



المناعة 1

CYTOKINES

Sawa University

College of health and medical techniques

Department of Medical Laboratories

Third Stage

جامعة ساوة الاهلية

كلية التقنيات الصحية والطبية

قسم تقنيات المختبرات الطبية

المرحلة الثالثة

محاضرة رقم 9

Lecture No. 9

الجانب النظري

Theoretical

تدريسي المادة : د. زيدون حسين مهدي

Battle of Amerli 2014





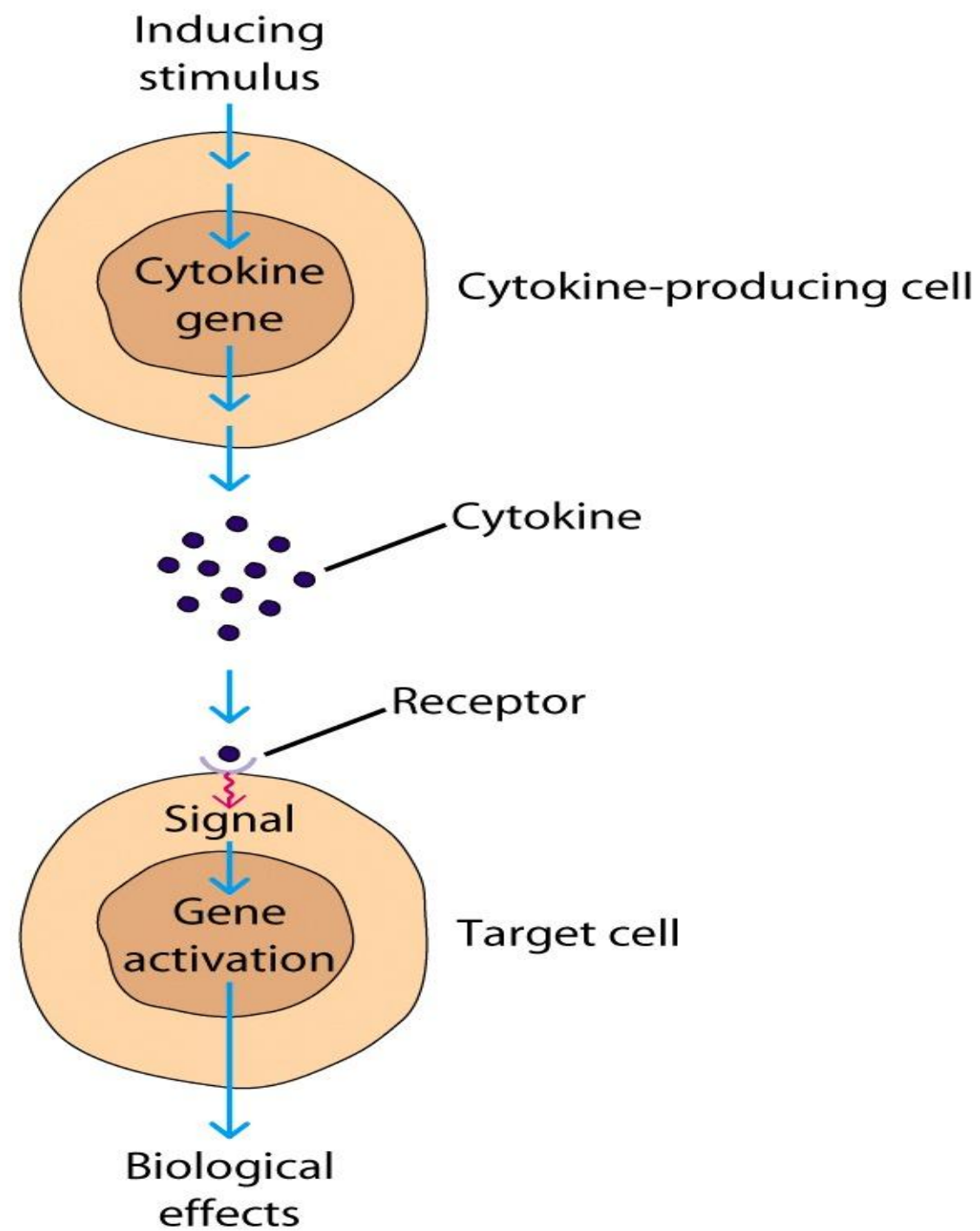
Alick Isaacs



Jean Lindenmann

What Is A Cytokine?

- Low molecular weight proteins (30 KDa)
- They play major role in **induction** and **regulation** of cellular interactions involving cells of immune, inflammatory and hematopoietic systems.
- Bind receptors, alter gene expression
- Very low K_d receptors (10^{-10} - 10^{-12} M)
- Cytokines regulate immune responses

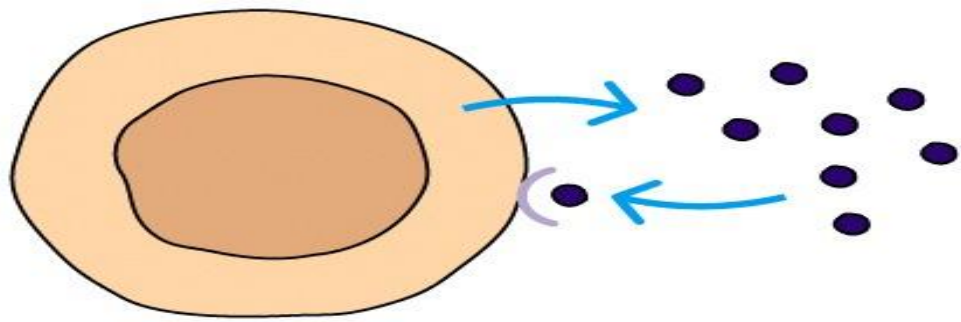


Names of Cytokines

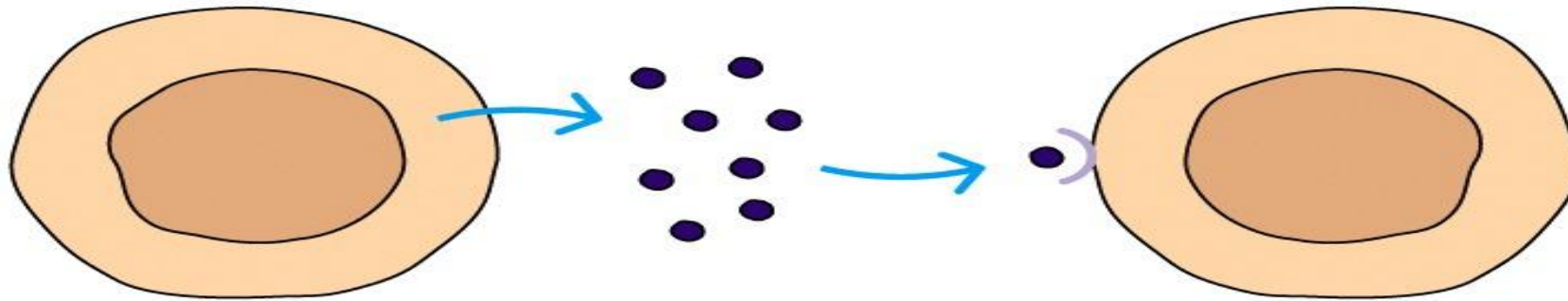
- **Source**
 - e.g., Lymphokine
- **Function**
 - e.g., Chemokines
- **Intercellular action** : secret by leukocyte effect
On other leukocyte
 - e.g., Interleukins

Mode of action of Cytokines

- **Autocrine**
 - Affects the generating cell (self)
- **Paracrine**
 - Affects cells in the immediate vicinity
- **Endocrine**
 - Affects cells remote from the secreting cell

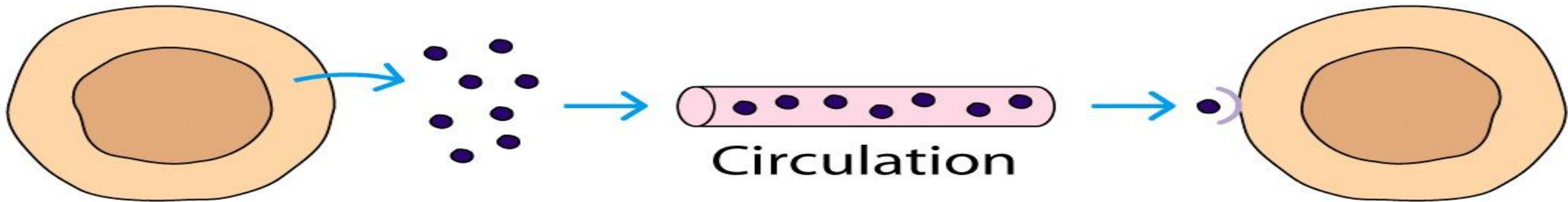


Autocrine action



Paracrine action

Nearby cell



Endocrine action

Circulation

Distant cell

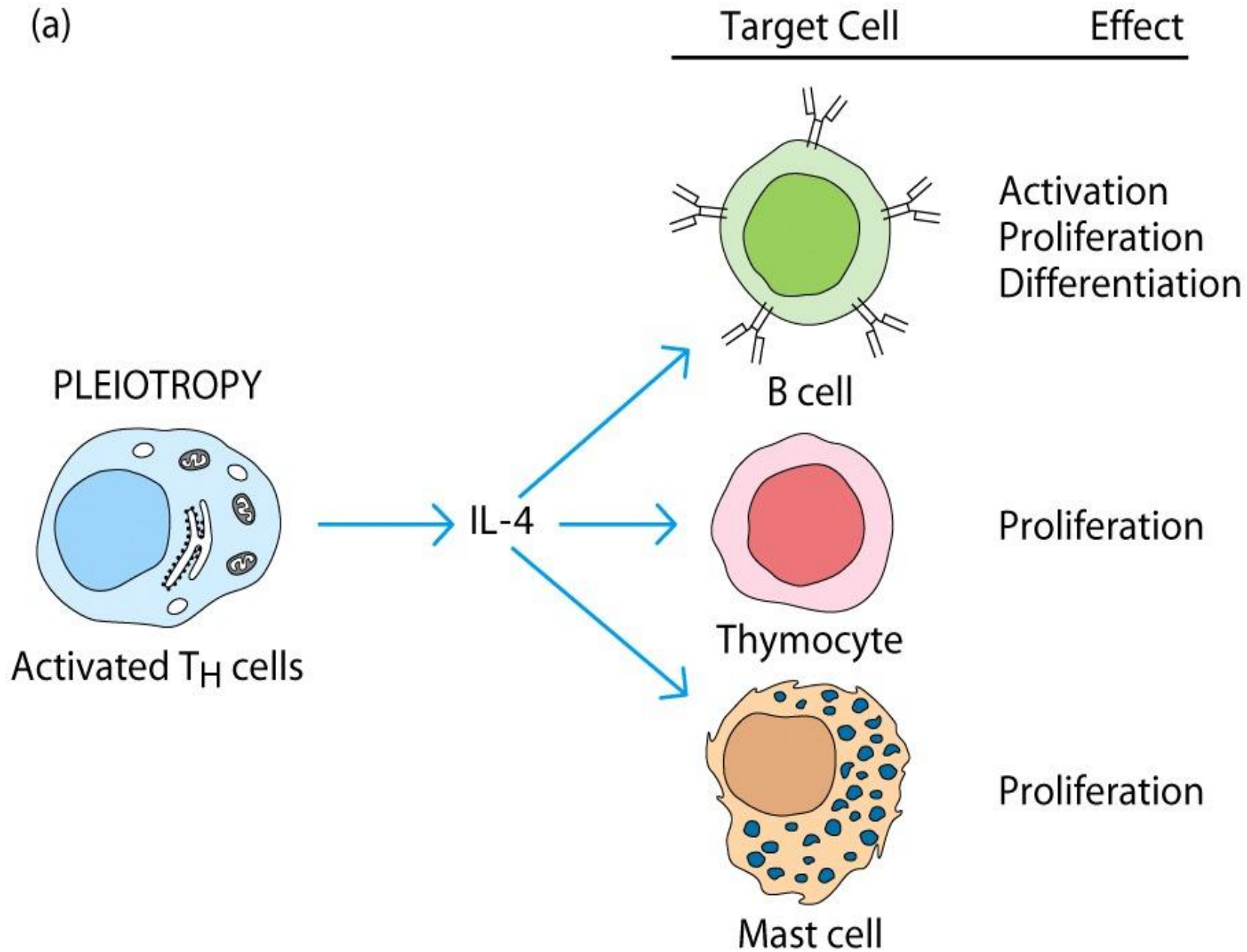
Action of Cytokines

- Pleiotropy
- Redundancy
- Synergy
- Antagonism
- Cascading

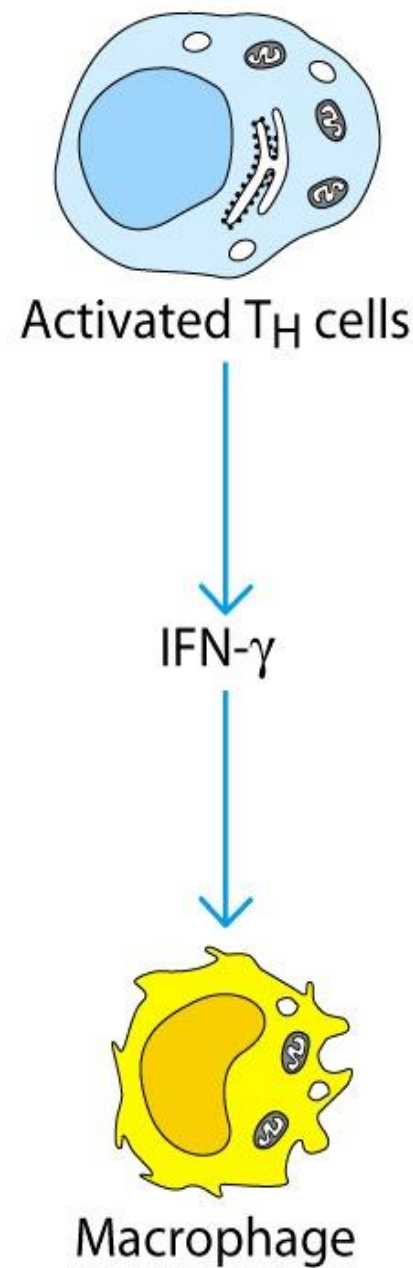
- **Pleiotropy** which mean that cytokine has **different biological effect on different target cells** e.g. IL-4 lead to proliferation of B lymphocyte, thymocyte, mast cell and activation of B-cell.
- **Redundancy** means that two or more cytokines can mediate the same functions e.g. IL-2, IL-4, IL-5 help to proliferate B-cell.

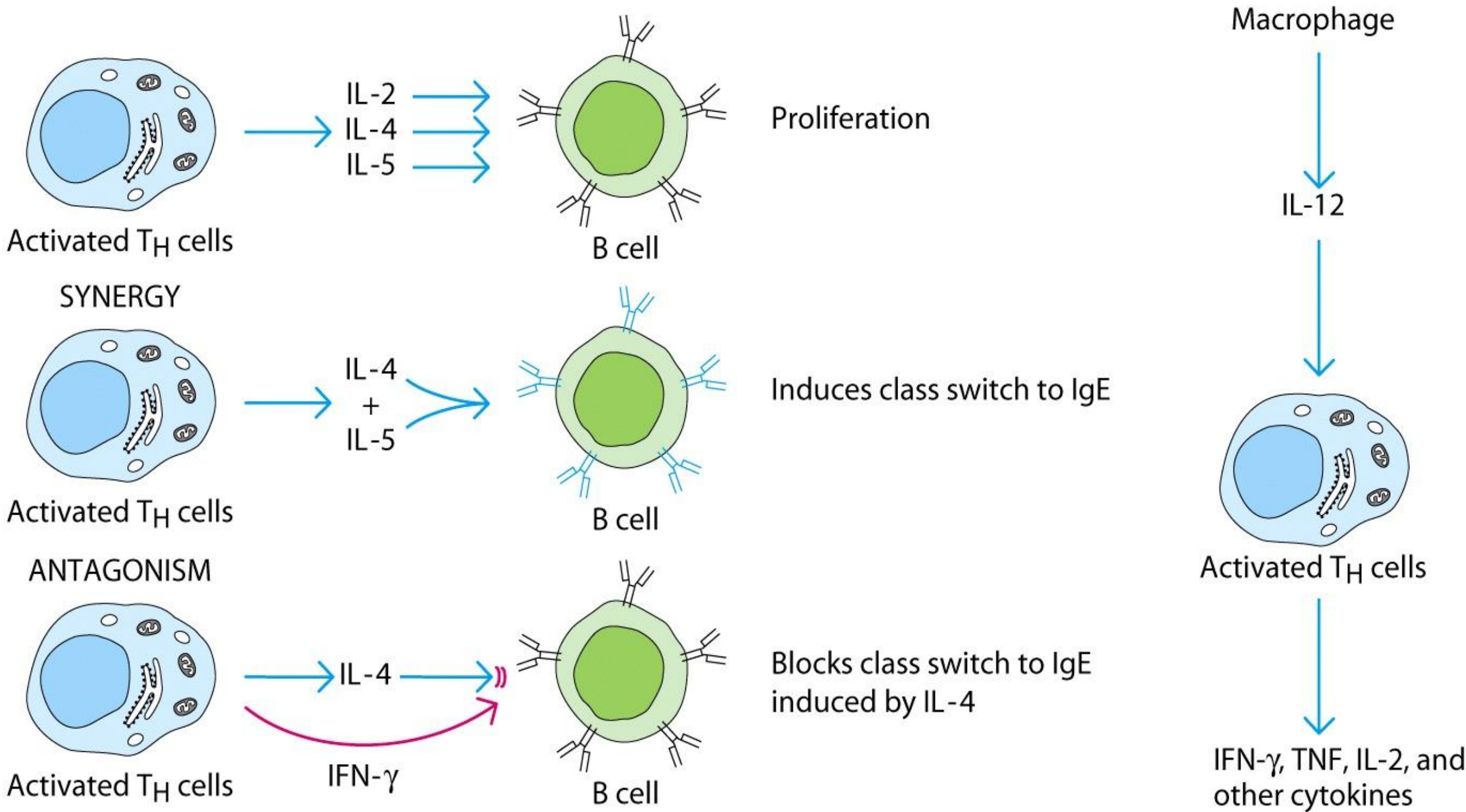
- **Synergy**, it occurs when the combined action of two cytokines on cellular activity is greater than the additive effects of individual cytokines. e.g. IL-4 + IL-5 help to induce class switching of IgE.
- **Antagonism** e.g. γ - INF block class switching induced by IL-4 On B-cell.

(a)



(b) CASCADE INDUCTION



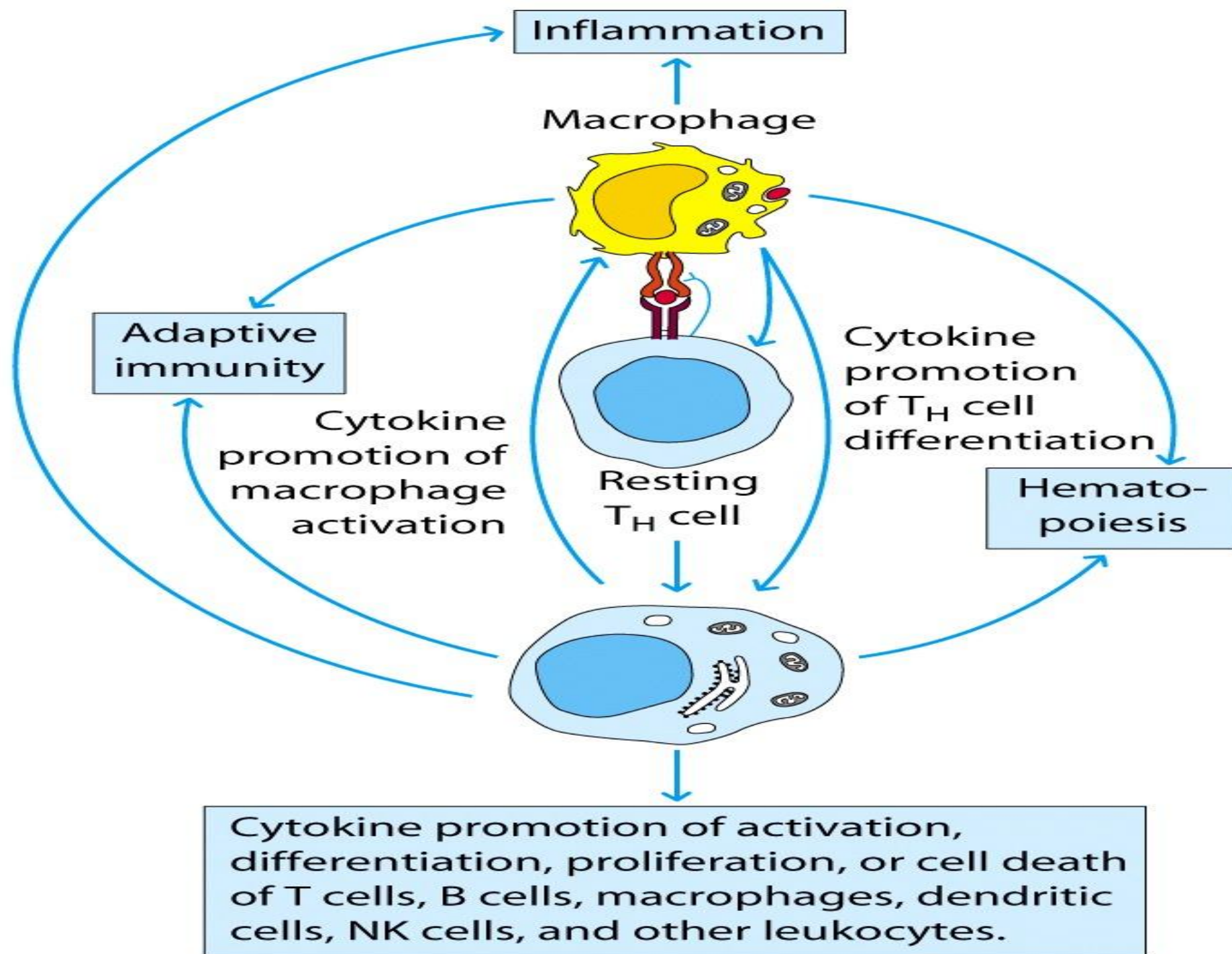


Cytokines in the Immune Response

- **Innate immune response**
 - IL 1-(Macrophage)-fever, capillary effects
 - IL 6-(Macrophage)-adaptive immunity via B cells
 - IL 12(Macrophage)-adaptive immunity via T helper cells
 - TNF (Macrophage)-capillary effects, activates neutrophils
 - IFN *alpha* (Macrophage)-multiple effects
 - IFN *beta* (Fibroblasts)-multiple effects

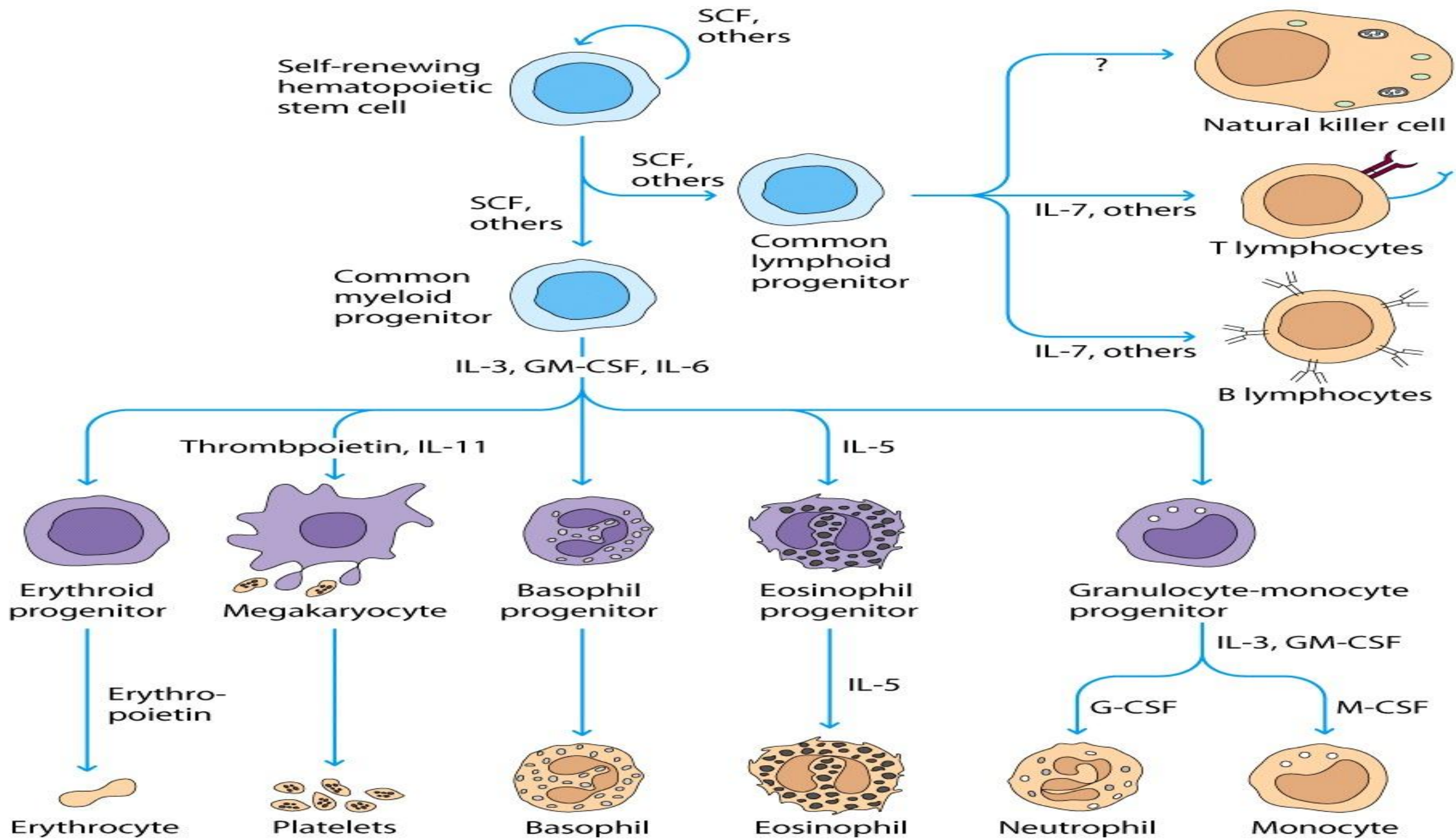
- **Adaptive immune response**

- IL 2-(T cells)-multiple effects
- IL 4-(T cells & mast cells)-T cell differentiation, IgE production
- TGF *beta* –(T cells, macrophages)-inhibits adaptive immune response
- IFN *gamma*-(T cells, NK cells)-Macrophage activation



Role of Cytokines in Hematopoiesis

- SCF (Stem cell factor)
- GM-CSF (Granulocyte-macrophage colony-stimulating factor)
- IL-3 (Interleukin 3)
- IL-5 (Interleukin 5)
- IL-7 (Interleukin 7)
- IL-11 (Interleukin 11)



Cytokine related diseases:

- **Septic shock**
 1. Caused by gram-negative bacteria, *E.coli*, *Klebsiella pneumoniae*, *neisseria meningitidis*.
 2. Can caused by trauma, injury, ischemia and certain cancer.
 3. It is fatal, characterized by drop of blood pressure, diarrhea, widespread blood clotting.
 4. It develop due to binding of endotoxins to **TLR** on **denderitic** cell causeing production of IL-1 &TNF- α .The cytokine imbalance causes very abnormal body temperature and respiratory rate and high white blood cell, followed by capillary damage and tissue injury and lethal organ damage.
 5. Binding of **superantigen** to **TCR** lead to same squally

- **Problems in adapting cytokine:**
 1. Maintaining effective dose levels over a clinical significant period.
 2. Achieving a local concentrations when cytokine must be administered systemically for clinical treatment is difficult.
 3. Cytokine have short half life.
 4. Cytokine is extremely potent biological response modifiers, and cause unpredictable side effect.

Examples :INF, GM-CSF, blocker of TNF (used for rheumatoid arthritis).

Use of cytokines in clinical medicine

- Inflammation
- Cancer therapy.
- Organ transplantation.
- Infectious disease.
- Allergy.

Thank
you!

