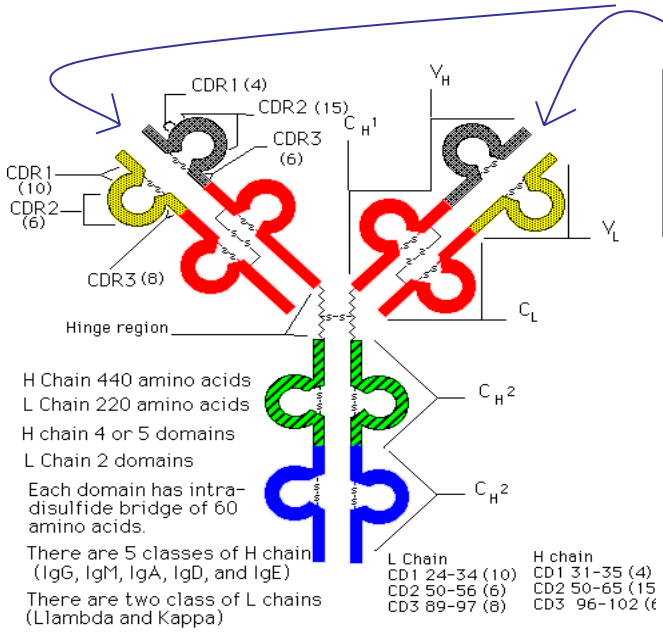
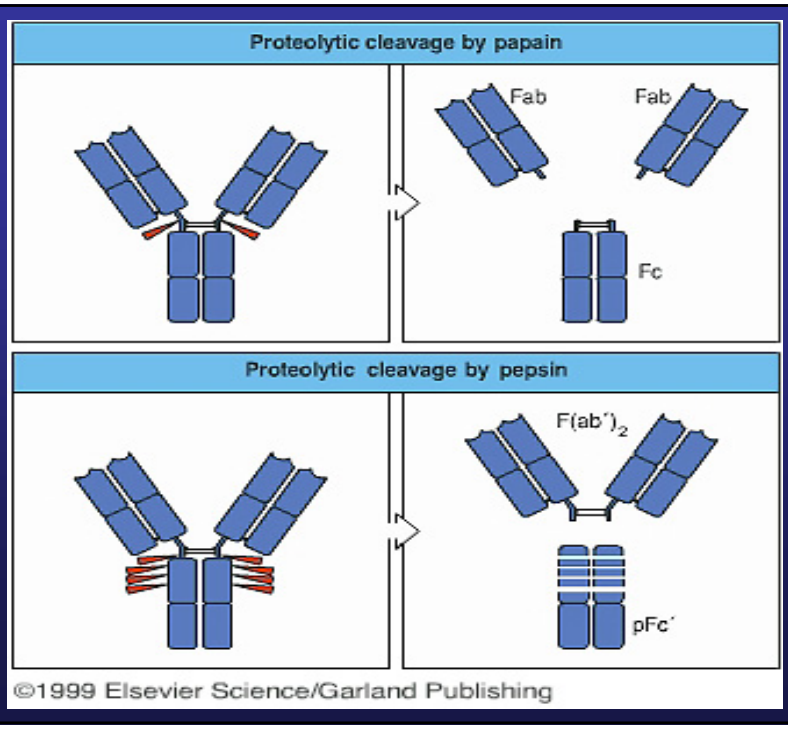
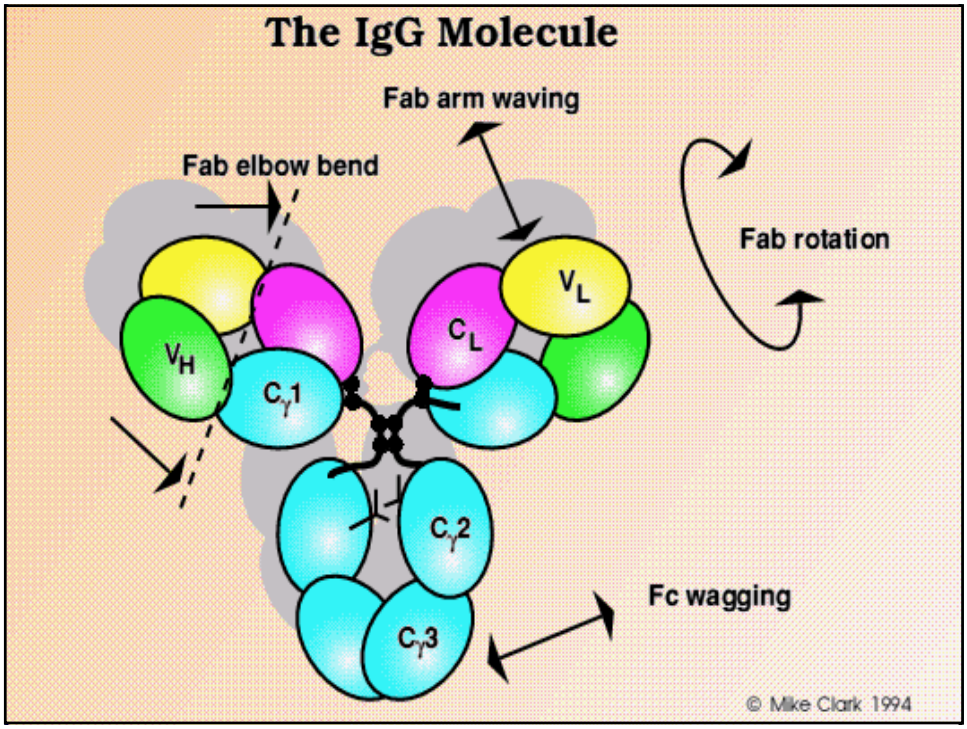
ANTIBODY: STRUCTURE AND FUNCTION



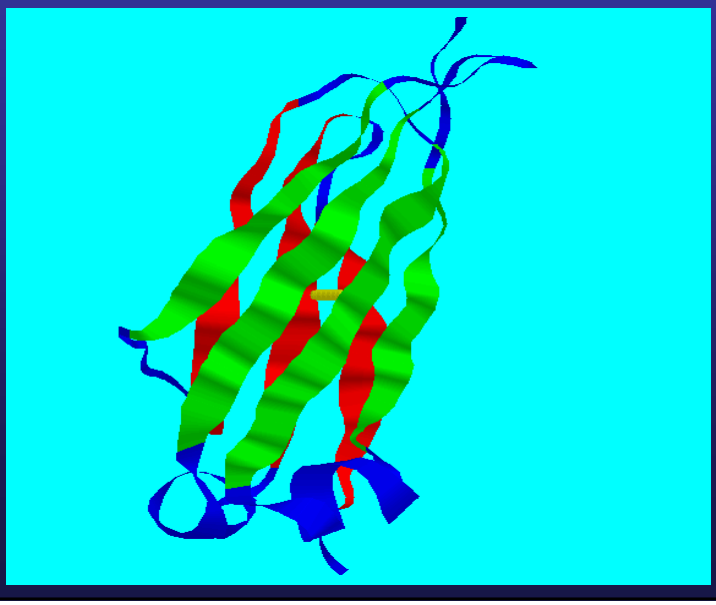
Antigen Recognition

Antigen Elimination

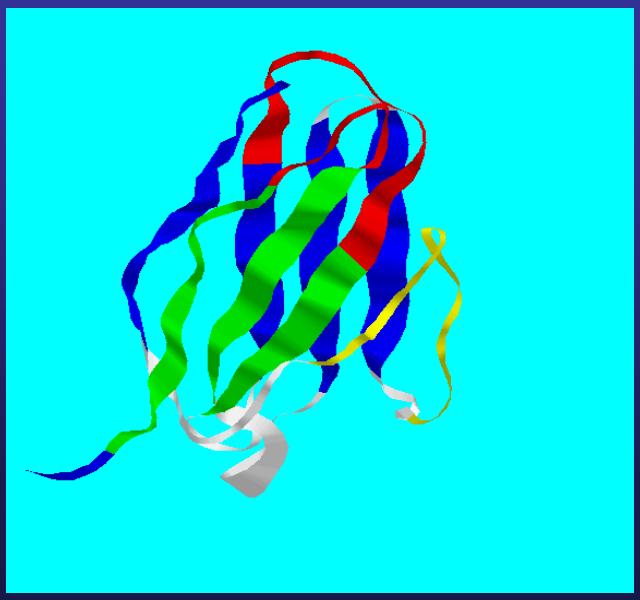


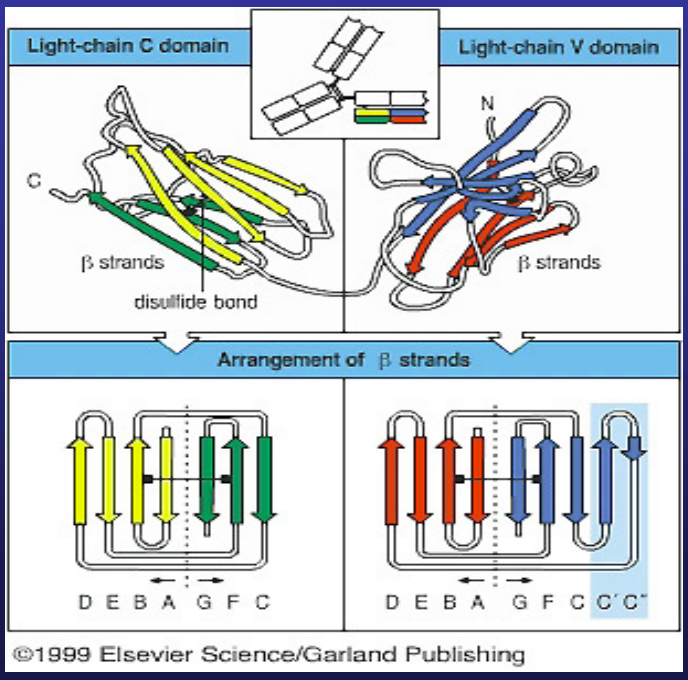


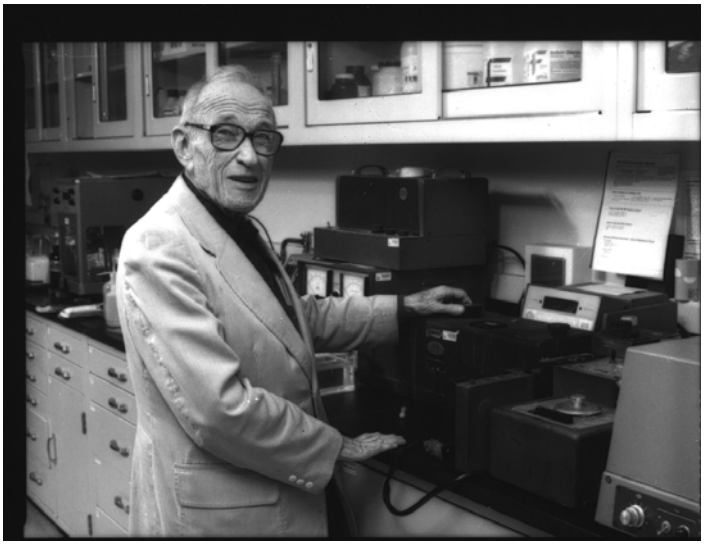
Ig CONSTANT DOMAIN



Ig VARIABLE DOMAIN

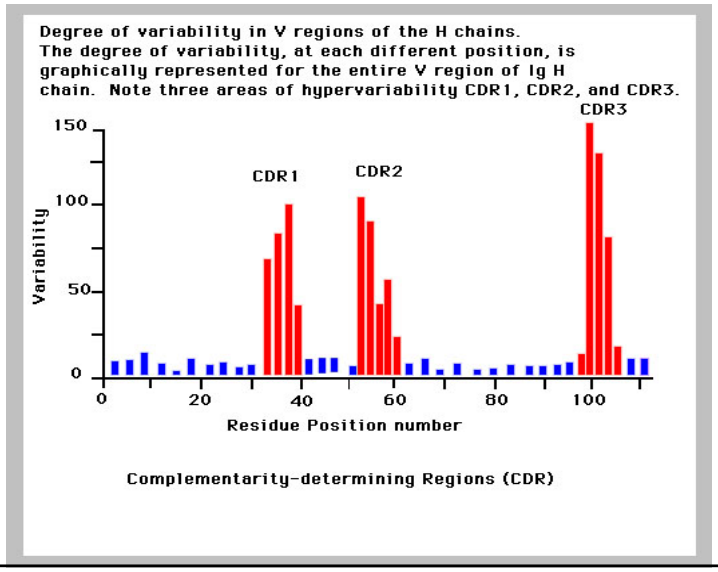


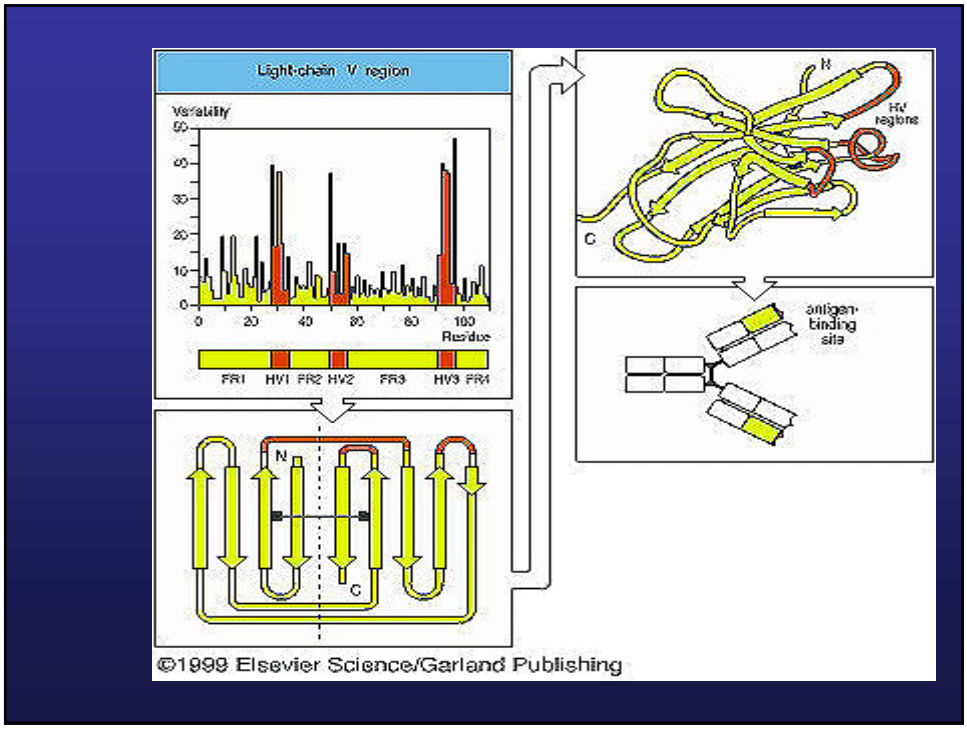




Dr. Elvin Kabat, Columbia University

Hypervariable (HV) or Complementarity Determining Regions (CDRs)




Light-chain V region
Variability
Residue
FR1 HV1 FR2 HV2 FR3 HV3 FR4
N
C
HV regions
antigen-binding site
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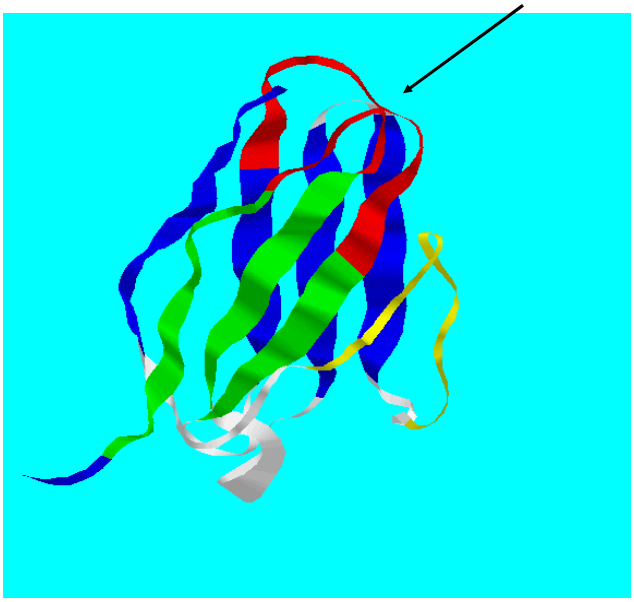
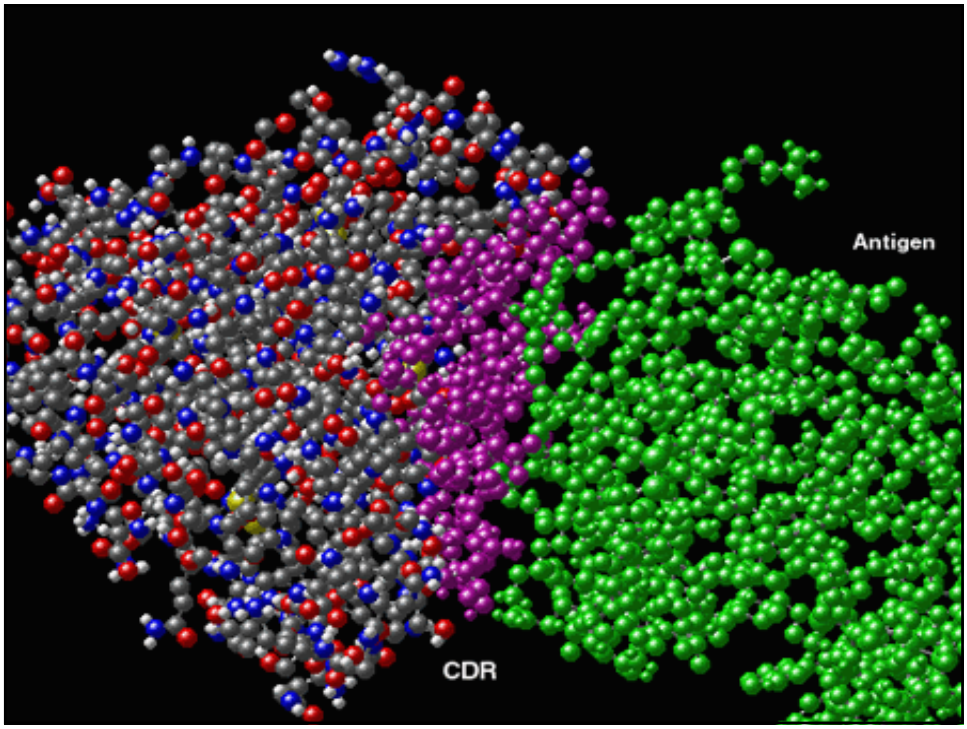
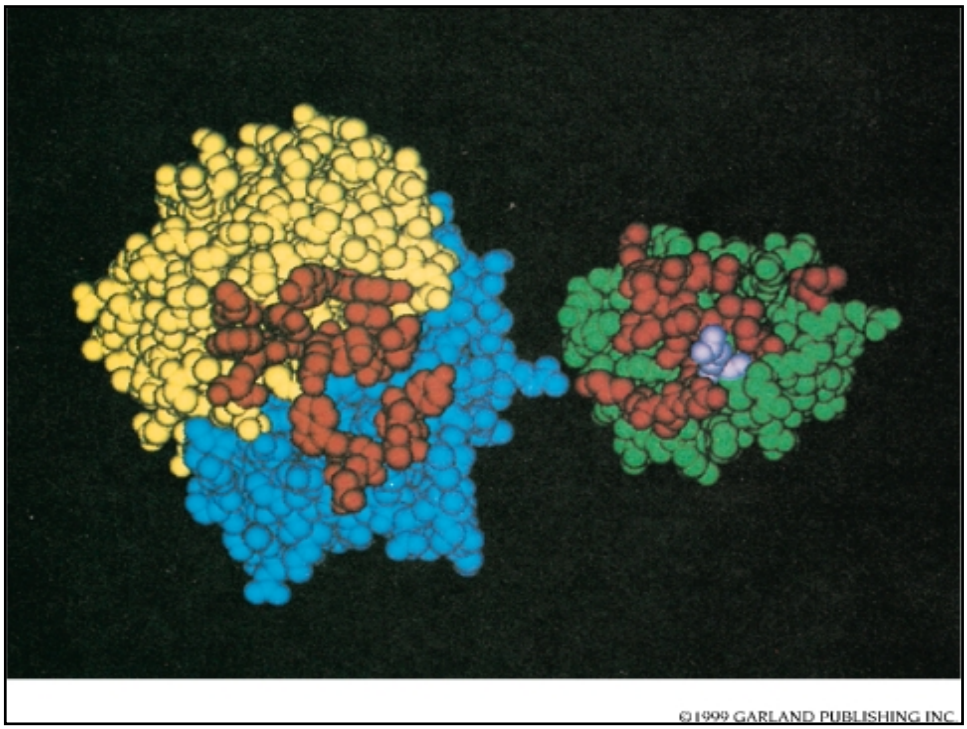
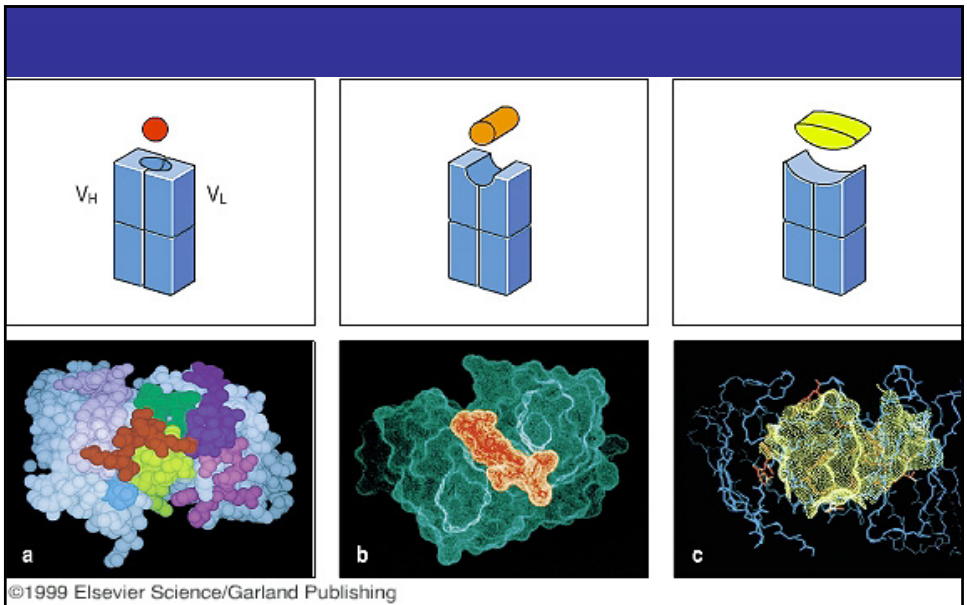
HV Regions

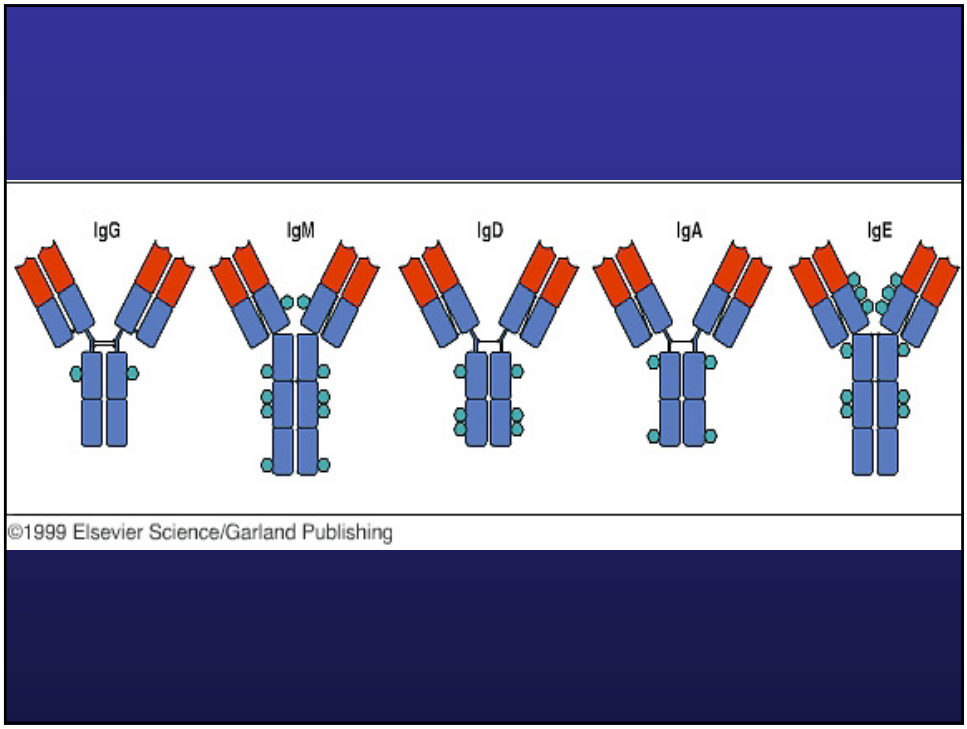



Antigen
CDR


©1999 GARLAND PUBLISHING INC.

Non-covalent forces	Origin	
Electrostatic forces	Attraction between opposite charges	$-\overset{\oplus}{N}H_3 \quad \overset{\ominus}{O}OC-$
Hydrogen bonds	Hydrogen shared between electronegative atoms (N,O)	$>N-H\cdots O=C<$ ($\delta^-\ \delta^+\ \delta^-$)
Van der Waals forces	Fluctuations in electron clouds around molecules oppositely polarize neighboring atoms	$\delta^+\ \delta^-$ ⇌ $\delta^-\ \delta^+$
Hydrophobic forces	Hydrophobic groups interact unfavorably with water and tend to pack together to exclude water molecules. The attraction also involves van der Waals forces	




IgG
IgM
IgD
IgA
IgE
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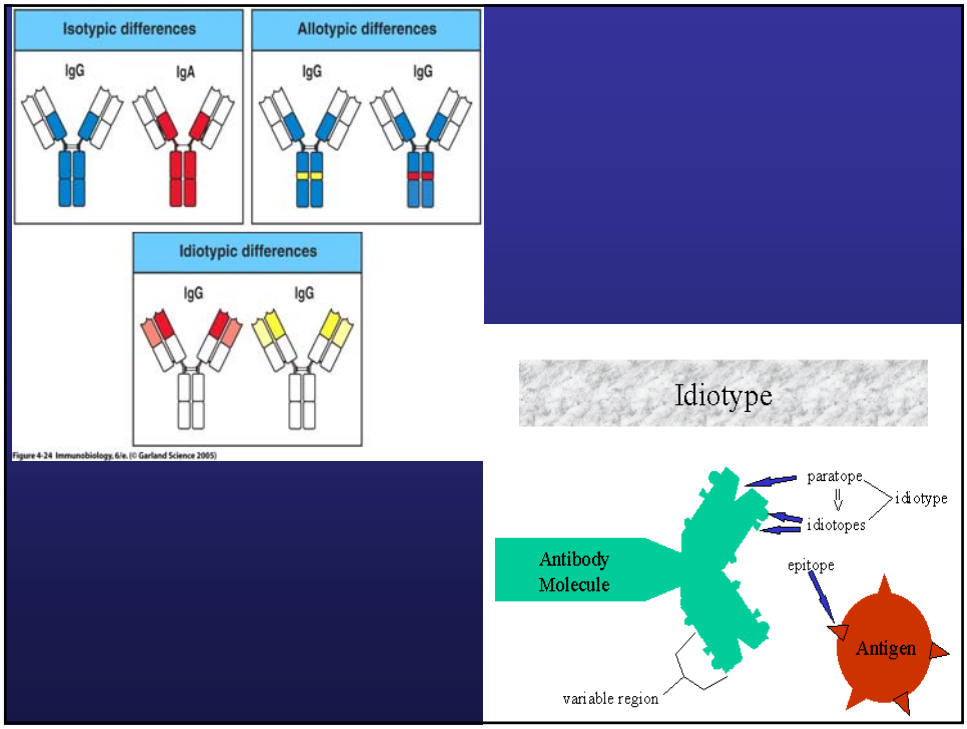
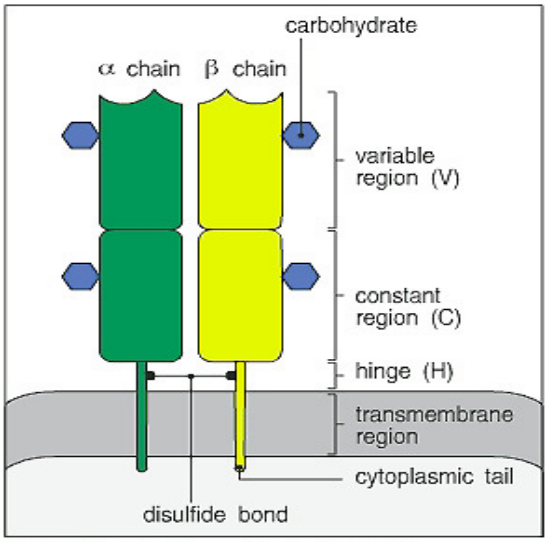
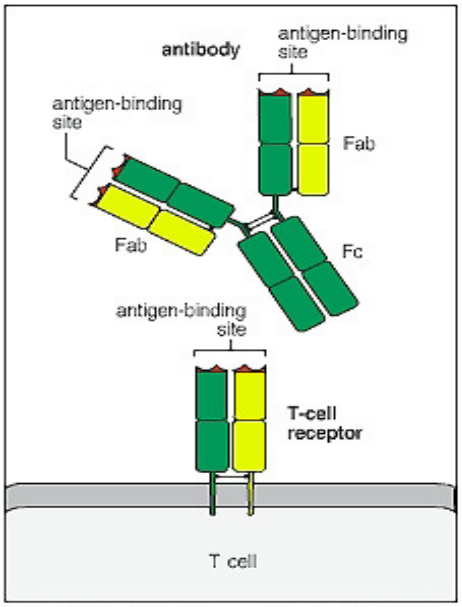

Isotypic differences
IgG
IgA
Allotypic differences
IgG
IgG
Idiotypic differences
IgG
IgG
Figure 4-24 Immunobiology, 6/e. (© Garland Science 2005)
Idiotype
paratope
idiotype
idiotopes
Antibody Molecule
epitope
Antigen
variable region

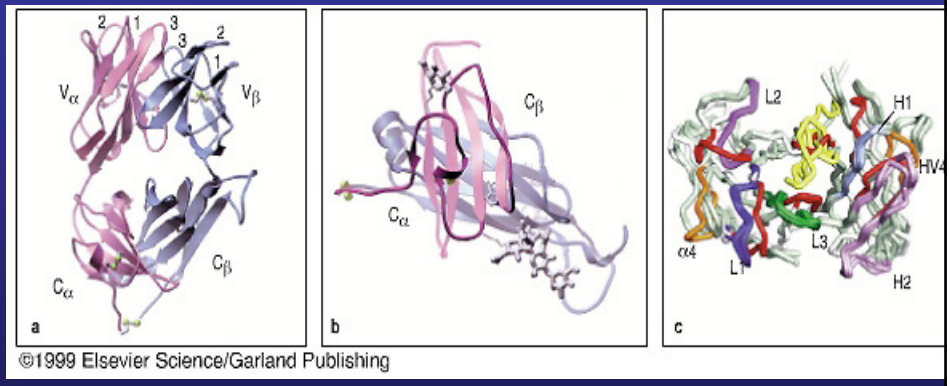
Antigen Recognition

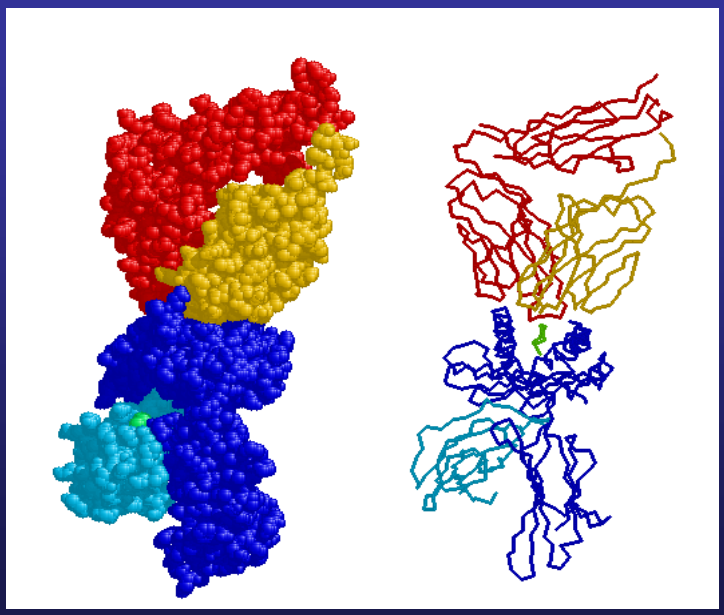


Antibodies: Secreted or Transmembrane

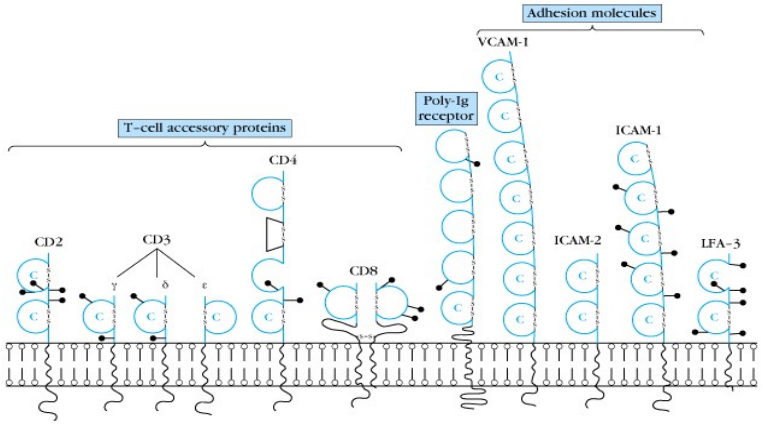
TCR: Transmembrane



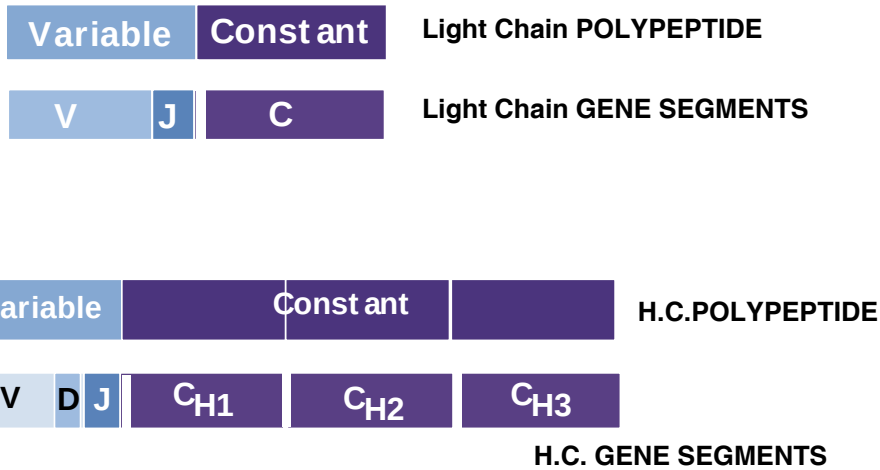




Evolutionary Conservation of Ig Domains: The Ig Supergene Family of Surface Proteins



Ig Polypeptides Are Encoded by Multiple Gene Segments

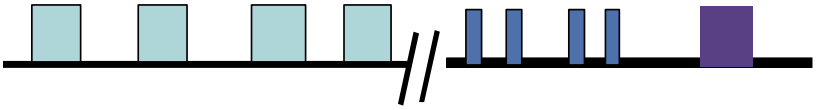


A Prototype Ig Gene: Murine Kappa

About 10 0 V_κ gene segments

4 J Gene Segment s

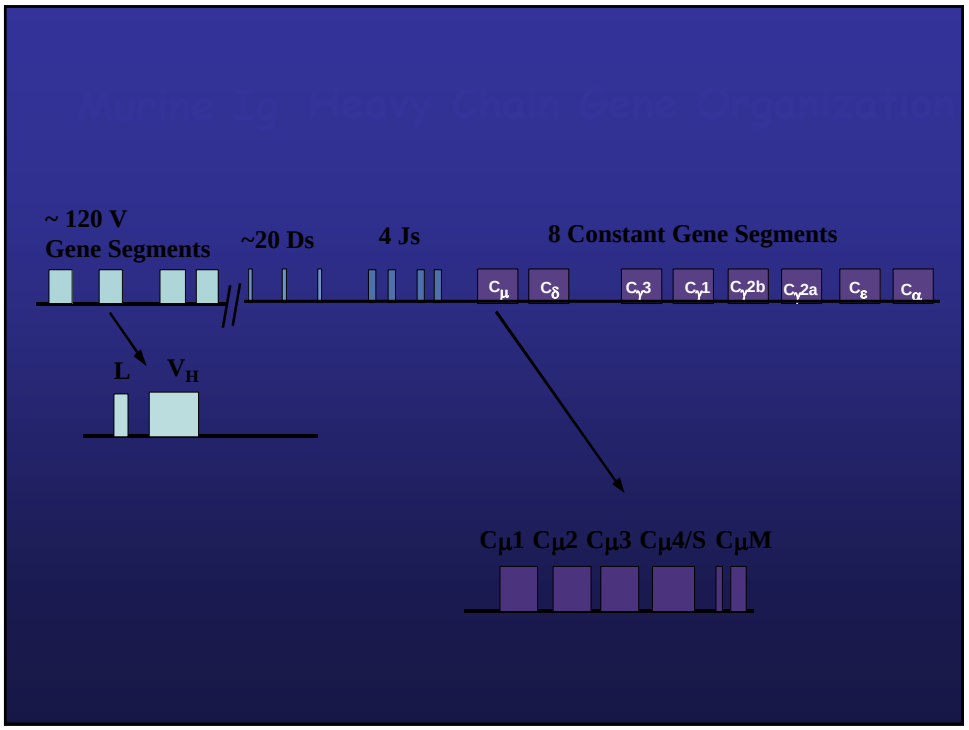
1 C_κ Gene Segment



Multiple V gene segments, distant from J and C

A few J gene segments

One C gene segment



Human Ig Loci

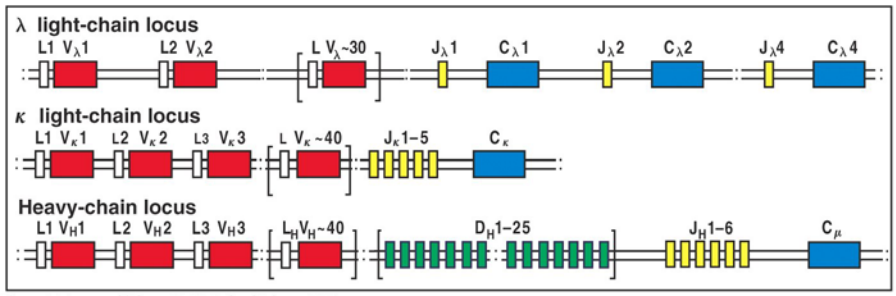
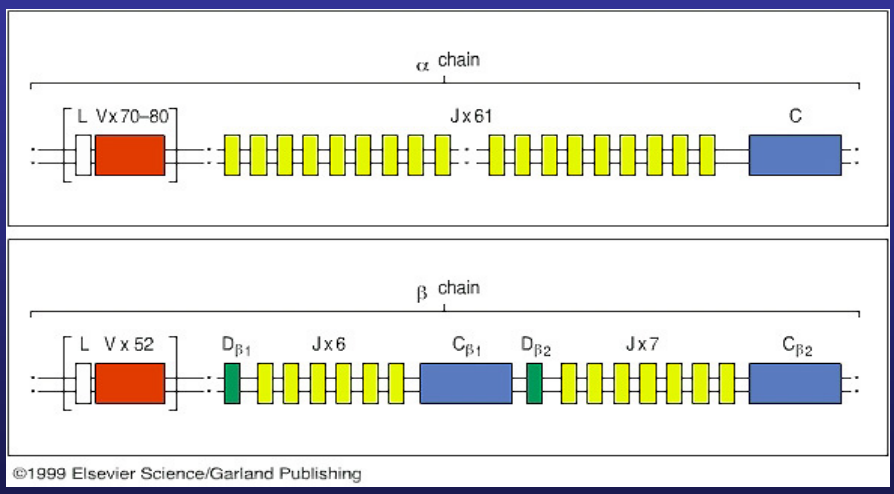


Figure 4-4 Immunobiology, 6/e. (© Garland Science 2005)



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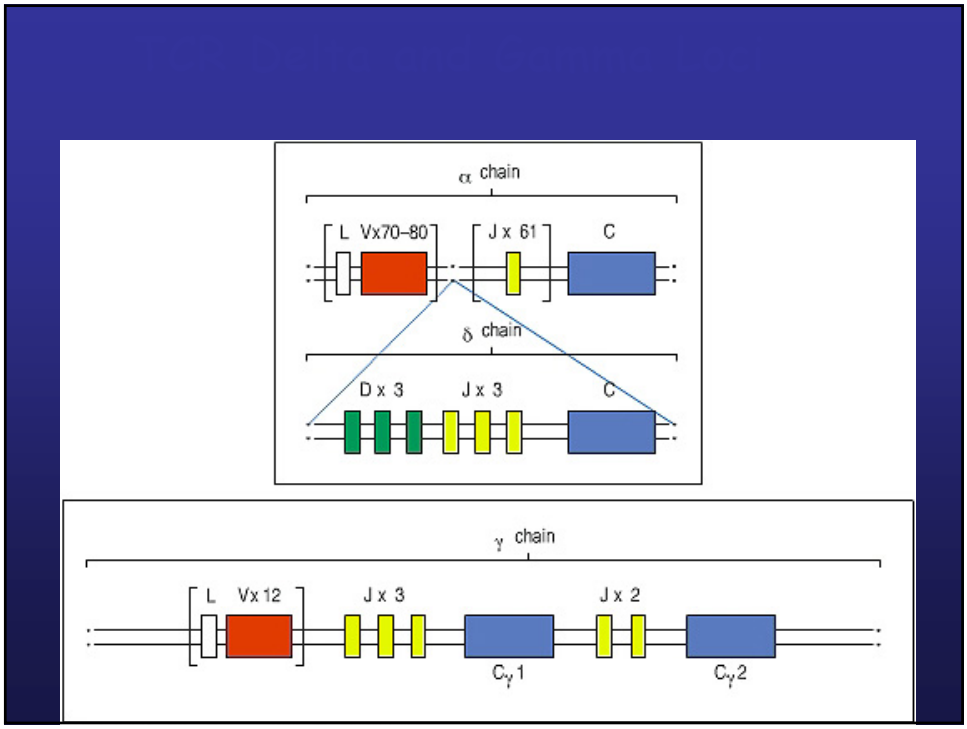

SUMMARY

1. Antibodies are comprised of 2 heavy and 2 light chain polypeptides.
2. N-terminal variable regions of antibodies recognize antigen and C-terminal heavy chain constant regions eliminate antigen.
3. Heavy and light chains are comprised of multiple Ig domains that have a characteristic beta pleated sheet structure.
4. Hypervariable amino acids in loops between beta sheets of variable regions contact antigen.
5. T cell receptors are comprised on one alpha and one beta chain and resemble Fab fragments of antibodies.
6. Genes encoding antibodies and TCRs are comprised of multiple V, D, J and C gene segments.