

# **T-cell & B-cell receptors – Role in the Immune Response**

# Effective Immune Response Requirements

## متطلبات الاستجابة المناعية الفعالة

I. Lymphocytes

II. Antigen presenting cells (APC)

Lymphocytes display receptors


تحمل مستقبلات للأرتباط بالانتيجينات الغريبة

- **Specificity**
- **diversity**
- **Memory**
- **Self- Non- Self Recognition**

# B-Lymphocytes

## تنشأ وتنضج في نخاع العظام

B cell receptor (BCR) = surface antibodies

Naive B cell + Antigen(Ag)  divide and replicate (proliferate)  
(BCR)

Memory B cell خلايا الذاكرة

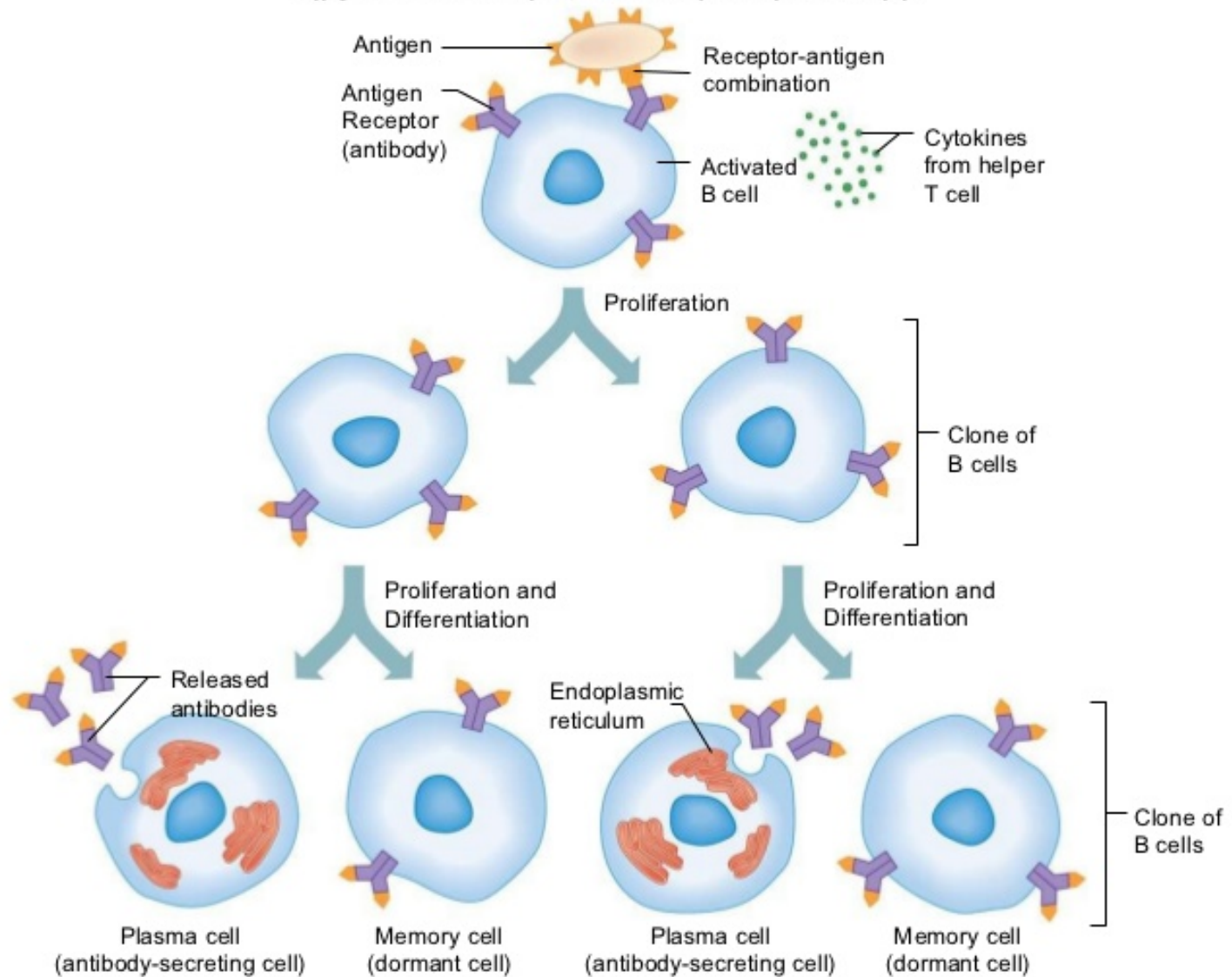
Effector B cell الخلايا الفعالة

 Plasma cell (antibody secreting cell)

Plasma cells short lived  
Memory B cells long lived

# B-Lymphocytes activation

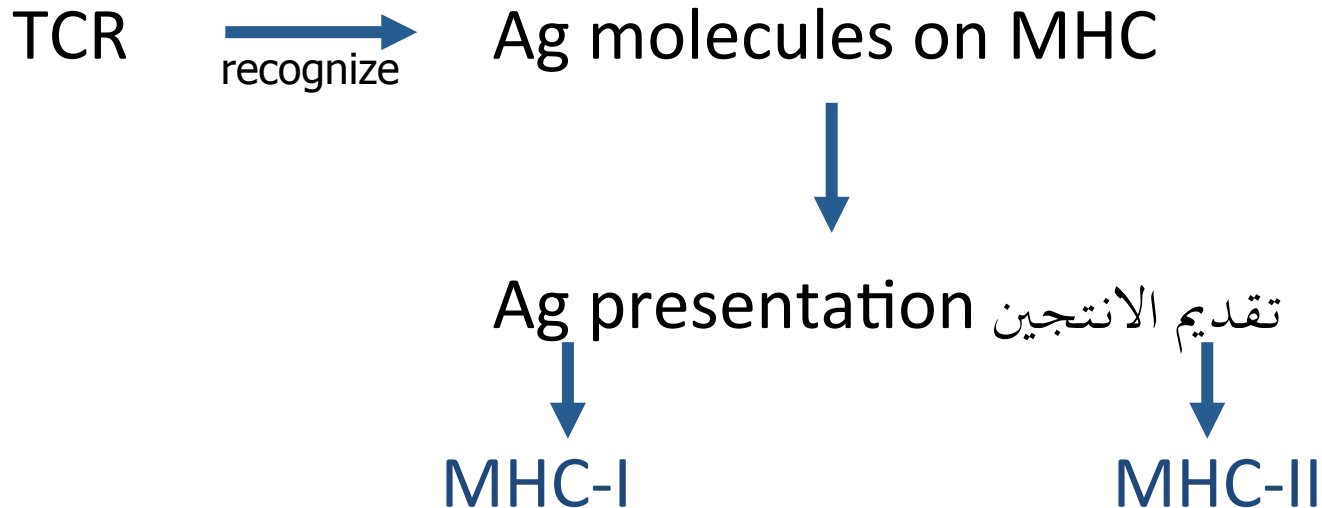
Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



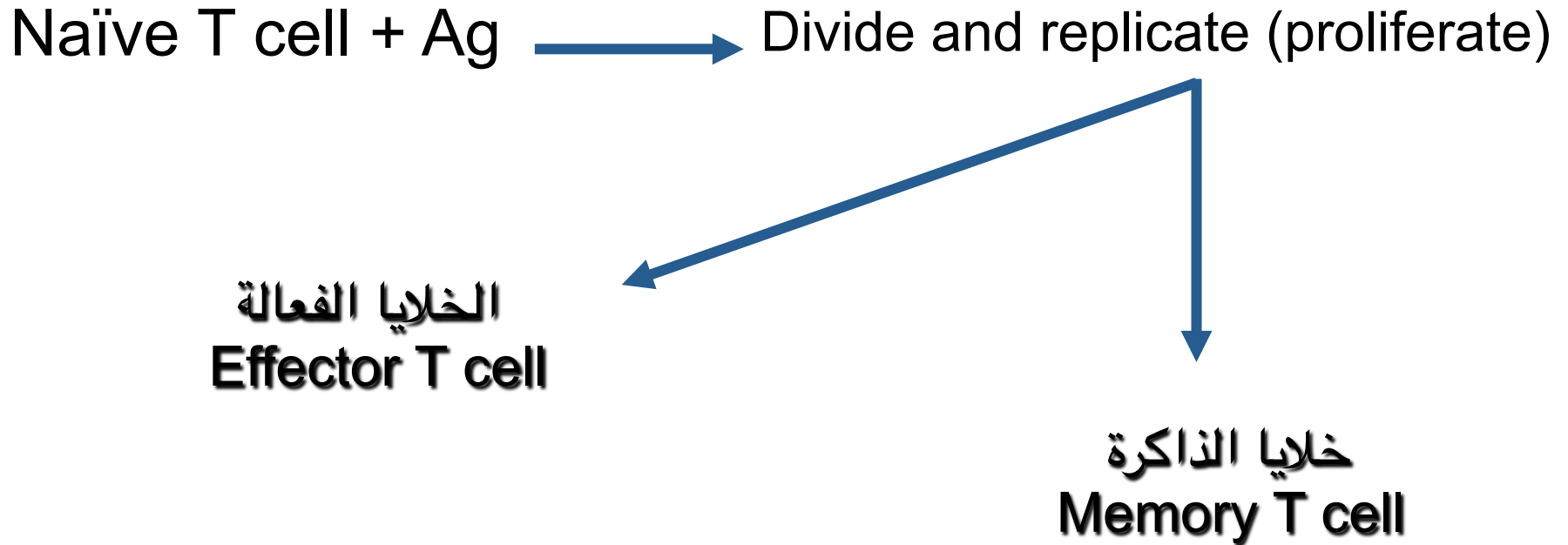
# T-Lymphocytes

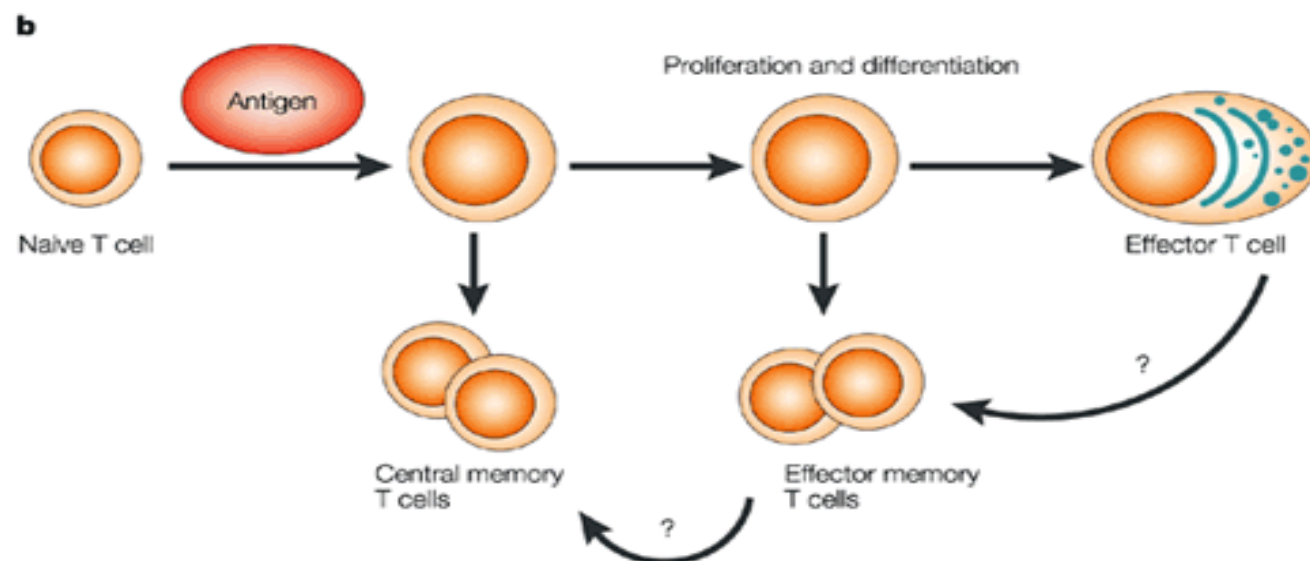
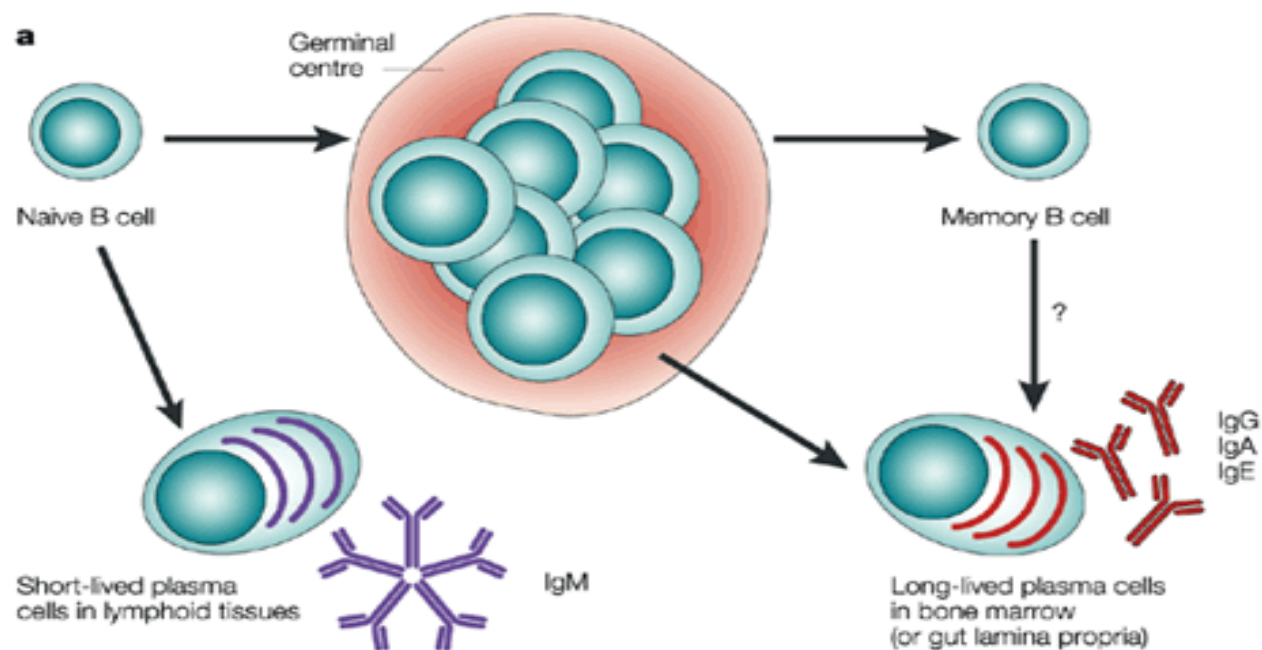
تنشأ في نخاع العظام وتنضج في الغدة السعترية  
Thymus gland

T cell receptor = TCR



# T-Lymphocytes activation





# Structure of T and B cell receptor

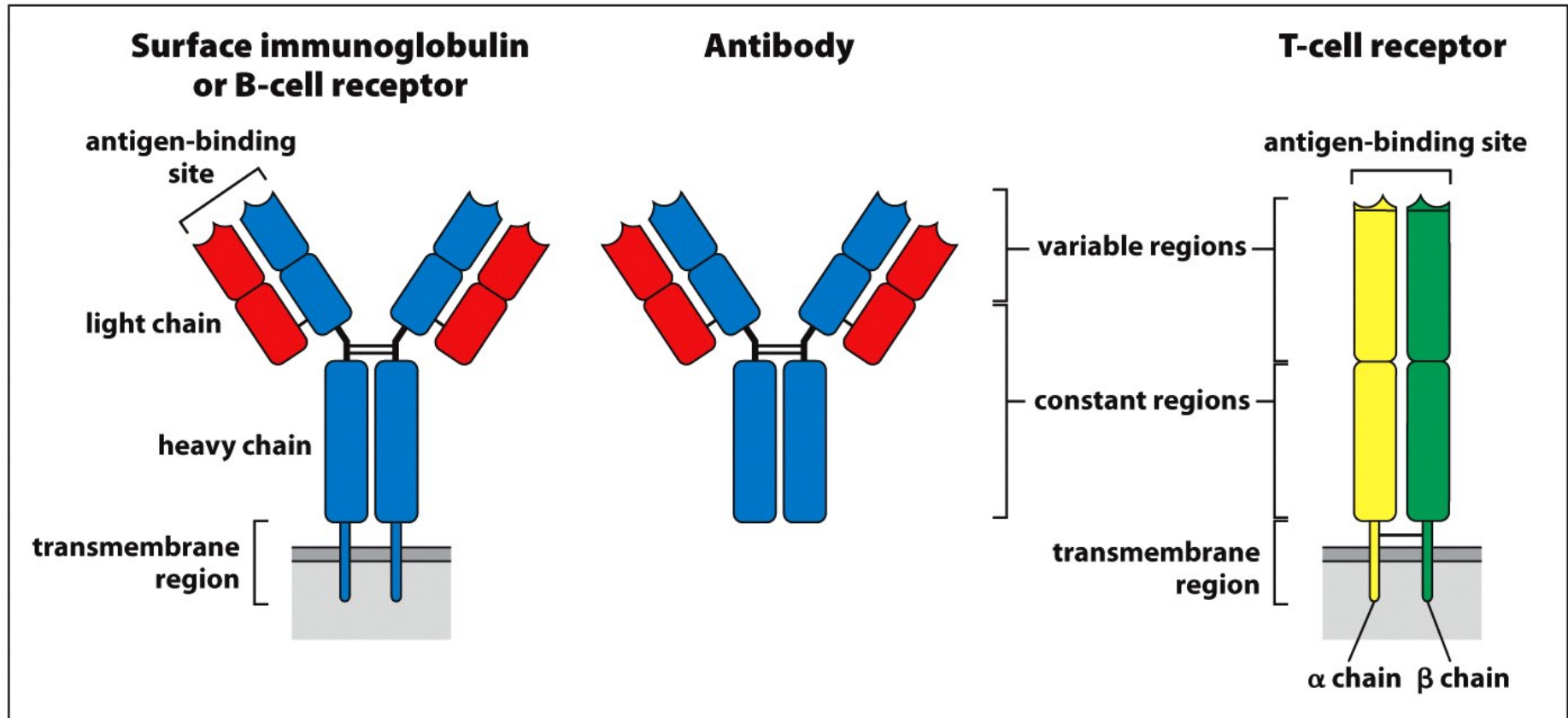


Figure 3.1 The Immune System, 3ed. (© Garland Science 2009)

# T cell features

- Bone marrow derived
- Mostly thymus dependent
- Express CD3-T cell receptor complex
- $\alpha\beta$  T cells :  $\alpha$  and  $\beta$  chains
- $\gamma\delta$  T cells:  $\gamma$  and  $\delta$  chains
- Most have  $\alpha\beta$  T cell antigen receptor (TCR)

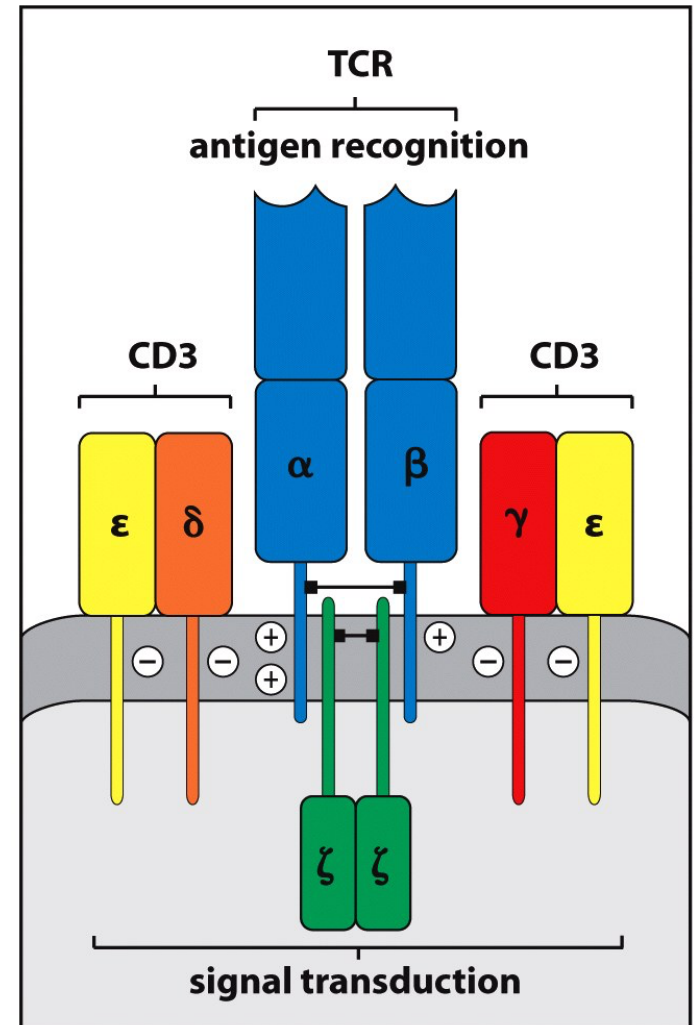


Figure 5.6 The Immune System, 3ed. (© Garland Science 2009)

# T cell subset & functions

## **CD8<sup>+</sup> T cells (cytotoxic T cell = Tc)**

- Cytotoxicity
- Bind antigen associated with MHC- I

## **CD4<sup>+</sup> T cells**

- Bind antigen associated with MHC- II

**1- T- helper cell (T<sub>H</sub>2) ..... Helper cells for B cells (Ab production)**

**2- T- helper cell (T<sub>H</sub>1)**

- Helper cells for cytotoxic T cells.
- Helper cells for macrophage activation

**3- Regulatory T cell (Treg cell) .....Regulation & suppression**

# CD4/CD8 co-receptors

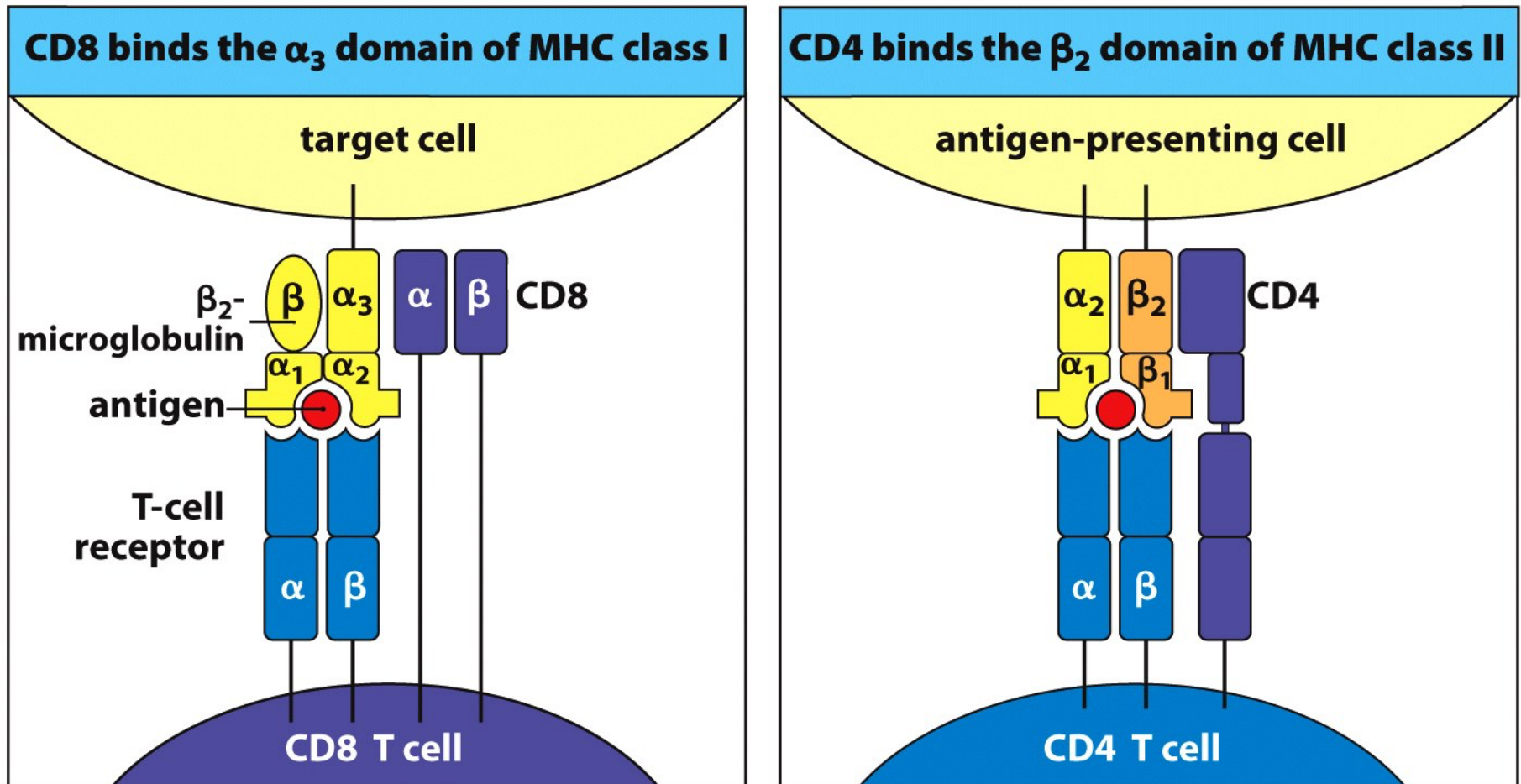


Figure 5.14 The Immune System, 3ed. (© Garland Science 2009)

# Antigen Presenting cell (APC)

- Ability to ingest, process and present antigen
- Express MHC class II, co-stimulatory molecules

For example:

1. Langerhans cells
2. Macrophages ( $M\Phi$ )
3. Dendritic cells (DC)
4. B cells

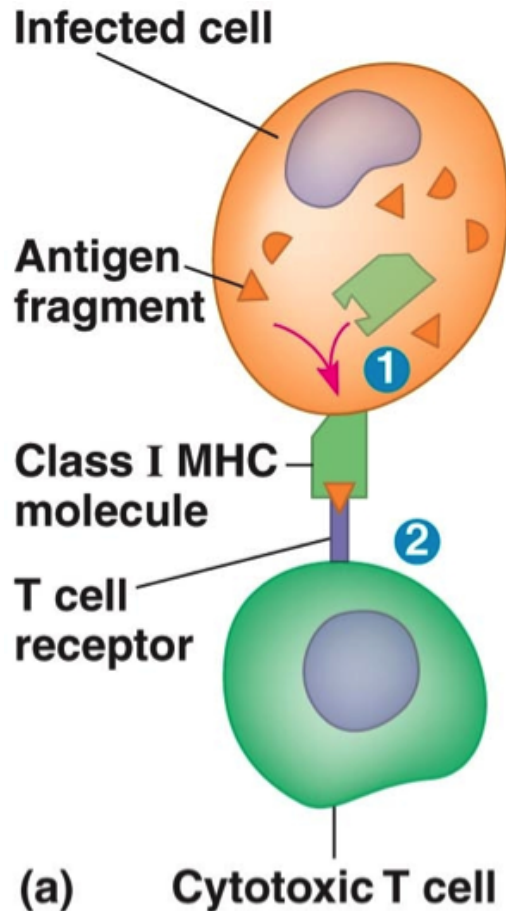
# Antigen recognition by T cells (1)

- Only recognise cell-bound antigen
- Recognise antigen in association with HLA

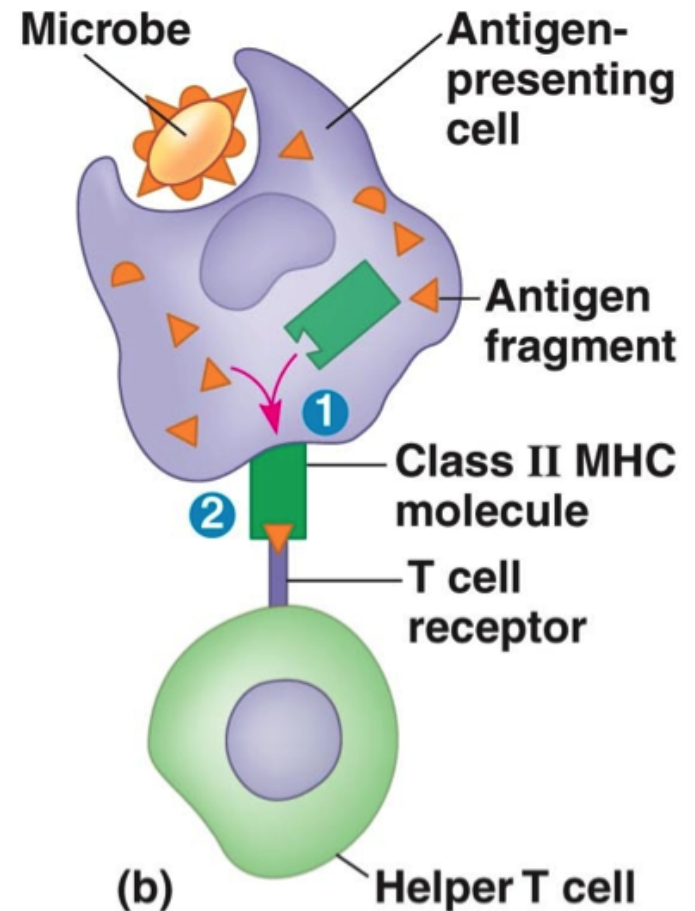
**CD4<sup>+</sup> T cells** - Recognise foreign antigenic peptide in context of self MHC class II (Fig. b)

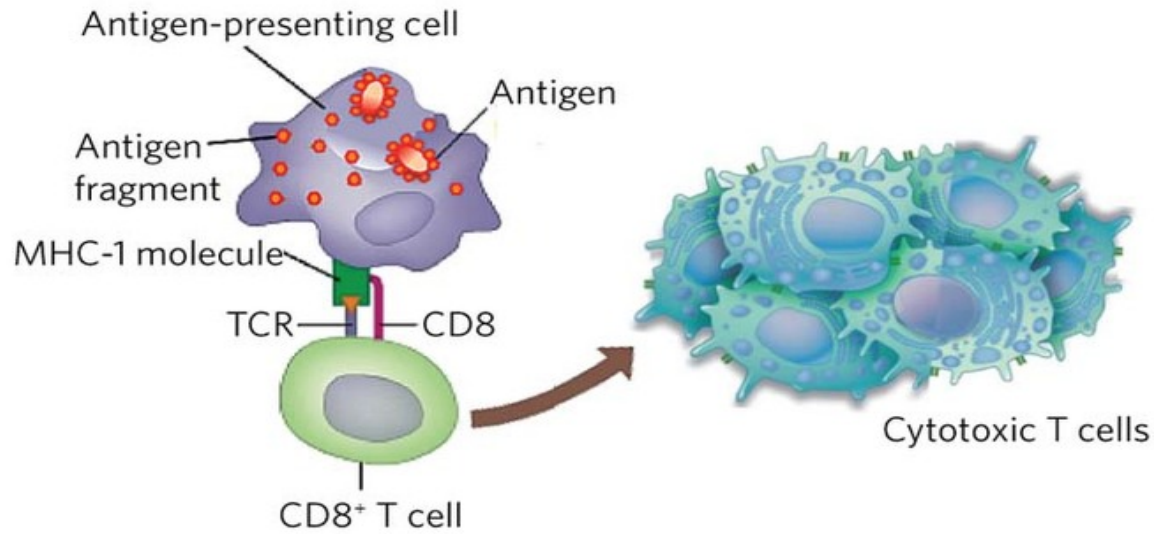
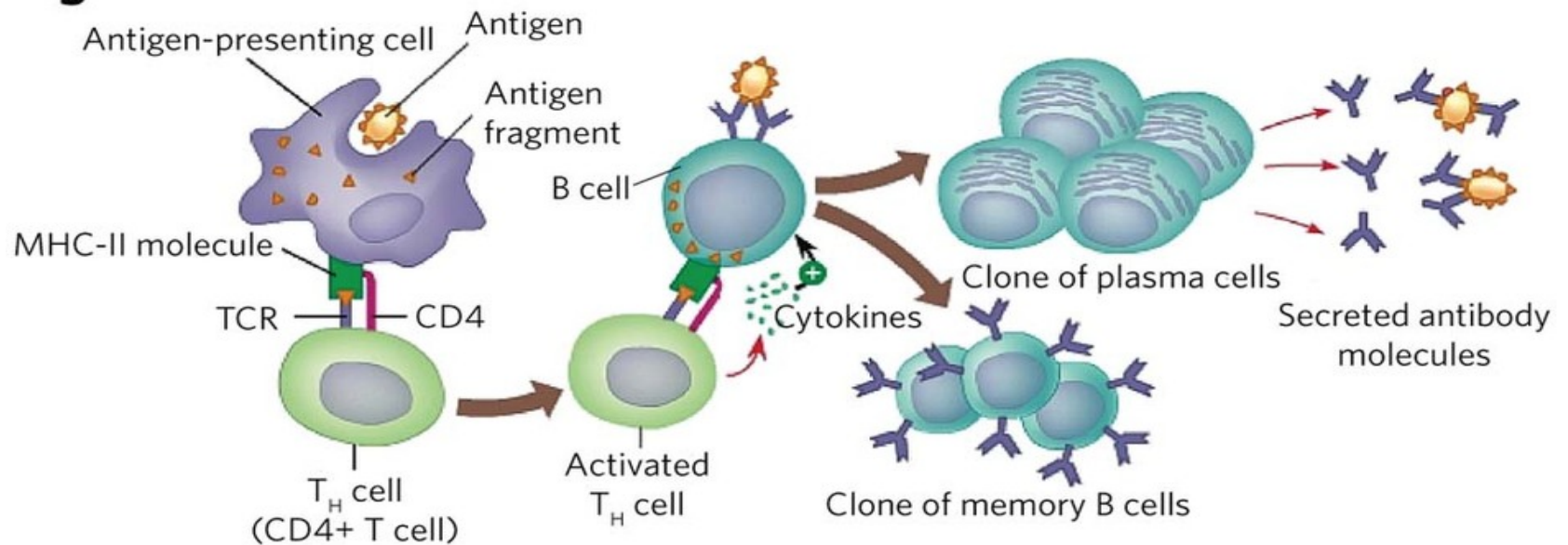
**CD8<sup>+</sup> T cells** - Recognise foreign antigenic peptide in context of self MHC class I (Fig. a)

# Antigen recognition by T cells (2)



- 1 Antigen associates with MHC molecule
- 2 T cell recognizes combination



**a****b**

# **T cells & B cells – differ their methods of antigen recognition**

B cells/antibodies can recognise whole native proteins

T cells do not require native protein – recognition of denatured protein is possible

# Regulatory T cell (Treg cell)

- Recently described CD4<sup>+</sup> CD25<sup>+</sup> population
- Depletion results in autoimmune disease
- Suppress both CD4<sup>+</sup> and CD8<sup>+</sup> T cells
- Regulate T cell responses and explain T cell 'suppression'

# Lymphocyte subsets

