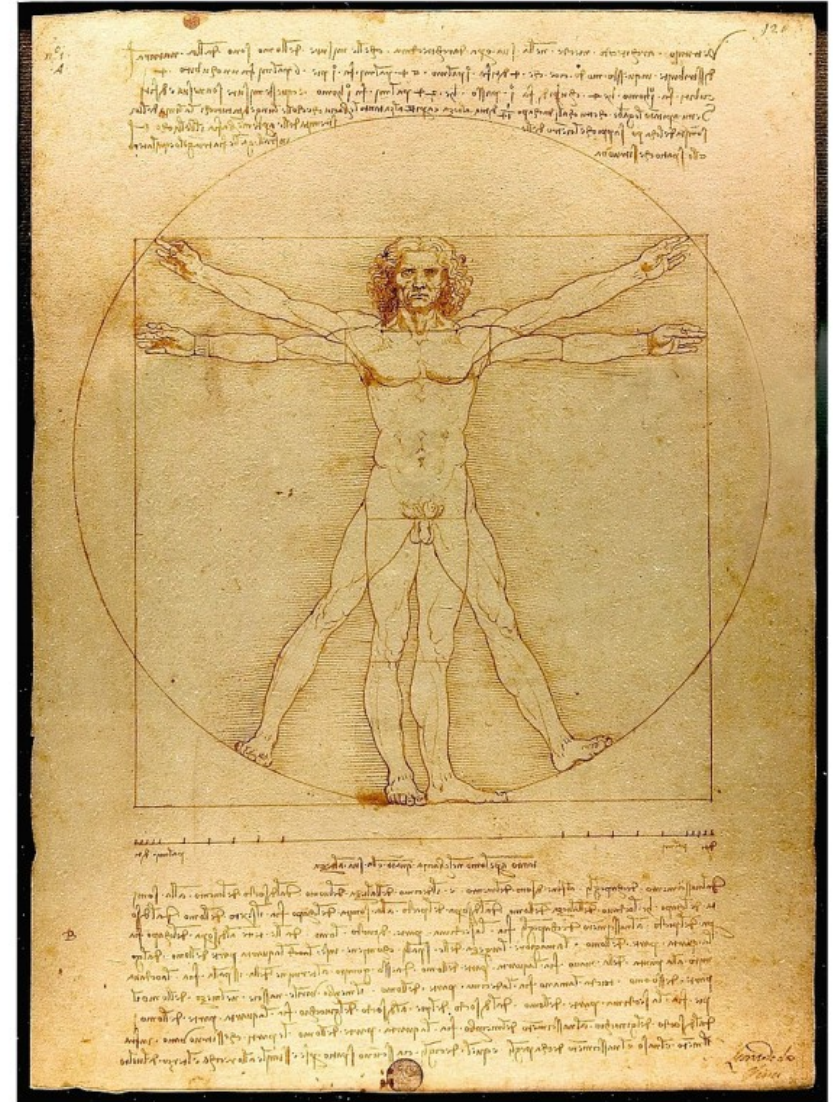


Lenfosit reseptör genlerinin organizasyonu

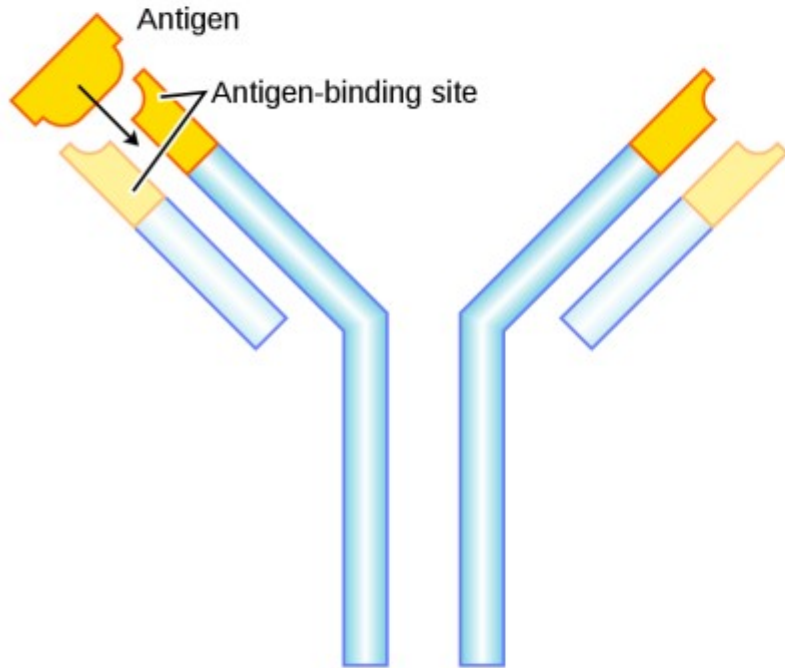
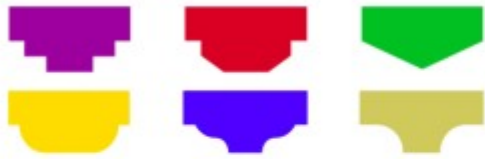
Angel of the West - Julian Voss-Andreae



Vitruvian Man - Leonardo da Vinci

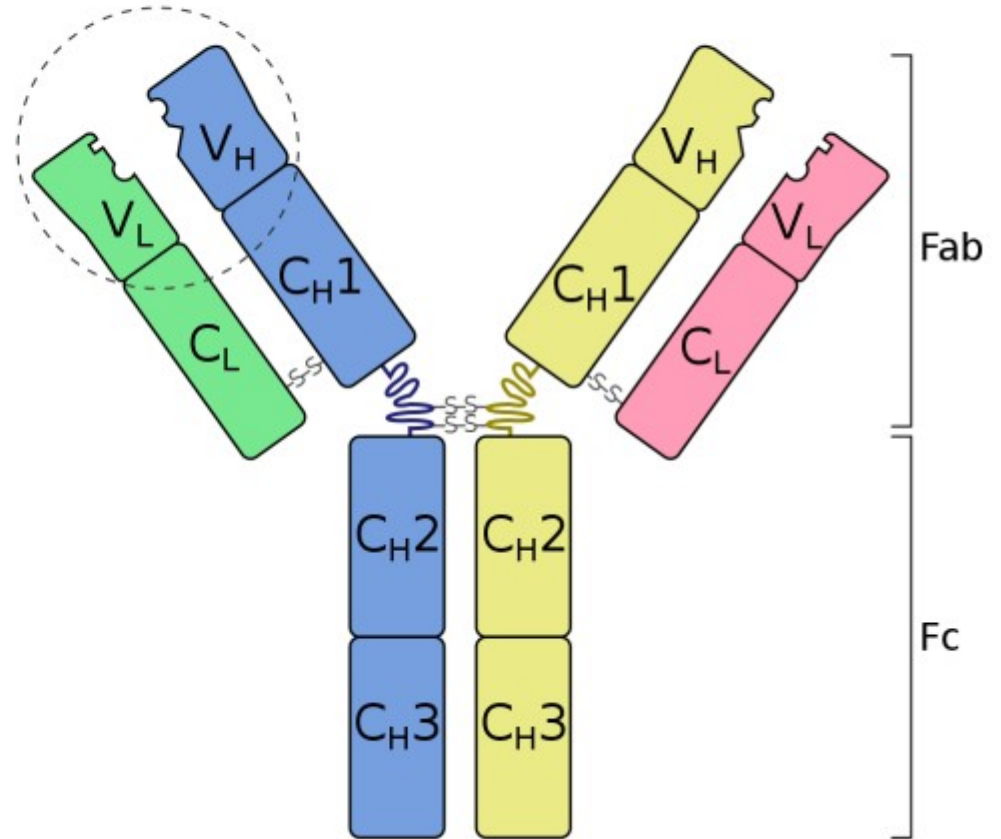


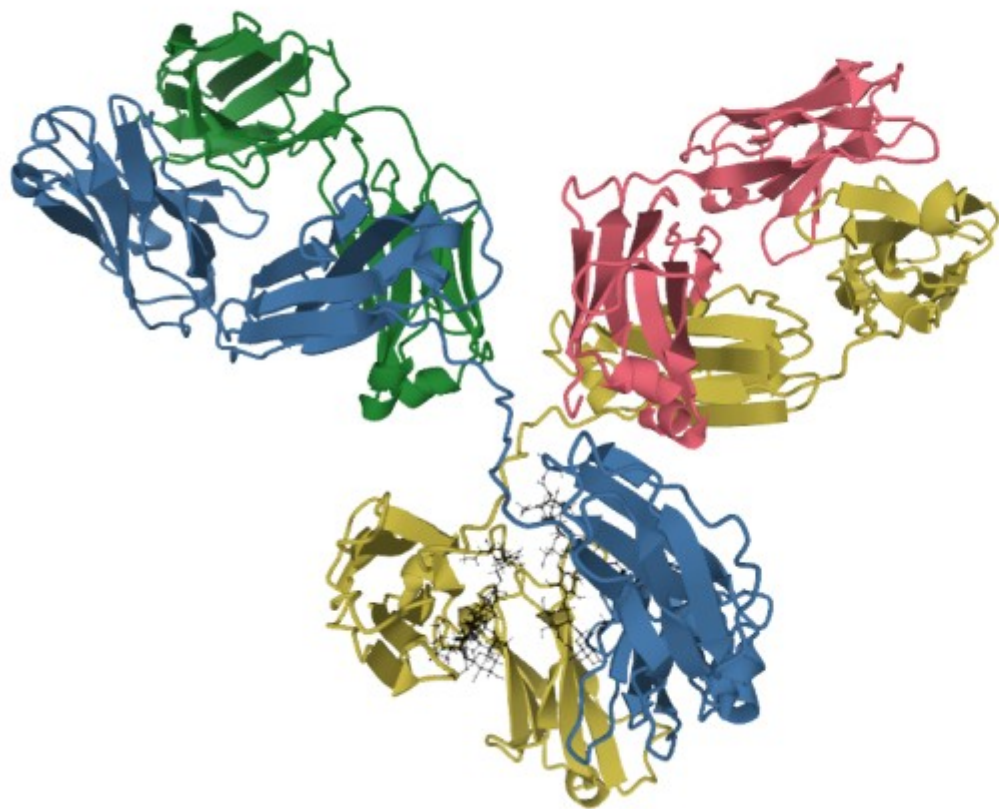
Antigens



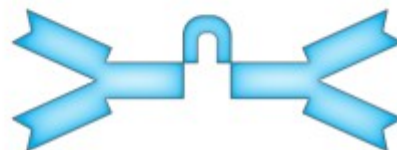
Antibody

<https://en.wikipedia.org/wiki/Antibody>

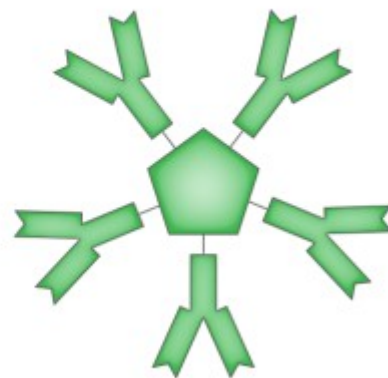




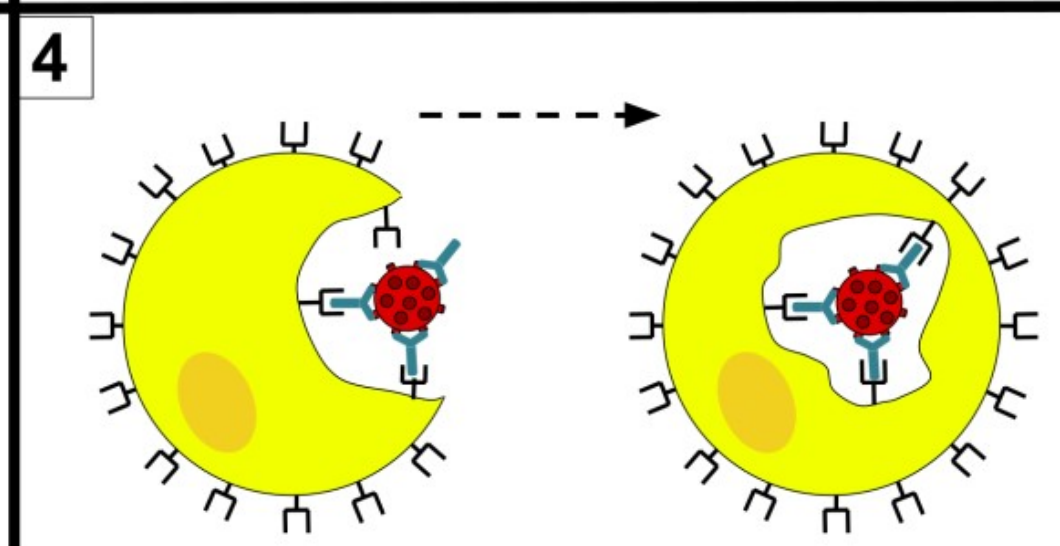
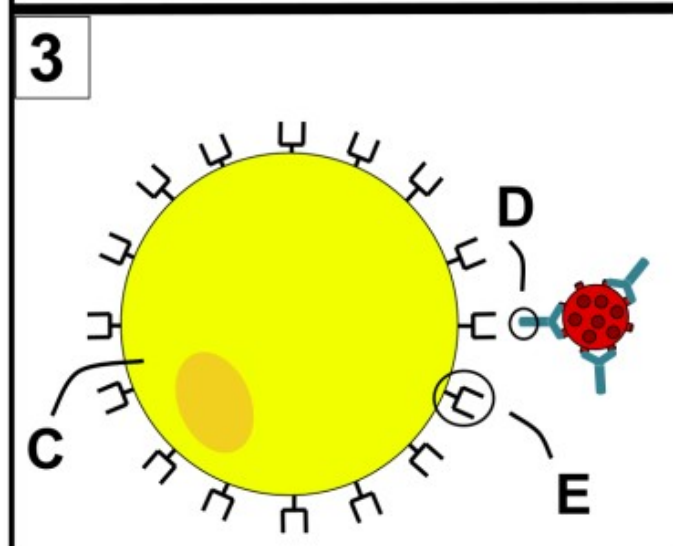
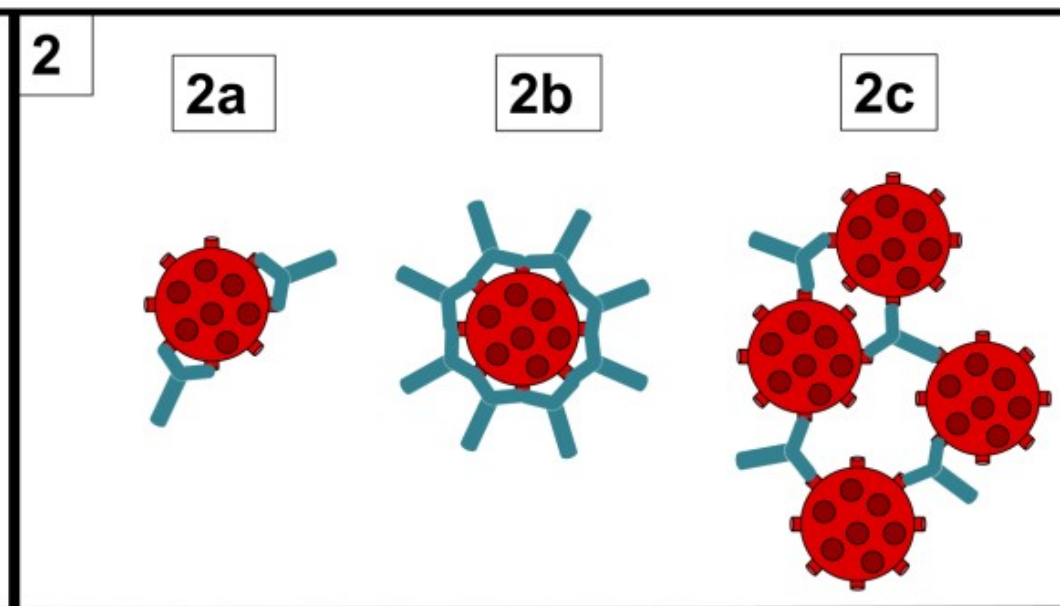
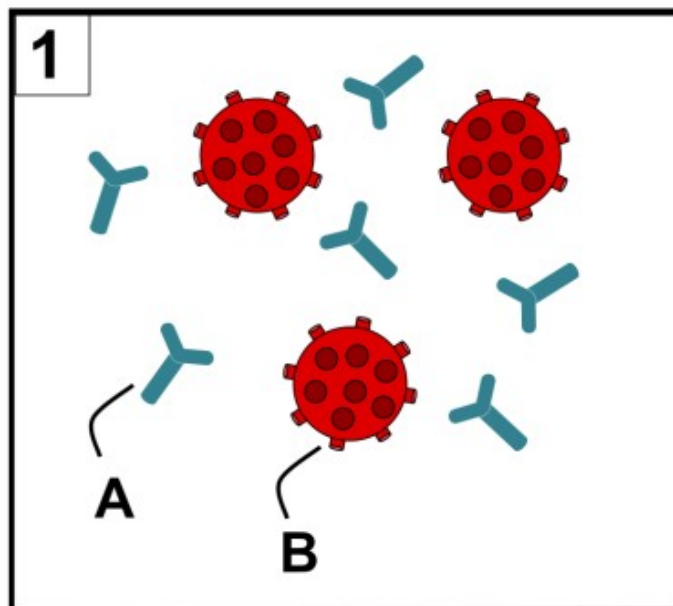
Monomer
IgD, IgE, IgG

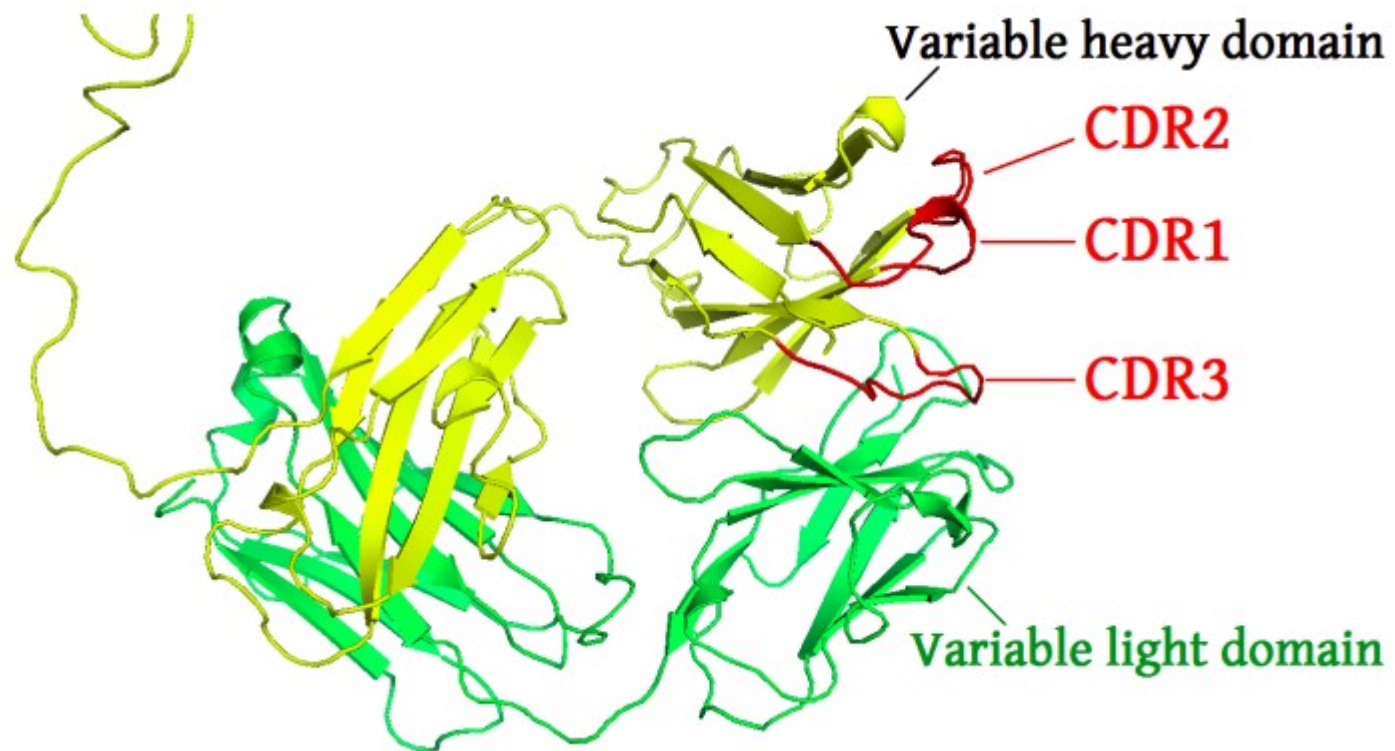


Dimer
IgA

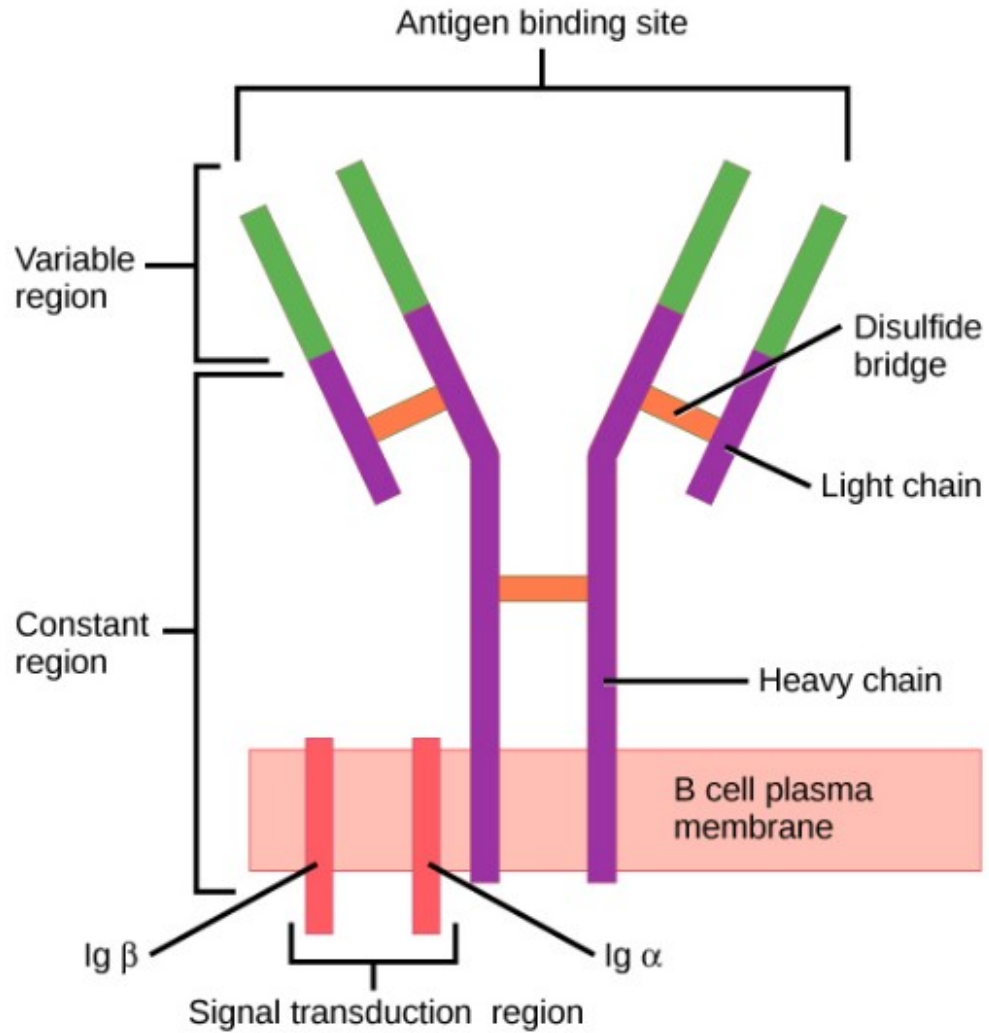


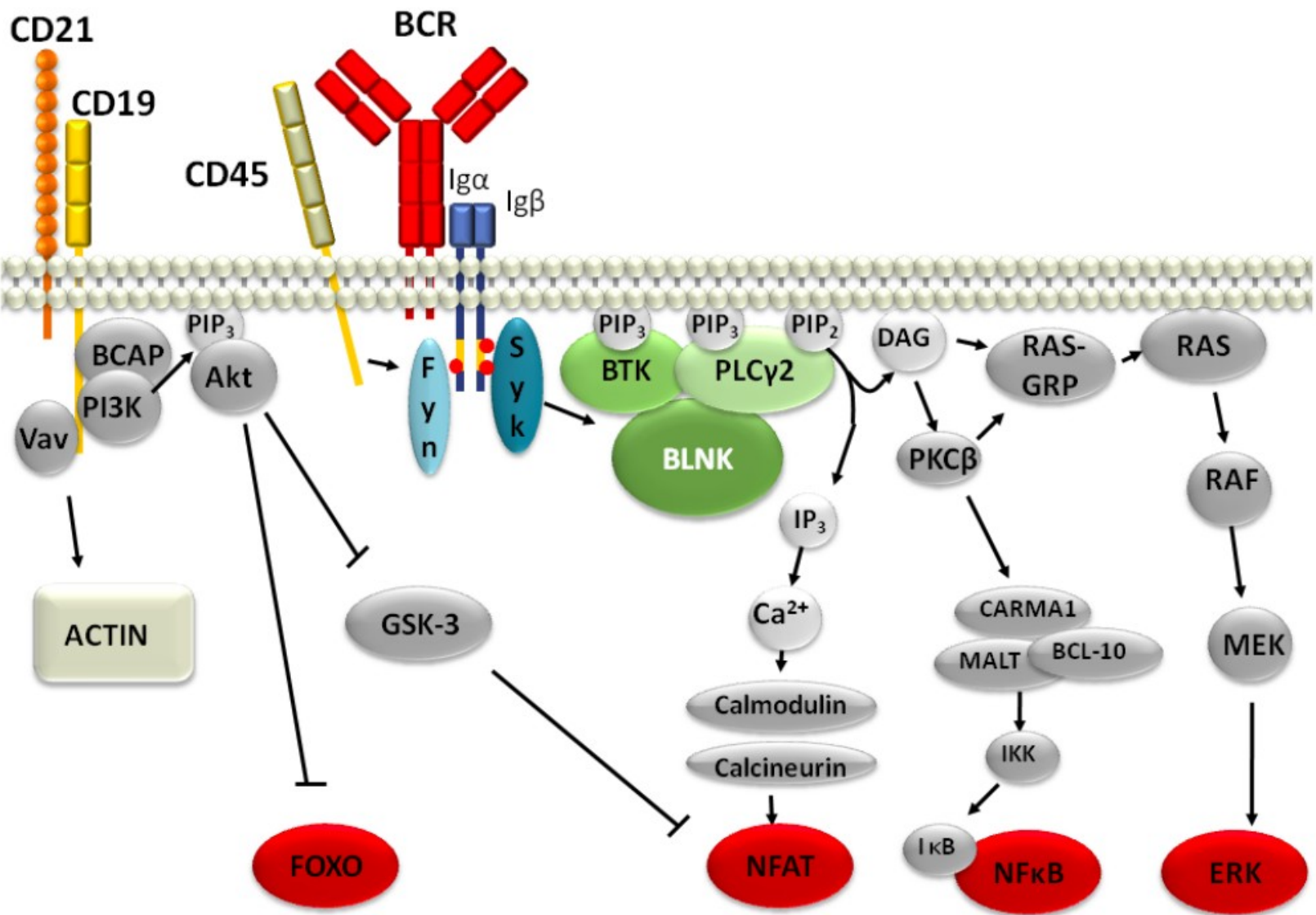
Pentamer
IgM





Class	Subclasses	Description
IgA	2	Found in mucosal areas, such as the gut, respiratory tract and urogenital tract, and prevents colonization by pathogens.[25] Also found in saliva, tears, and breast milk.
IgD	1	Functions mainly as an antigen receptor on B cells that have not been exposed to antigens.[26] It has been shown to activate basophils and mast cells to produce antimicrobial factors.[27]
IgE	1	Binds to allergens and triggers histamine release from mast cells and basophils, and is involved in allergy. Also protects against parasitic worms. [5]
IgG	4	In its four forms, provides the majority of antibody-based immunity against invading pathogens.[5] The only antibody capable of crossing the placenta to give passive immunity to the fetus.
IgM	1	Expressed on the surface of B cells (monomer) and in a secreted form (pentamer) with very high avidity. Eliminates pathogens in the early stages of B cell-mediated (humoral) immunity before there is sufficient IgG.[5][26]
IgY		Found in birds and reptiles; related to mammalian IgG.[31]
IgW		Found in sharks and skates; related to mammalian IgD.[32]





[https://en.wikipedia.org/wiki/V\(D\)J_recombination](https://en.wikipedia.org/wiki/V(D)J_recombination)

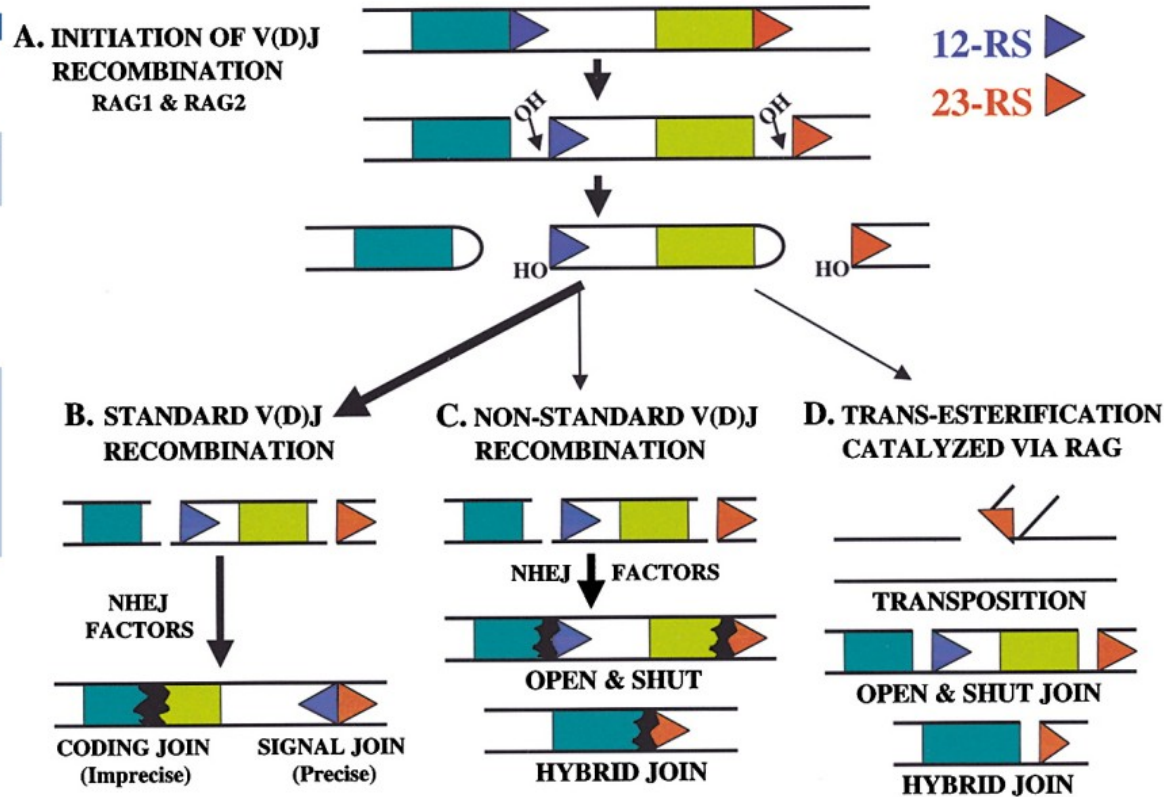
immunoglobulin heavy locus (IGH@) → chromosome 14

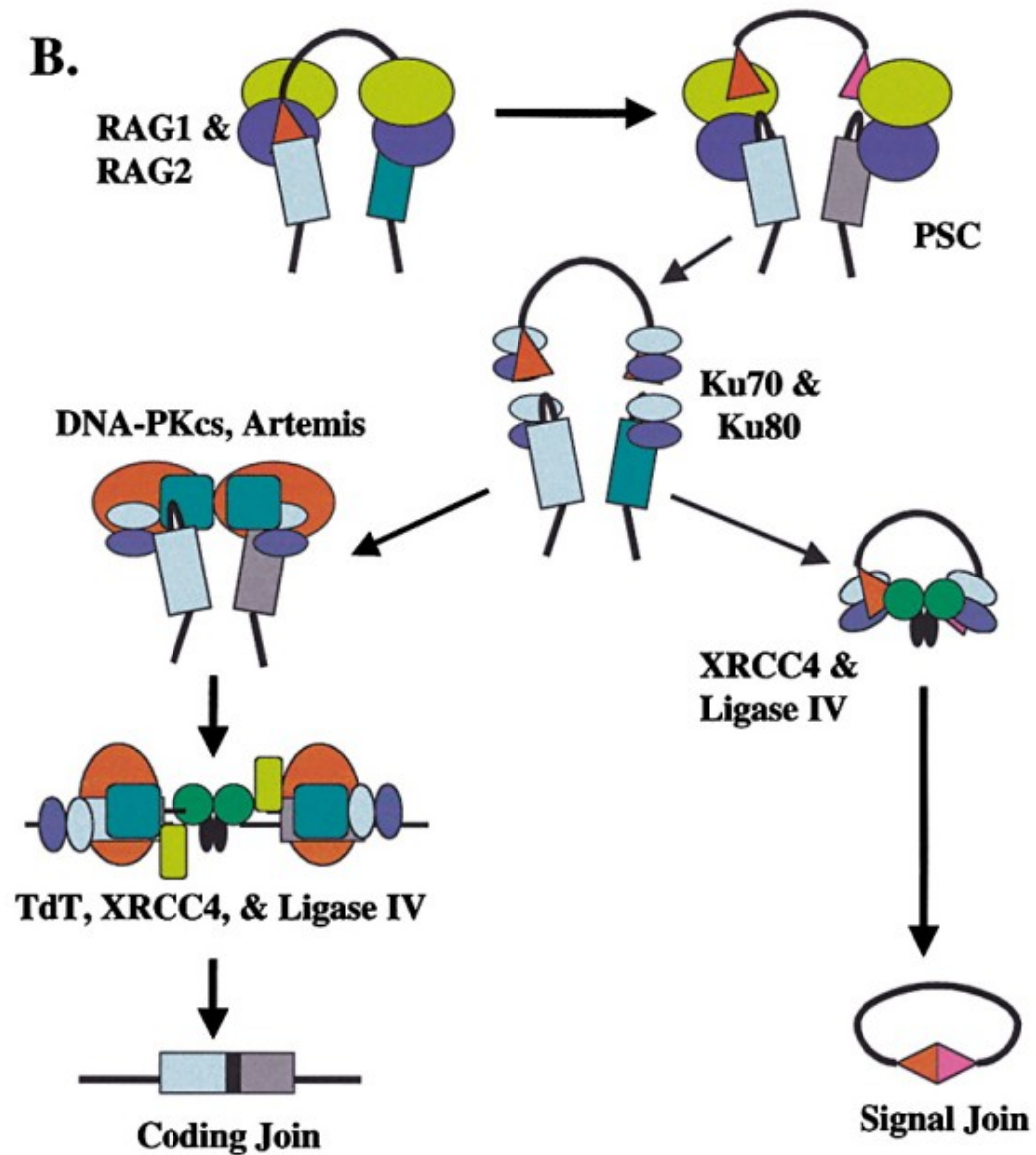
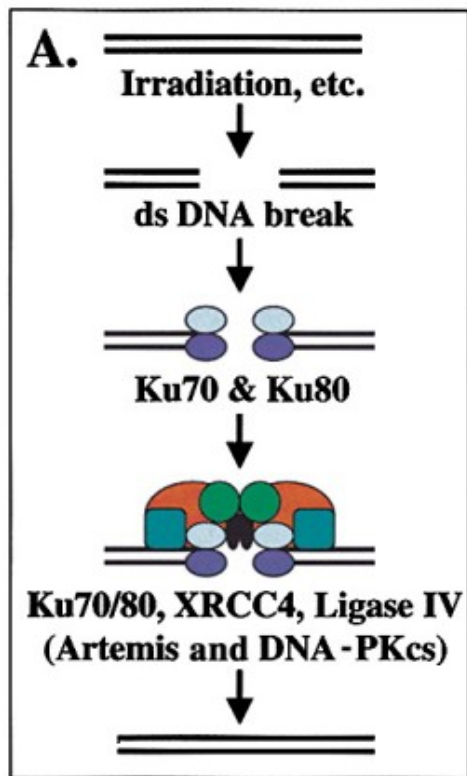
immunoglobulin kappa (κ) locus (IGK@) → chromosome 2

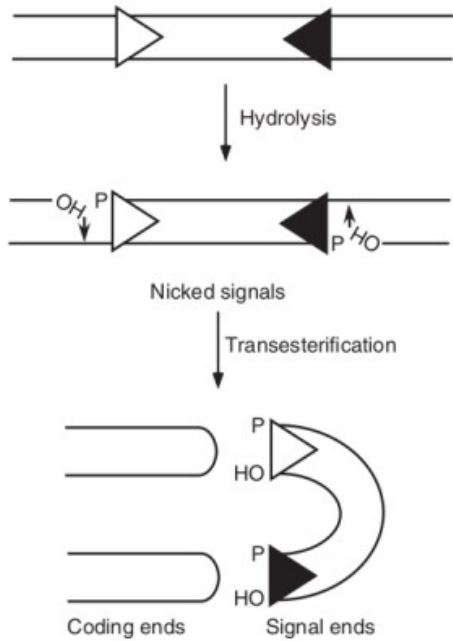
immunoglobulin lambda (λ) locus (IGL@) → chromosome 22

Bassing CH, Swat W, Alt FW. The mechanism and regulation of chromosomal V(D)J recombination. Cell. 2002 Apr;109 Suppl:S45-55. doi: 10.1016/s0092-8674(02)00675-x. PMID: 11983152.

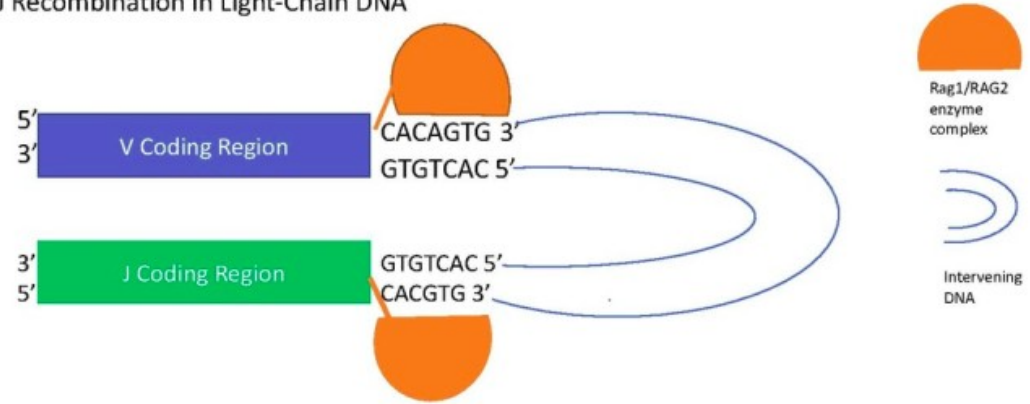
Genotype	Phenotypes	References
TdT deficiency	Normal B and T cell Development Reduced junctional diversity (no N nucleotides)	Gilfillan et al. 1993, Komori et al. 1993
RAG-1 or RAG-2 deficiency	Complete block in B and T cell development No other phenotypes	Mombaerts et al. 1992, Shinkai et al. 1992
DNA-PKcs deficiency (classical SCID)	Leaky block in B and T cell development (coding joining) Ionizing radiation sensitivity (variable) Normal size mice; no cell proliferation defects	Bosma and Carroll 1991, Gao et al. 1998a, Taccioli et al. 1998, Kurimasa et al. 1999
Ku70 or Ku80 deficiency	Leaky block in B and T cell development (RS and coding joining) Increased IR sensitivity Small size mice; cell proliferation defects Increased neuronal apoptosis	Nussenzweig et al. 1996, Zhu et al. 1996, Gu et al. 1997, Gu et al. 2000, Ouyang et al. 1997
XRCC4 or Ligase 4 deficiency	Block in B and T cell development (RS and Coding joining) Increased IR sensitivity Cell proliferation defects Late embryonic lethality and severe neuronal apoptosis (rescued by p53 deficiency)	Barnes et al. 1998, Frank et al. 1998, Frank et al. 2000, Gao et al. 1998b



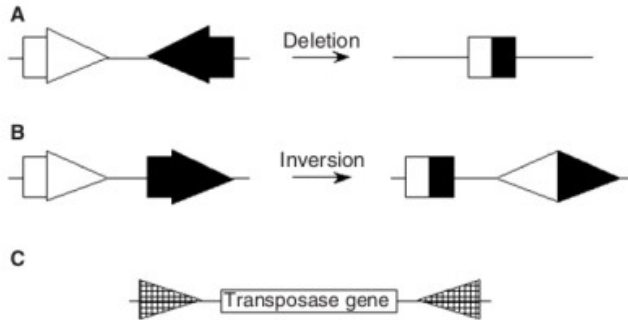


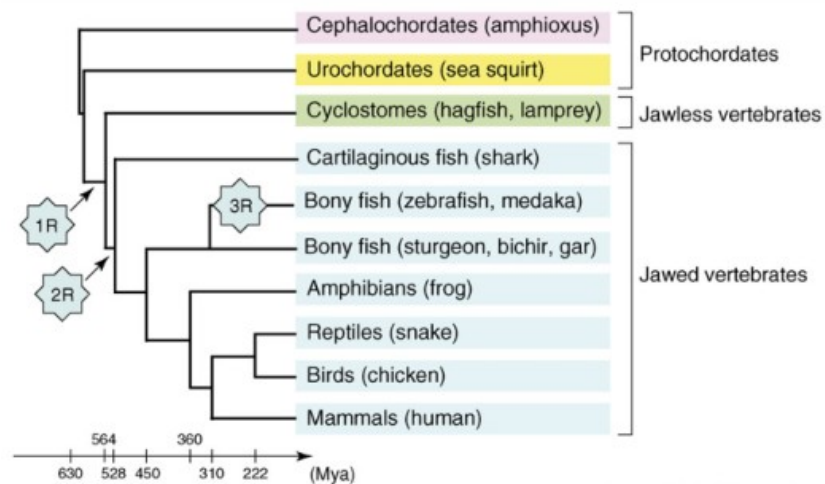


VJ Recombination in Light-Chain DNA



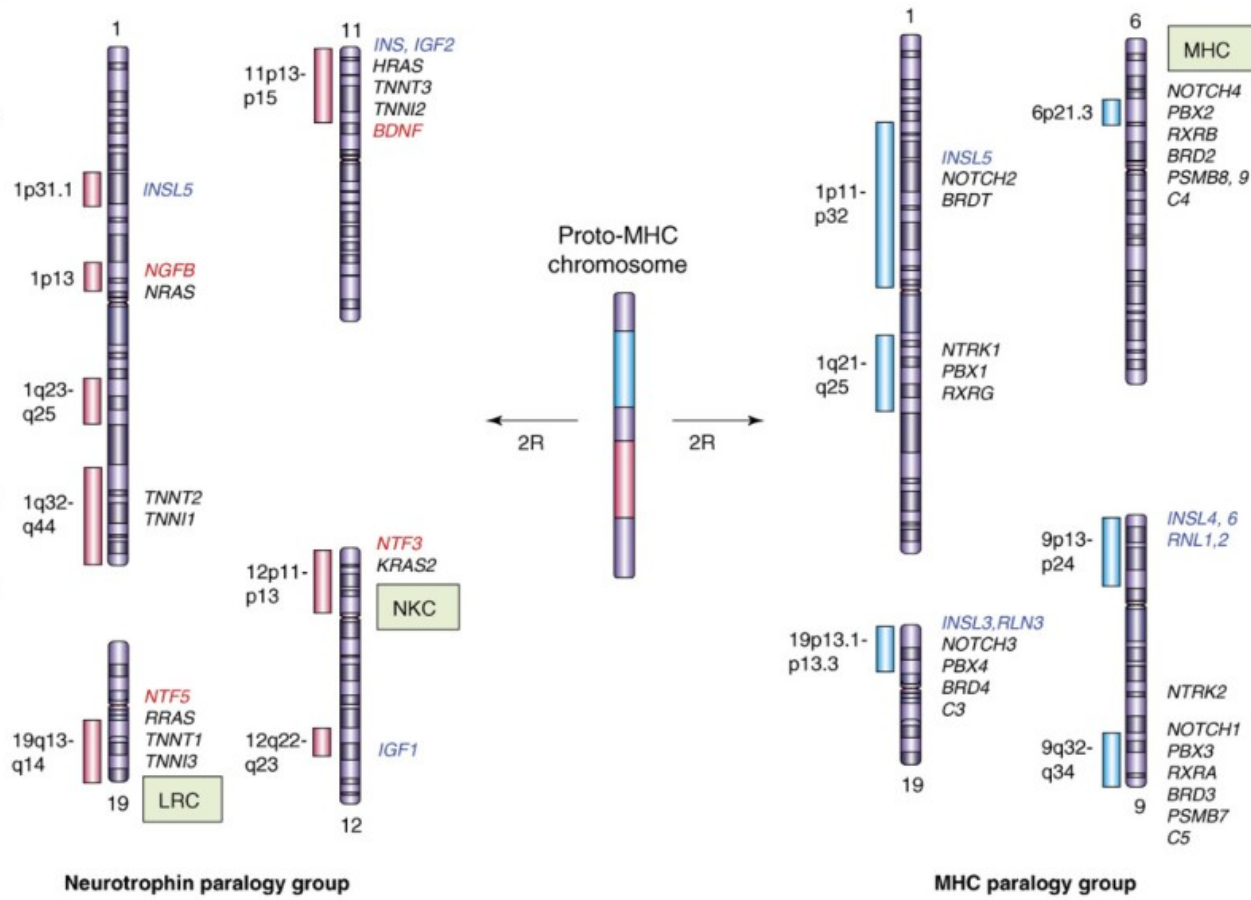
https://en.wikipedia.org/wiki/Recombination-activating_gene



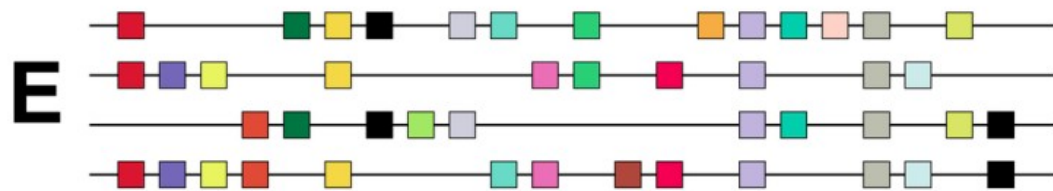
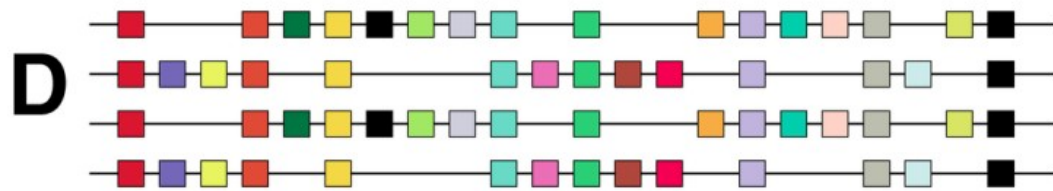
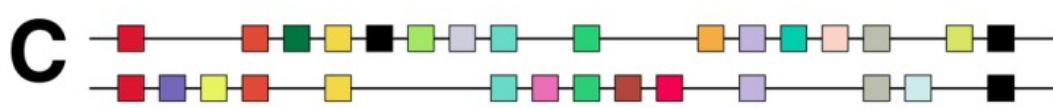
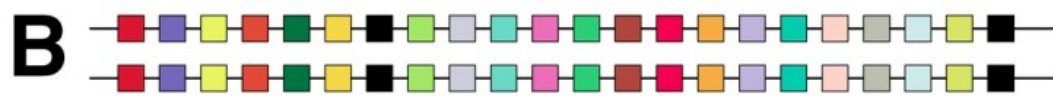
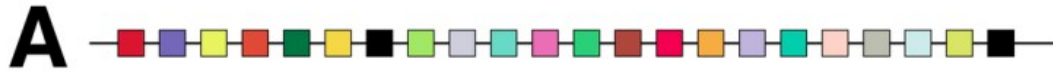


Current Opinion in Immunology

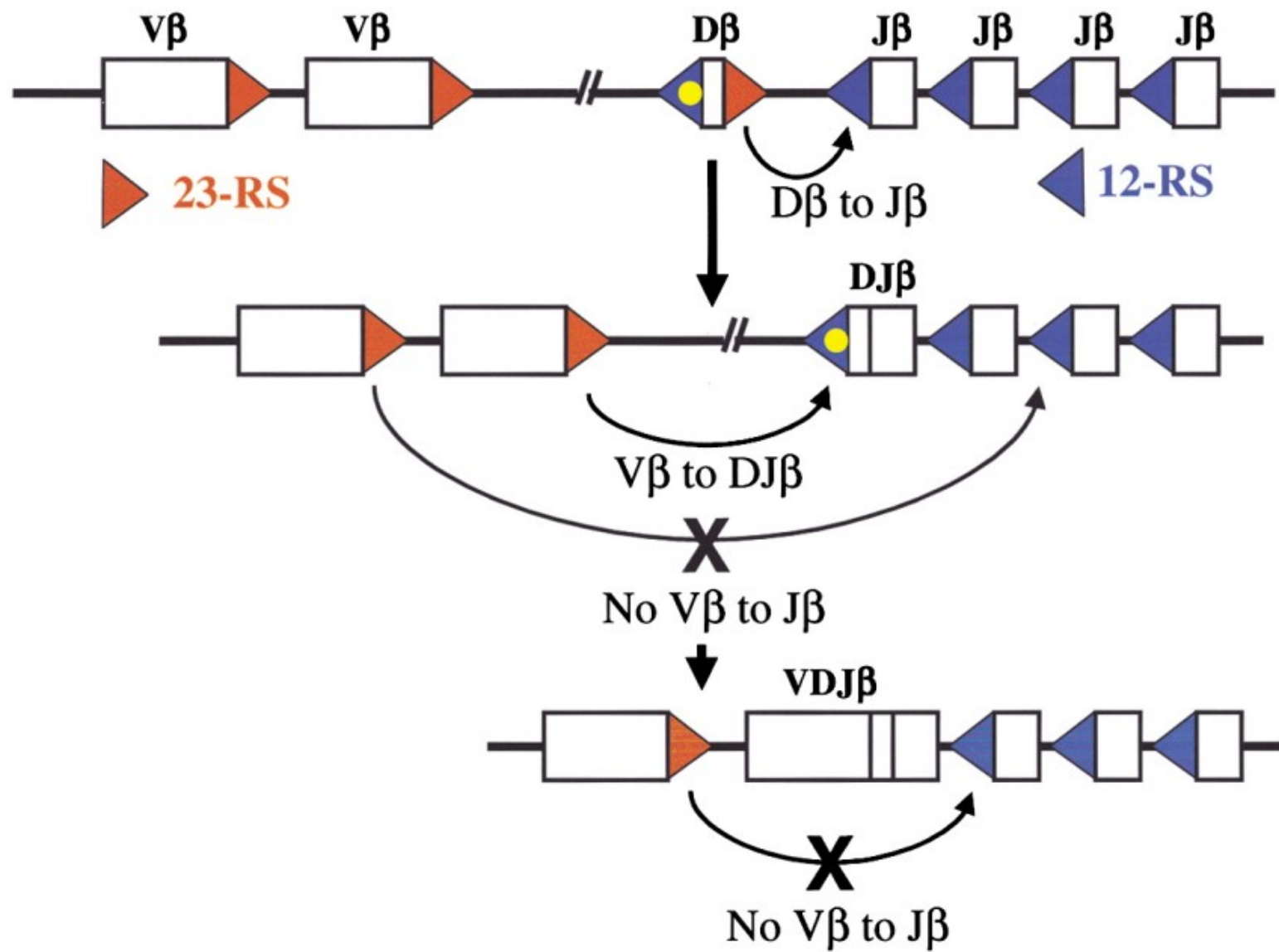
Kasahara M. The 2R hypothesis: an update. *Curr Opin Immunol.* 2007 Oct;19(5):547-52. doi: 10.1016/j.coi.2007.07.009. Epub 2007 Aug 17. PMID: 17707623.



Current Opinion in Immunology



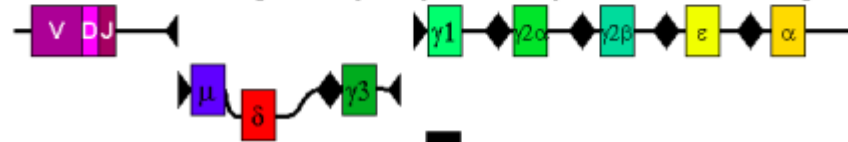
https://en.wikipedia.org/wiki/2R_hypothesis



Genes in heavy chain locus of an IgM expressing B cell



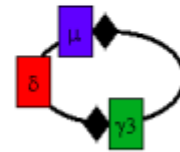
Removal of DNA segment by enzyme activity between switch regions



Non-homologous end joining of DNA at switch regions



Genes in heavy chain locus of an IgG expressing B cell



Excised DNA segment