ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΑΝΟΣΟΛΟΓΙΑΣ ΚΑΙ ΜΗΧΑΝΙΣΜΟΙ ΙΣΤΙΚΗΣ ΒΛΑΒΗΣ ΣΤΑ ΡΕΥΜΑΤΙΚΑ ΝΟΣΗΜΑΤΑ

Ειδική ανοσία

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Innate Immunity (Metchnikoff, 1908):

✓direct response to pathogens

✓conserved microbial products

✓ not “antigen-specific”

✓ has no memory

Adaptive Immunity (Ehrlich, 1908):

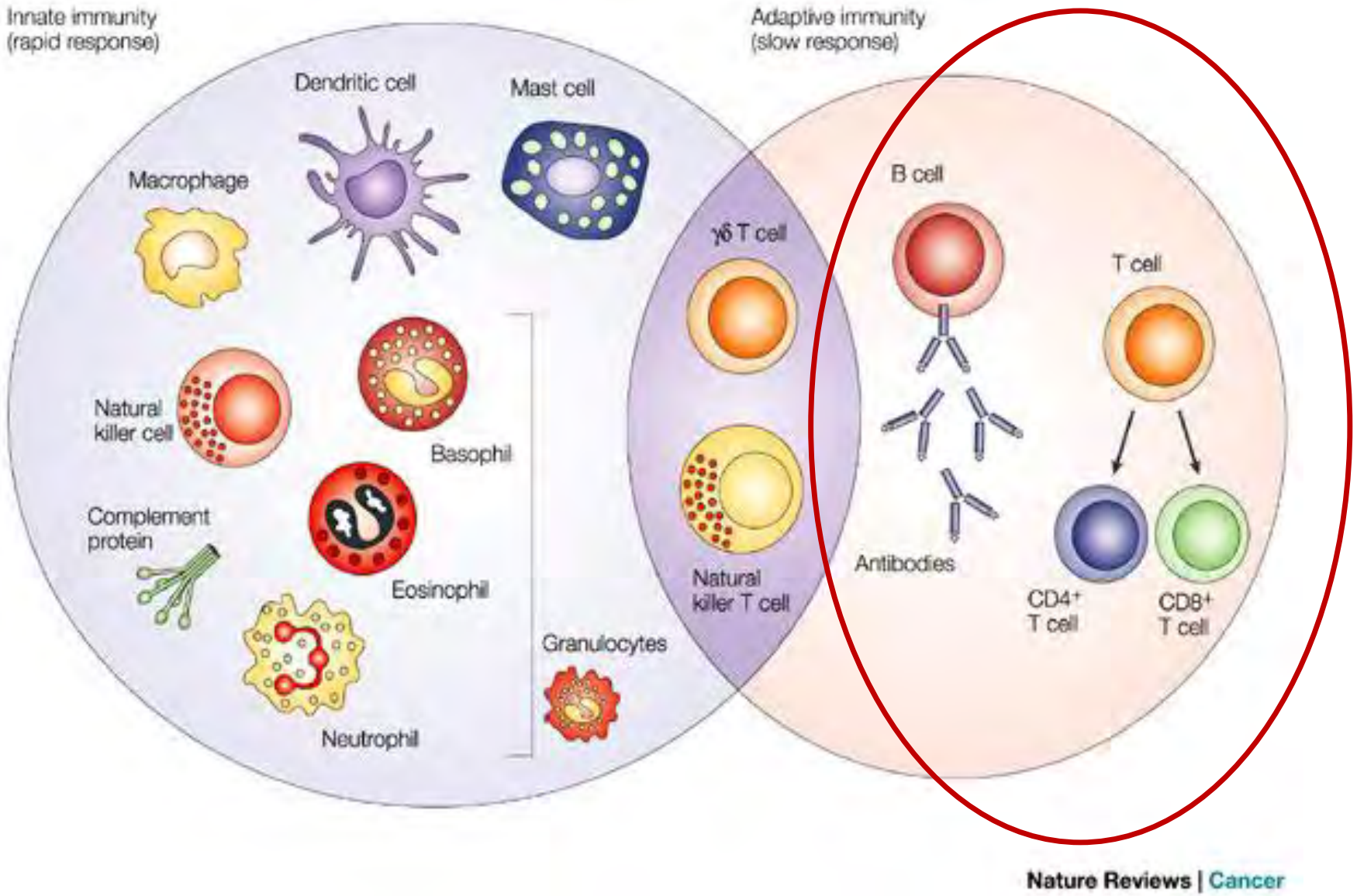
✓specific antibodies (**specificity**)

✓variable antigens (**diversity**)

✓Distinguishes **self to non self**

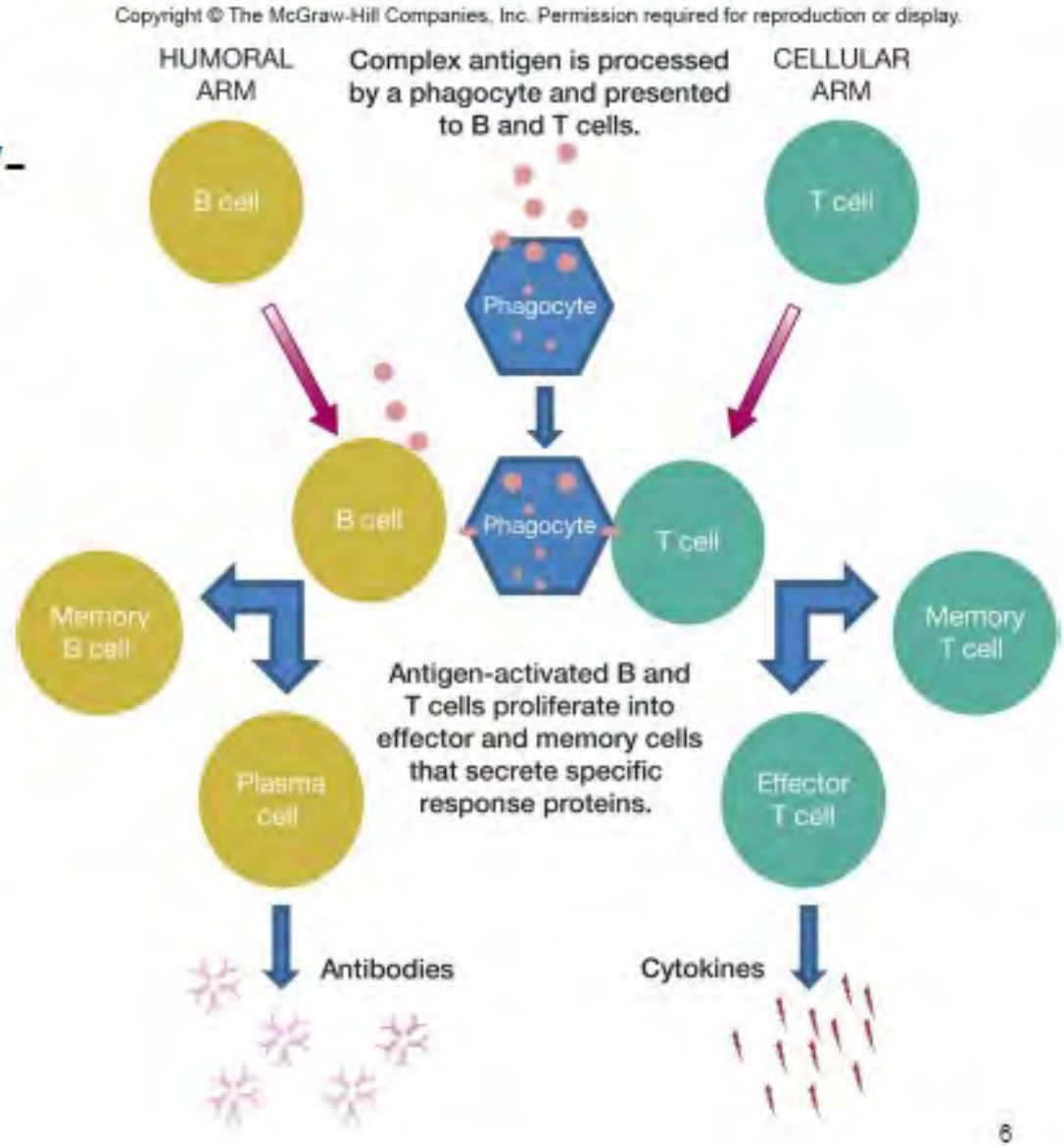
✓**Memory**

✓Stimulation of T (cellular responses)- and B-cells (humoral responses)


Innate immunity
(rapid response)
Adaptive immunity
(slow response)
Dendritic cell
Mast cell
Macrophage
γδ T cell
B cell
T cell
Natural
killer cell
Basophil
Complement
protein
Eosinophil
Natural
killer T cell
Antibodies
CD4+
T cell
CD8+
T cell
Granulocytes
Neutrophil
Nature Reviews | Cancer

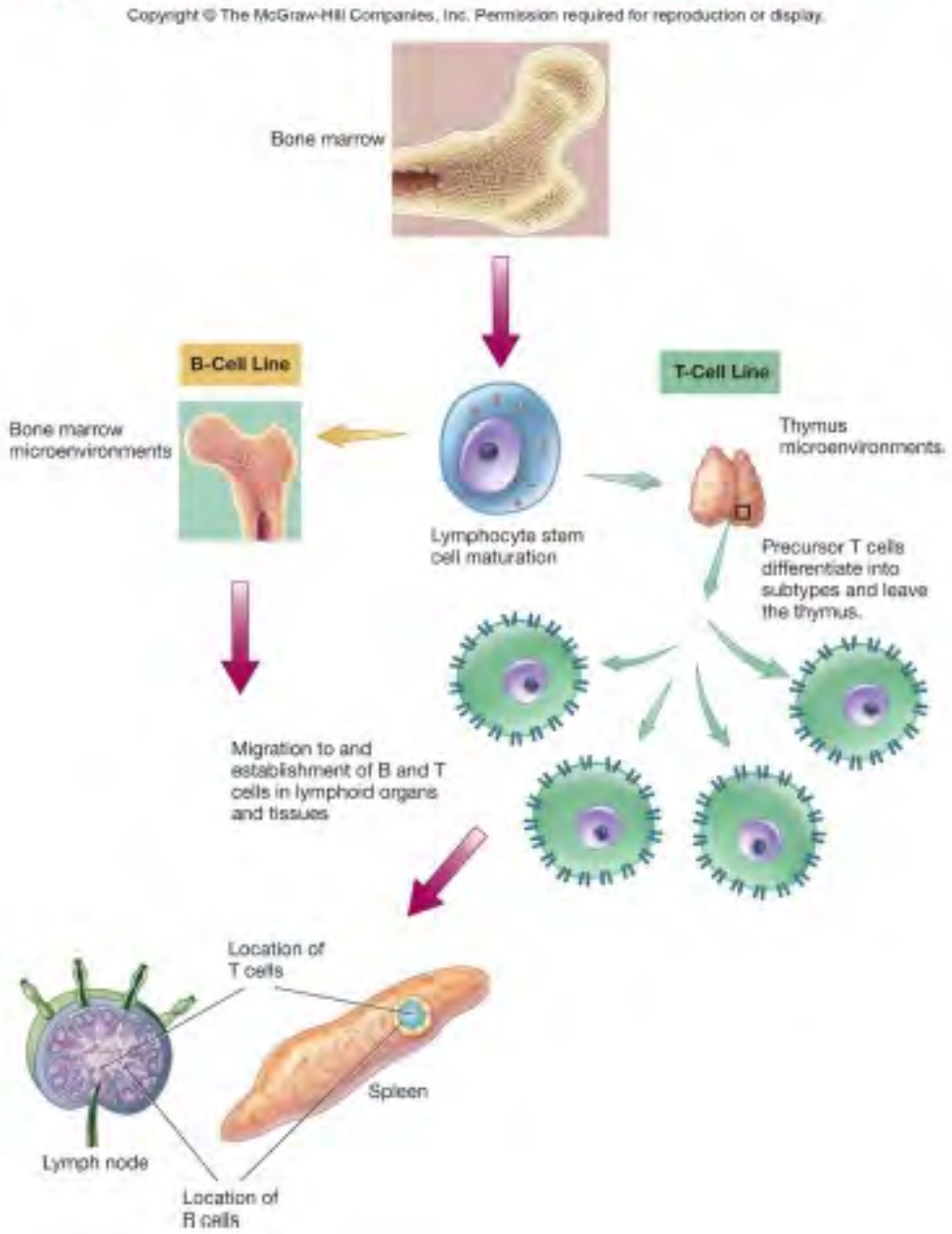
Types of adaptive immunity

- Humoral immunity
  - also called antibody-mediated immunity
  - based on antibody activity
- Cellular immunity
  - also called cell-mediated immunity
  - based on action of specific kinds of T lymphocytes

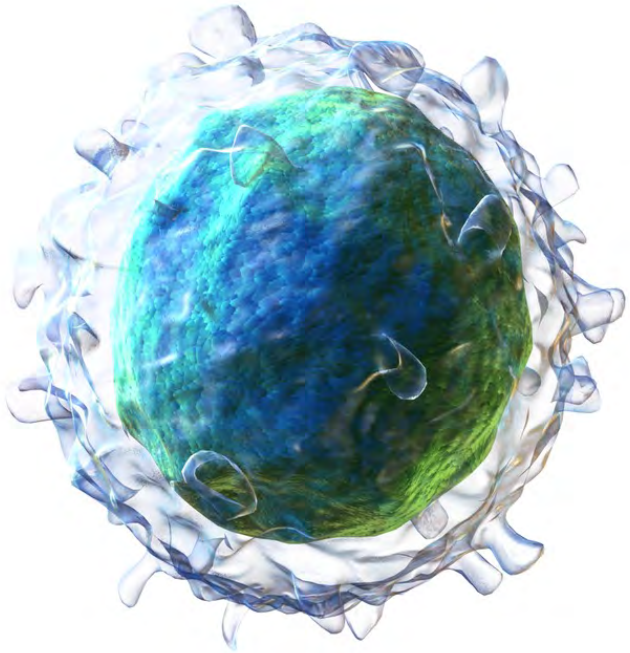


Acquired Immune System Development

- B and T cells initially arise in the bone marrow
  - B cells continue to mature there
  - T cells are moved to the thymus for further maturation
- Both cell types go through extensive screening to avoid self-reactivity



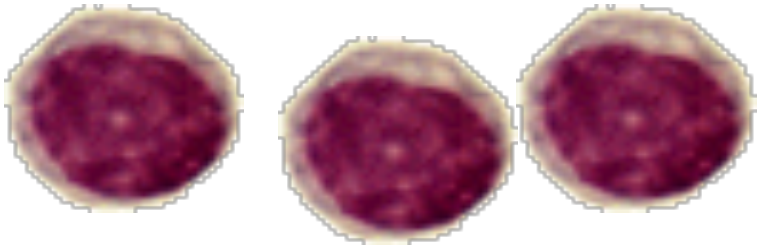
HUMORAL IMMUNITY



Lymphocyte

B cell

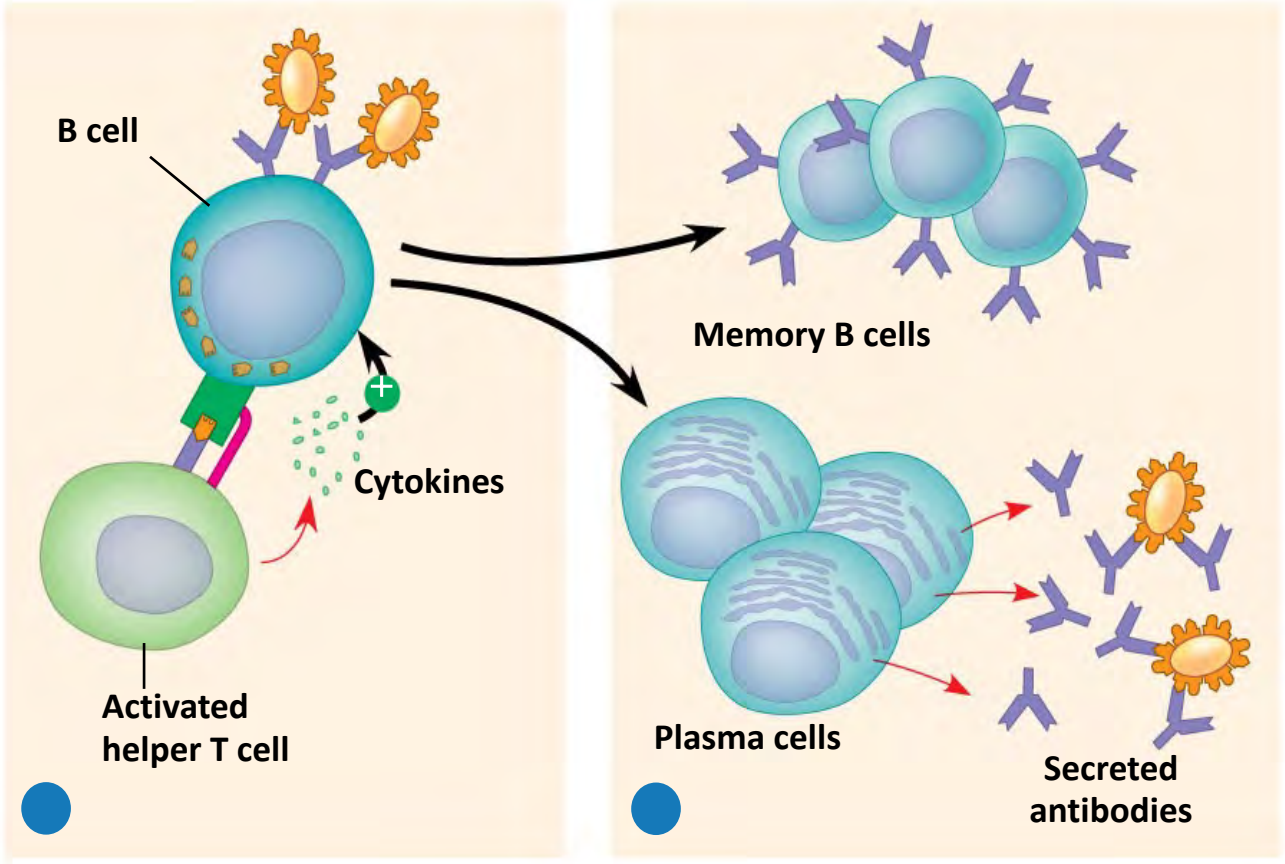
B Lymphocytes



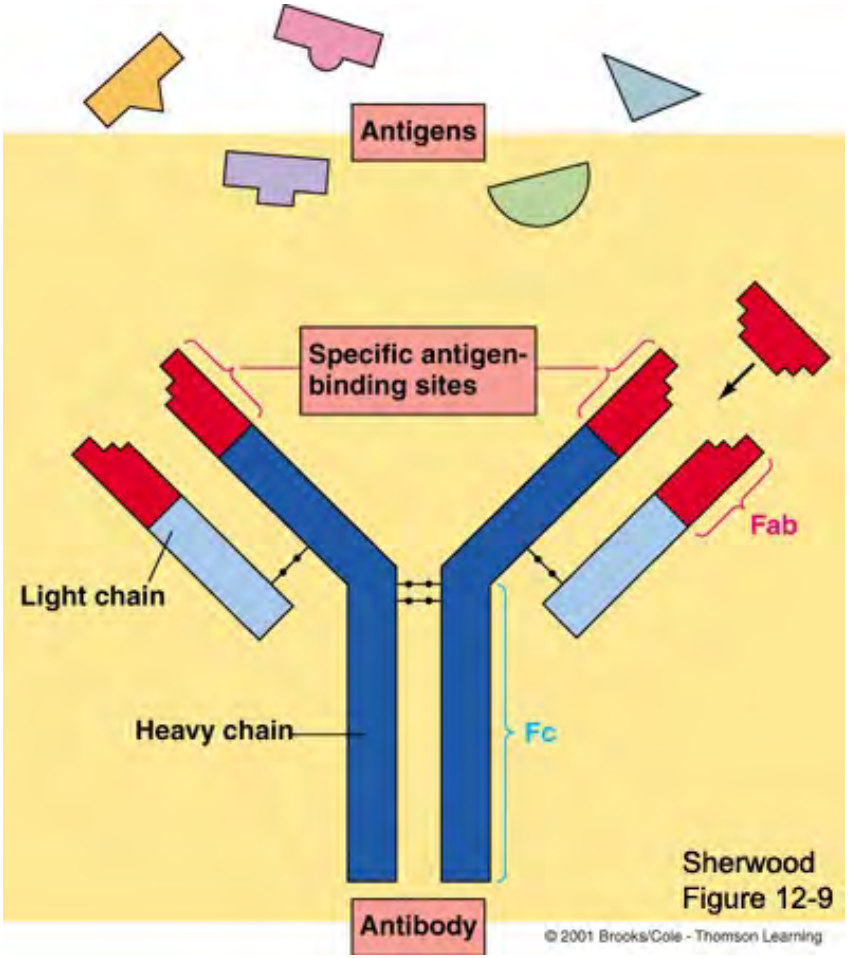
- involved in adaptive immune responses-humoral immunity
- Are characterized by the expression of CD19, CD20
- recognize circulating and cell surface antigens via specific receptors (BCR, B cell receptors)
- secrete antigen-specific antibodies which eliminate pathogens through activation of phagocytosis or release of inflammatory mediators
- act as APCs

Activation of B Cells

In response to cytokines from helper T cells and an antigen, a B cell proliferates and differentiates into memory B cells and antibody- secreting effector cells called **plasma cells**

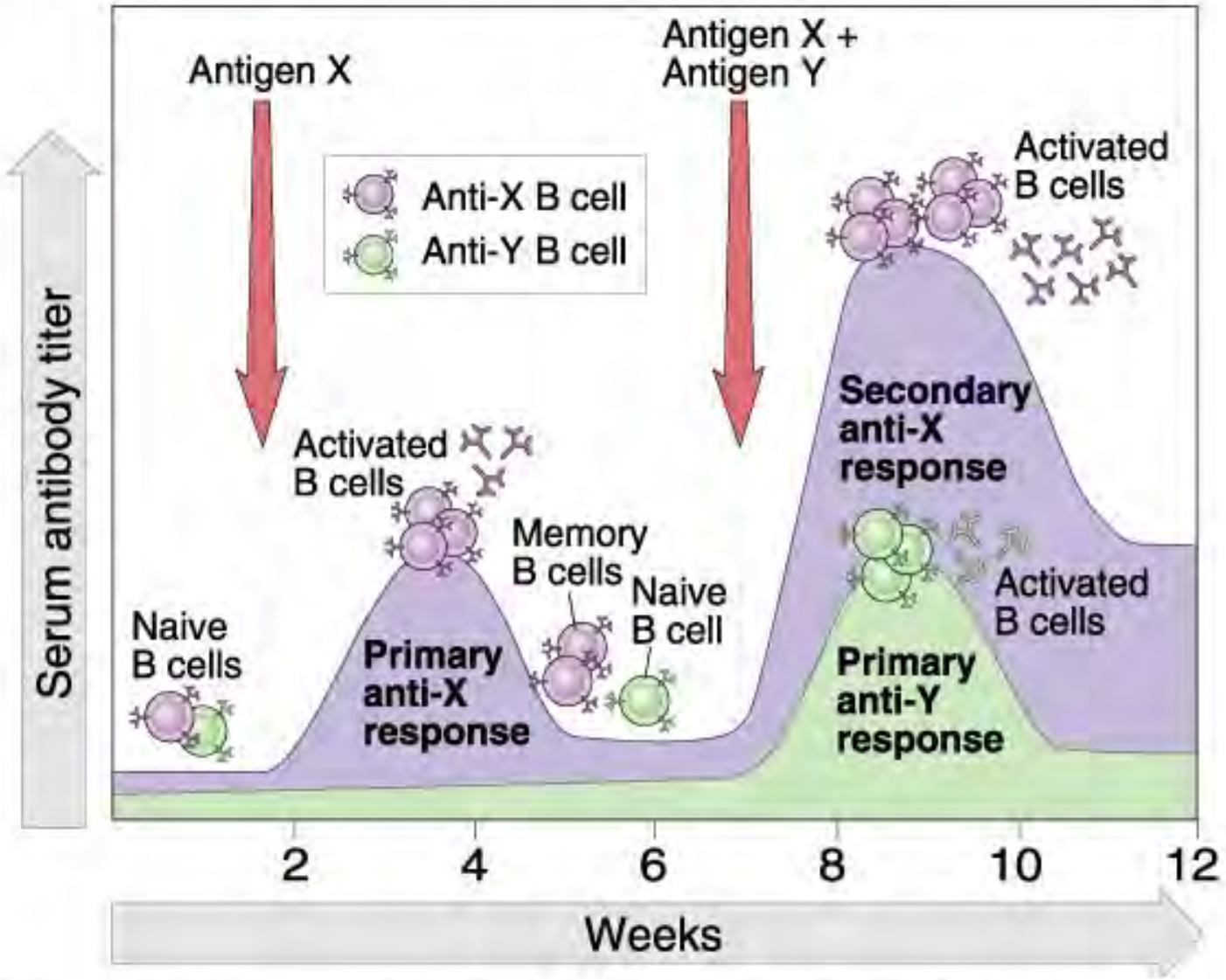


Antibody: structure and function



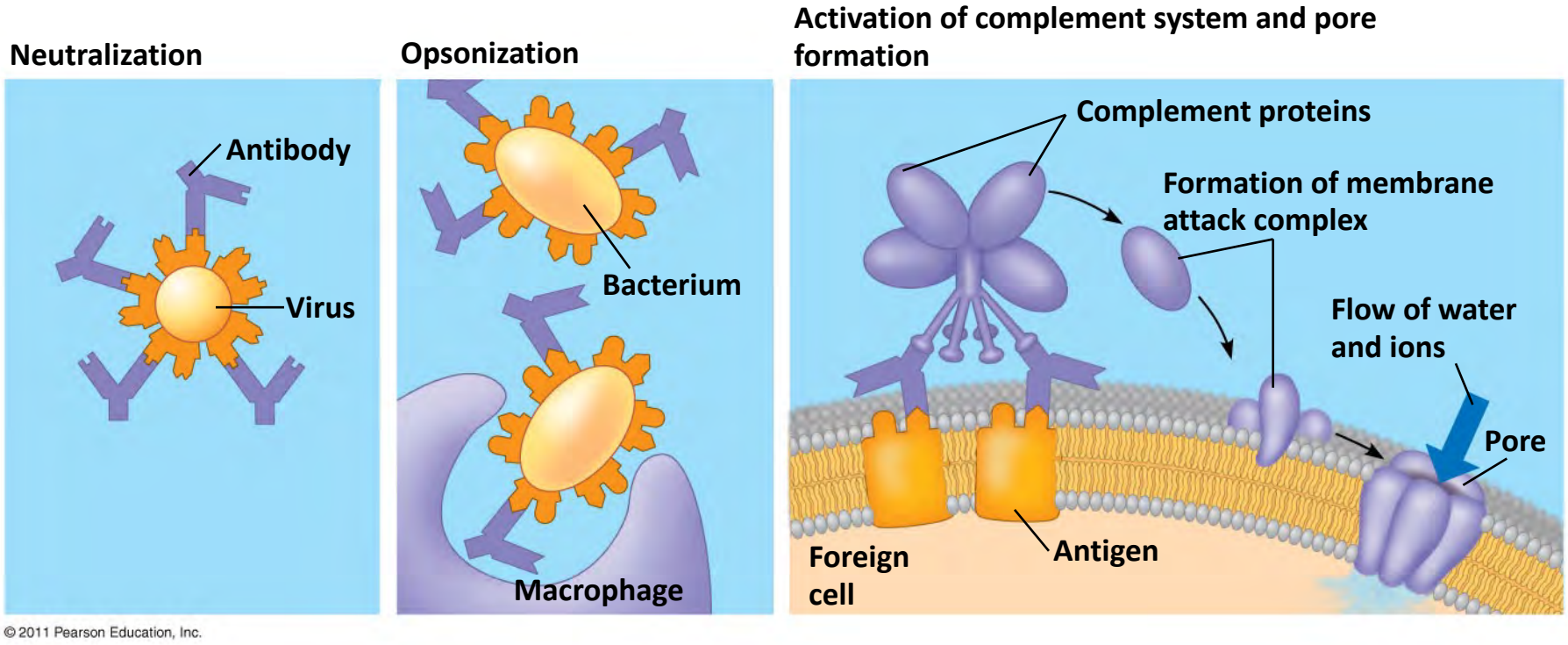
- Fab – fragment antigen binding
- Fc- Fragment constant

Specificity and memory in adaptive immunity, illustrated by primary and secondary immune responses.

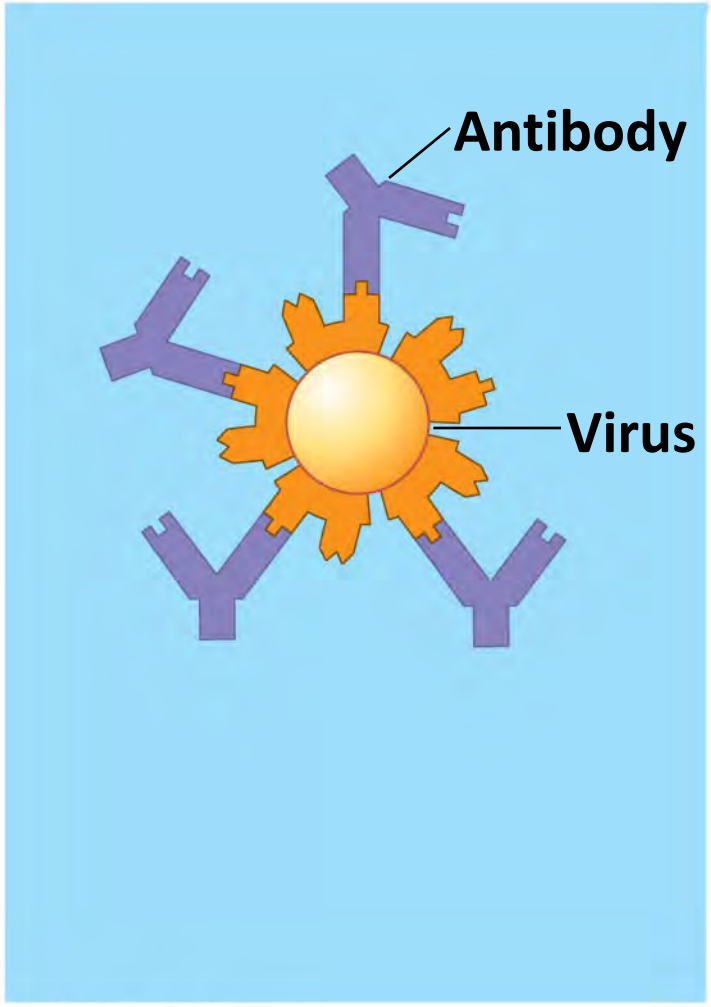


How do Antibodies Function?

Antibodies do not kill pathogens; instead they mark pathogens for destruction

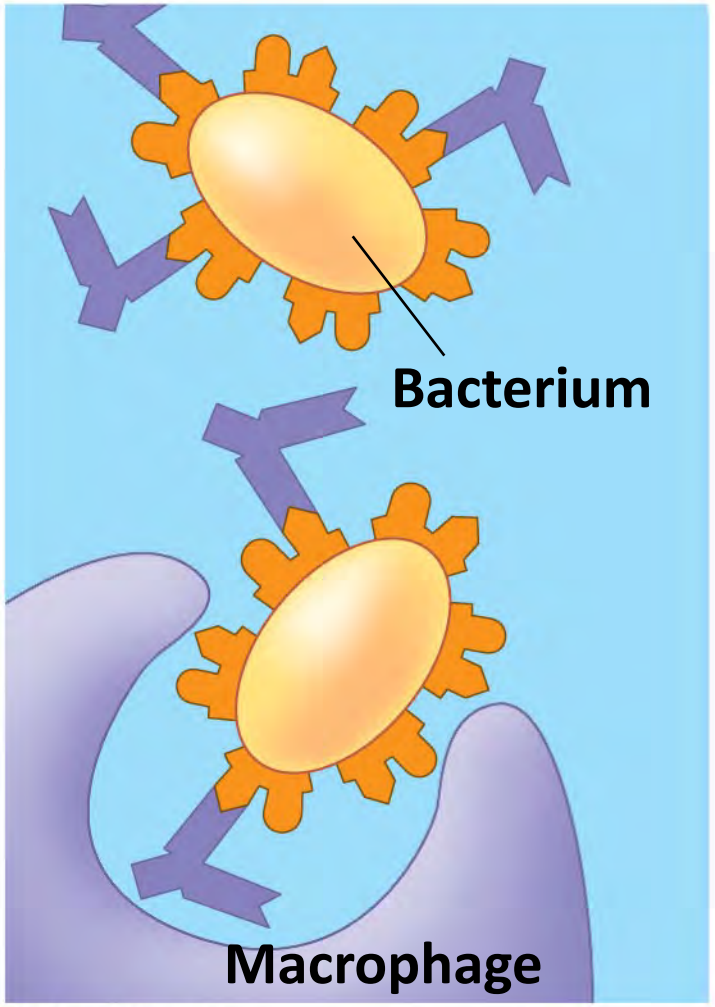


Neutralization



- In neutralization, antibodies bind to viral surface proteins preventing infection of a host cell
- Antibodies may also bind to toxins in body fluids and prevent them from entering body cells

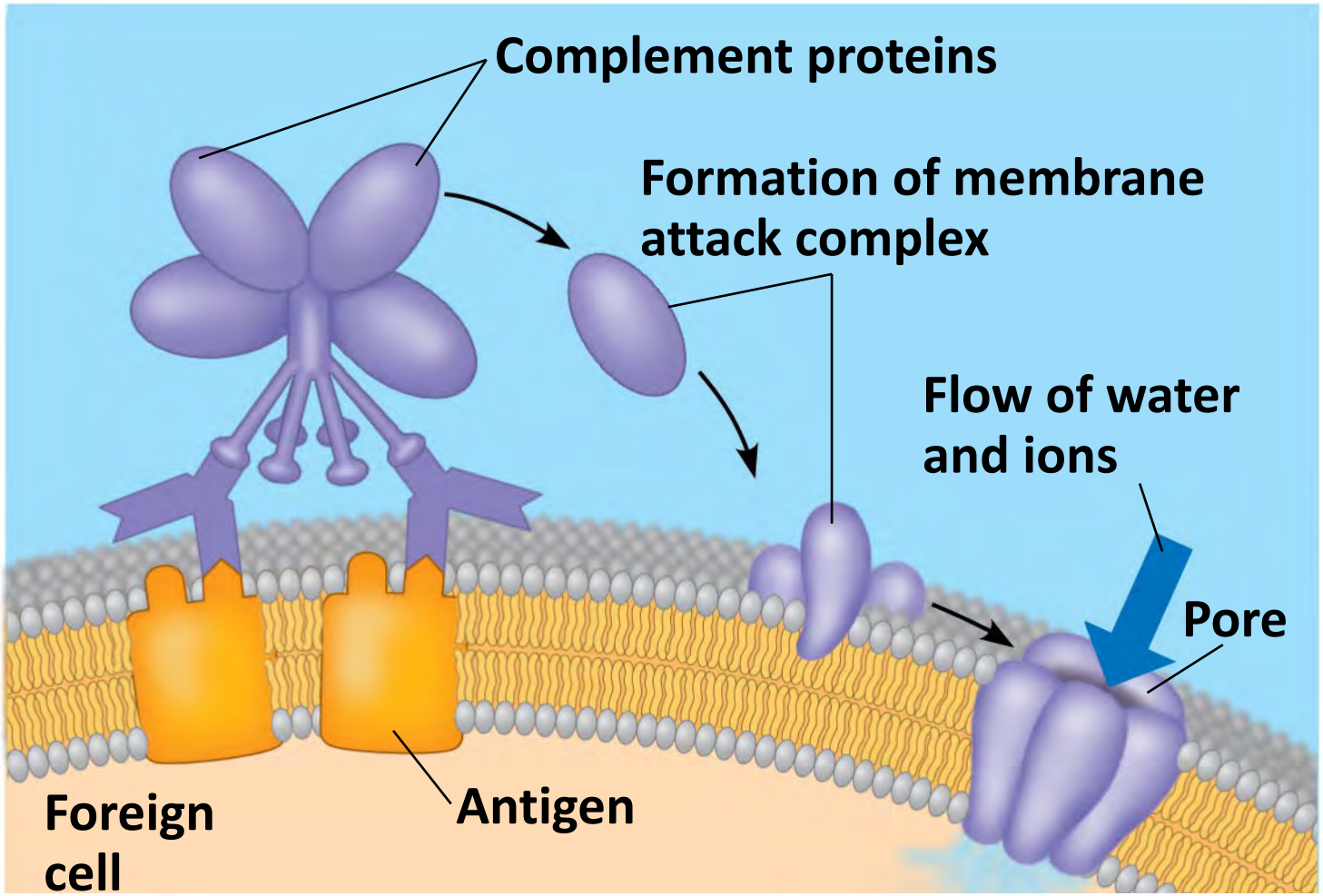
Opsonization



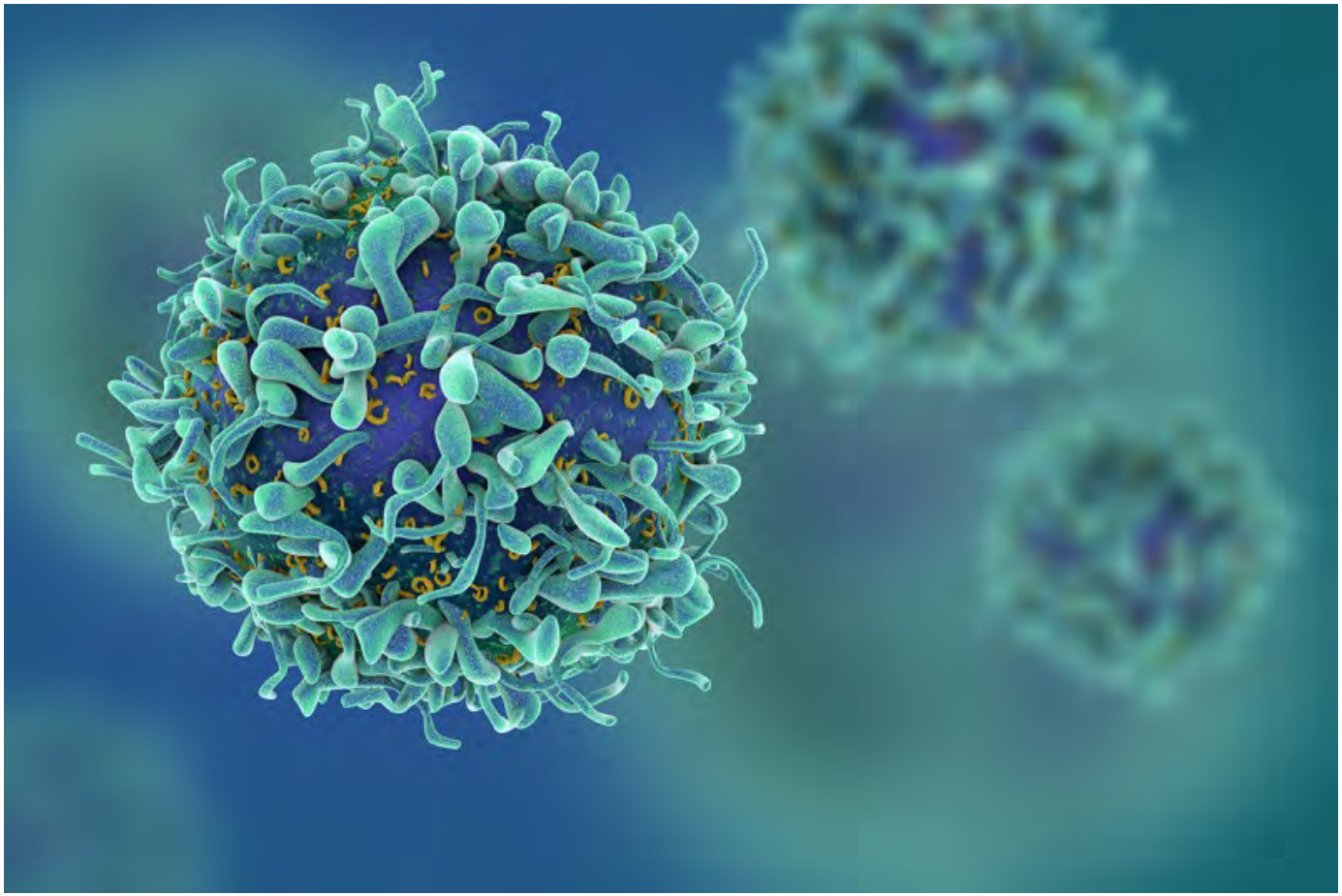
- In opsonization, antibodies bind to antigens on bacteria creating a target for macrophages or neutrophils, triggering phagocytosis

Activation of complement system and pore formation

- Antigen-antibody complexes may bind to a complement protein—which triggers a cascade of complement protein activation
- Ultimately a membrane attack complex forms a pore in the membrane of the foreign cell, leading to its lysis

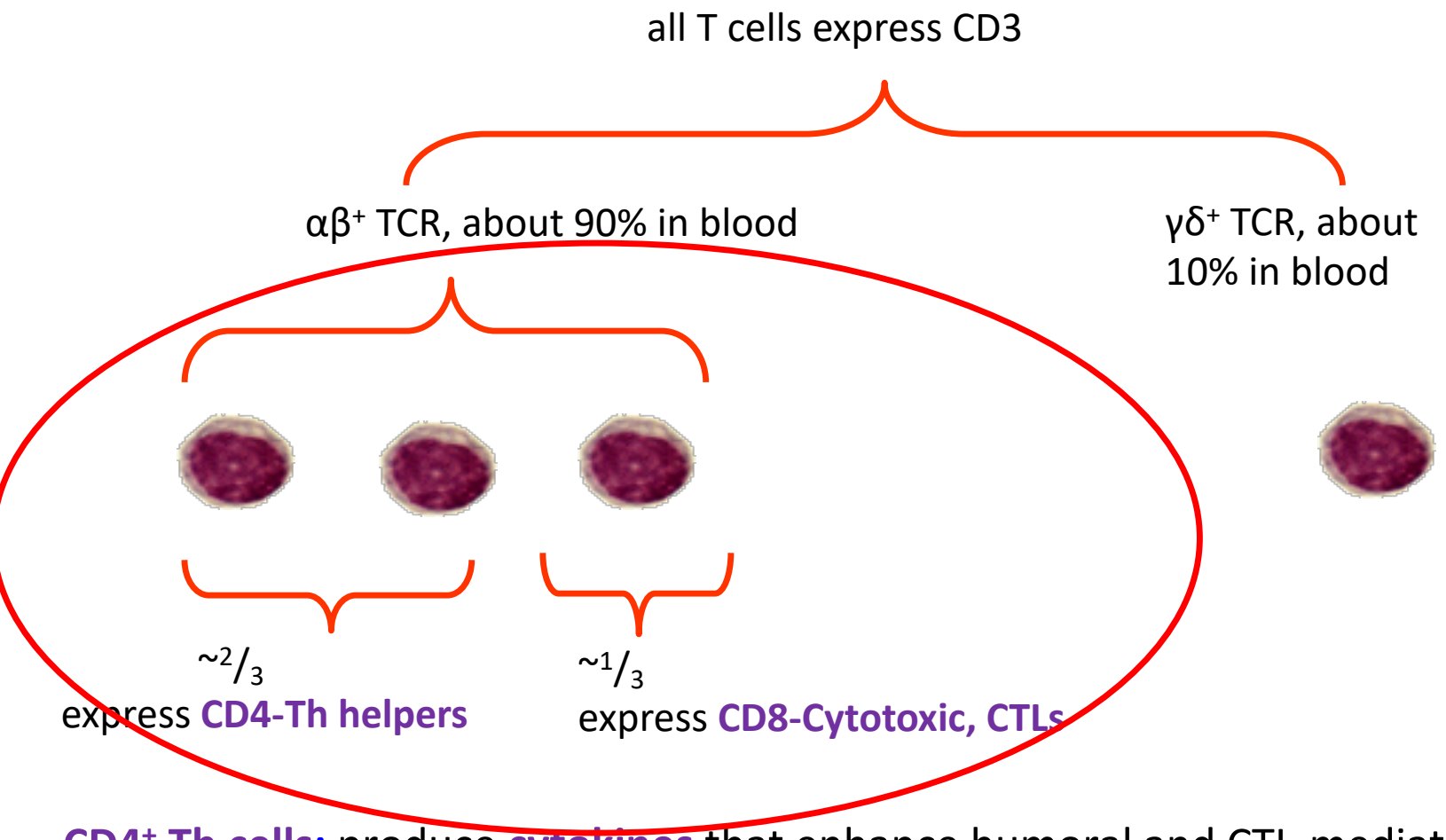


CELLULAR IMMUNITY



Lymphocyte: T cell

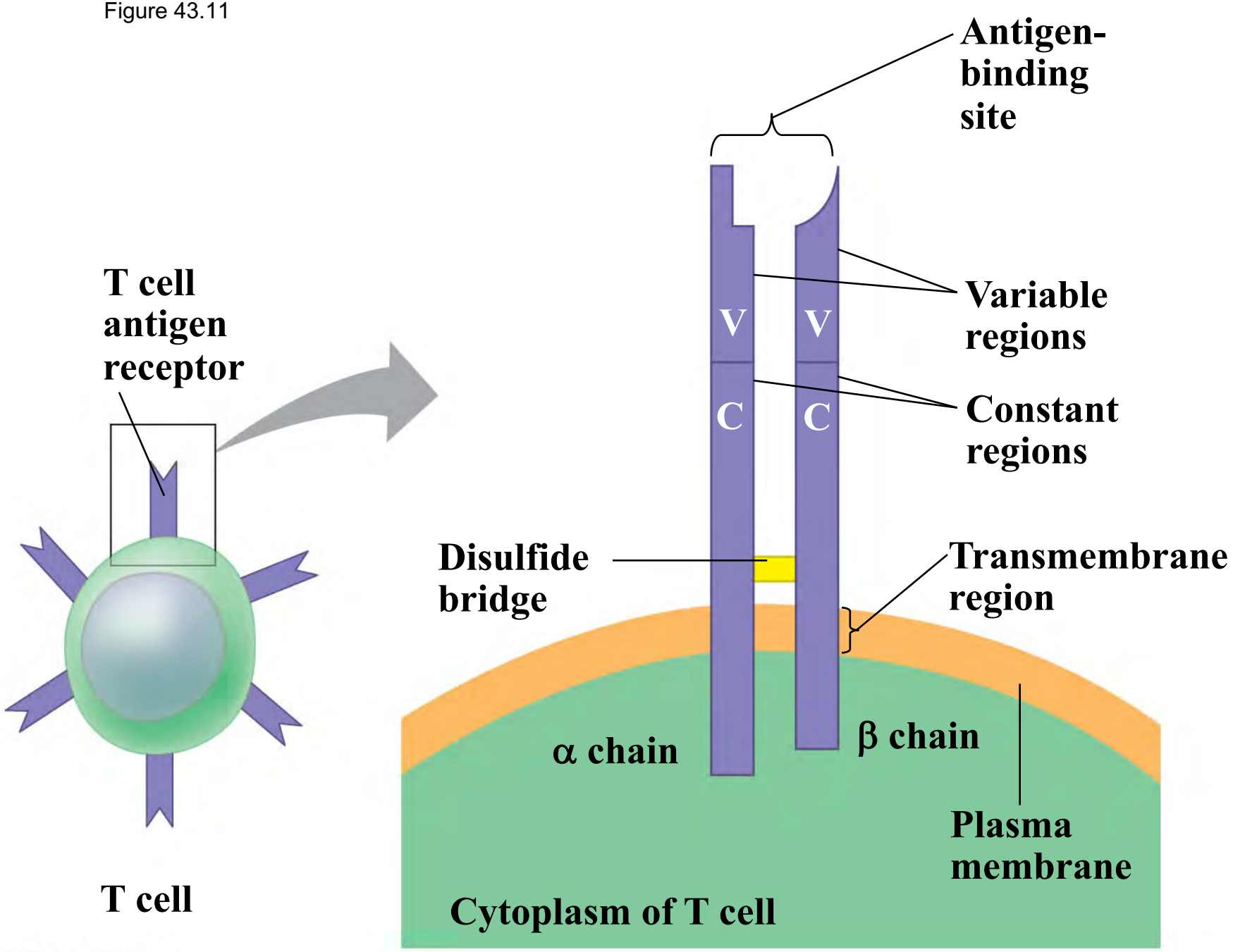
T lymphocytes



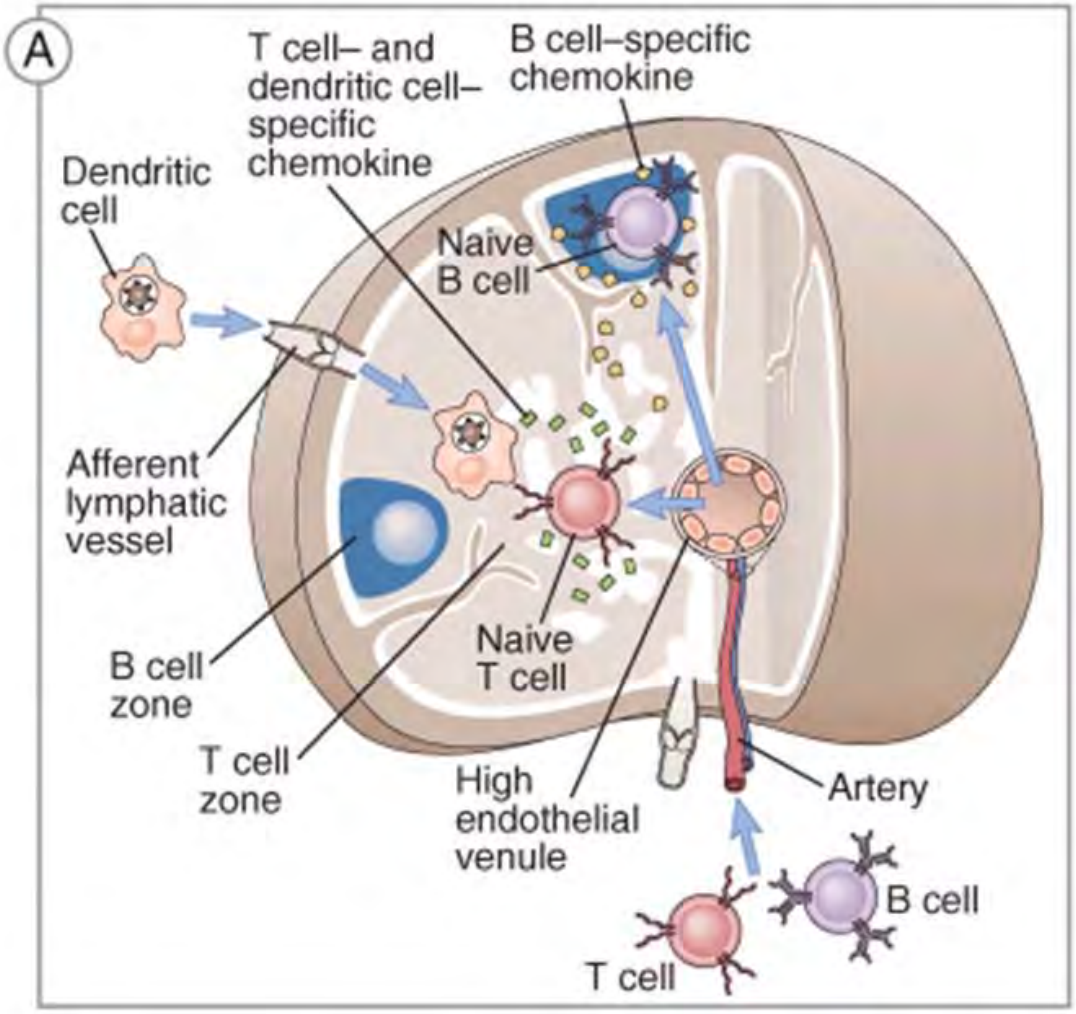
CD4⁺ Th cells: produce **cytokines** that enhance humoral and CTL-mediated immunity and non-specific innate mechanisms of defense.

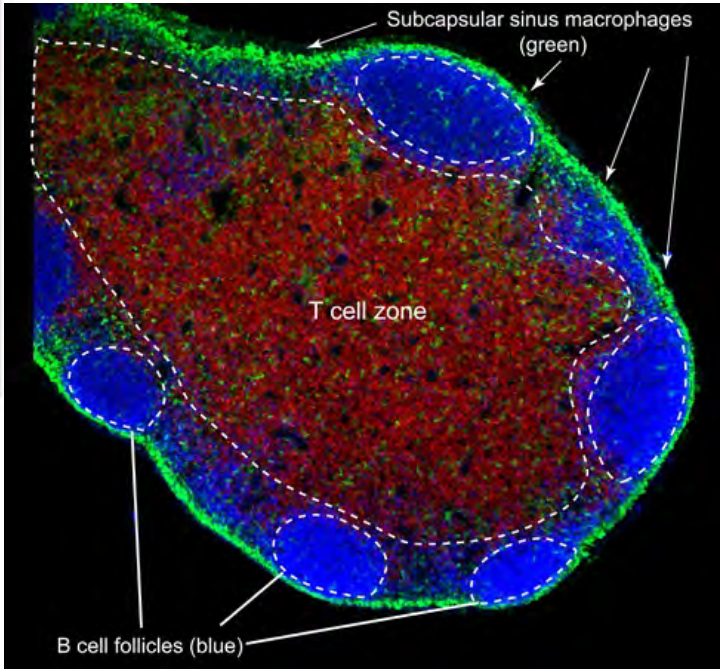
CD8⁺ CTLs cells: directly **kill** infected cells through production of perforins and granzyme B.

Figure 43.11



the path by which naive T and B lymphocytes migrate to lymph nodes





Anatomy of naïve T cell priming (cont.)

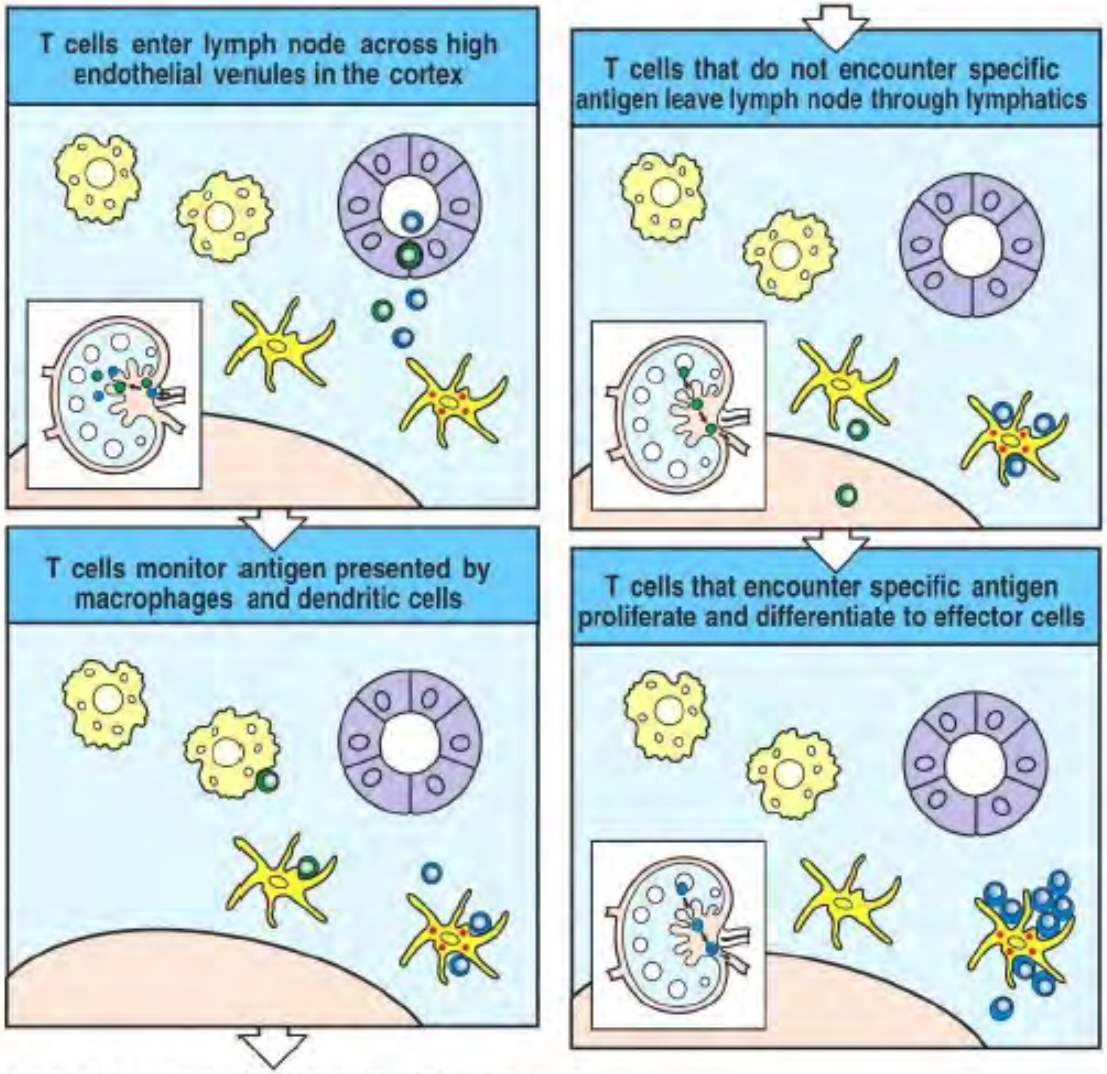
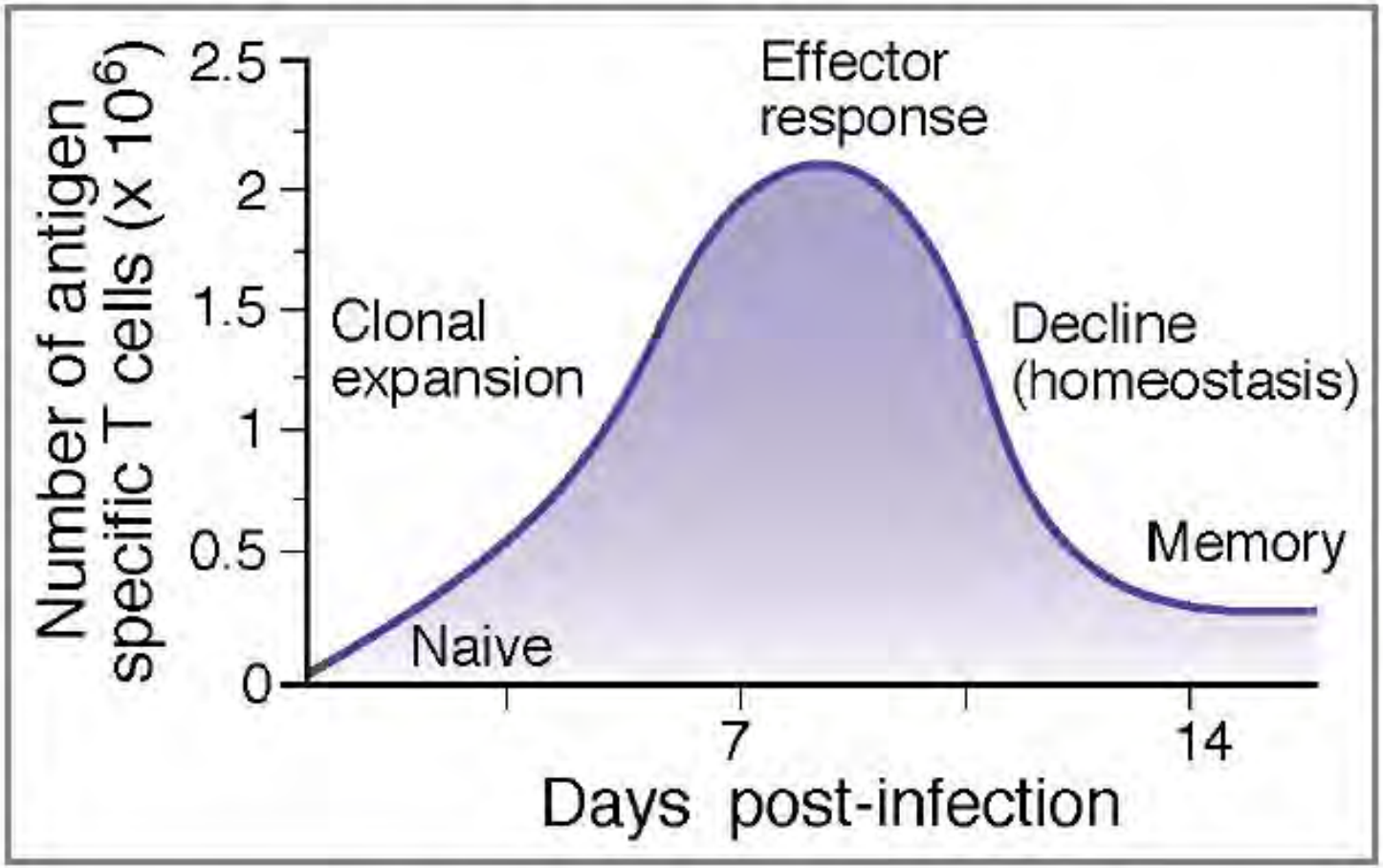


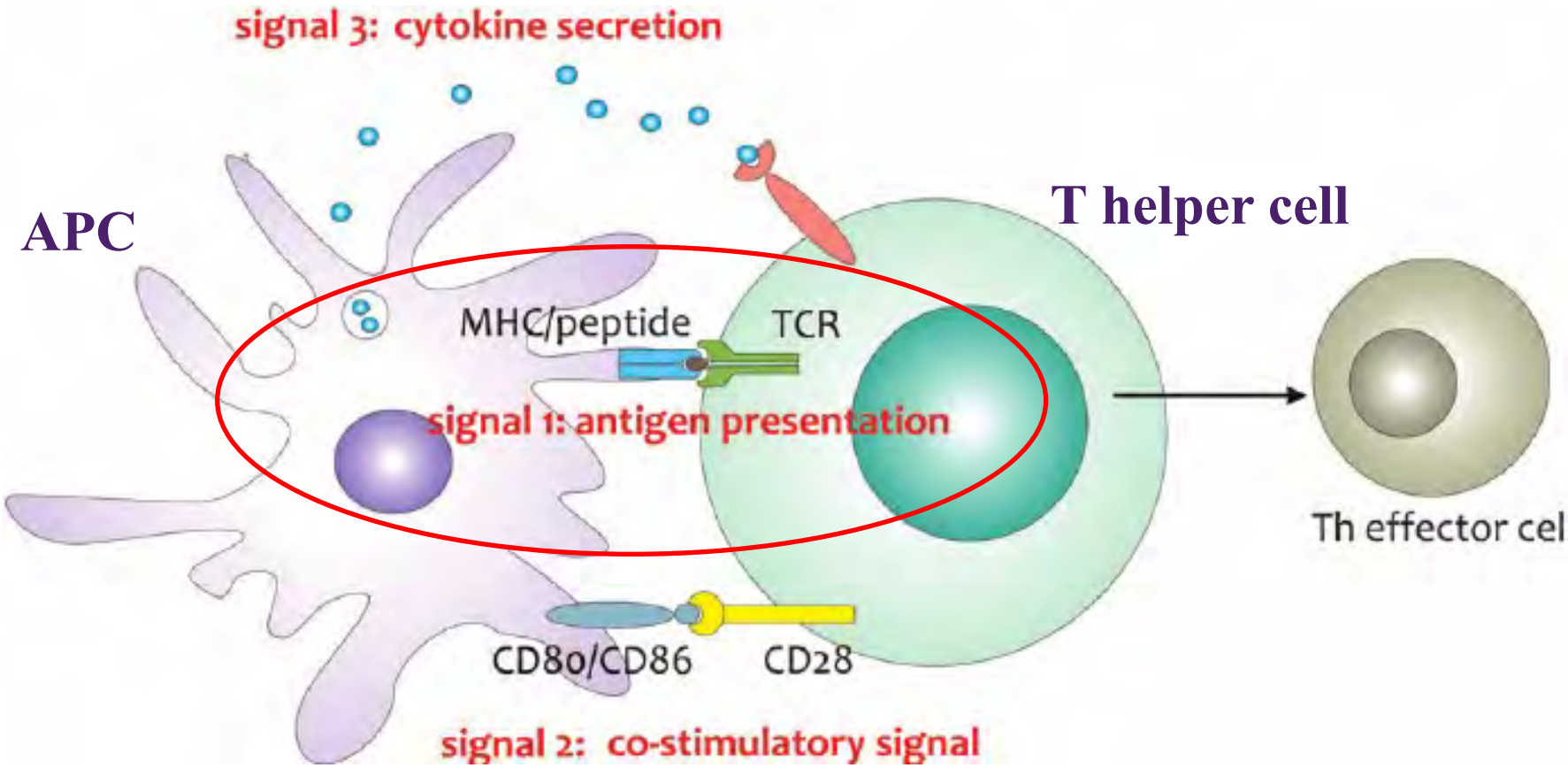
Figure 8-4 Immunobiology, 6/e. (© Garland Science 2005)

Kinetics of a T cell response



From: Abbas & Lichtman, Cellular & Molecular Immunology, W. B. Saunders, 2003

T cell stimulation requires “antigen presentation” by antigen presenting cells



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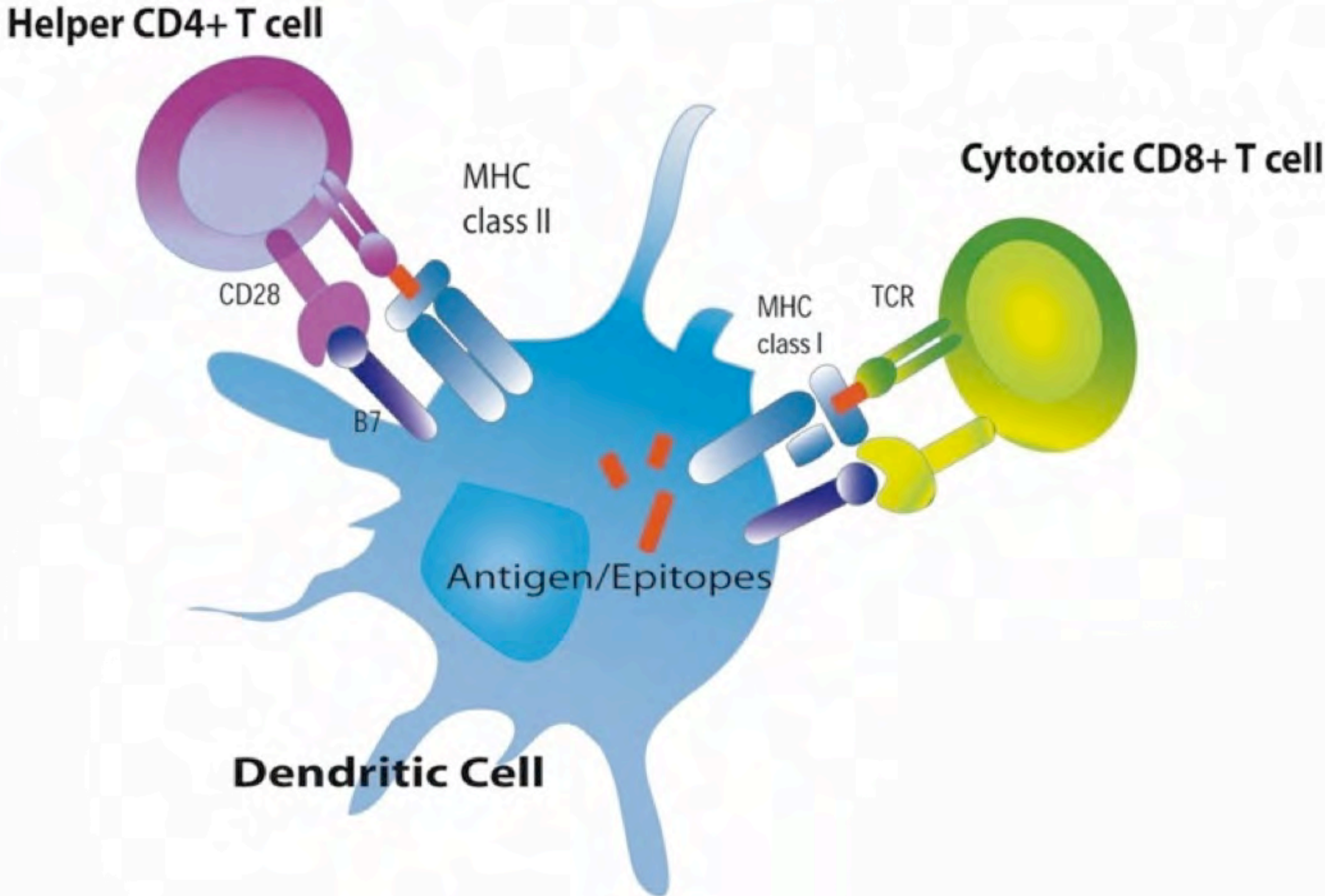
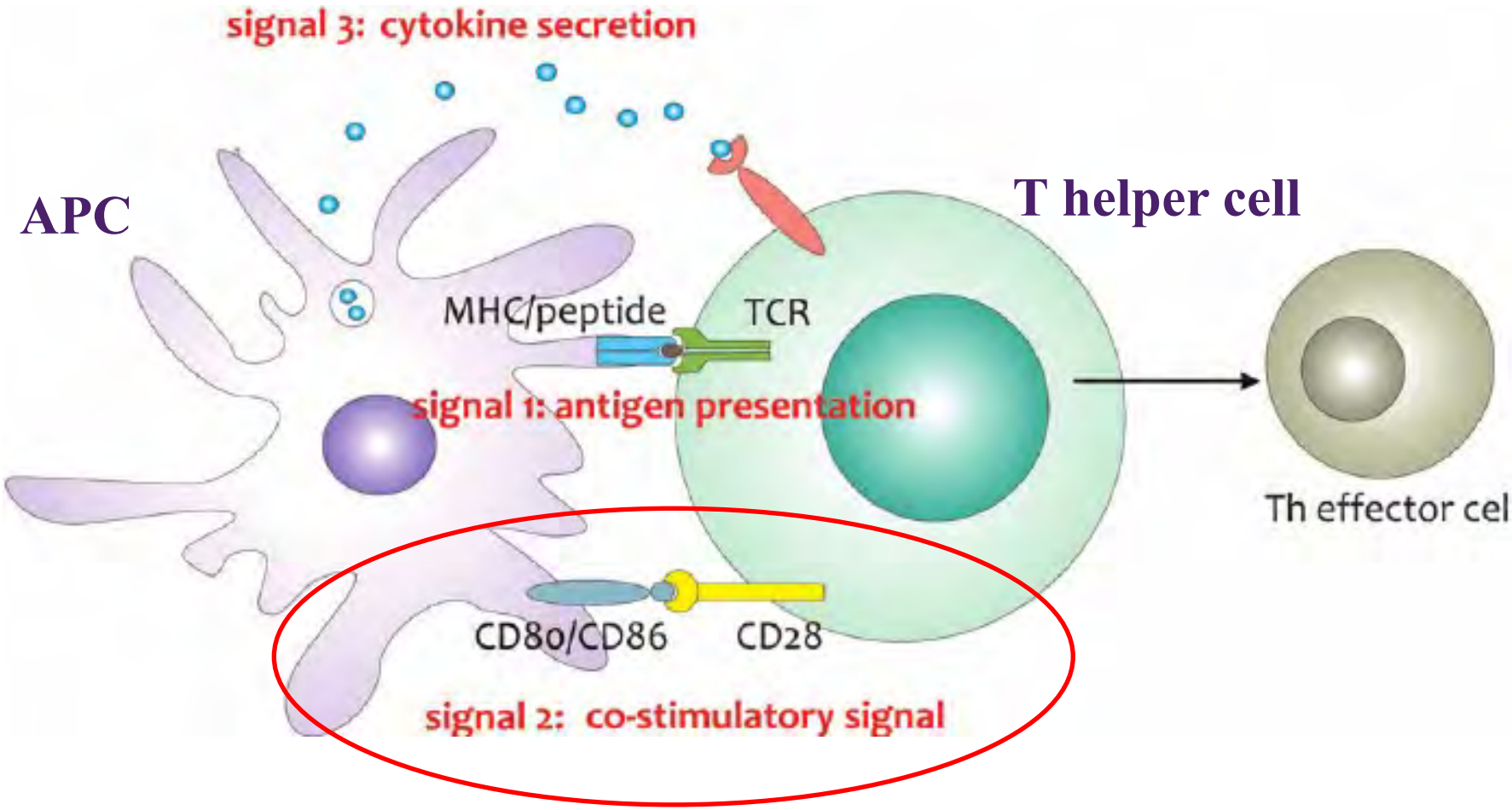
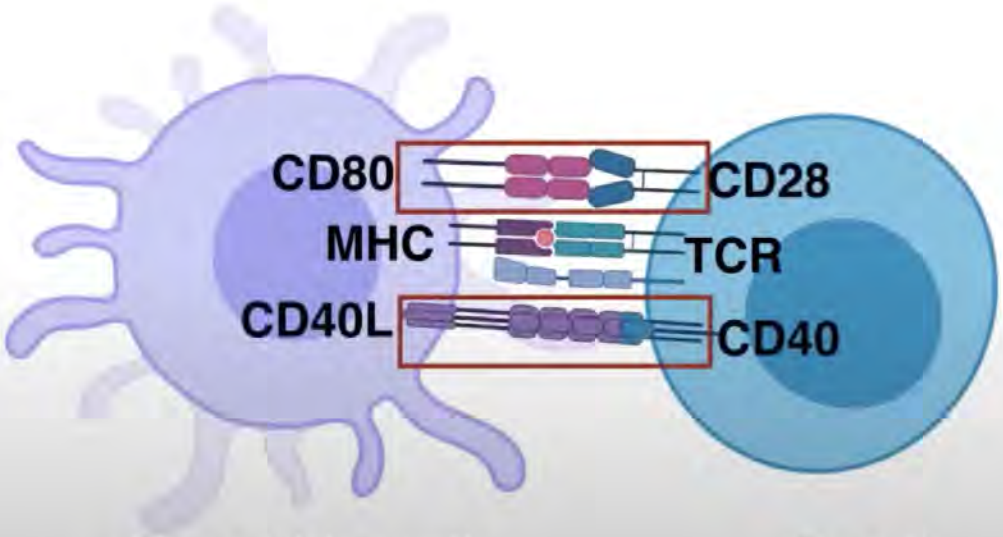


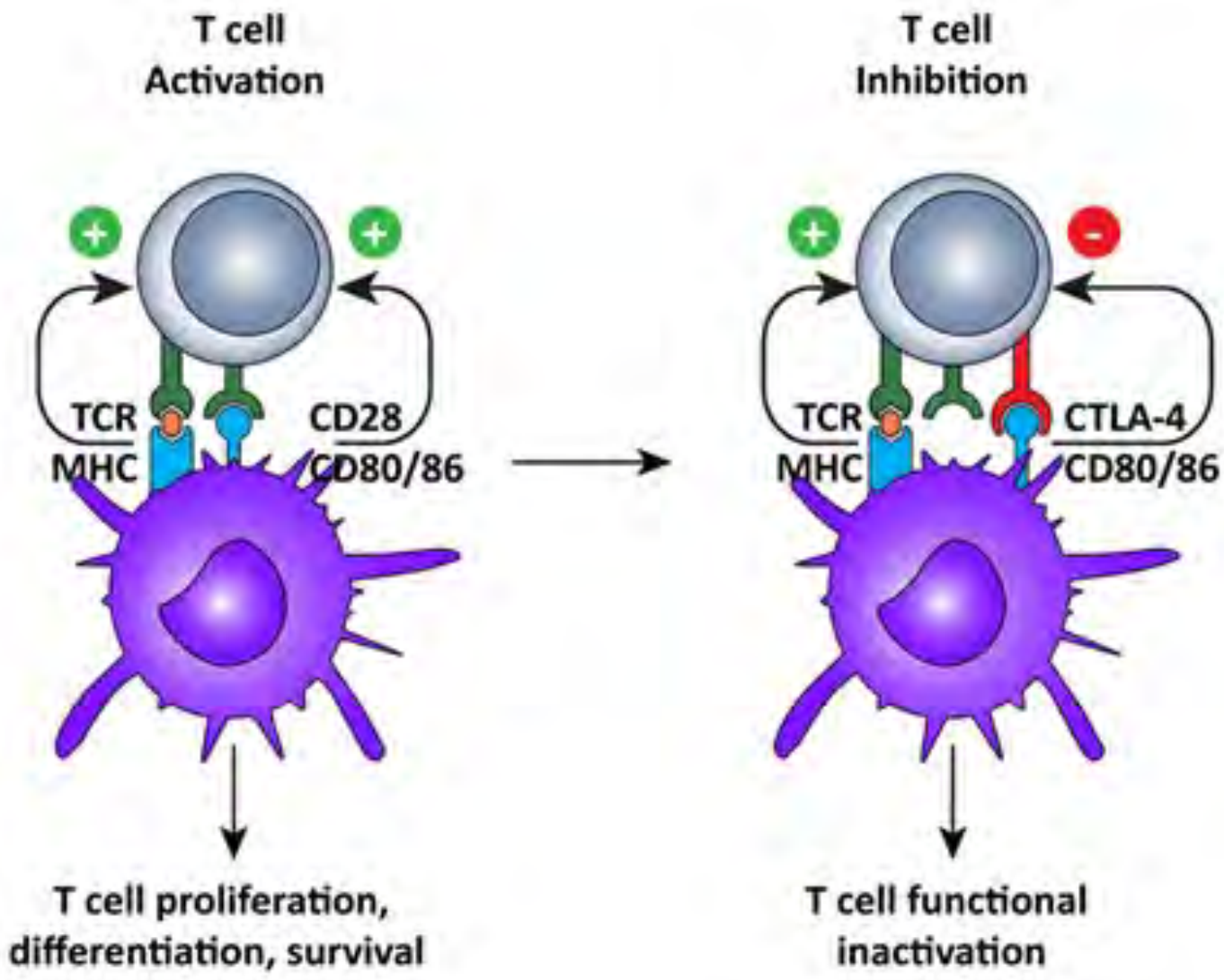
T cell stimulation requires “antigen presentation” by antigen presenting cells

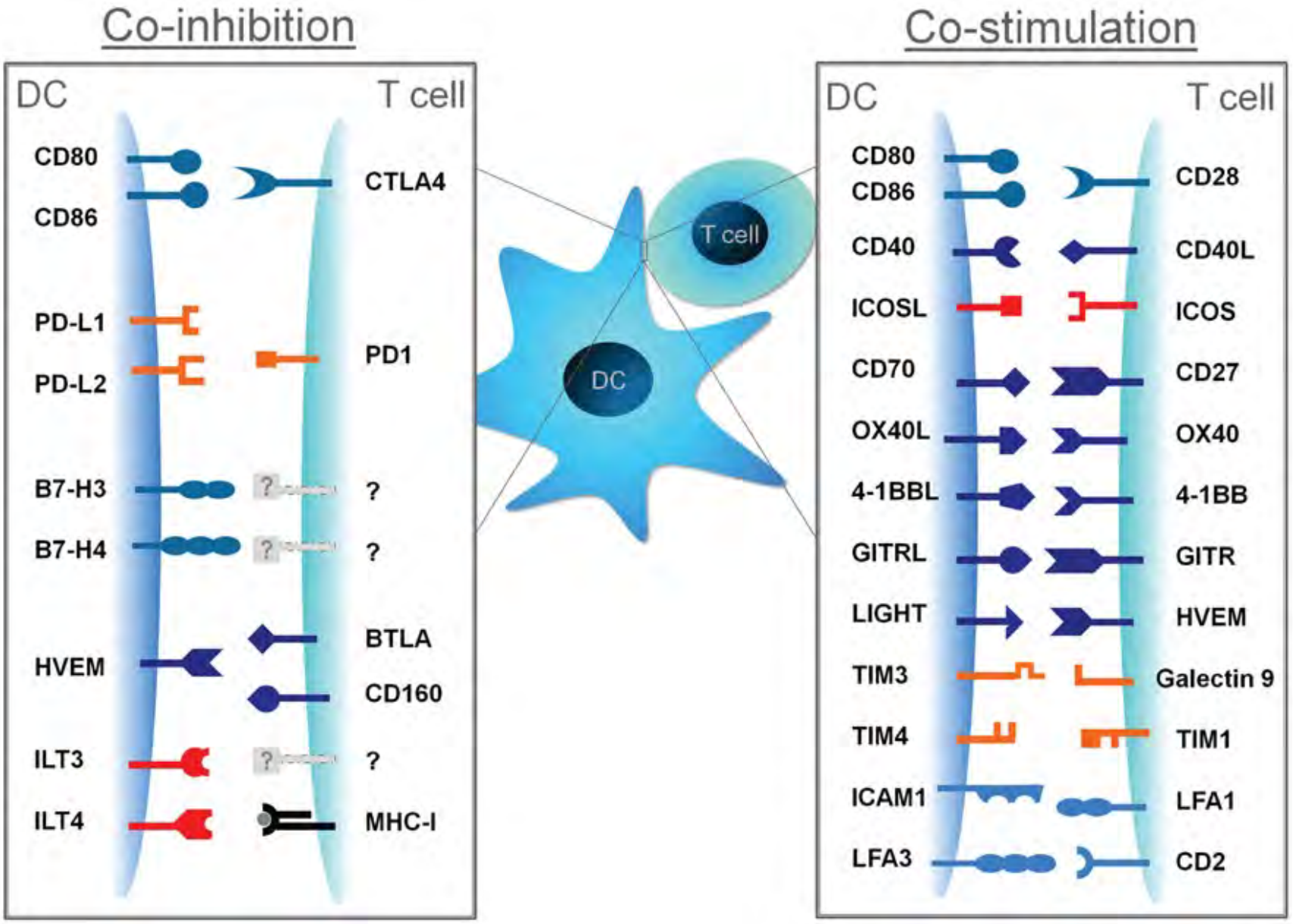


Two signal requirement for T cell activation

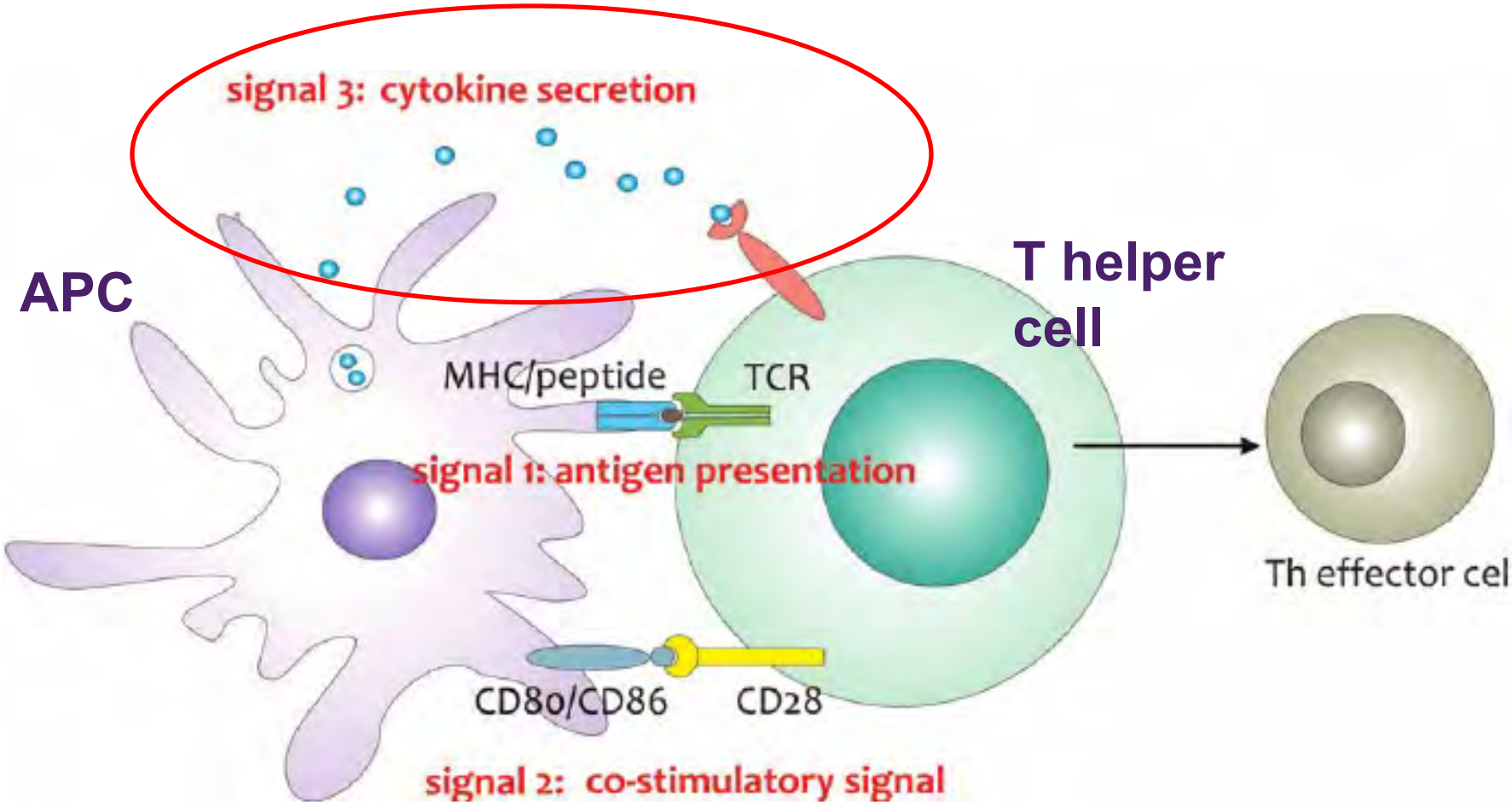
And this second signal is co-stimulatory molecules
However co-stimulatory molecules are not constituvely expressed on an APC they also reguire a stimulus in order to be up-regulated



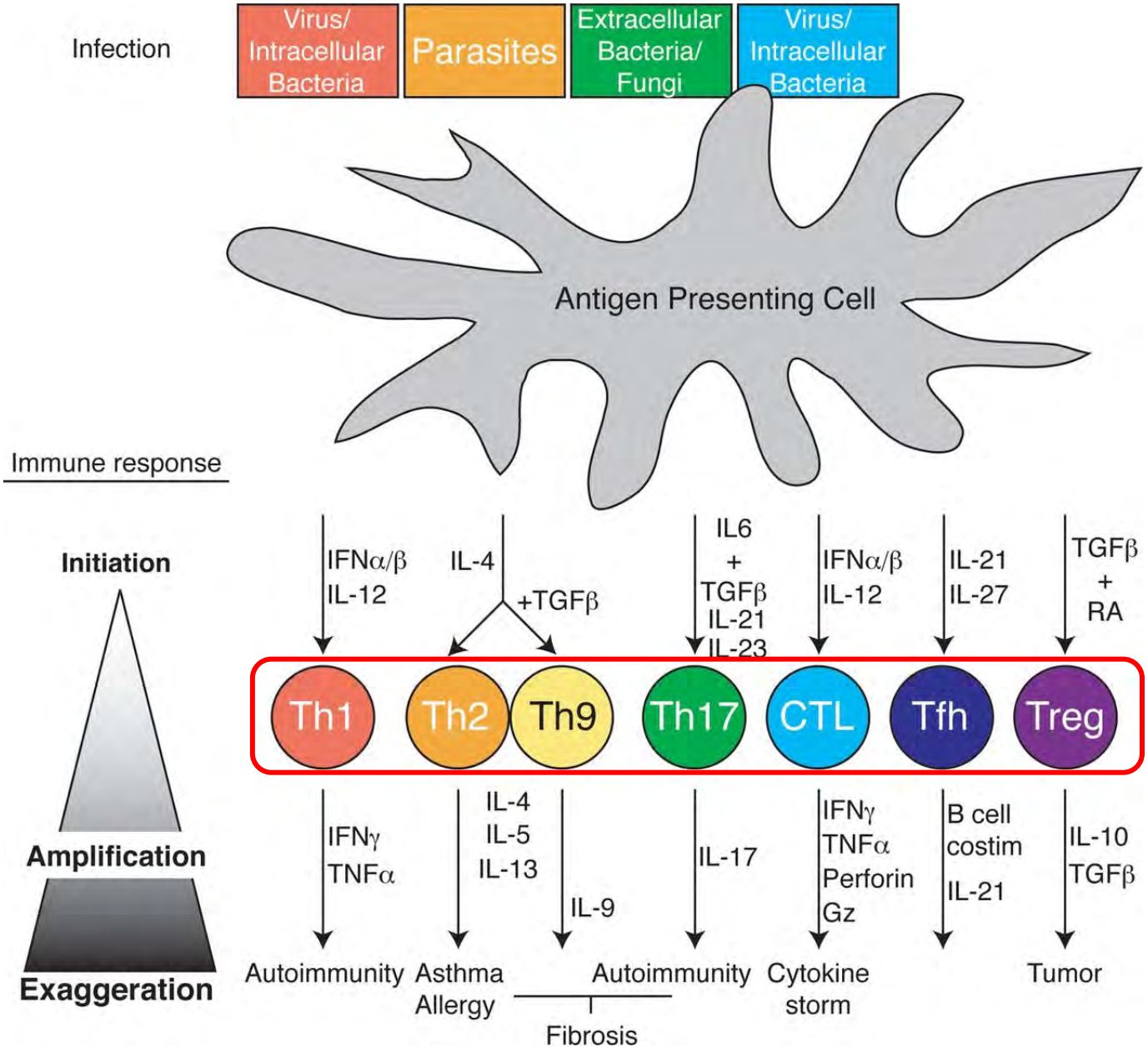

T cell
Activation
T cell
Inhibition
TCR
MHC
CD28
CD80/86
TCR
MHC
CTLA-4
CD80/86
T cell proliferation,
differentiation, survival
T cell functional
inactivation


Co-inhibition
DC
T cell
CD80
CD86
CTLA4
PD-L1
PD-L2
PD1
B7-H3
?
B7-H4
?
BTLA
HVEM
CD160
ILT3
?
ILT4
MHC-I
T cell
DC
Co-stimulation
DC
T cell
CD80
CD86
CD28
CD40
CD40L
ICOSL
ICOS
CD70
CD27
OX40L
OX40
4-1BBL
4-1BB
GITRL
GITR
LIGHT
HVEM
TIM3
Galectin 9
TIM4
TIM1
ICAM1
LFA1
LFA3
CD2

T cell stimulation requires “antigen presentation” by antigen presenting cells



Th cell differentiation



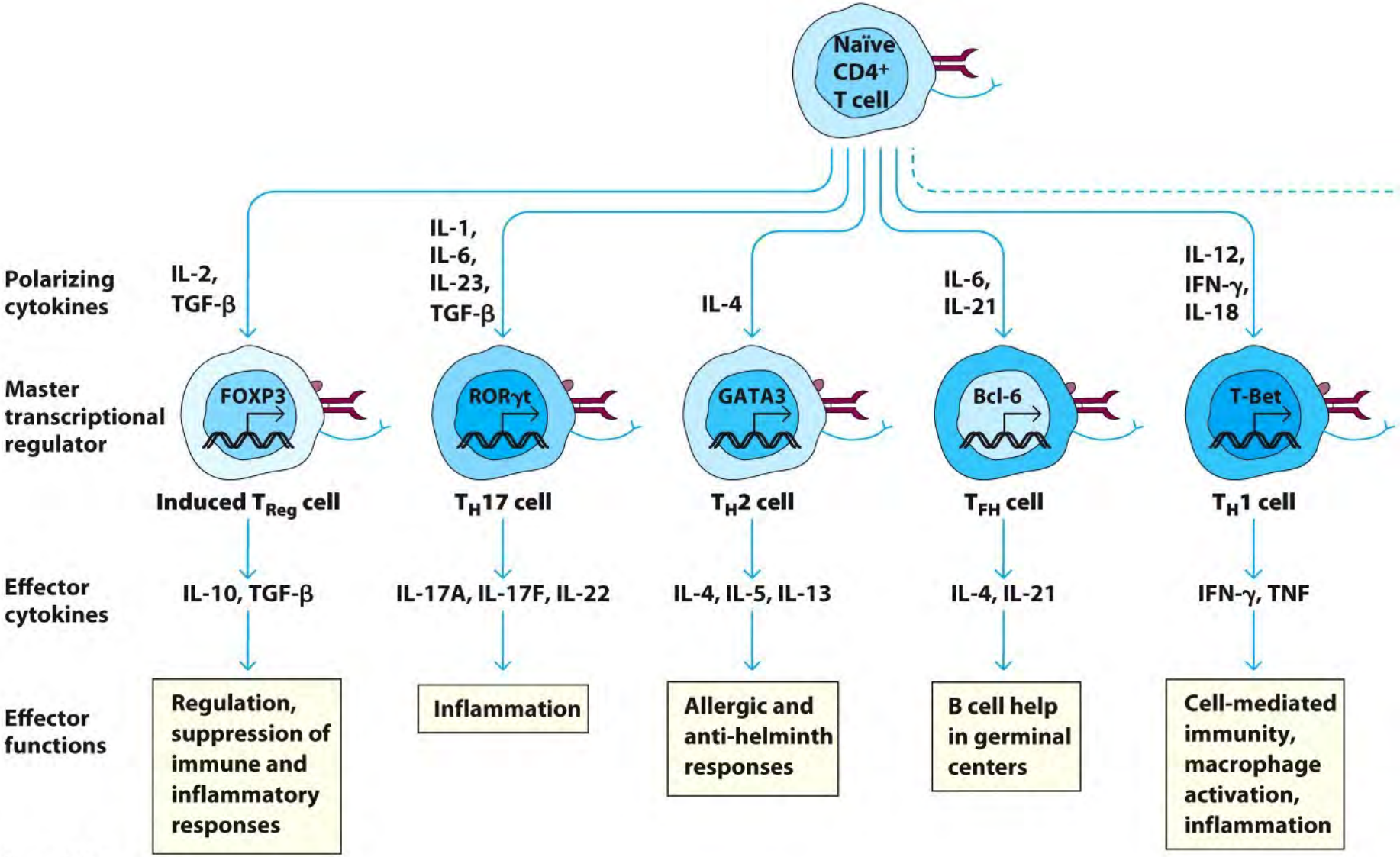
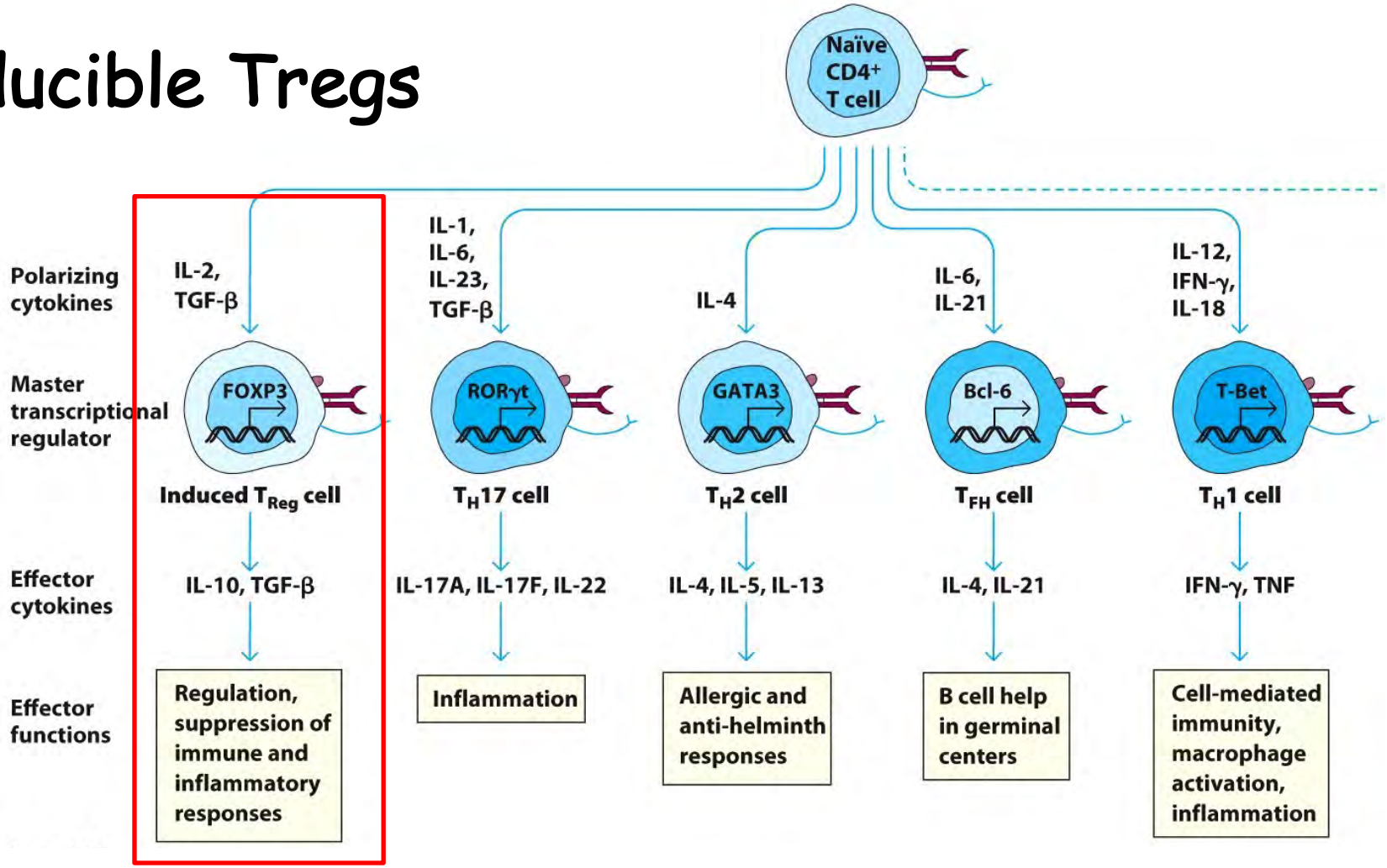
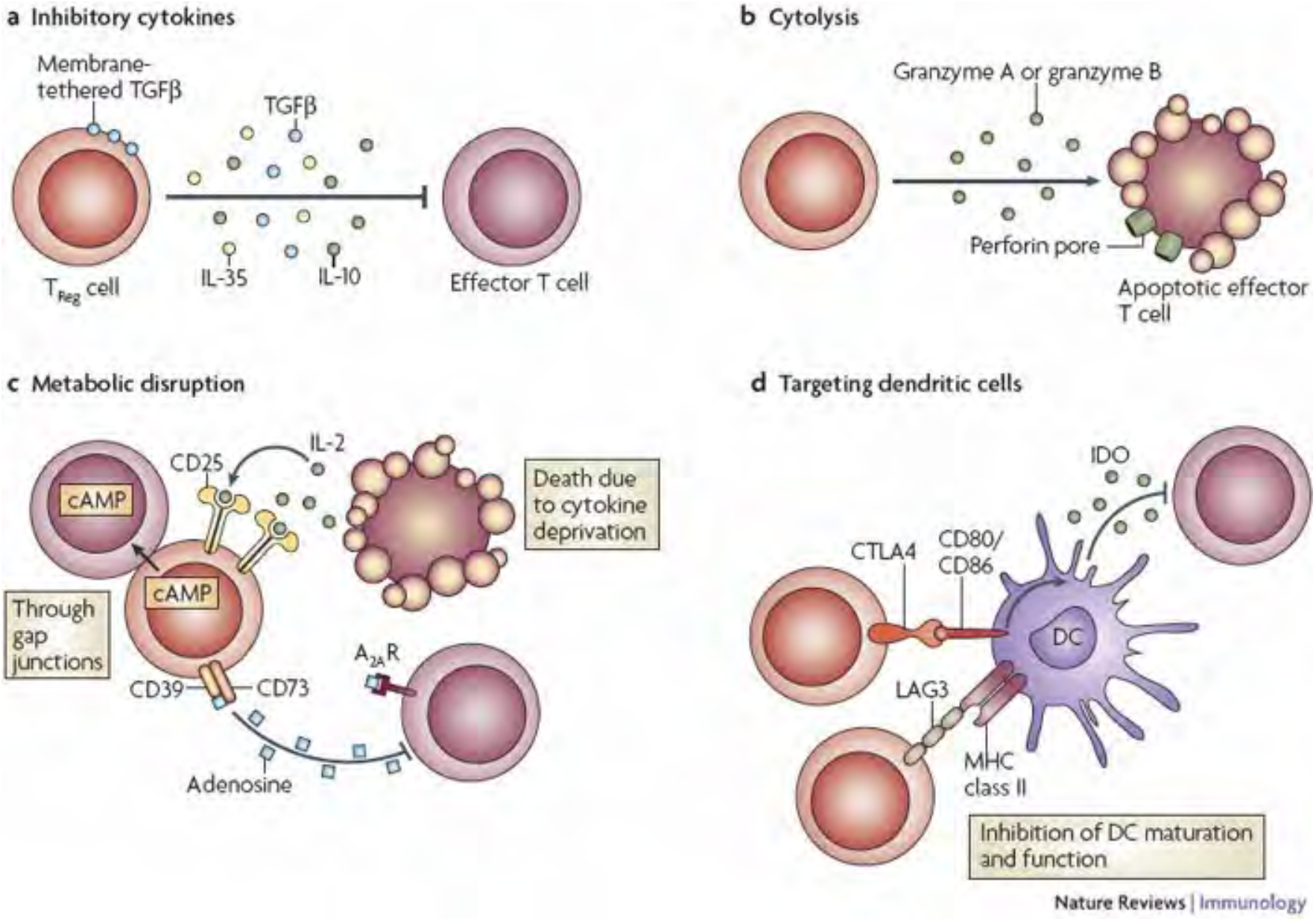


Figure 11-11
Kuby Immunology, Seventh Edition

inducible Tregs



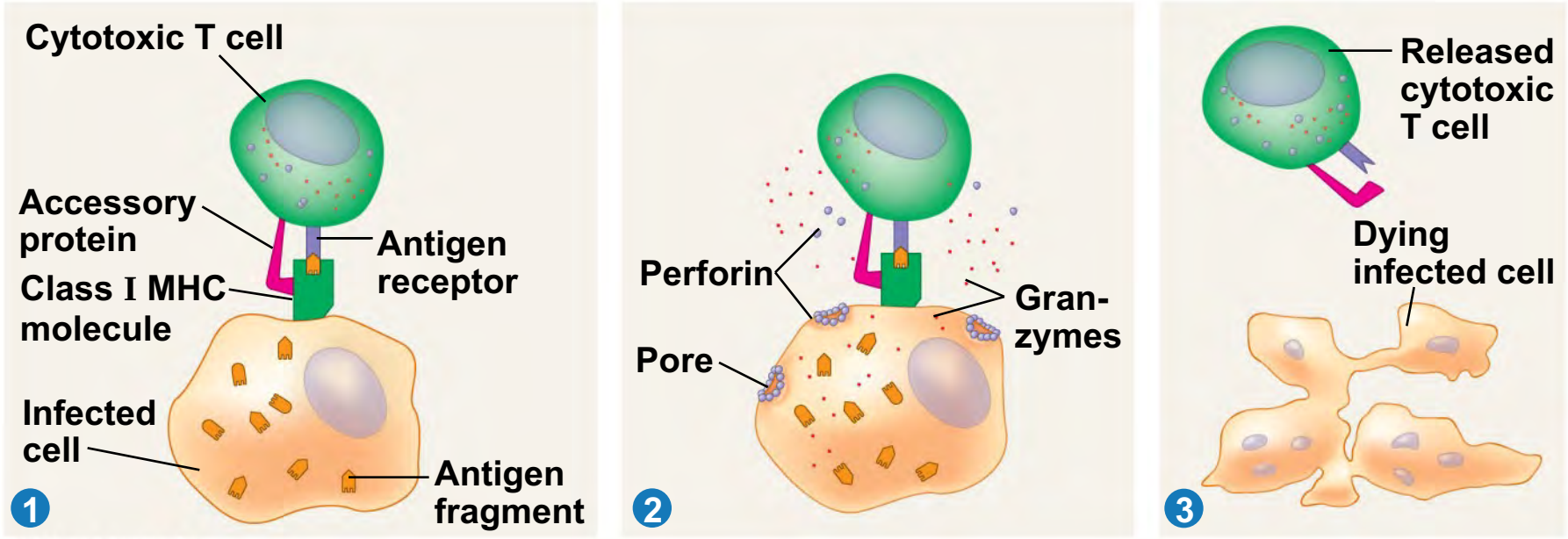
Basic mechanisms of Treg cell function



$CD8^+$ Cytotoxic T Cells (CTLs)

- **CTLs** are the effector cells in cell-mediated adaptive responses
- Defense against **intracellular** pathogens, including bacteria and viruses
- **CTLs** recognize fragments of foreign proteins produced by infected cells and possess an accessory protein that binds to class I MHC molecules
- Activated CTLs secrete proteins that disrupt the membranes of target cells and trigger apoptosis.

$CD8^+$ Cytotoxic T Cell responses



Adaptive immune in Rheumatoid Arthritis