Cytokines (Interleukins) and its classification

The lymphokines and other cells secrete certain glycoproteins in response to stimulus and infection. These glycoproteins are referred as interleukins which promote cellular growth of immune component cells. The interleukins are named as IL-1, IL-2 to - IL-15 as per their order of discovery.

Alic Isaacs and Team Lindemann identified the first cytokine in 1957 while working on viral interference by anti viral agents. They isolated anti viral protein and called it ~~as~~ interferon. The interferon γ (IFγ) is secreted by T cells. Certain cytokines possess anti tumor activities and one called tumor necrosis factor- α (TNF-α)

The term cytokines and lymphokines refer to glycoproteins secreted by lymphocytes. Monocytes and macrophages produce inter leukin called as Monokines. The study of cytokines can be done as follows —

1) Structure of cytokines — The cytokines belong to hematopoetin family its about 30 KDa mol wt. The IL-2 and IL-4 are four polypeptide chain structure contain 2 α-helical proteins and β pleated sheets. These polypeptides are connected by loops.

2) Production of cytokines —
The Production and classification of key immune cytokines are shown in the table in next page.

Table showing a profile of activities of key immune cytokine

Cytokine	Producing cell	Target cell	function.
GM-CSF	TH1 cells	Progenitor cells	Production of monocytes
IL-1 α IL-1 β	Macrophages B cells dendritic cells	NK cells	Inflammation, fever
2. IL-2	TH1 cells	Activated T cells B cells and NK cells	Growth Proliferation
3. IL-3	~~Stem cells~~ TH1 cells and ~~NK cells~~ mast cells TH1 cells and NK cells Mast cells	Stem cells & mast cells	Growth and differentiation
4. IL-4	TH2 cells	Activated B cells macrophages T cells	Differentiation Ig G1 and IgE Synthesis MHC-II, activation of B cells.
5. IL-5.	TH2 cells monocytes	Activated B cells	Proliferation and differentiation of B cells. Ig A Synthesis
6. IL-6	Macrophages Stromal cells TH2 cells	Plasma cells stem cells	Antibody Secretion
7. IL-7	Marrow stroma Thymus Stroma	Stem cells	Differentiation of Progenitor B and T cells.
8 IL-8	Macrophages endothelial cells	Neutrophils	Chemotaxis
9. IL-10	TH2 cells	Macrophages B cells	Inhibition of cytokine production
10 IL-12	Macrophages B cells	Activated TC cells	Differentiation into CTL, Inhibition of viral replication

11. IFN-α	Leukocytes	various	Increase, MHc class I II
IFN-β	Fibroblasts	various	expression and inhibition of viral replication.
12. IFN-β	~~fibroblast~~ TH1 cells, Tc cells NK cells	Macrophages Activated B cells TH2 cells Macrophages	MHc expression Ig class switch to IgG2a Inhibition of Proliferation Pathogen elimination
13 MIP-1-α	Macrophages	Monocytes-Tcells	chemotaxis
-1-β	Lymphocytes	Monocytes-Tcells	
TGF β -	T cells monocytes	Activated Macrophages	IL-1 Synthesis
TNF-α -	Macrophages, mast Cells, NK cells	Macrophages Tumor cells	CAM and cytokine expression cell death.
TNF β -	TH1 cells and Tc cells	Phagocytes Tumor cells	Phagocytosis nitric oxide Production cell death.

CTL - Cytotoxic T lymphocyte GM-CSF Granulocyte monocyte Colony Stimulating Factor IFN - Interferon, IL - interleukin, MIP - Macrophage inflammatory protein TGF - Tumor growth factor, TNF Tumor necrosis factor.
Tc - Cyto Toxic T cell.

Properties of cytokines -
1/ cytokines are small secreted protein produced in response to an immune stimulus
2/ cytokines act at a very low concentration

and mediate and regulate immunity, inflamation and hematopoiesis.

3/ They normally act over short distances via binding to specific membrane receptors.

4) They act via second messenger, such as tyrosine Kinase, to alter its behavior via altered gene expression.

5) cytokines may act on the cells that secrete them (autocrine) or nearby cells (Paracrine) or distant cells (endocrine)

6/ Cytokines are often produced in a cascade as one cytokine stimulates its target cells to express additional cytokines, it can also act synergistically in which two or more cytokines act together or antagonistically in which cytokines cause opposite activities.

7/ The properties of cytokines depend upon cytokine function and cytokine receptors.