

ANTIGEN PRESENTATION AND PRIMARY LYMPHOCYTE ACTIVATION

- MHC/HLA, TCR and BCR structure
- Quick review on antigen presentation
- Location, location, location.....
- 1st and 2nd signals for lymphocyte activation, origin of 2nd signals
- Activation of T cells
- Primary B cell activation

Antigen presentation is essential for T cell activation;

All nucleated cells express class I MHC;

Professional antigen presenting cells – macrophages, DCs, B cells – also express class II MHC;

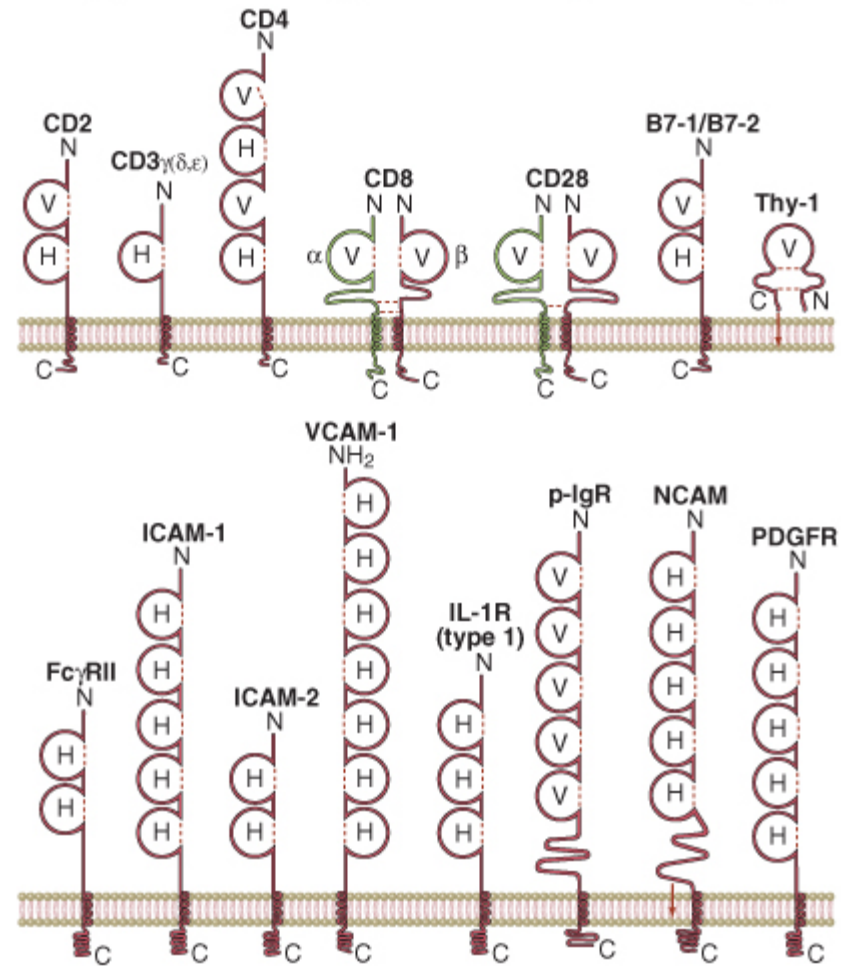
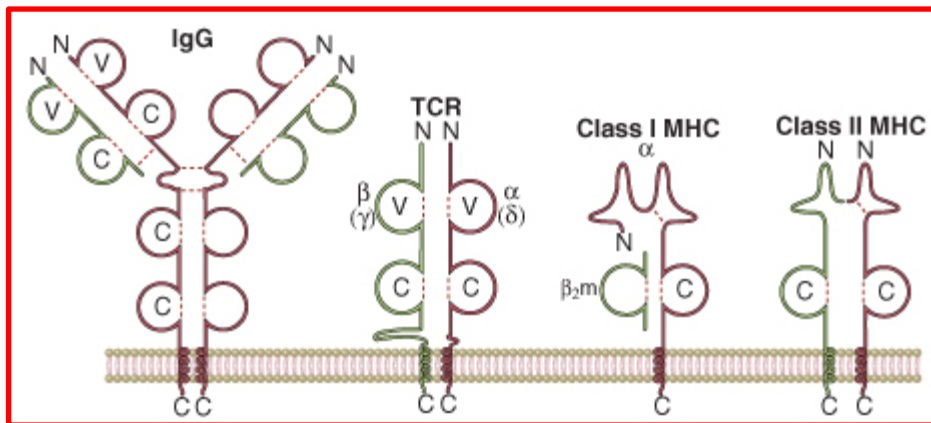
MHC proteins are NOT receptors;

BCR and TCR – B cell and T cell receptors – antigen receptors;

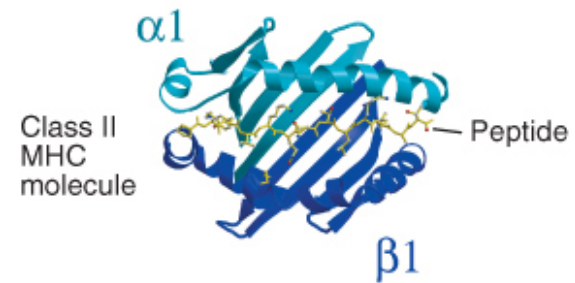
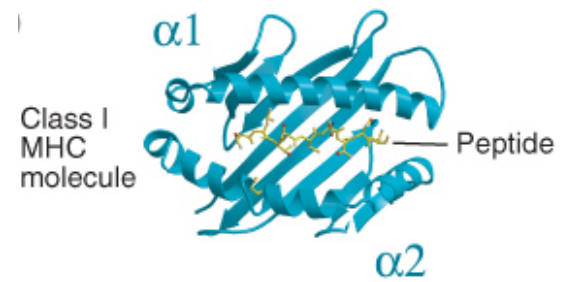
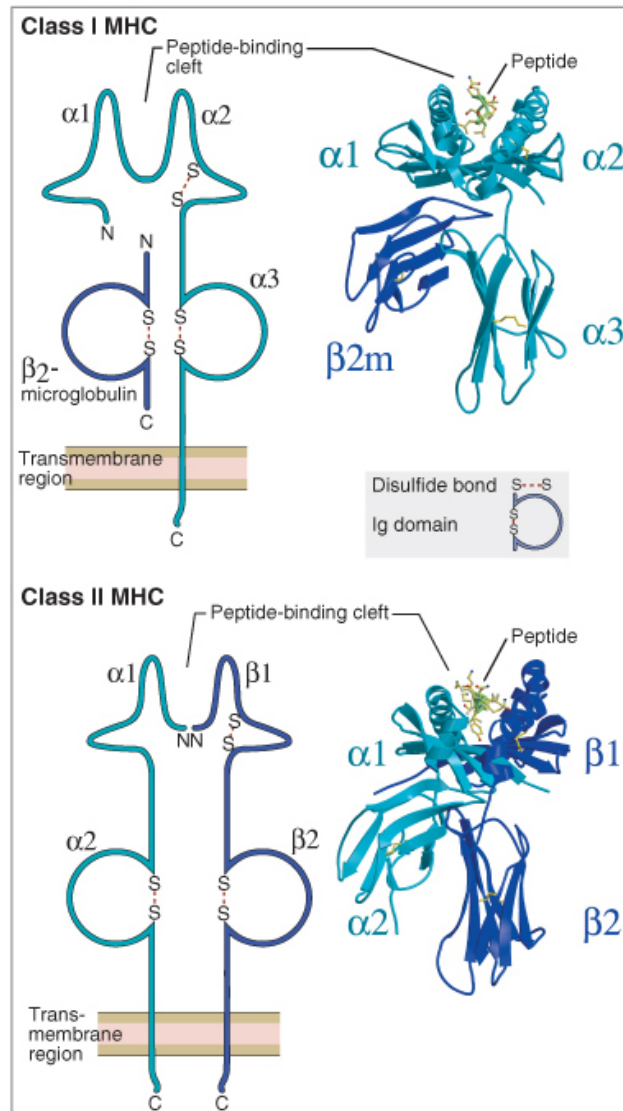
Mostly, TCR only binds to peptides presented in the MHC context;

BCR binds to soluble antigen (conformational or linear antigens);

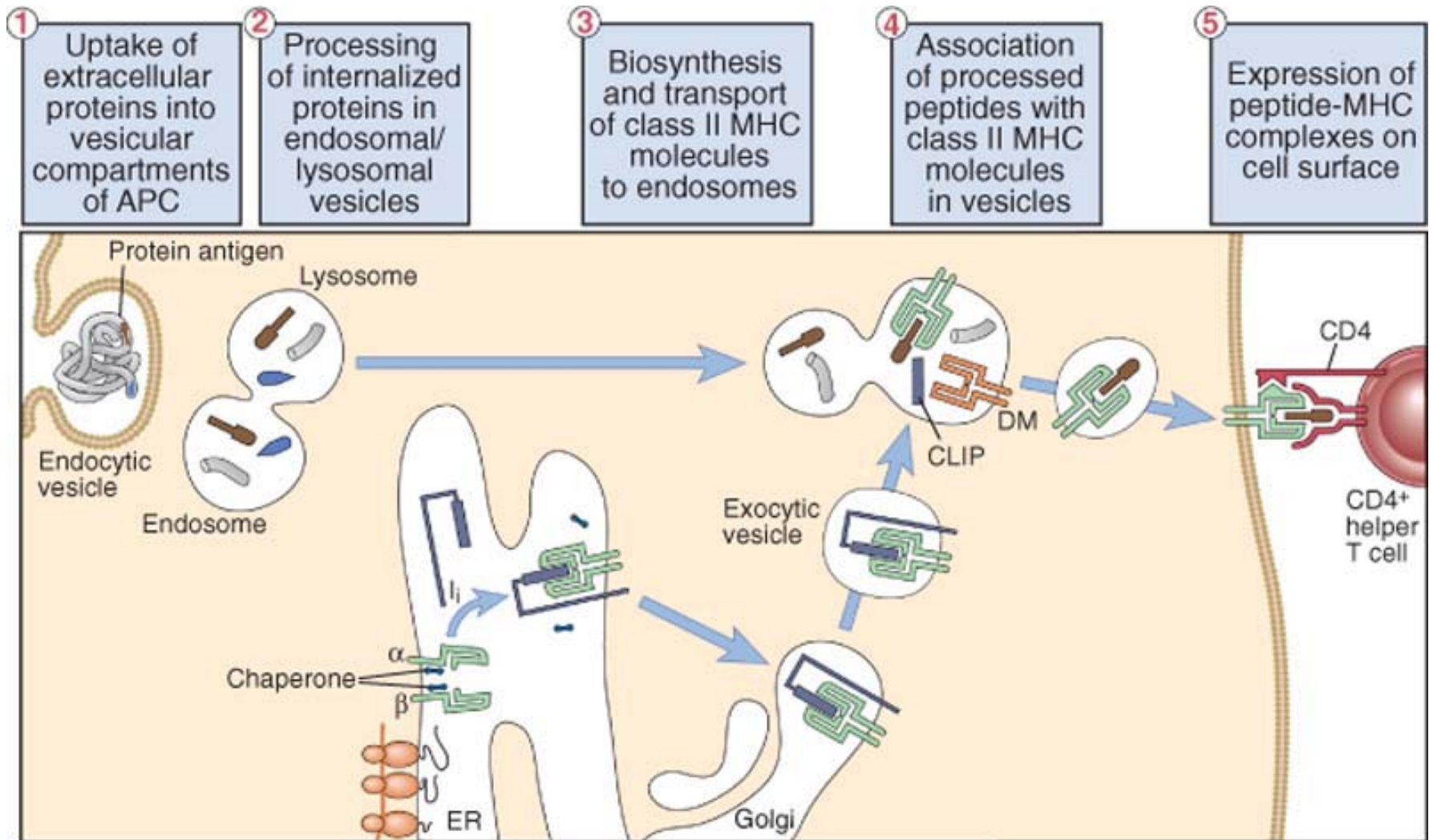
- MHC/HLA, TCR and BCR structure



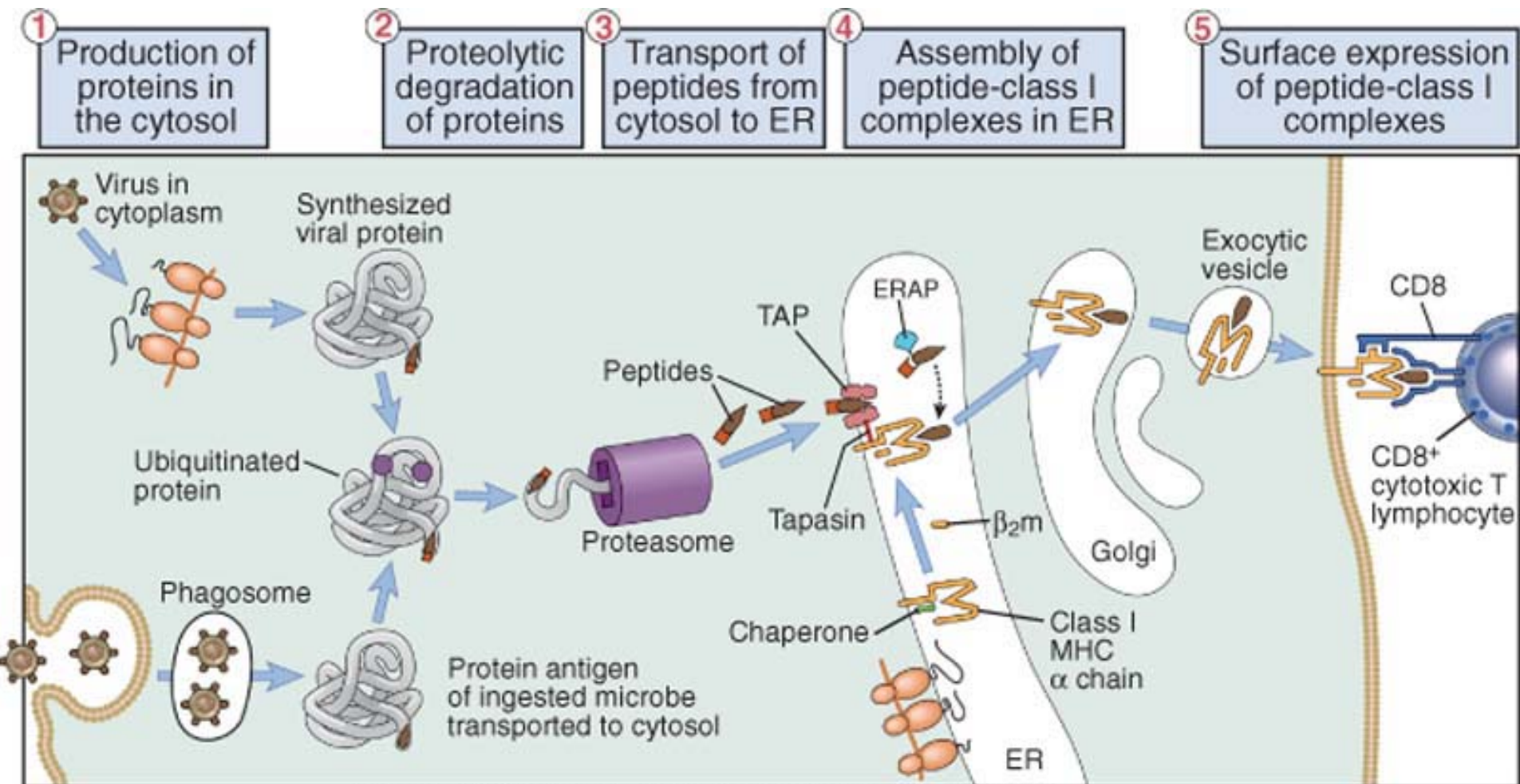
MHC/HLA



Class II pathway


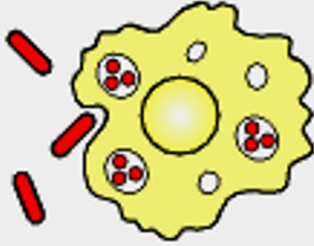
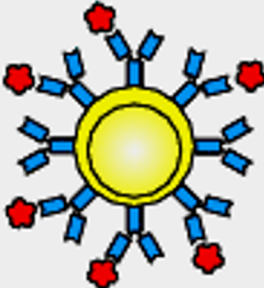


Class I pathway

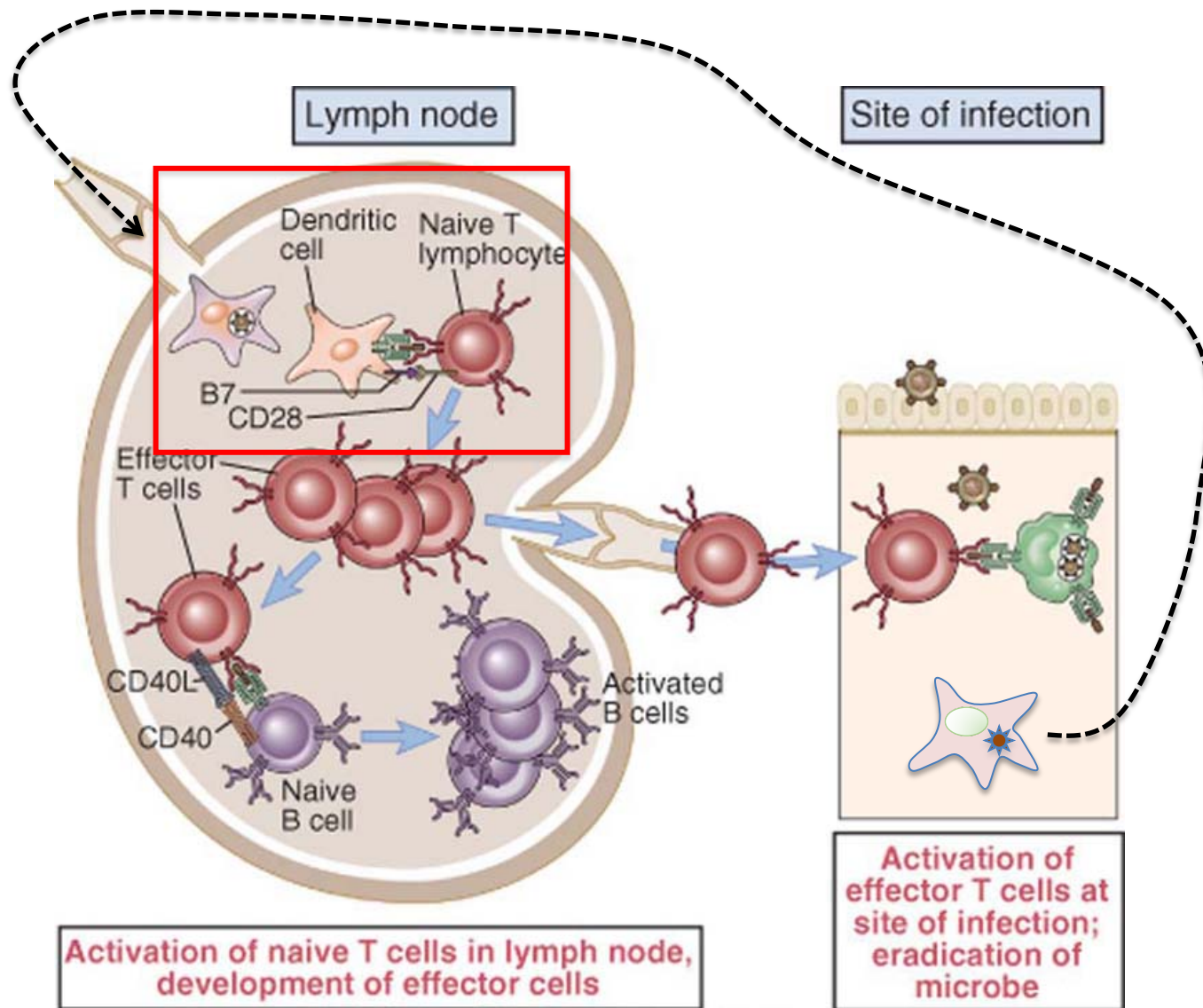


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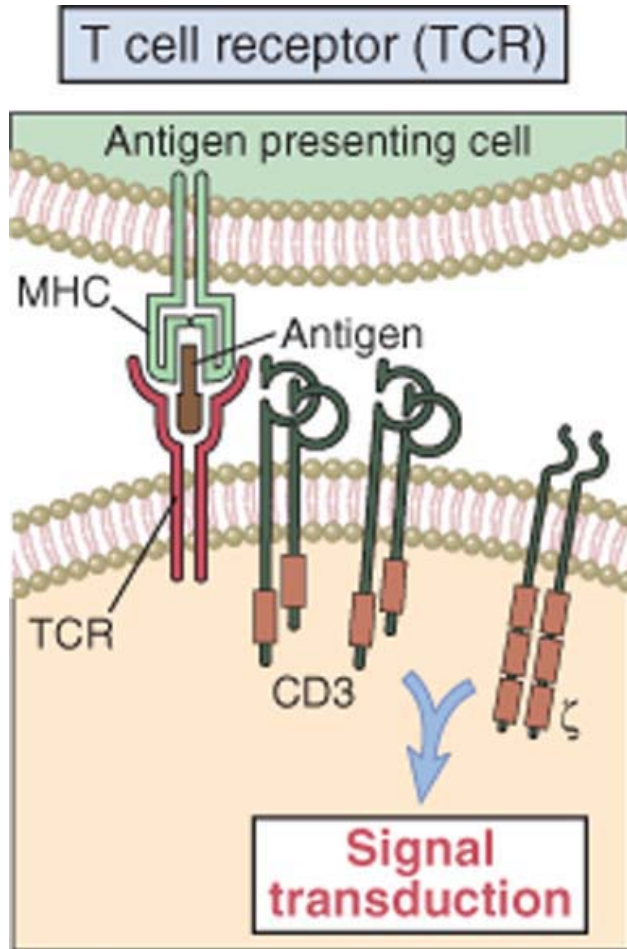
Antigen presenting cells

	Dendritic cells	Macrophages	B cells
			
Antigen uptake	+++ Macropinocytosis and phagocytosis by tissue dendritic cells Viral infection	Phagocytosis +++	Antigen-specific receptor (Ig) ++++
MHC expression	Low on tissue dendritic cells High on dendritic cells in lymphoid tissues	Inducible by bacteria and cytokines - to +++	Constitutive Increases on activation +++ to ++++
Co-stimulator delivery	Constitutive by mature, nonphagocytic lymphoid dendritic cells ++++	Inducible - to +++	Inducible - to +++
Antigen presented	Peptides Viral antigens Allergens	Particulate antigens Intracellular and extracellular pathogens	Soluble antigens Toxins Viruses
Location	Lymphoid tissue Connective tissue Epithelia	Lymphoid tissue Connective tissue Body cavities	Lymphoid tissue Peripheral blood

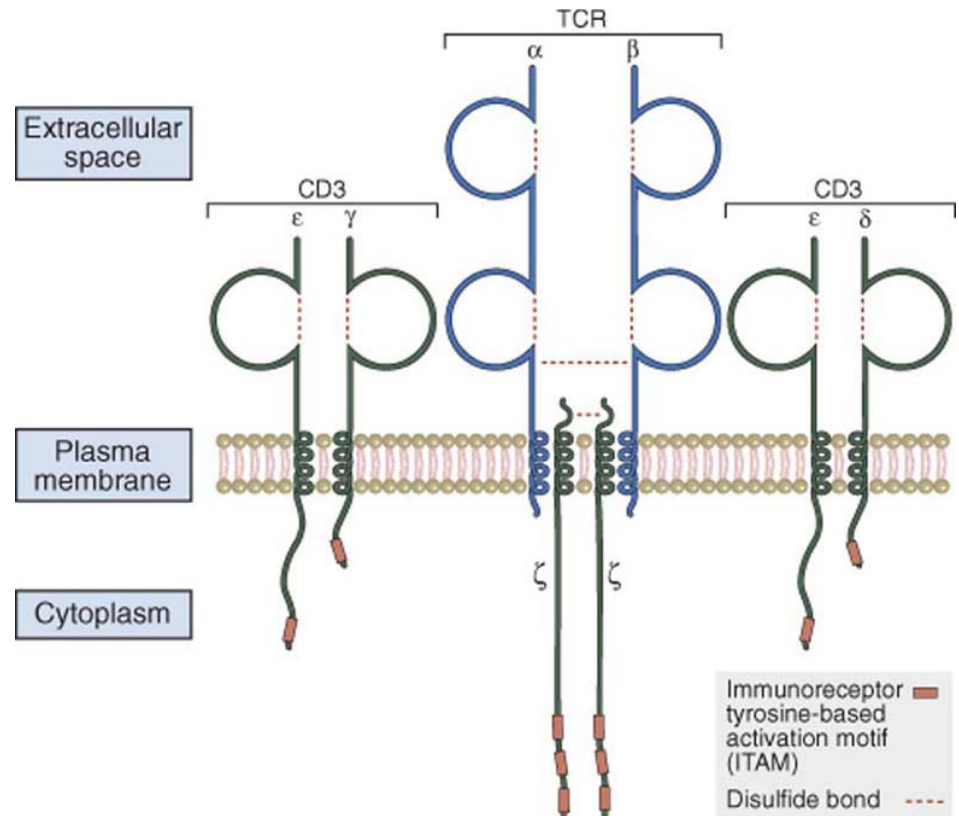
- Location, location, location.....



T cell receptor complex



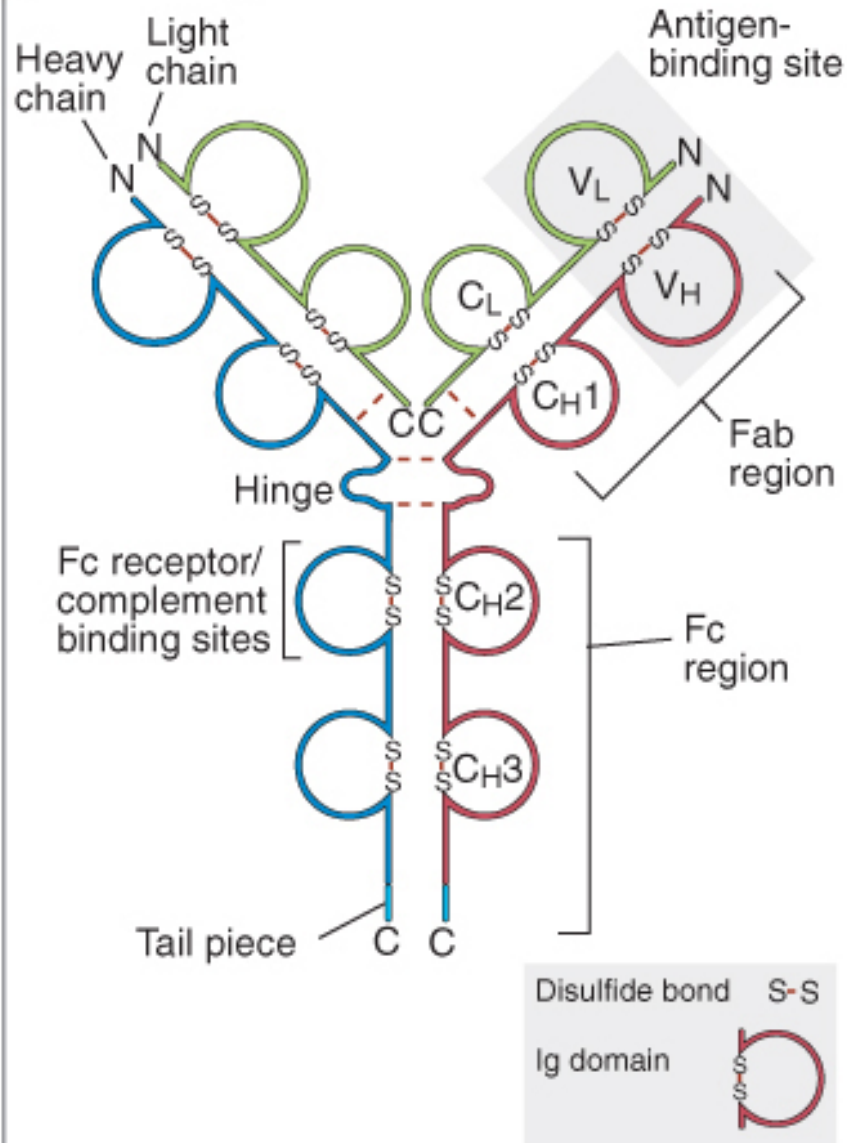
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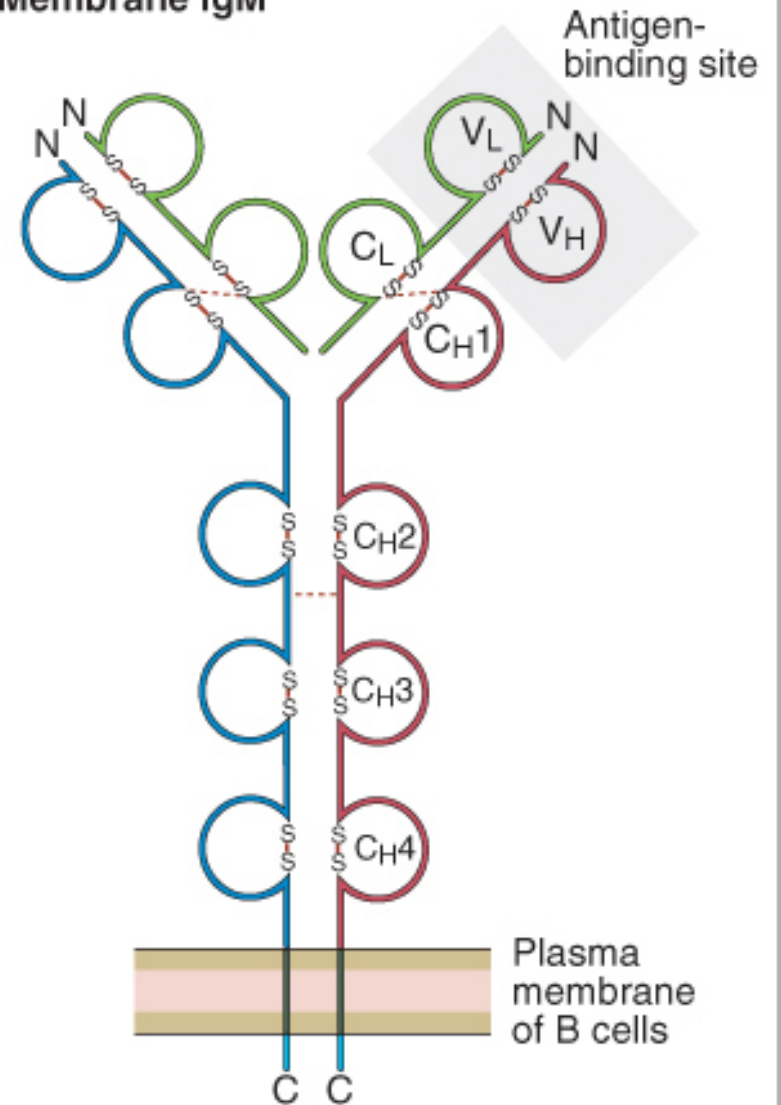
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B CELL RECEPTOR

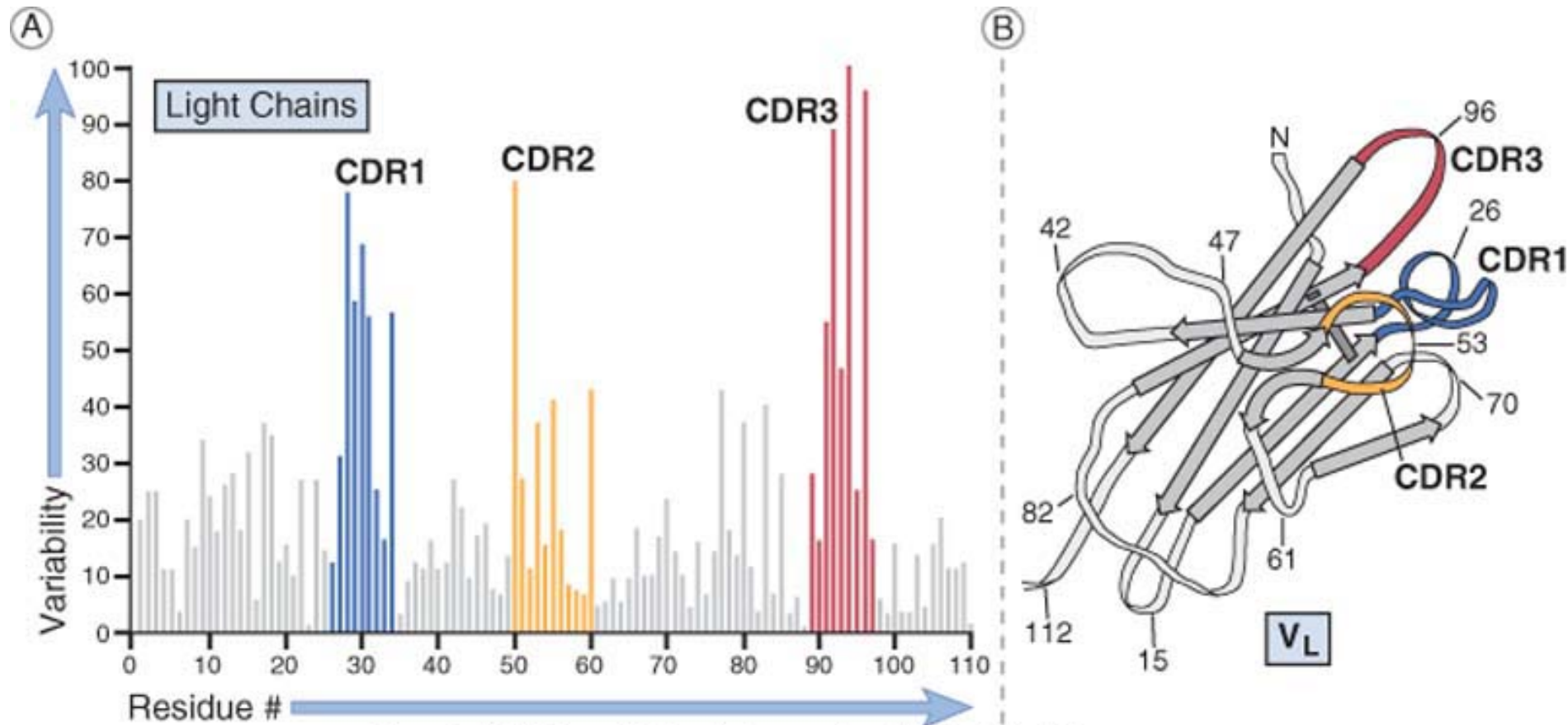
A Secreted IgG



B Membrane IgM



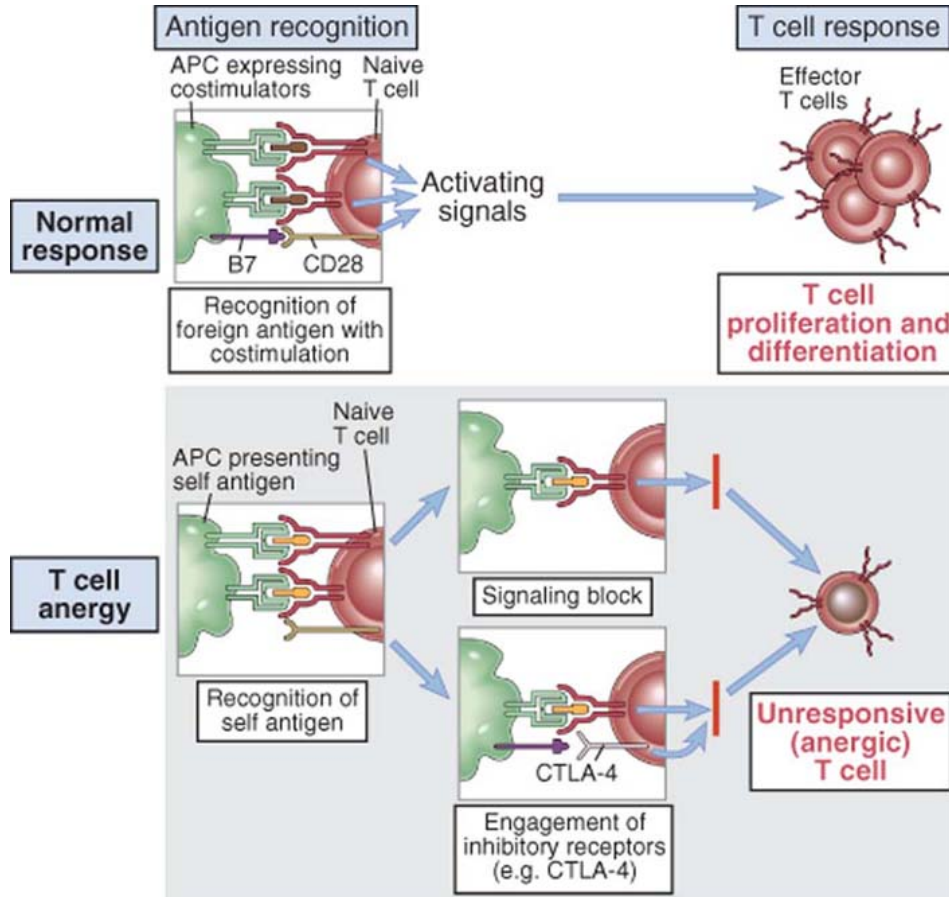
Complementary determination region



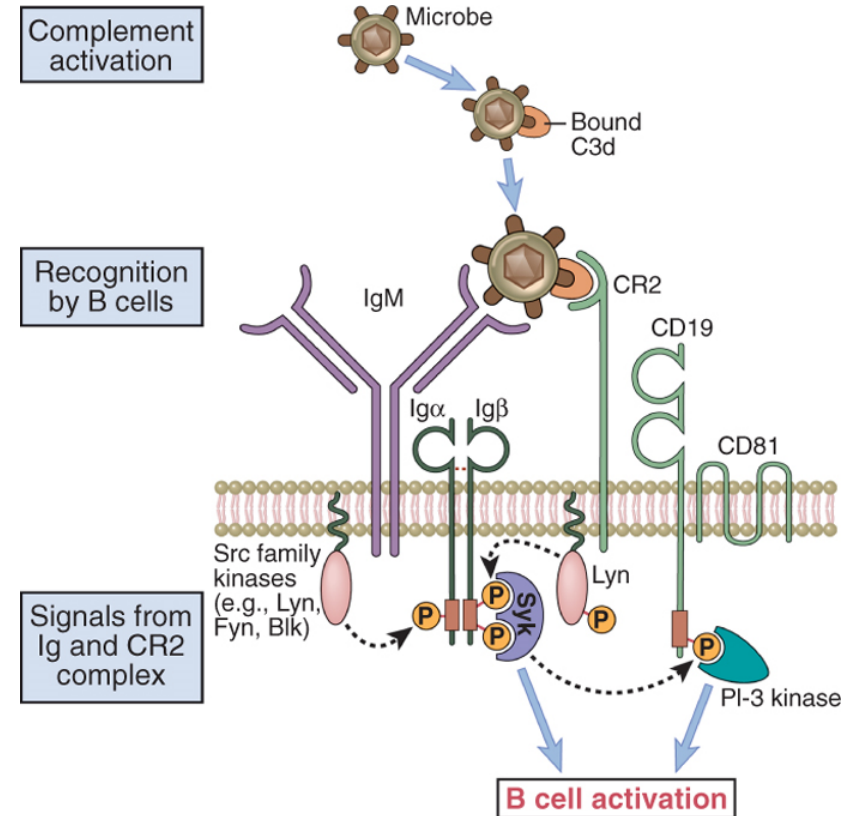
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- 1st and 2nd signals for lymphocyte activation, origin of 2nd signals

T cells

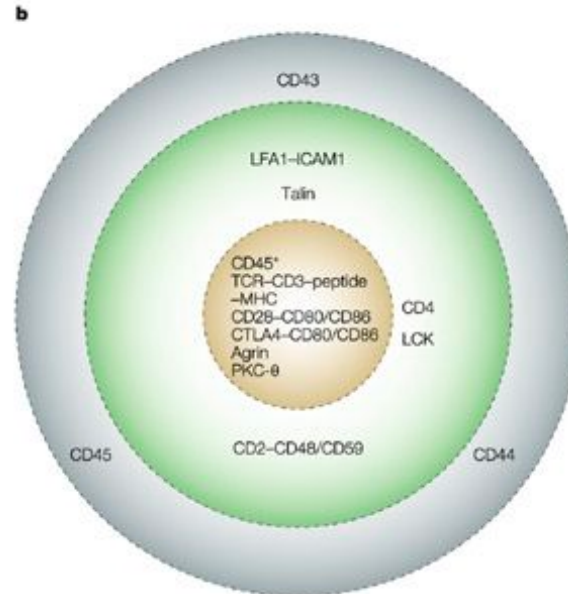
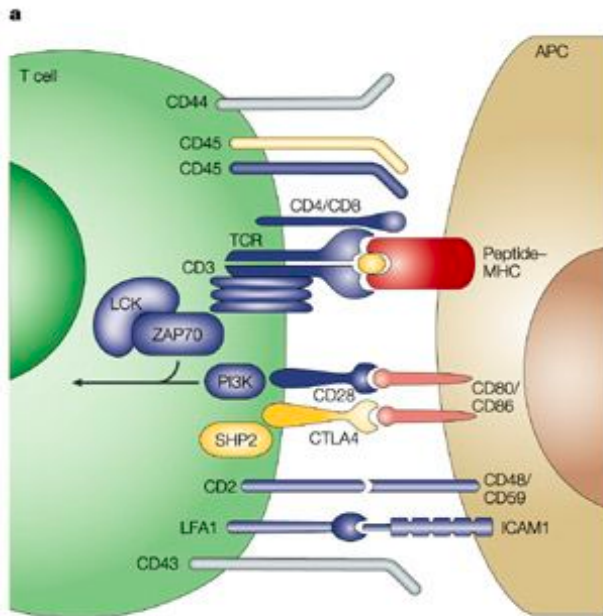
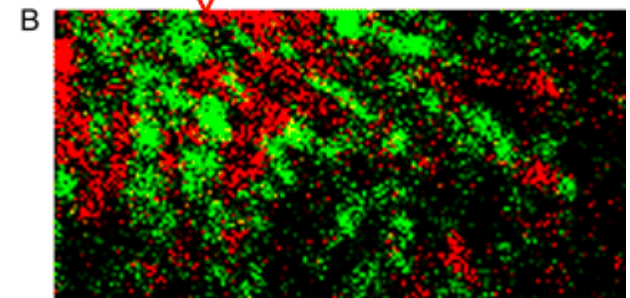
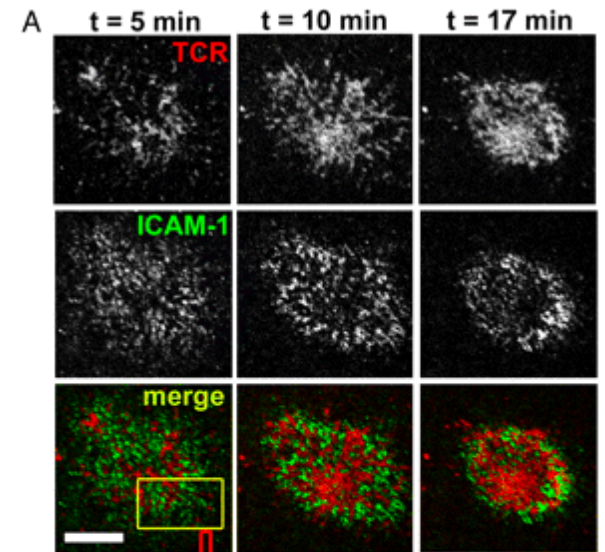
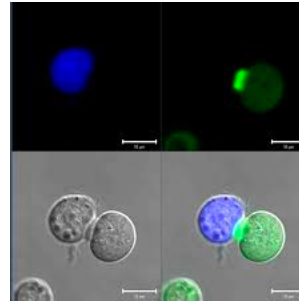
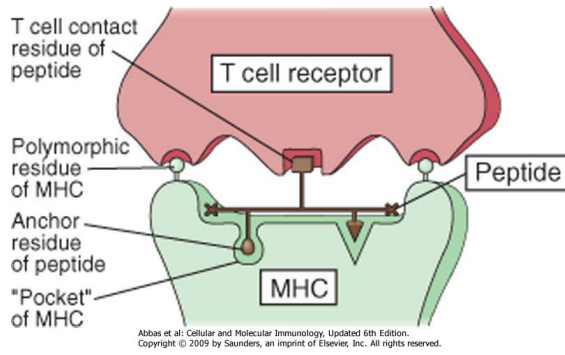


B cells – 1ary activation

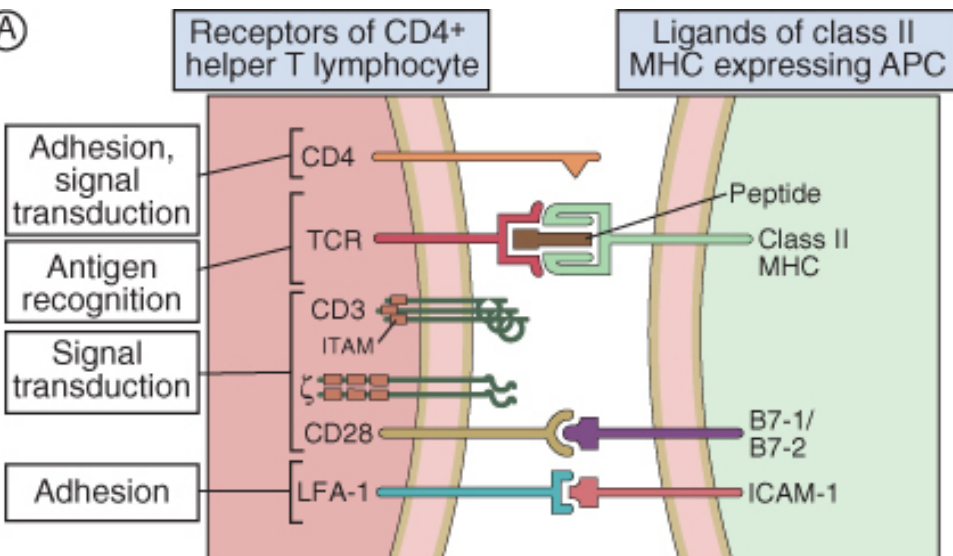


- Activation of T cells

Immunological synapse

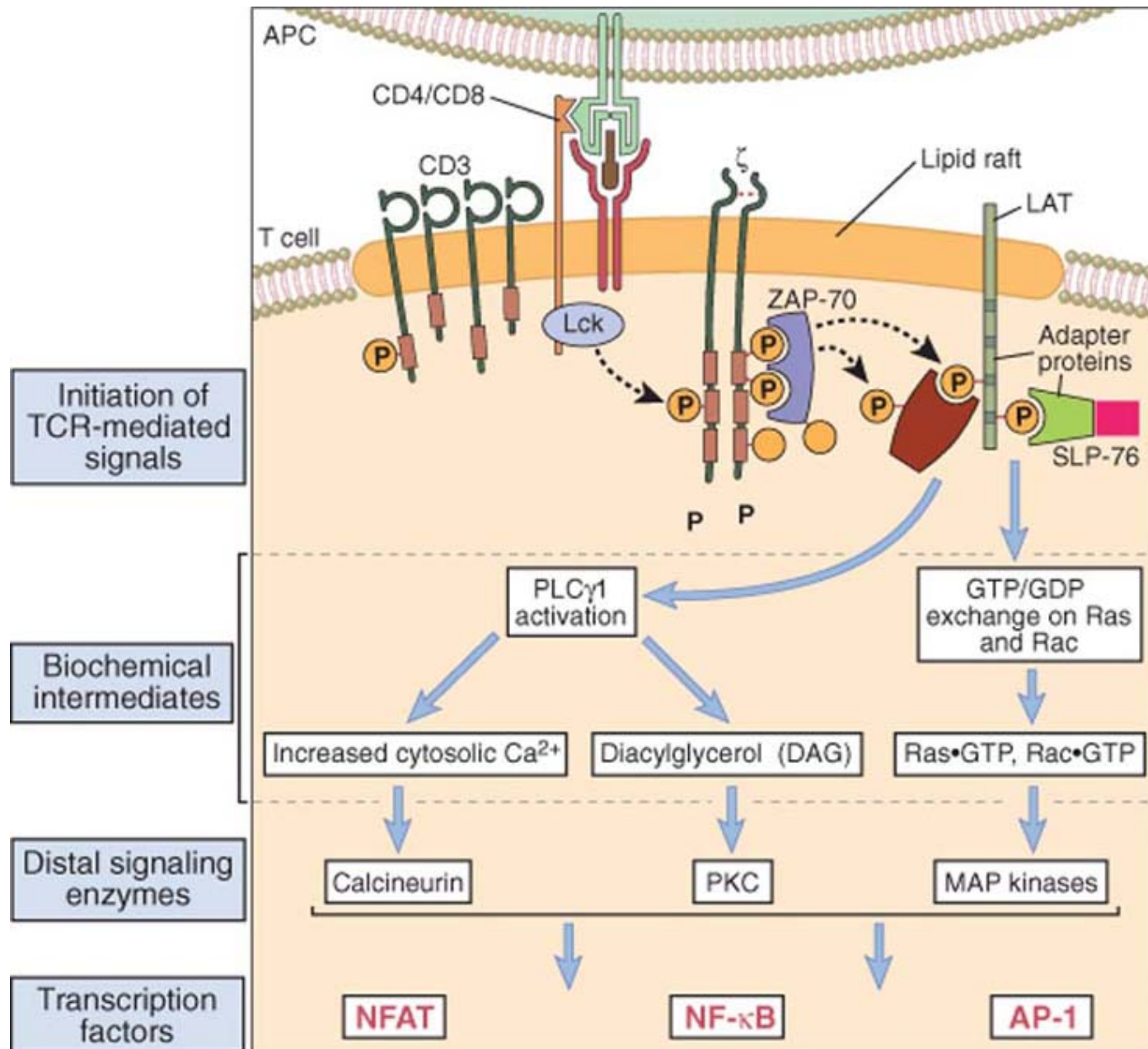


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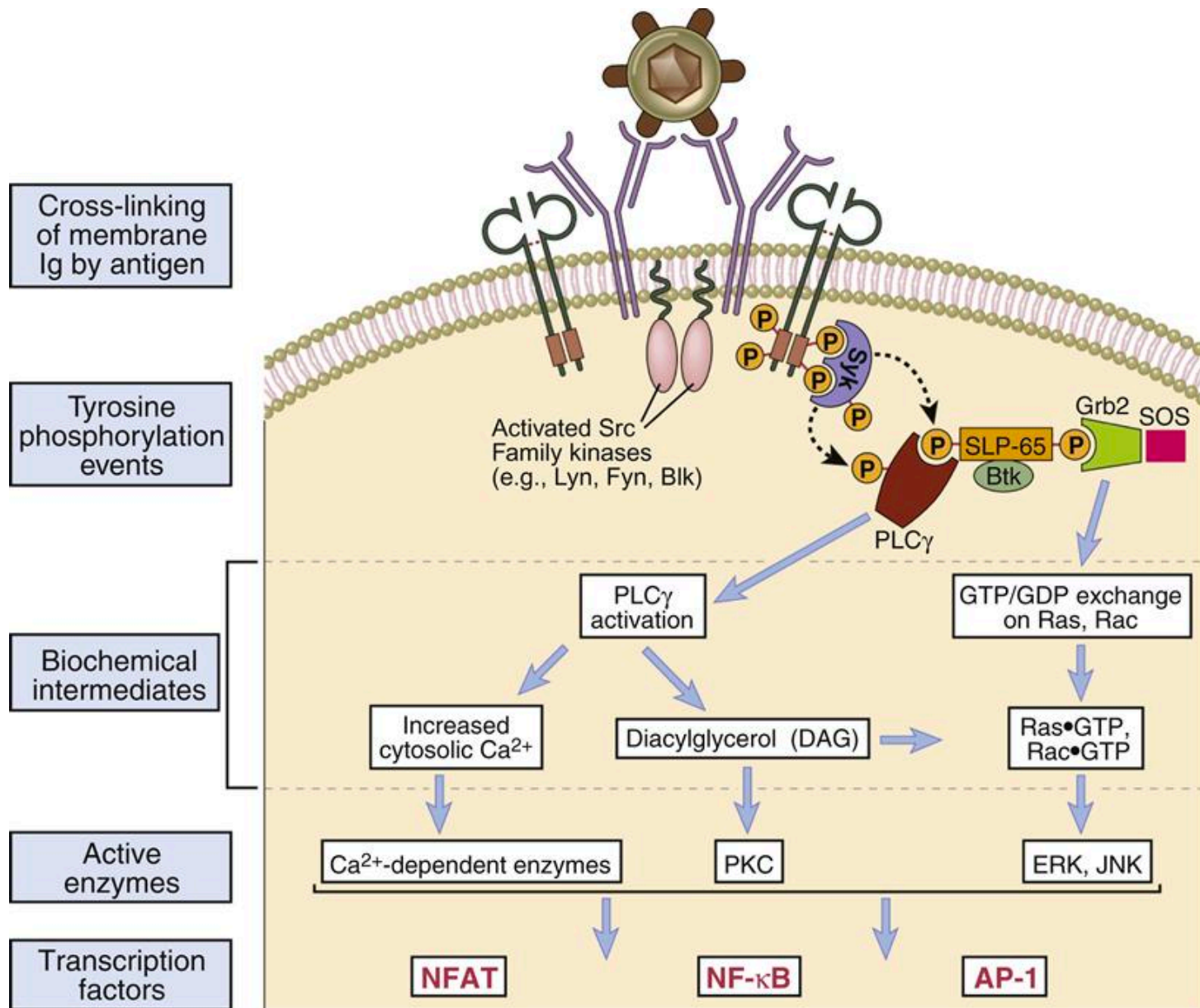


T cell accessory molecule	Function	Ligand	
		Name	Expressed on
CD3	Signal transduction by TCR complex	None	
ζ	Signal transduction by TCR complex	None	
CD4	Adhesion and signal transduction	Class II MHC	Antigen-presenting cells
CD8	Adhesion and signal transduction	Class I MHC	Antigen-presenting cells, CTL target cells
CD28	Signal transduction (costimulation)	B7-1/B7-2	Antigen-presenting cells
CTLA-4	Signal transduction (negative regulation)	B7-1/B7-2	Antigen-presenting cells
LFA-1	Adhesion	ICAM-1	Antigen-presenting cells, endothelium
VLA-4	Adhesion	VCAM-1	Endothelium

T cell activation



Primary B cell activation



Results of lymphocyte activation:

- Clonal expansion
- Production of antibodies by B lymphocytes
- Effector T cell responses – CD4 differentiation, CD8 activation