master@shinegene.org.cn)