

Cytokine

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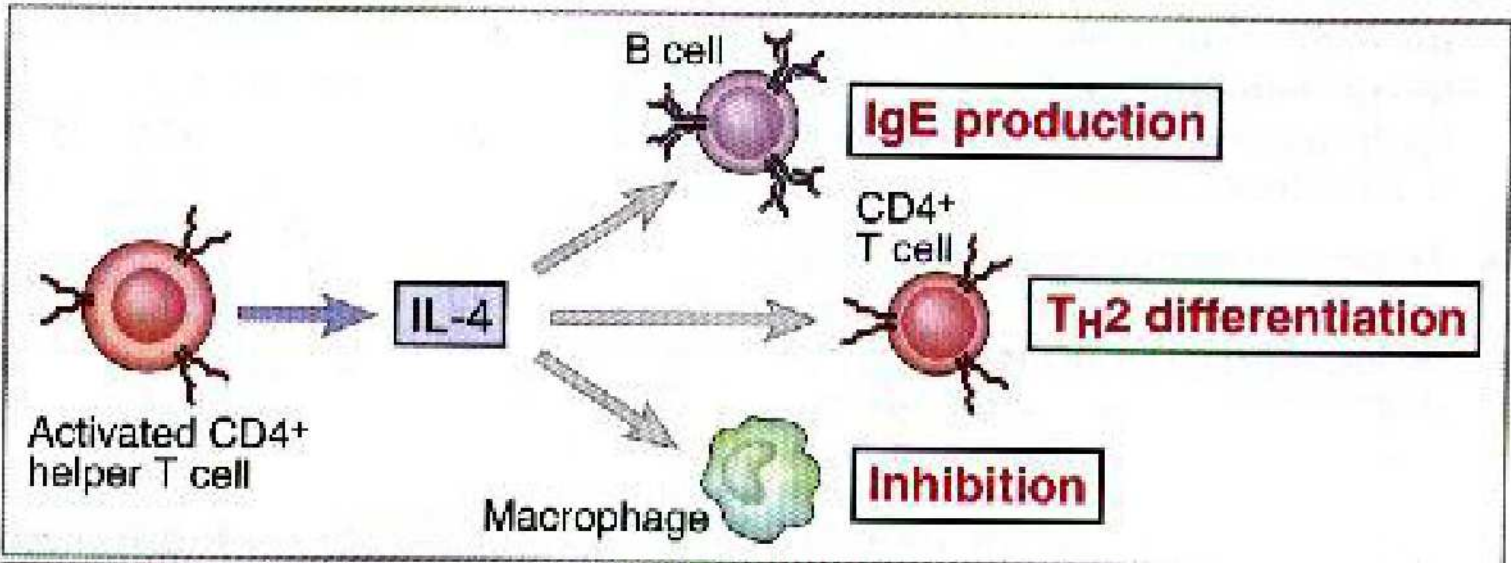
Part I: Definition and common features of cytokines

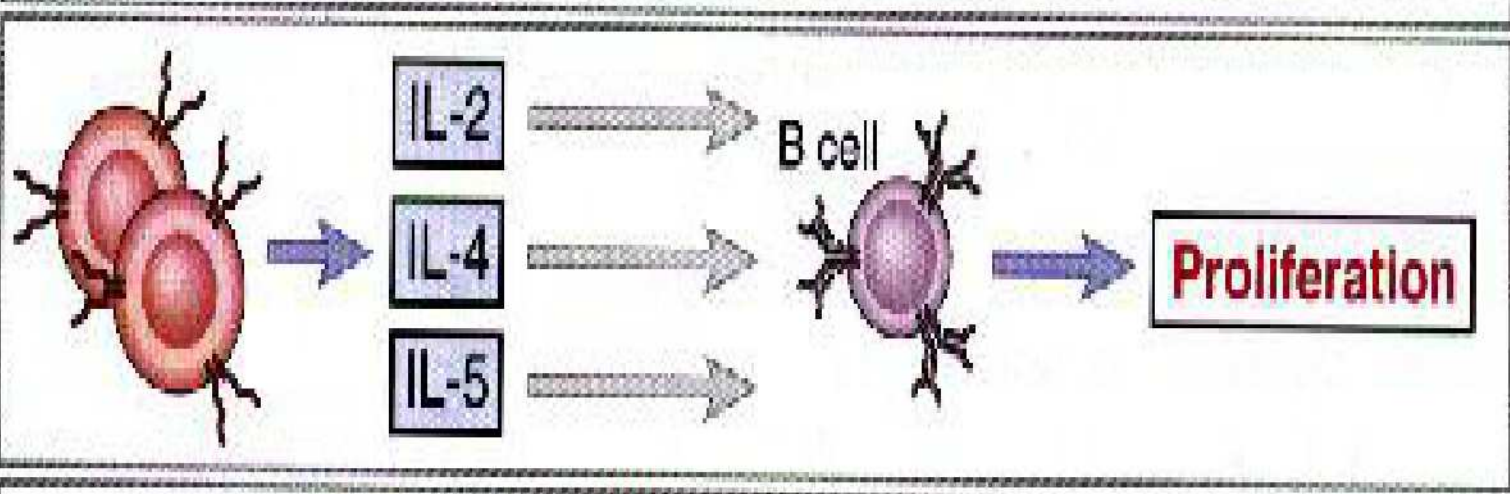
1. What is cytokine?

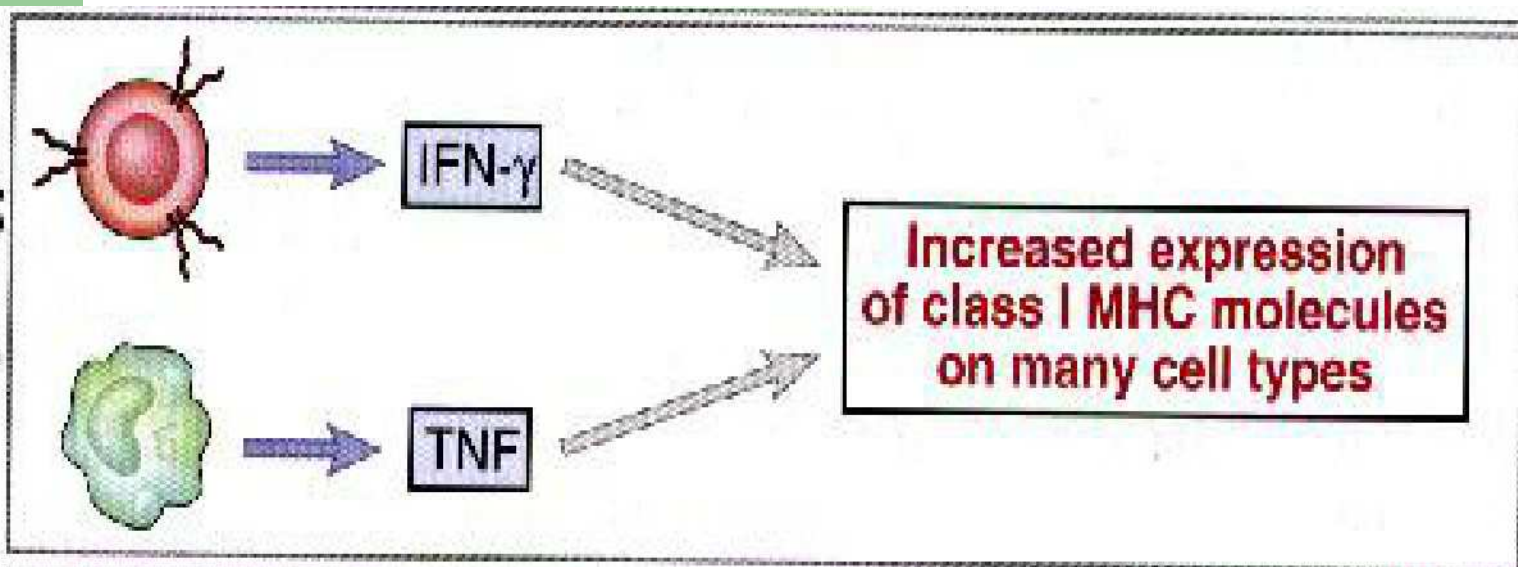
A group of low molecule weight proteins that are released by various cells in the body and induce biological response through binding to their corresponding cell surface receptors.

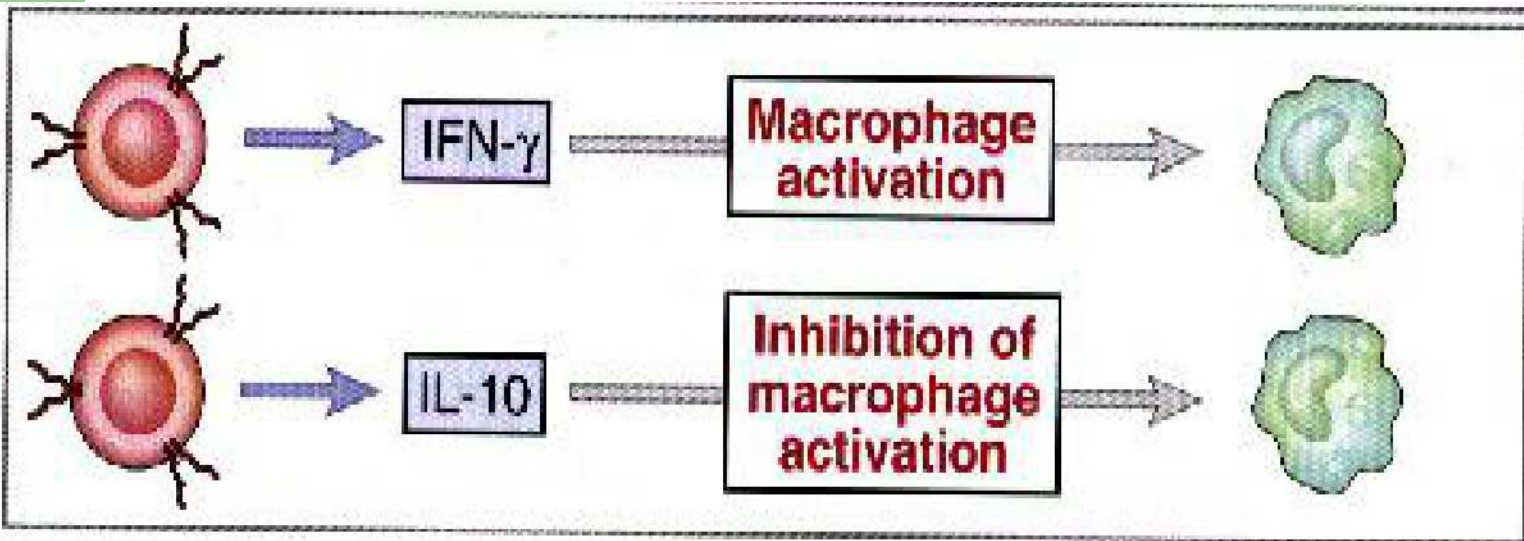
2. Common features of cytokines

- **Most cytokines are low MW**
- **Cytokines can induce biological effect at relatively low concentration**
- **The biological effect of cytokines are mediated by their high affinity cell surface receptor**
- **Cytokines can take effect in three ways: autocrine, paracrine, and endocrines**
- **The effects of cytokines are often pleiotropism, redundant, synergy, antagonism, and form a cytokine network**

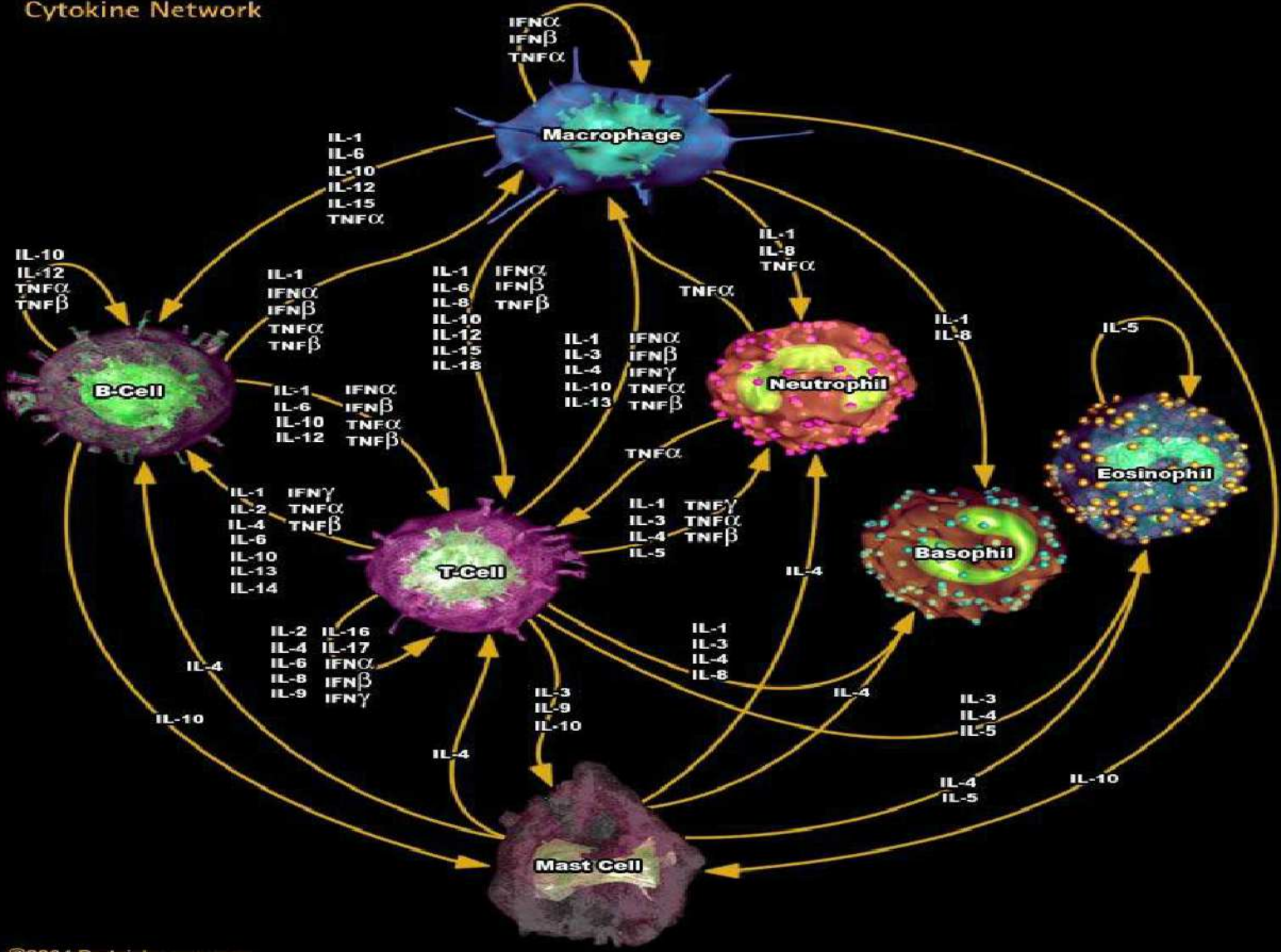








Cytokine Network



Part II: Classification of cytokines

1. **Interleukin, IL**
2. **Interferon, IFN**
3. **Tumor necrosis factor, TNF**
4. **Colony-stimulating factor, CSF**
5. **Chemokine**
6. **Growth factor**

1. Interleukine (IL)

- **Cytokines secreted by leukocytes that have the ability to act as signal molecules within different population of leukocytes**

2. Interferon (IFN)

- Interfere virus infection and duplication
 - Type I: IFN- α secreted by leukocytes
IFN- β secreted by fibroblasts
 - Type II: IFN- γ secreted by activated T cells and NK cells

Figure 11-8 Biologic actions of type I interferons.

Type I IFNs (IFN- α , IFN- β) are produced by virus-infected cells and macrophages (not shown). Type I IFNs inhibit virus infection and enhance CTL activity against virus-infected cells.

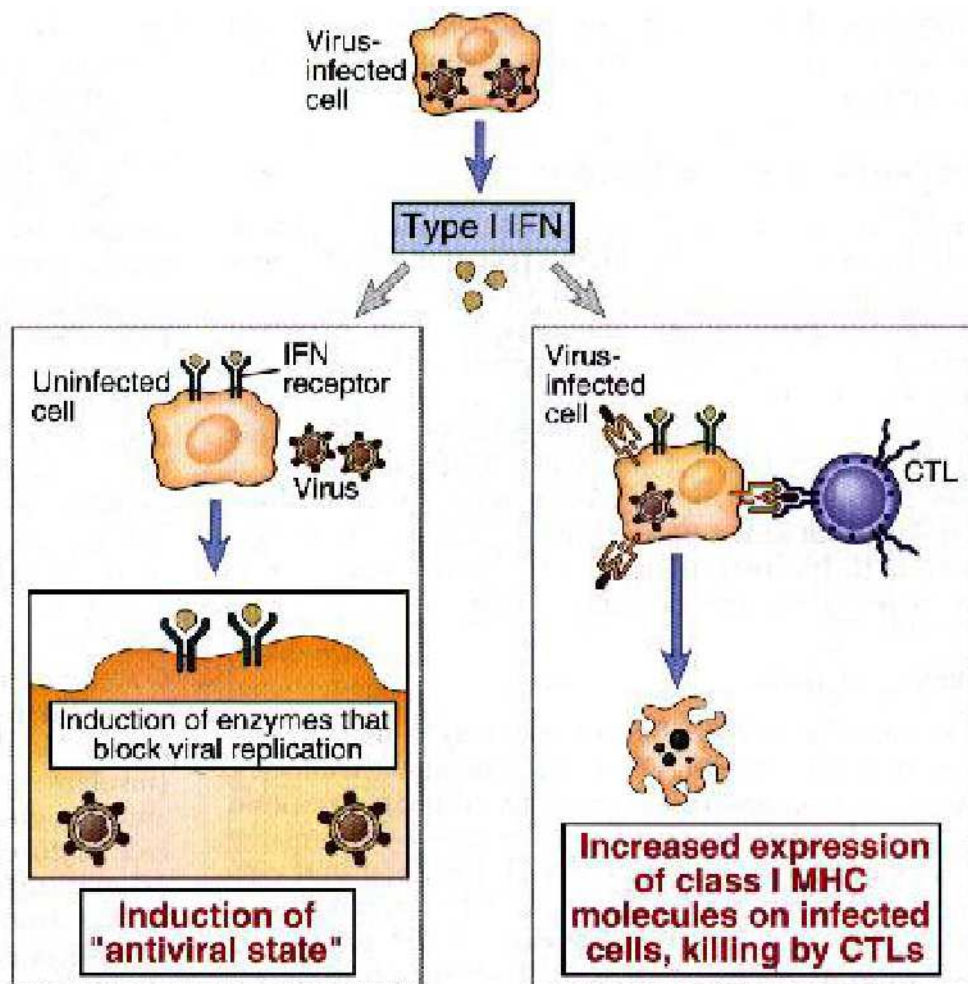
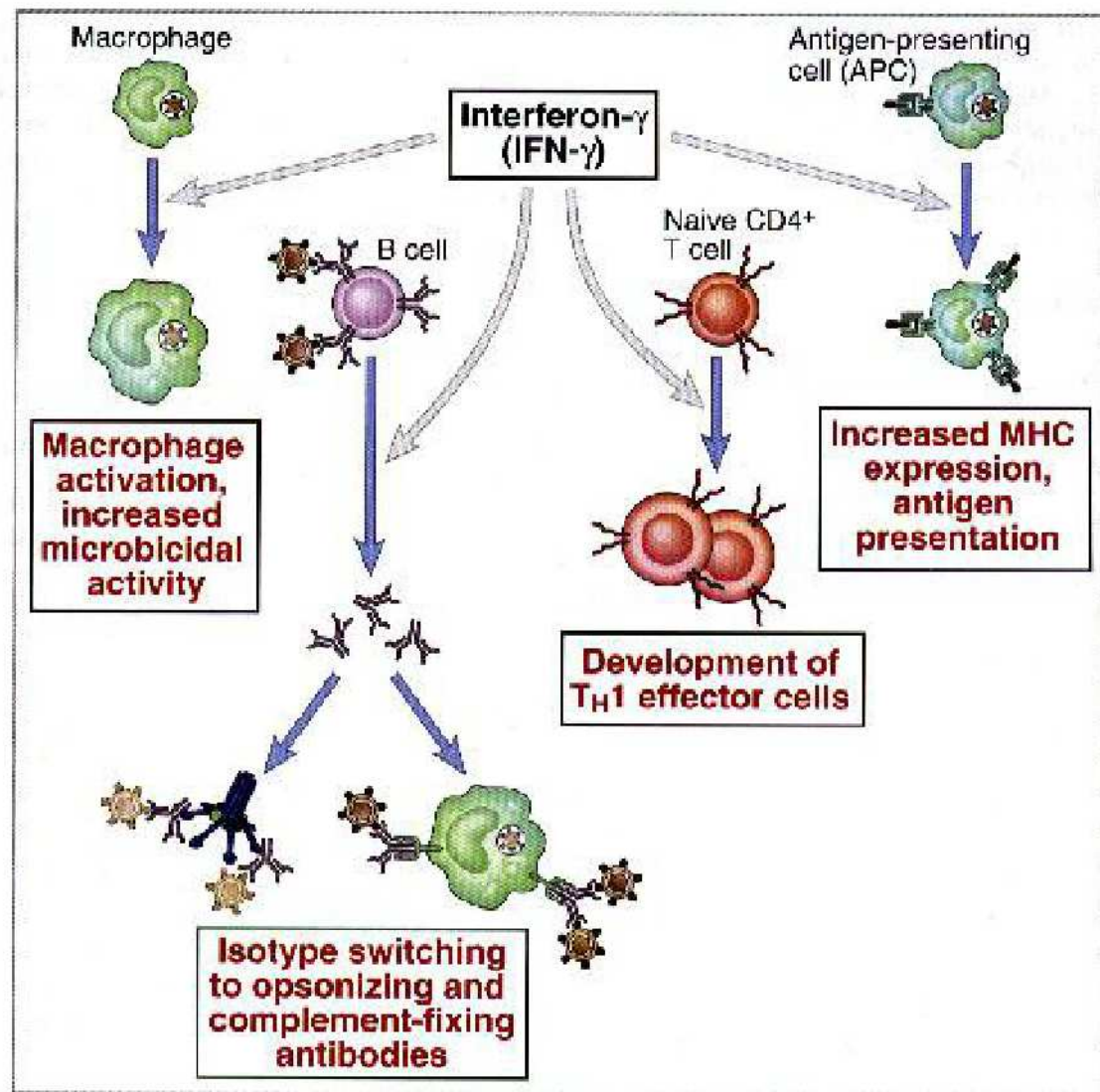


Figure 11-14 Biologic actions of IFN- γ .

IFN- γ activates phagocytes and APCs and induces B cell switching to some immunoglobulin isotypes (that often bind complement and Fc receptors on phagocytes and are distinct from the isotypes induced by IL-4). The T_H1-inducing effect of IFN- γ may be indirect, mediated by increased IL-12 production and receptor expression.

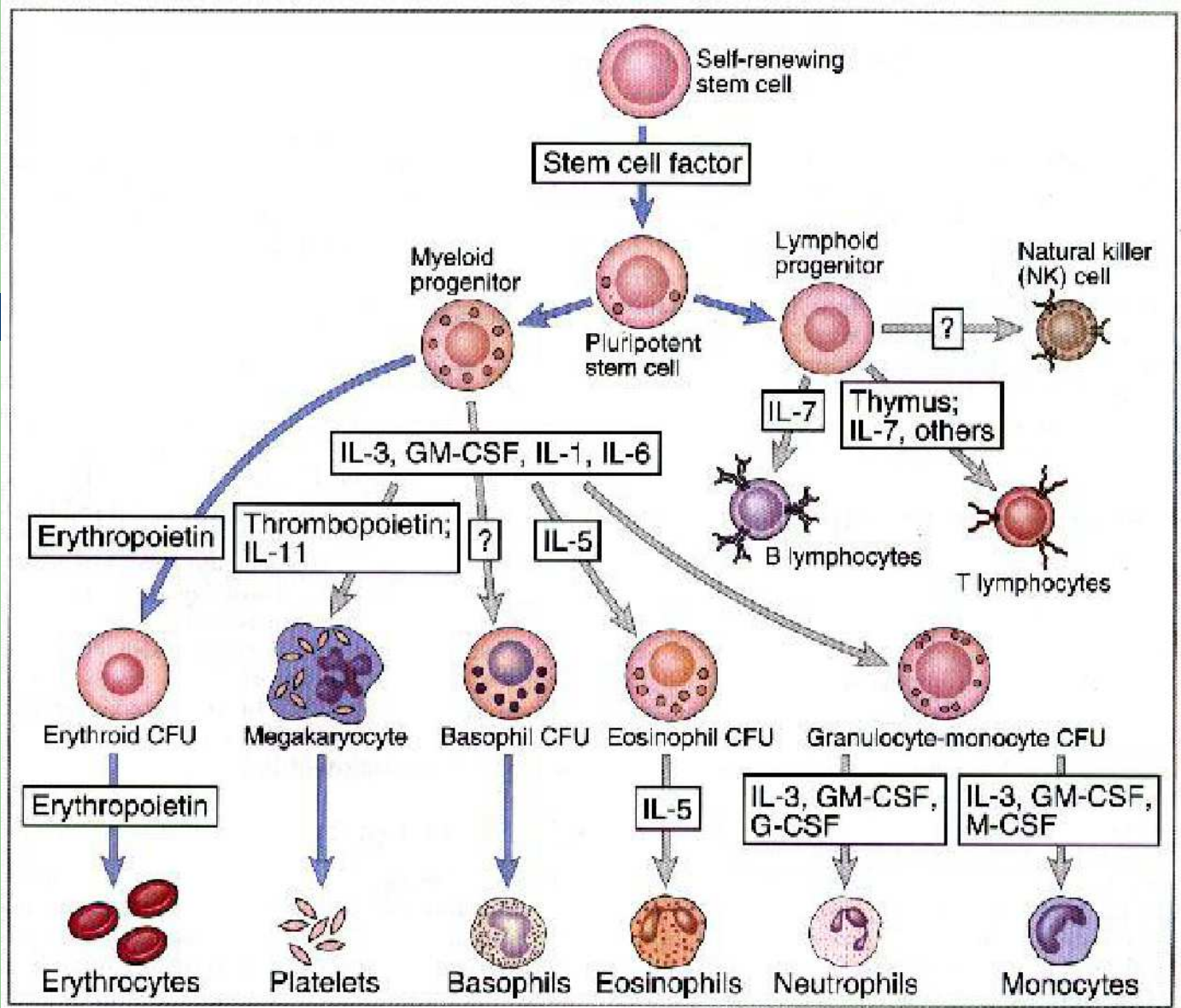


3. Tumor necrosis factor (TNF)

- TNFs were originally thought of as selective antitumour agents, but are now known to have a multiplicity of actions.
- TNF- α is produced mainly by LPS activated monocytes and macrophages.
- TNF- β (lymphotoxin, LT) is produced mainly by activated Th0 and Th1.

4. Colony-stimulating factors (CSF)

- **Cytokines that stimulate proliferation or differentiation of pluripotent hematopoietic stem cell and different progenitors.**
 - **Multi-CSF (IL-3)**
 - **Granulocyte macrophage-CSF (GM-CSF)**
 - **Monocyte-CSF (M-CSF)**
 - **Granulocyte-CSF (G-CSF)**
 - **Stem cell factor (SCF)**
 - **Erythropoietin (EPO)**



5. Chemokine

- **Chemokines are cytokines which recruiting monocytes, granulocytes and lymphocytes in blood to the sites of inflammation.**
 - **CXC chemokines: IL-8**
 - **CC chemokines: MCP-1**
 - **C chemokines**
 - **CX₃C chemokines**

*C: cysteine; X: any amino acid

6. Growth Factor

- Growth-factor are cytokines which stimulate the growth of their target cells.
 - Transforming growth factor- β (TGF- β)
 - Epithelia growth factor (EGF)
 - Vascular endothelia cell growth factor (VEGF)
 - Fibroblastic growth factor (FGF)

Part III: Cytokine receptors

- Ig superfamily receptor : IL-1R
- Type I CK receptor: IL-2R
- Type II CK receptor: IFN- γ R
- TNF receptor superfamily: TNFR1
- Chemokine receptor: IL-8R

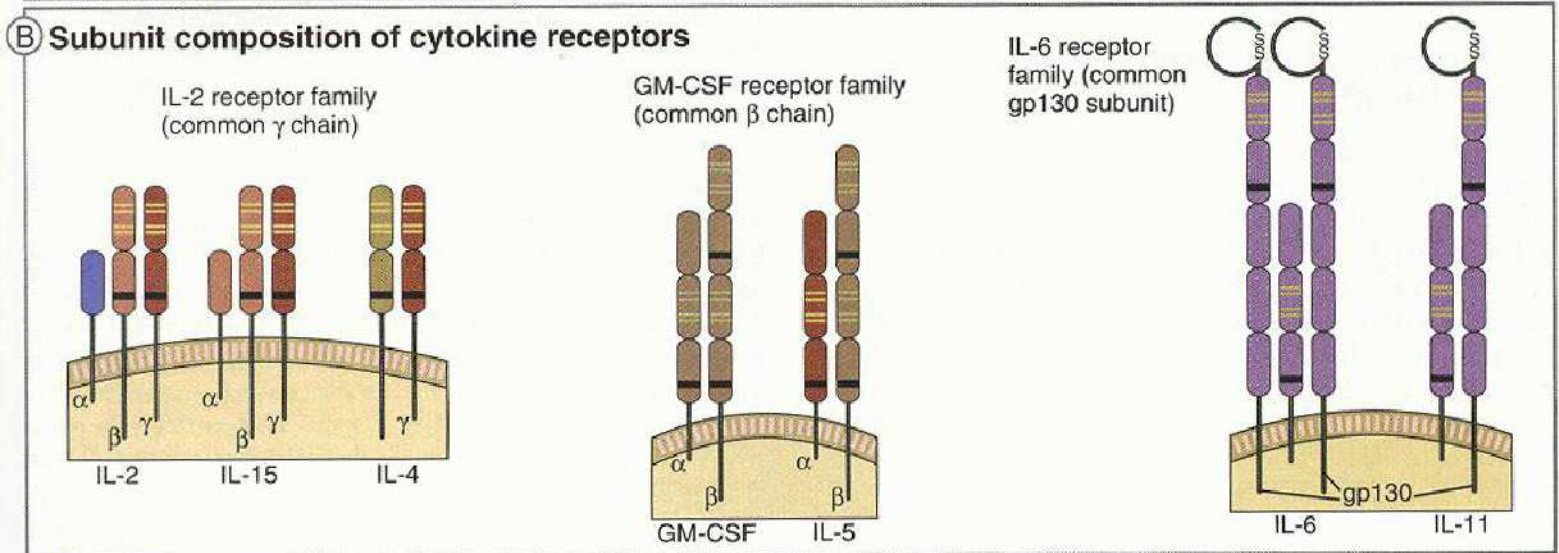
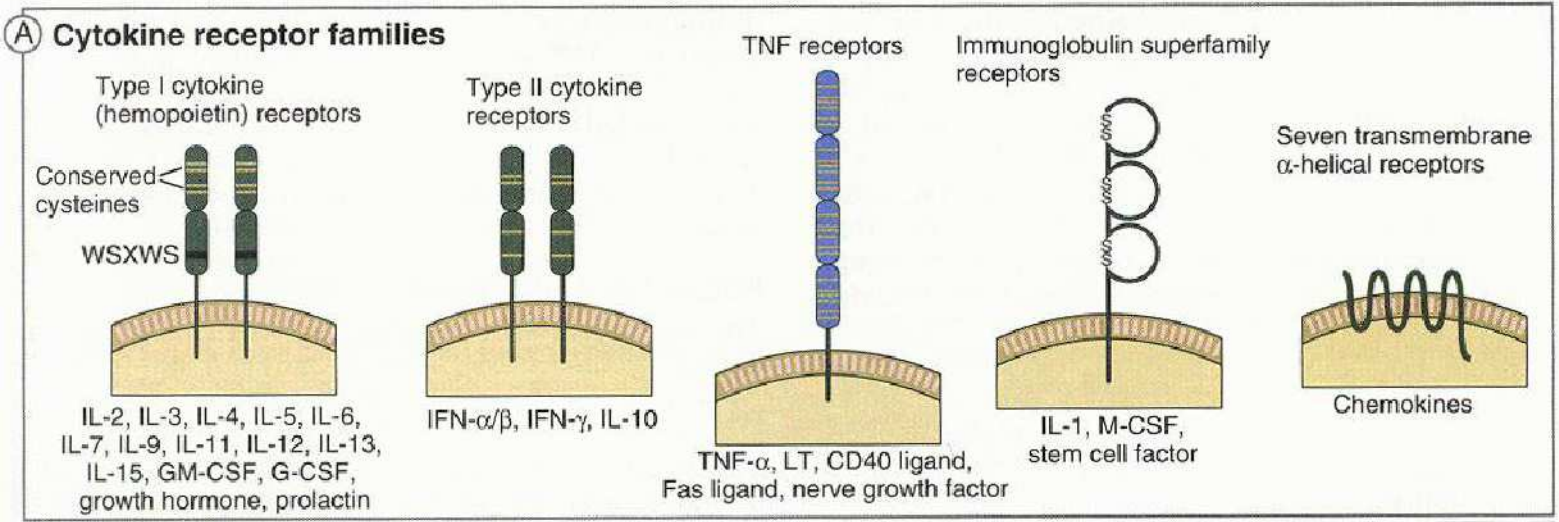


Figure 11-3

Part IV:

Biological functions of cytokines

- Involved in innate immunity modulation
- Involved in adaptive immunity modulation
- Stimulating hemotopoiesis
- Inducing apoptosis of target cells
- Promoting trauma recovery

Part V: Cytokines and diseases

- H5 N1 virus can induce “cytokine storm”, in which situation many kind of cytokines, such as TNF- α , IL-1, IL-6, IL-12, IFN- α , IFN- β , IFN- γ , MCP-1, and IL-8 were quickly elevated in tissue fluid.
- Cytokine storm is one of the important inducer for ARDS and multiple organ failure.

- Recombinant IFN- α : Intron-A, Roferon-A
hairy-cell leukemia, chronic myelogenous leukemia, renal cell carcinoma, melanoma, C and B type hepatitis
- EPO: Epogen
chronic renal failure, anti-AIDS medicine induced severe anaemia
- TNF chimeric antibody : Neumega, Inflixmab
rheumatoid arthritis, ulcerative colitis