Chapter 16

THE BODY'S DEFENSES

Body's Defenses: Overview

Nonspecific defenses		Specific defenses
First line of defense: External barriers	**Second line of defense: Internal defenses**	**Third line of defense: Immune system**
• Skin • Mucous membranes • Secretions of skin and mucous membranes	• White blood cells • Defensive proteins • The inflammatory response	• Antibodies • Lymphocytes
	• The lymphatic system	

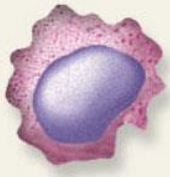
Cells involved in nonspecific immunity

Leukocytes

Neutrophils:
Engulf and kill bacteria; mediate inflammation.

Eosinophils:
Line mucosal surfaces; kill parasites; participate in allergic responses.

Monocytes:
Develop into macrophages.



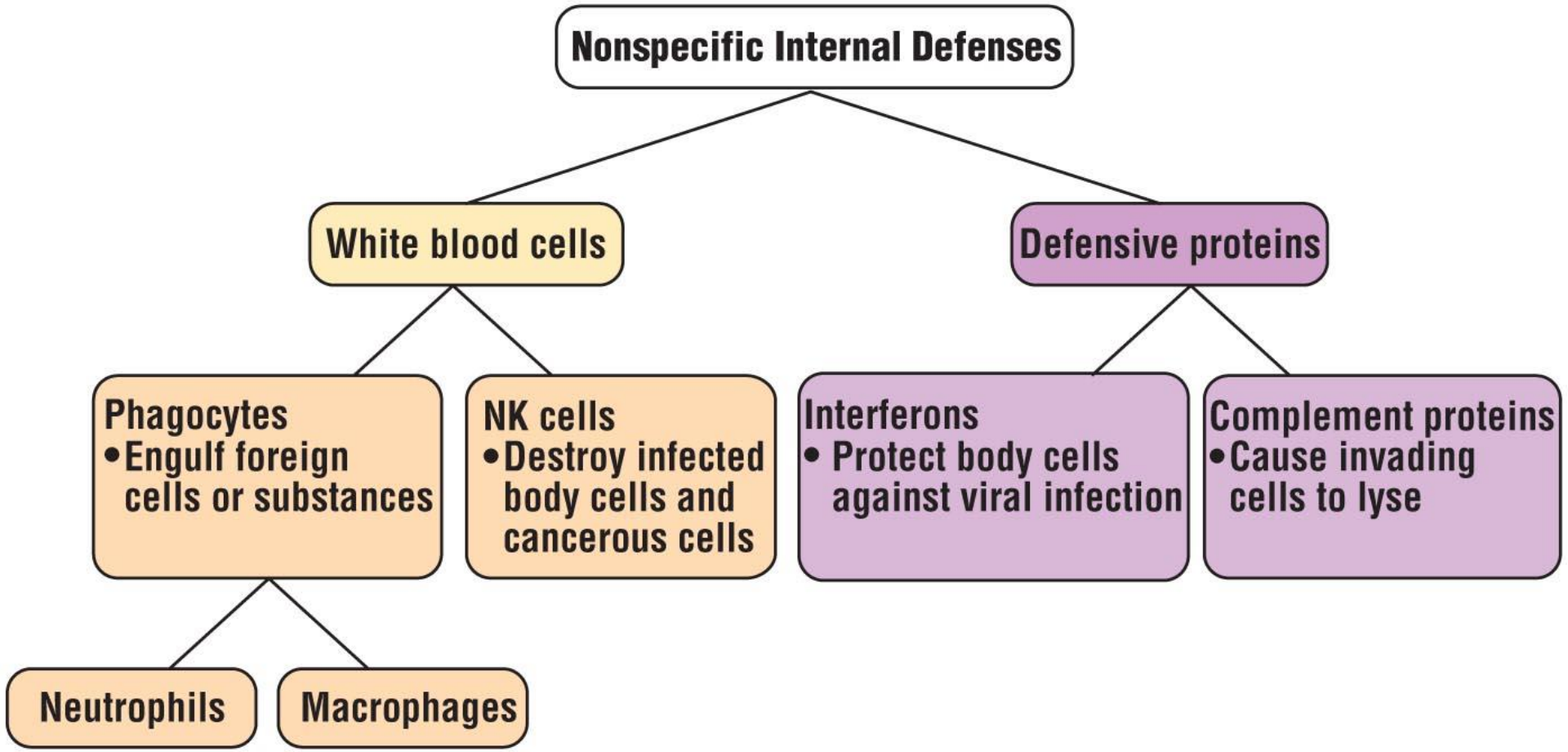
Macrophages:
Phagocytize microbes; mediate inflammation; present antigens to T cells.

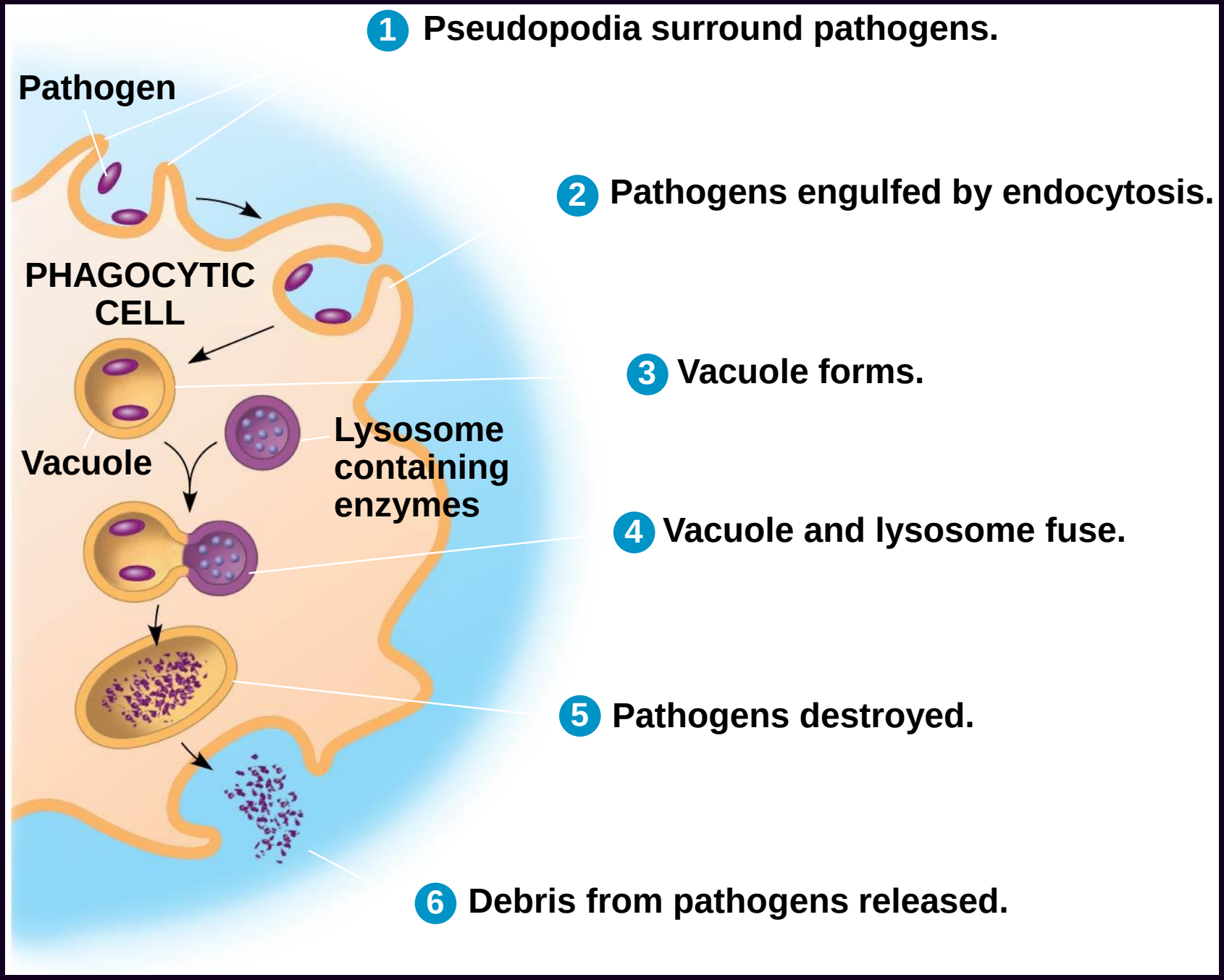
Basophils:
Enter tissues at site of injury; secrete anti-clotting factor, heparin.

Dendritic cells:
Similar to macrophages.

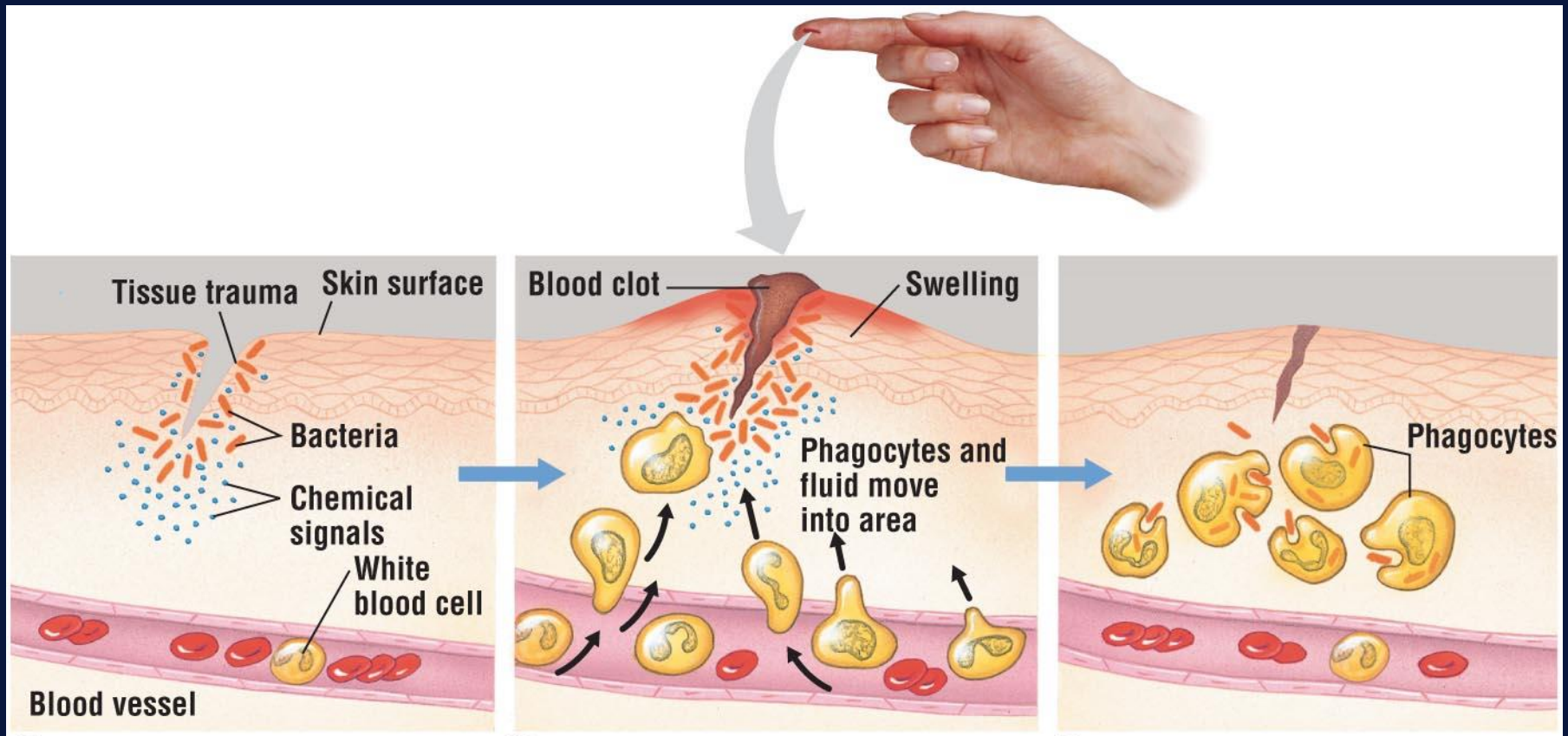
Mast cells:
Secrete histamine in inflammatory response.

The Second Line of Defense




1 Pseudopodia surround pathogens.
Pathogen
2 Pathogens engulfed by endocytosis.
PHAGOCYTIC CELL
3 Vacuole forms.
Lysosome containing enzymes
Vacuole
4 Vacuole and lysosome fuse.
5 Pathogens destroyed.
6 Debris from pathogens released.

Inflammation is a non-specific response

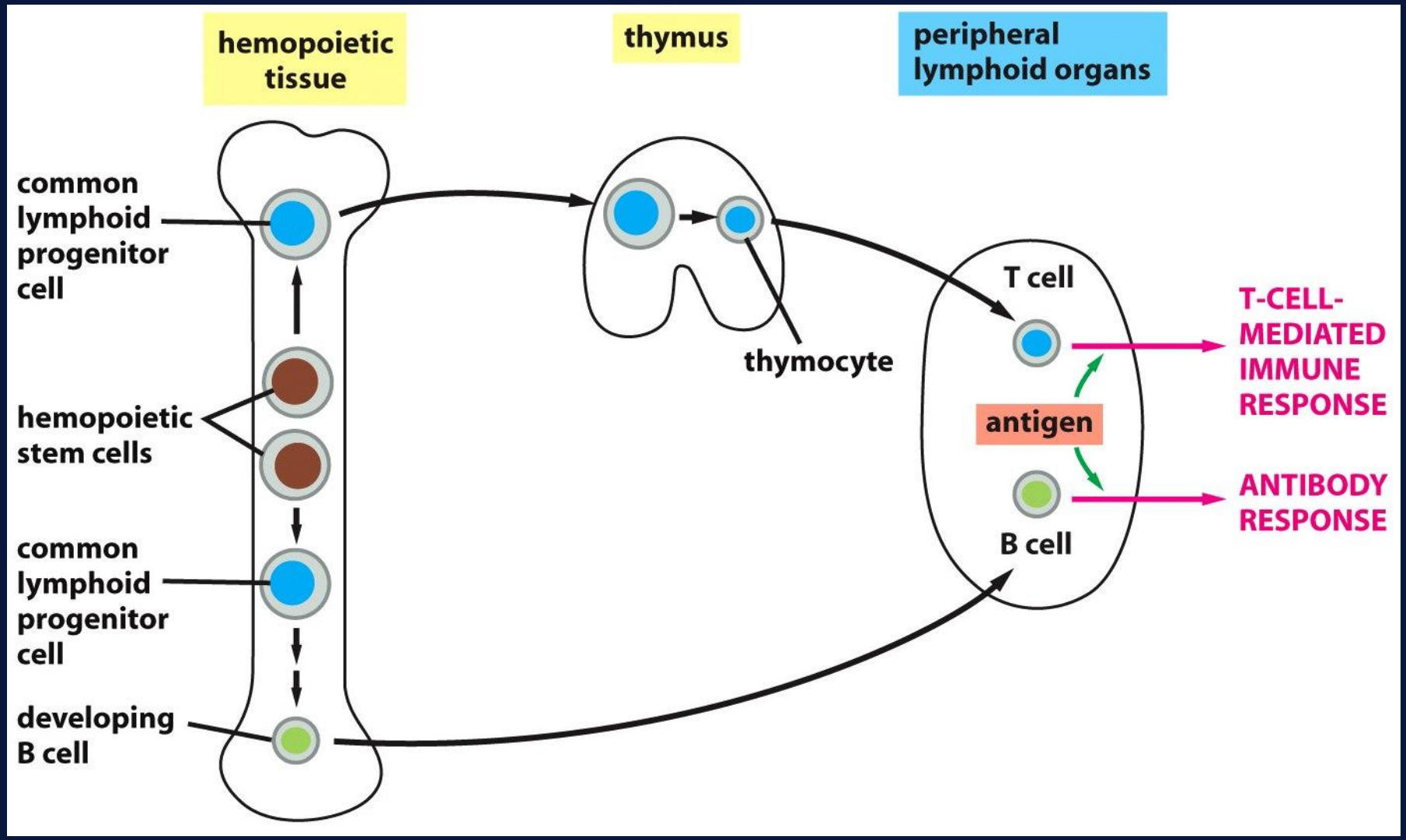


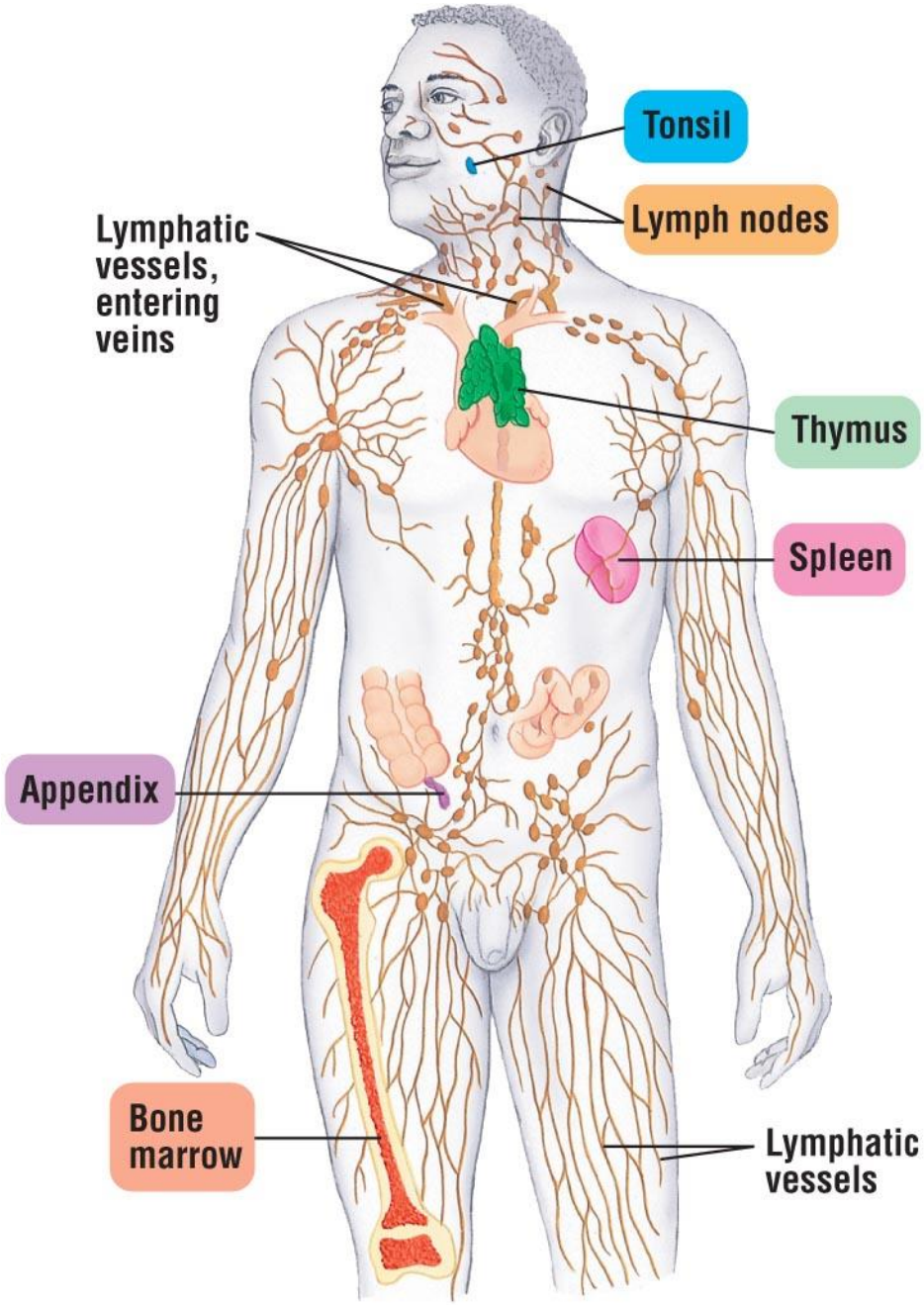
The Third Line of Defense

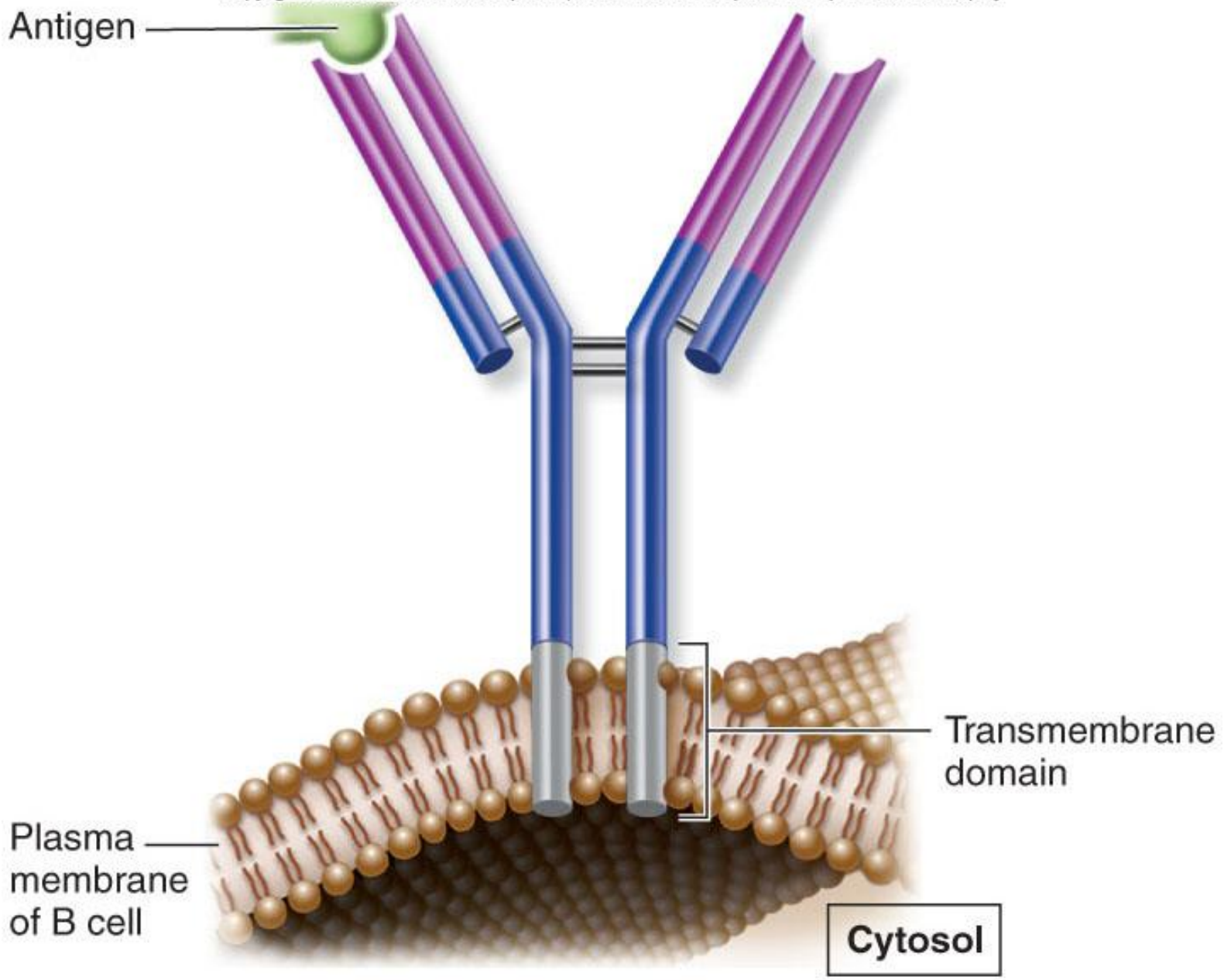
- Adaptive/Specific Immunity
- Four characteristics
  - Specificity
  - Diversity
  - Memory
  - Ability to distinguish self from non-self

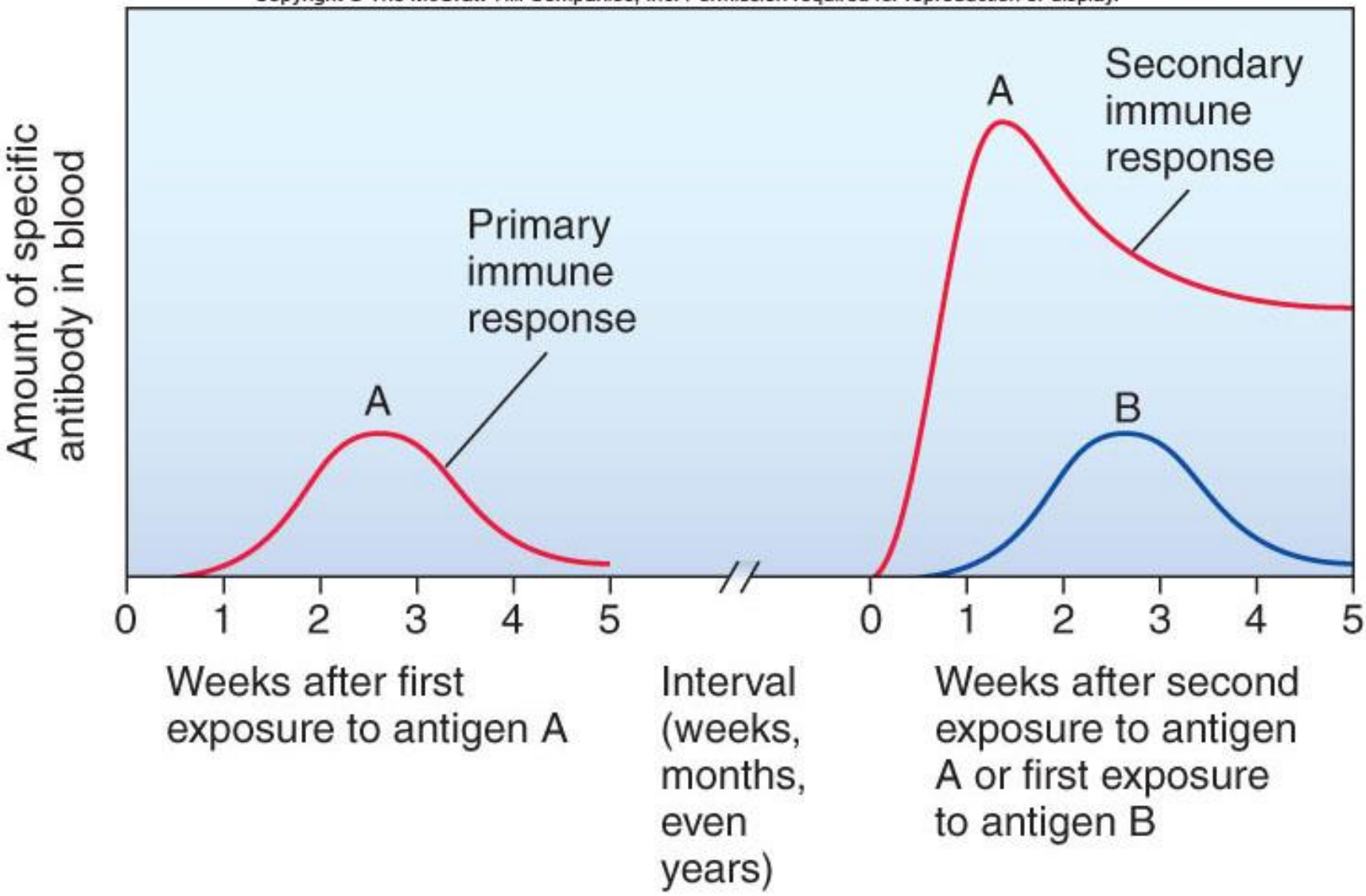
The Specific Immune Response

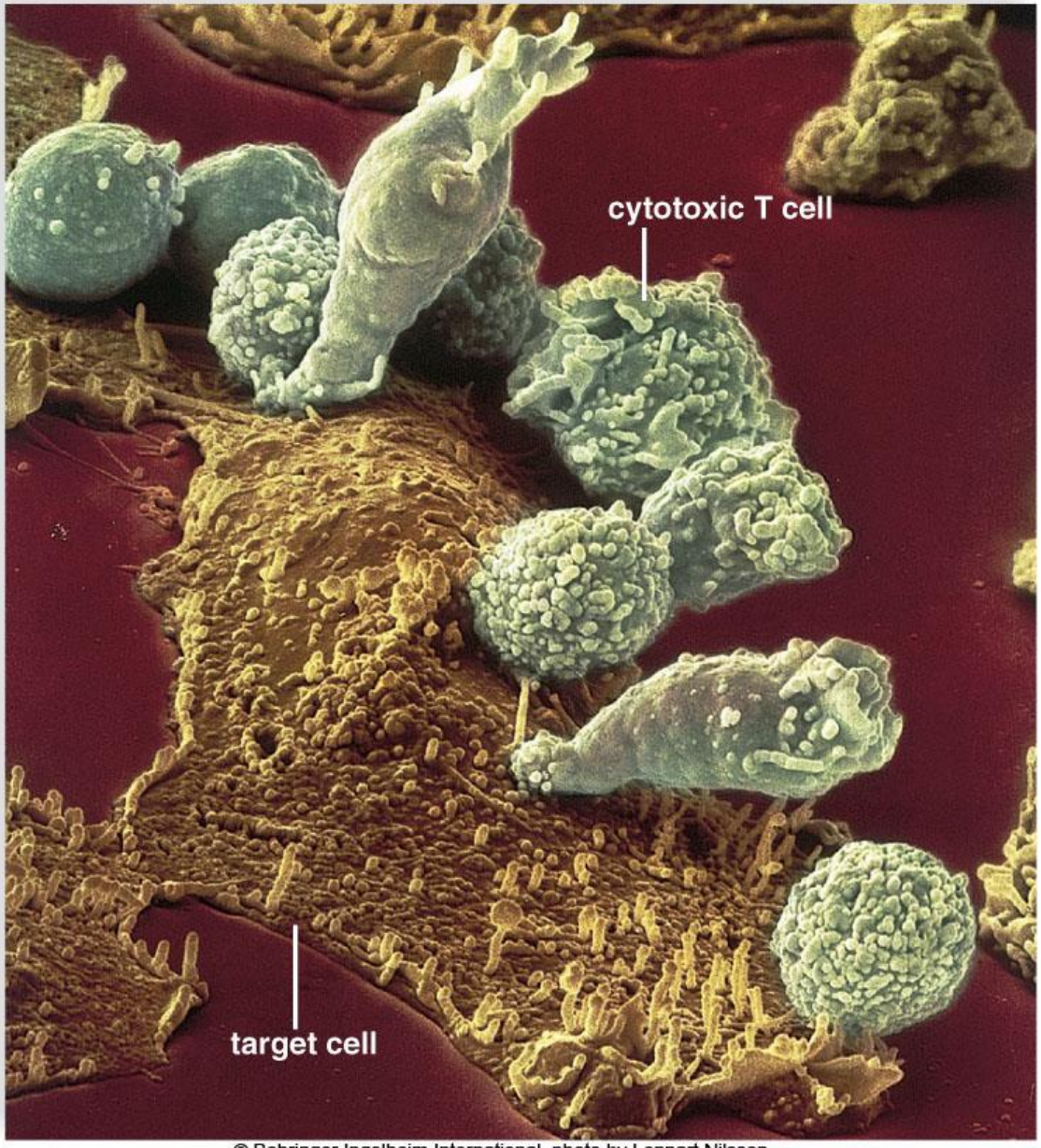
- Involves specific lymphocytes – B and T lymphocytes
- Also takes help of the non-specific arm of immunity – phagocytes (e.g., macrophages)
- Cells also secrete other chemicals that enhance the response


hemopoietic tissue
thymus
peripheral lymphoid organs
common lymphoid progenitor cell
hemopoietic stem cells
common lymphoid progenitor cell
developing B cell
thymocyte
T cell
antigen
B cell
T-CELL-MEDIATED IMMUNE RESPONSE
ANTIBODY RESPONSE

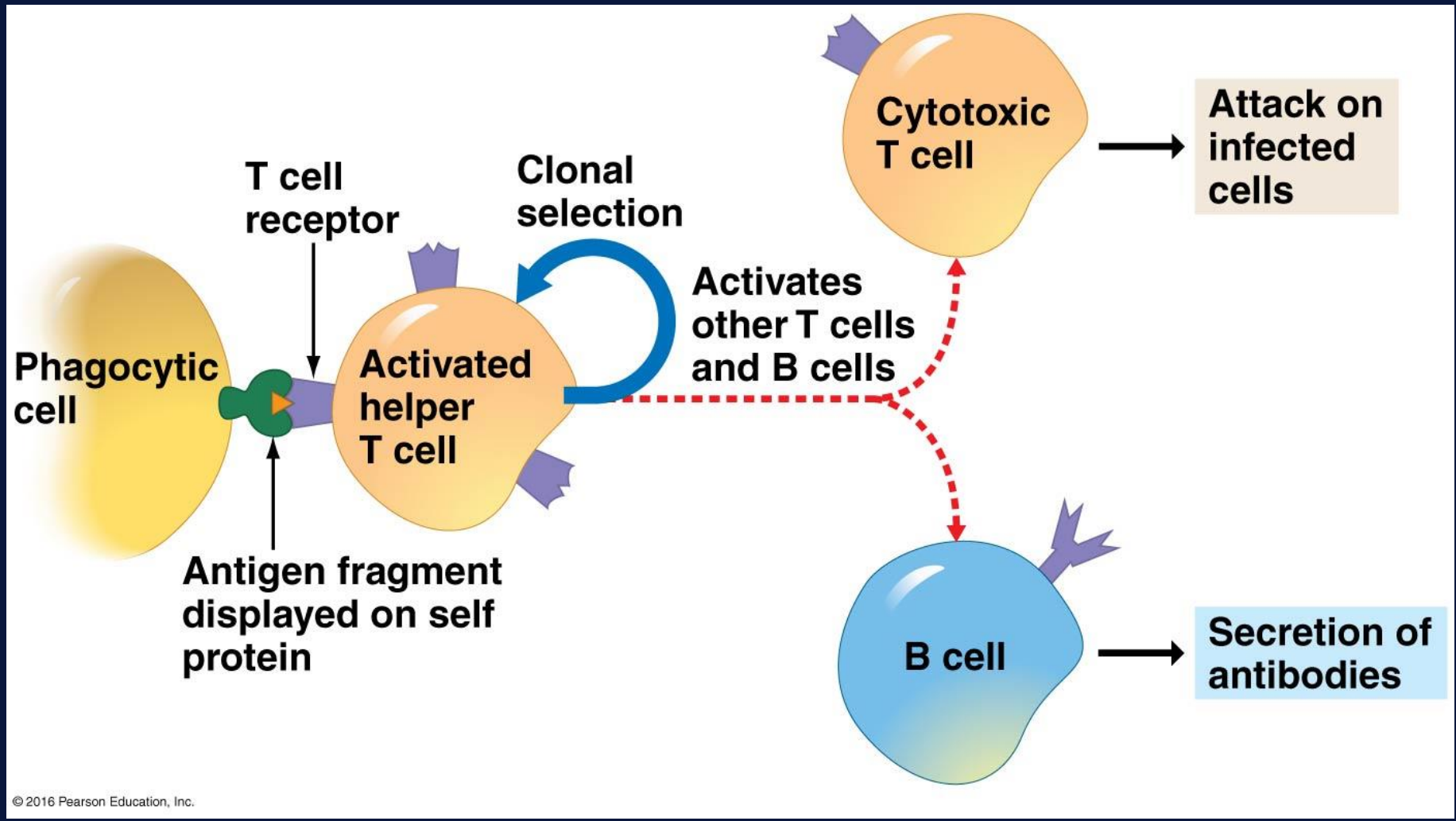


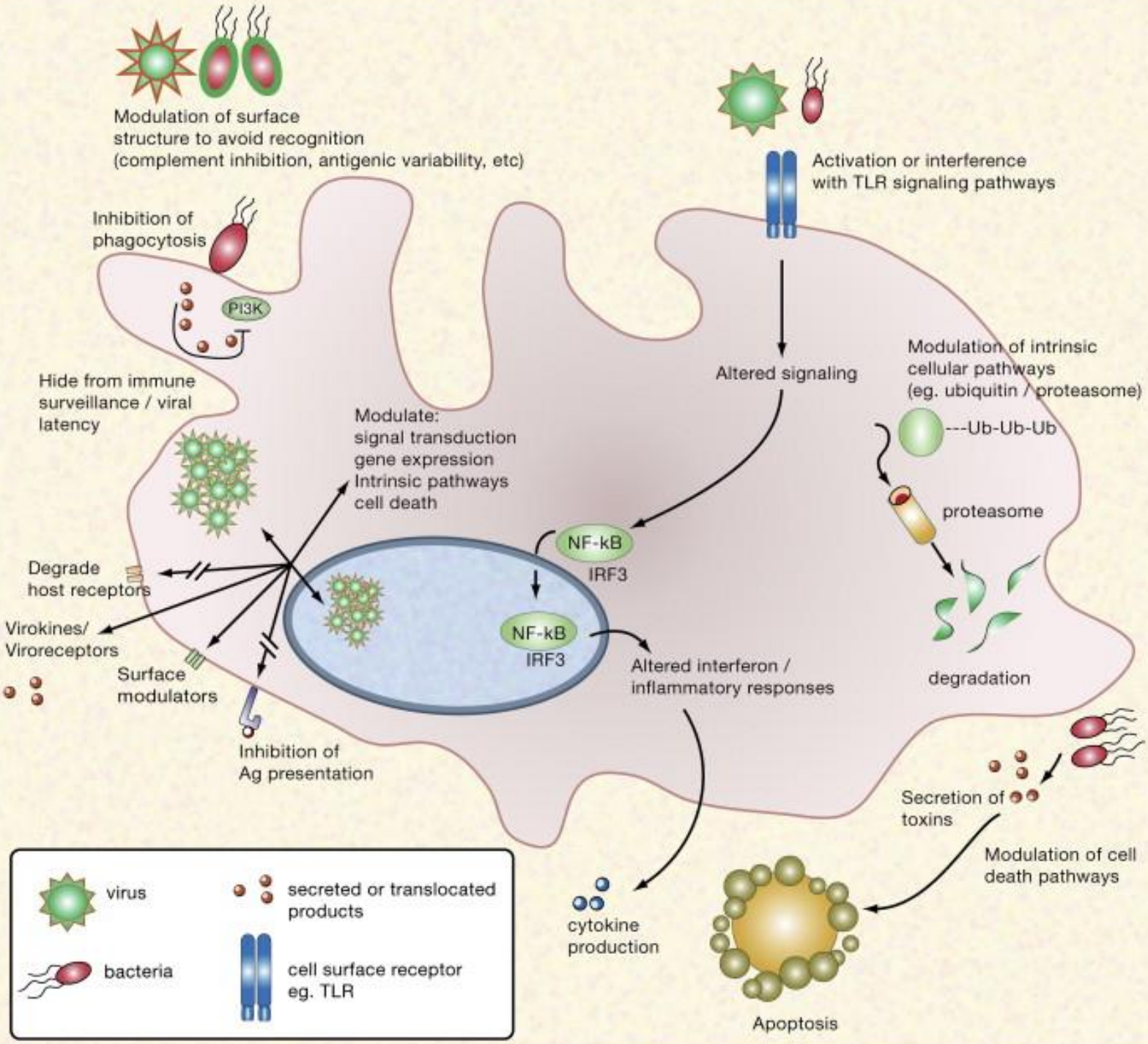






Important Role of Helper T cells




Modulation of surface structure to avoid recognition (complement inhibition, antigenic variability, etc)
Activation or interference with TLR signaling pathways
Inhibition of phagocytosis
PI3K
Hide from immune surveillance / viral latency
Altered signaling
Modulation of intrinsic cellular pathways (eg. ubiquitin / proteasome)
---Ub-Ub-Ub
proteasome
Modulate: signal transduction gene expression Intrinsic pathways cell death
NF-kB
IRF3
Degrade host receptors
Virokines/ Viroreceptors
Surface modulators
NF-kB
IRF3
Altered interferon / inflammatory responses
degradation
Inhibition of Ag presentation
Secretion of toxins
Modulation of cell death pathways
cytokine production
Apoptosis
virus
bacteria
secreted or translocated products
cell surface receptor eg. TLR

Autoimmune Diseases

- The immune system turns against the body's own molecules
  - ***Myasthenia gravis*** (antibodies against receptors on muscle cells)
  - ***Type I diabetes*** (antibodies against insulin-secreting cells of the pancreas)
  - ***Psoriasis*** (T-cell attack against skin cells)

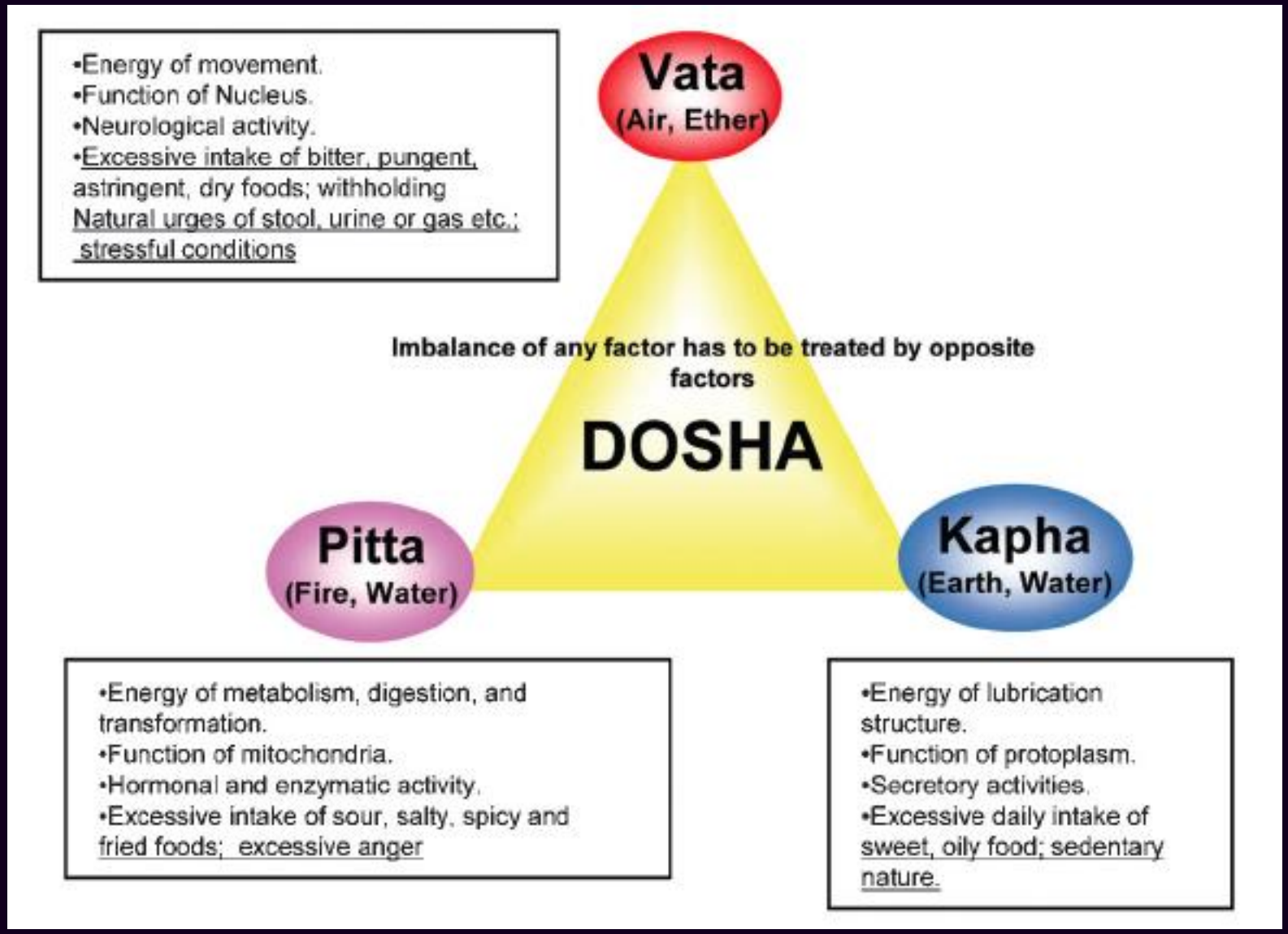
ARTICLE

From Ancient Medicine to Modern Medicine: Ayurvedic Concepts of Health and Their Role in Inflammation and Cancer

Prachi Garodia, Haruyo Ichikawa, Nikita Malani, Gautam Sethi, Bharat B. Aggarwal

Journal of the Society for Integrative Oncology, Vol 5, No 1 (Winter), 2007

Framework of Ayurveda



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Ayurvedic view of Cancer

Granthi
(Begin glandular swelling)

Arbuda
(Definite malignancy)

- Sarcomas (Mamsarbuda)
- Leukemia (Raktarbuda)
- Oral cancer (Mukharbuda)
- Incurable or malignant uclers (Asadhya Vrana)

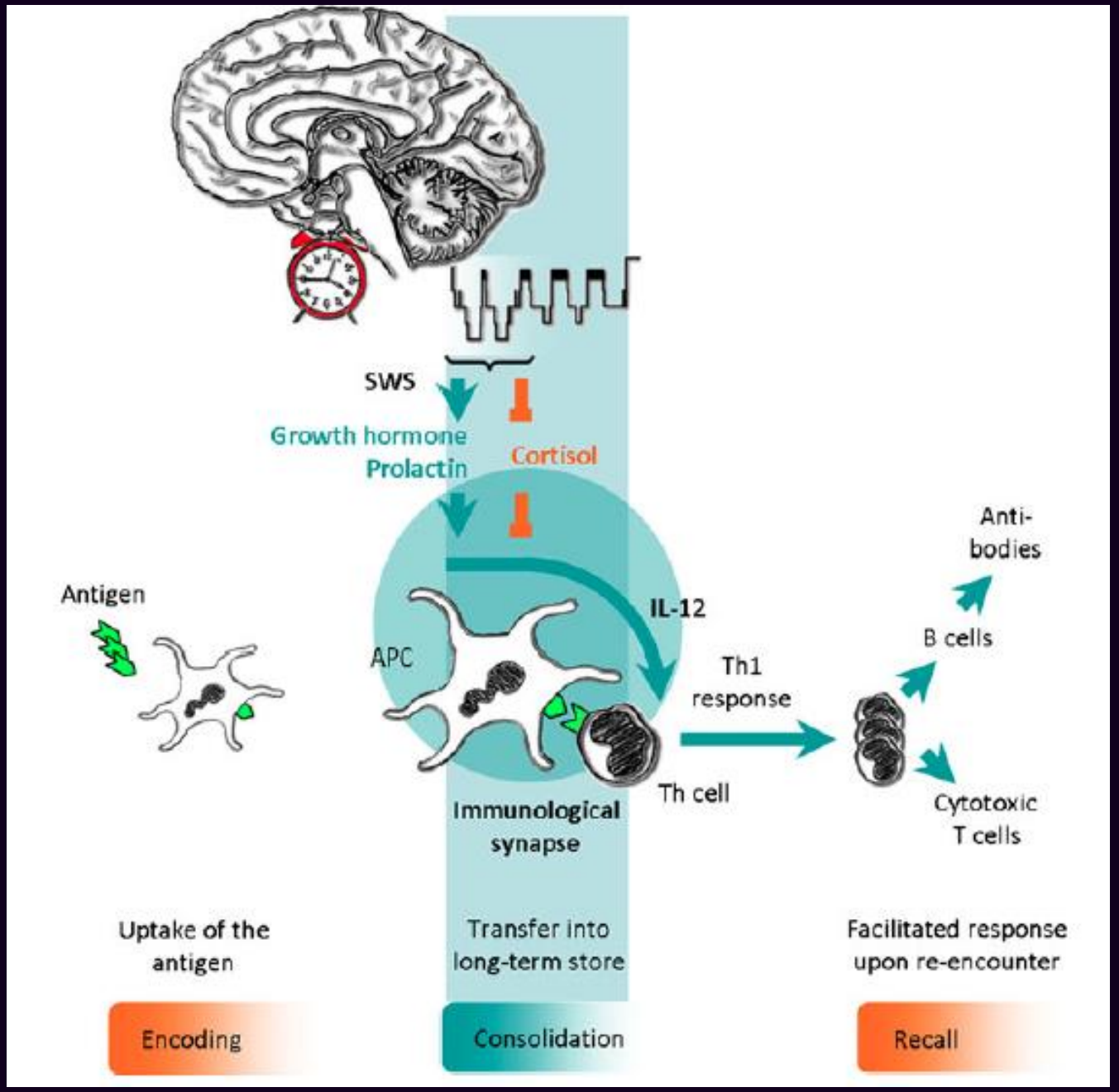
Karkatarbuda
(Malignant, hard tumor)

Adhyarbuda
(Primary metastasis)

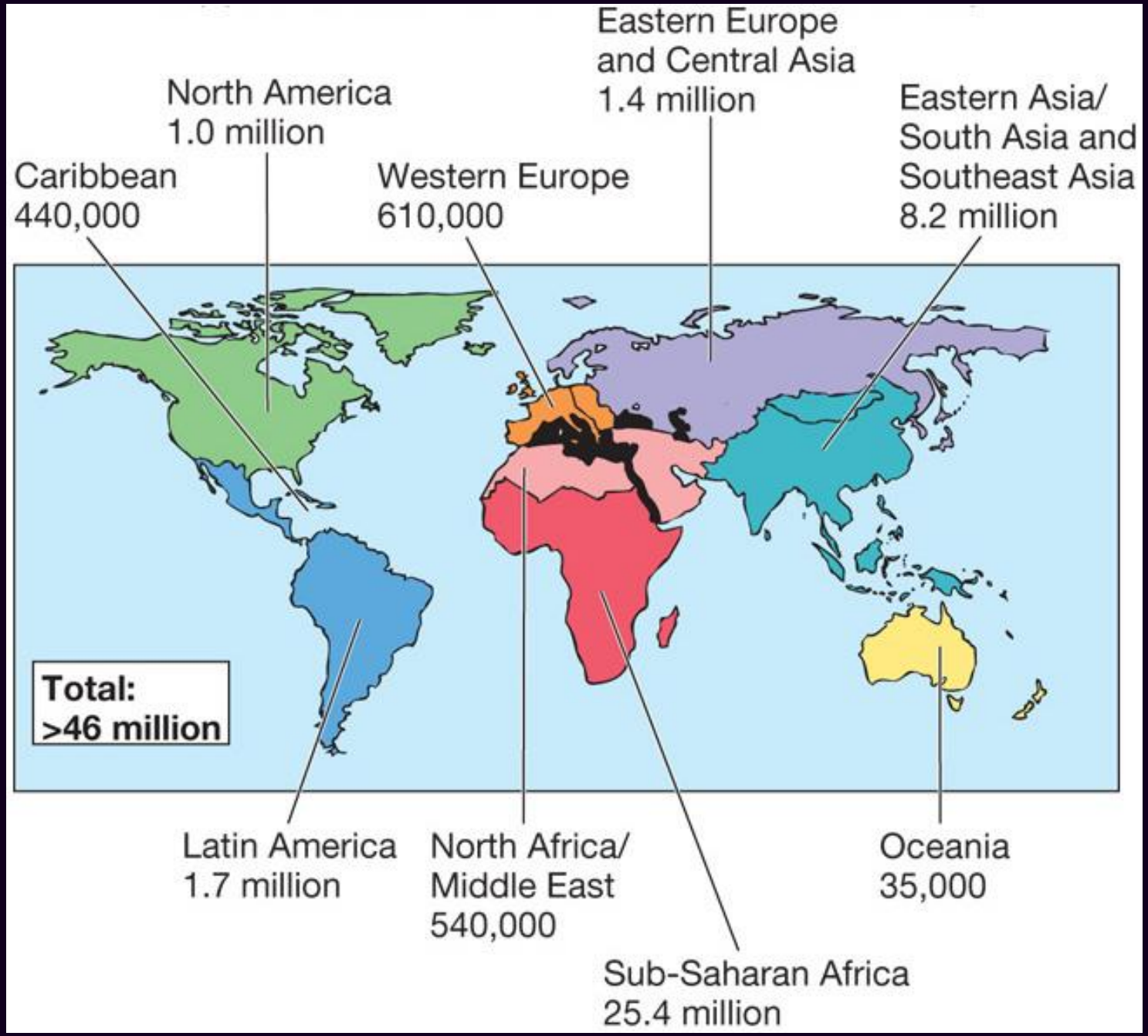
Vranarbuda
(Ulcerative tumors)

Dwiarbuda
(Secondary metastasis)

Journal of the Society for Integrative Oncology, Vol 5, No 1 (



Pflugers Arch - Eur J Physiol (2012) 463:121–137


Eastern Europe
and Central Asia
1.4 million
North America
1.0 million
Eastern Asia/
South Asia and
Southeast Asia
8.2 million
Caribbean
440,000
Western Europe
610,000
Total:
>46 million
Latin America
1.7 million
North Africa/
Middle East
540,000
Oceania
35,000
Sub-Saharan Africa
25.4 million