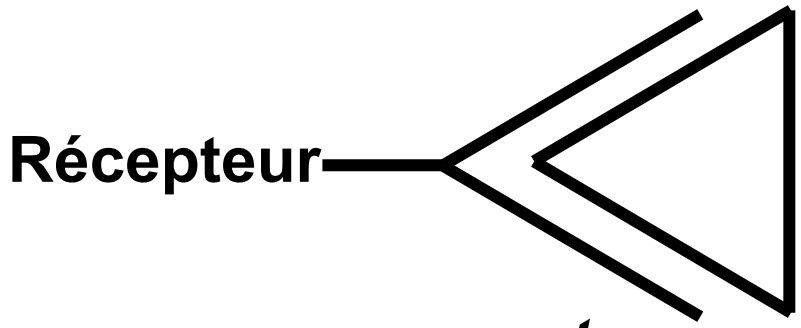
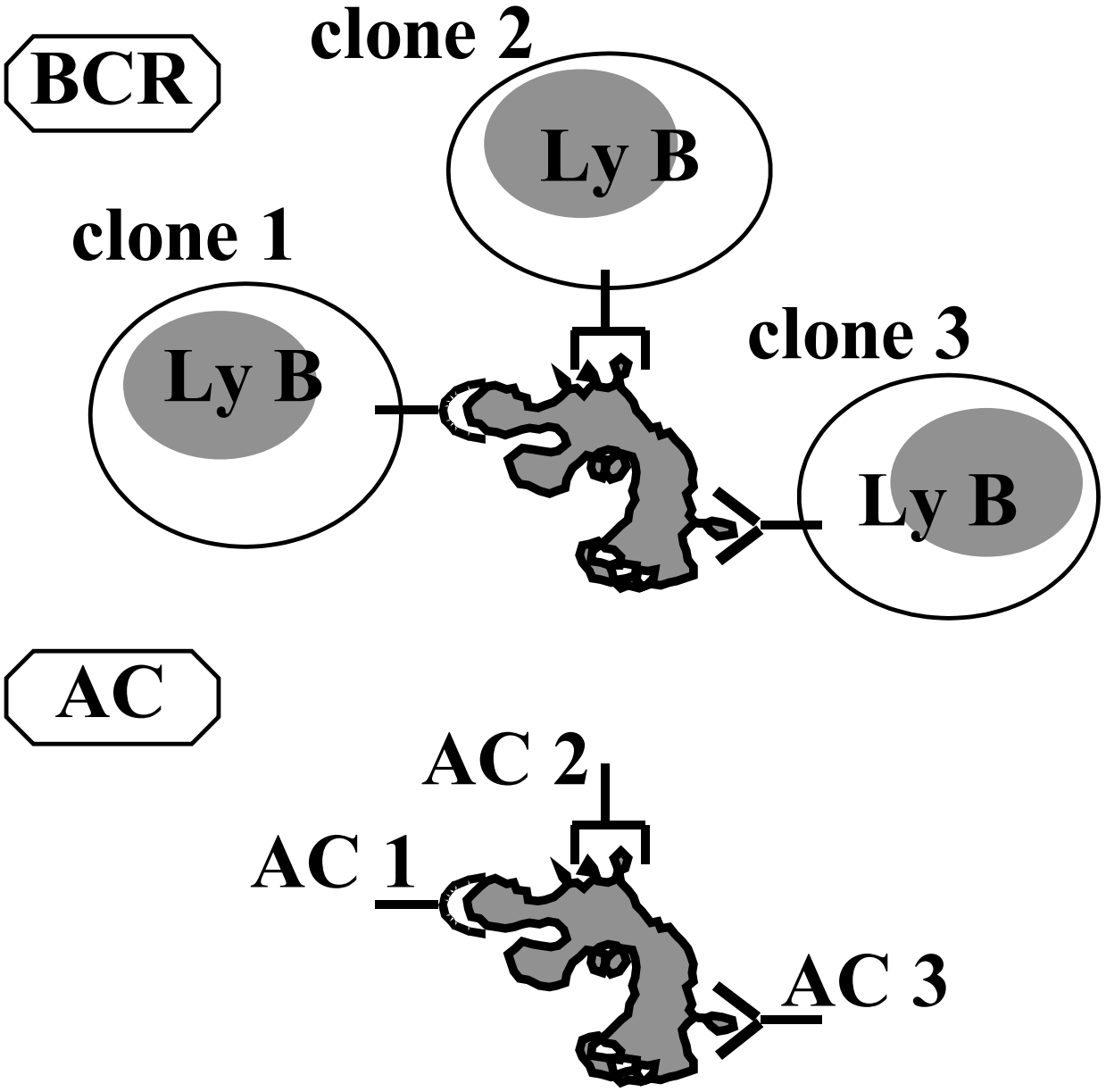
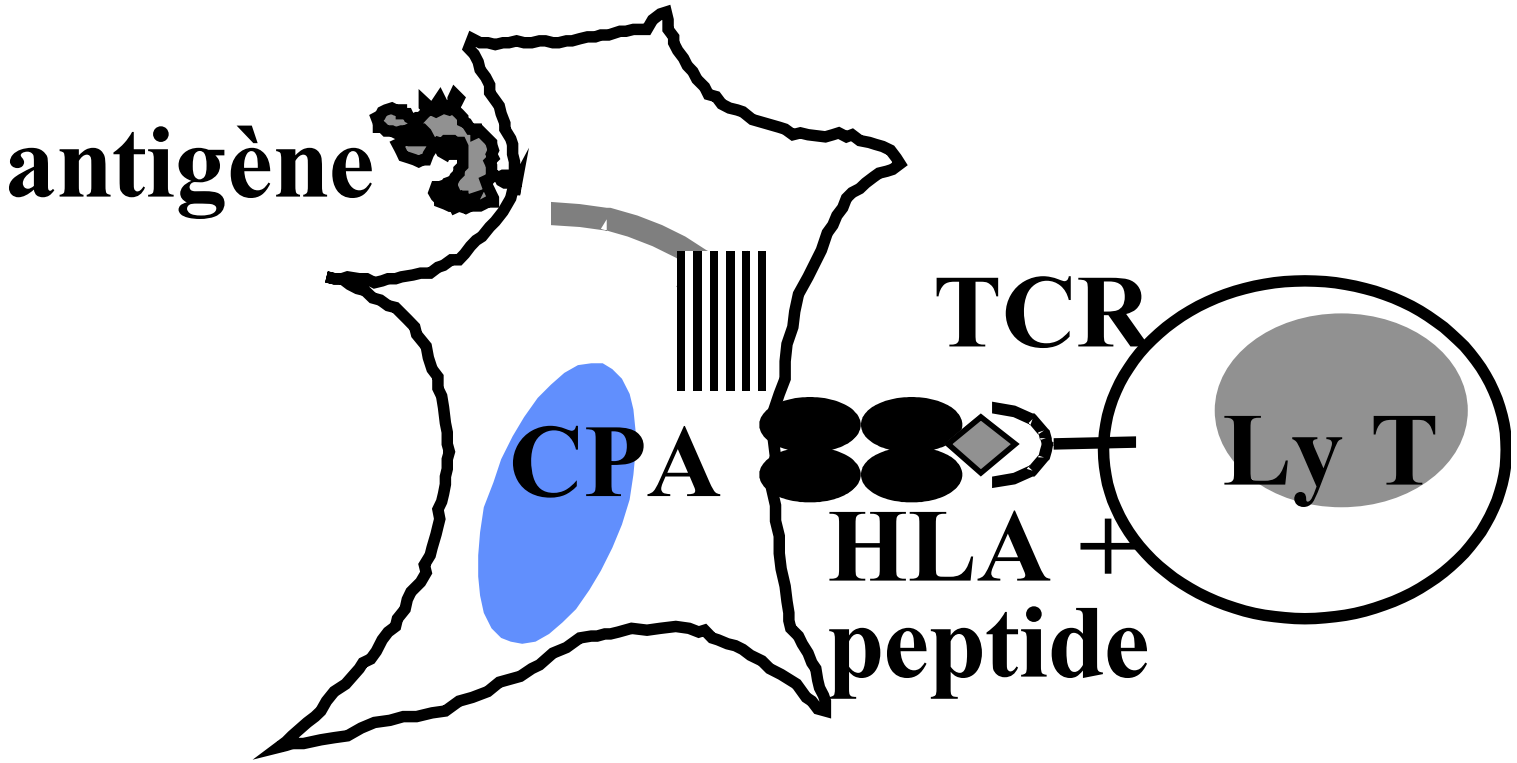
spécifique

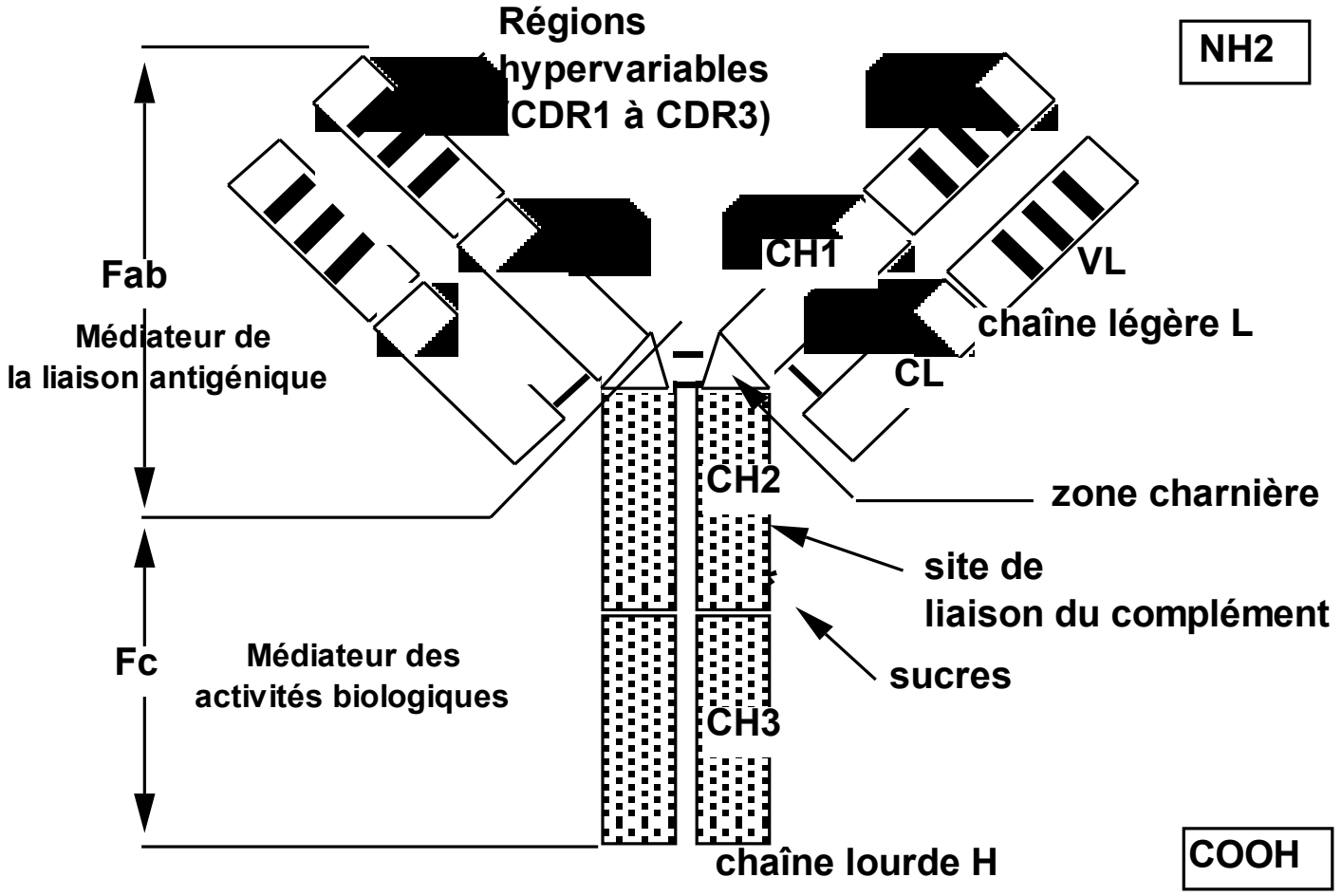


Signal d'activation

non spécifique

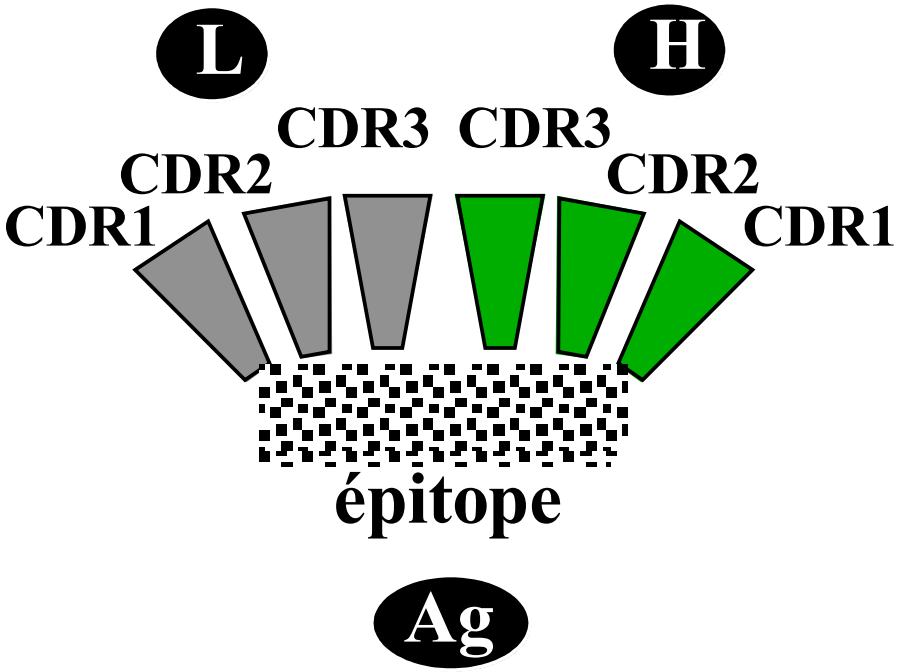

BCR
clone 2
Ly B
clone 1
Ly B
clone 3
Ly B
AC
AC 2
AC 1
AC 3

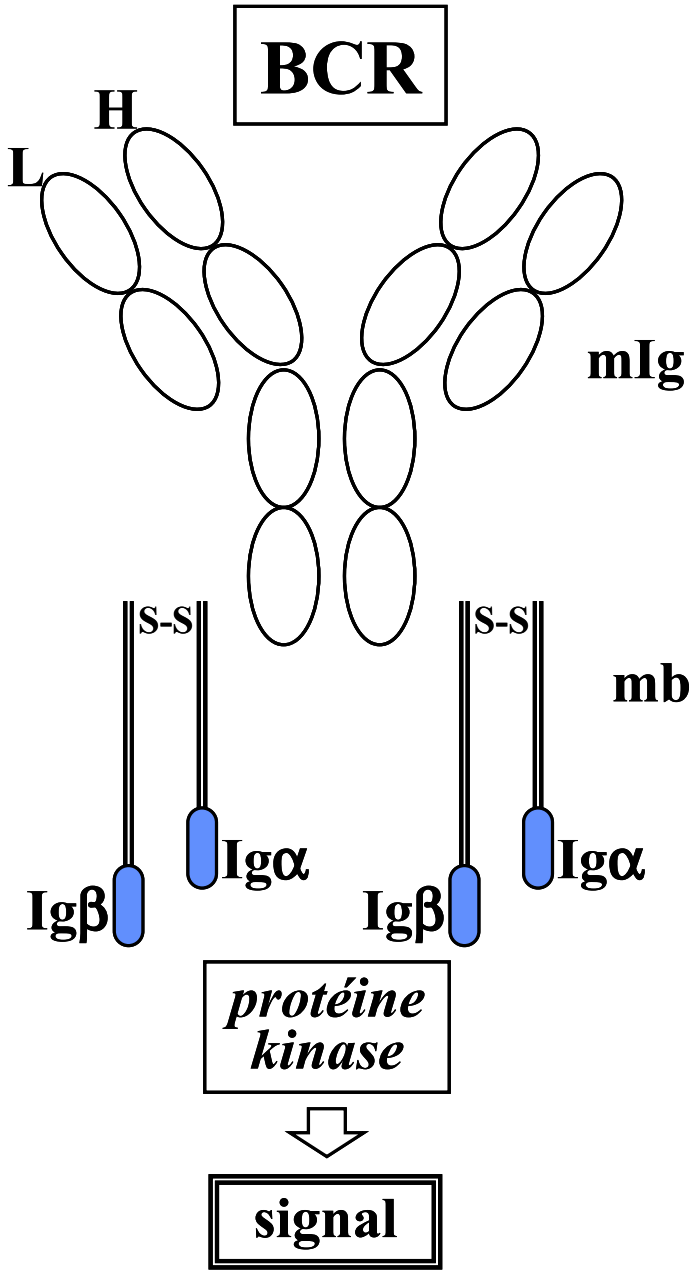

antigène
TCR
CPA
Ly T
HLA +
peptide

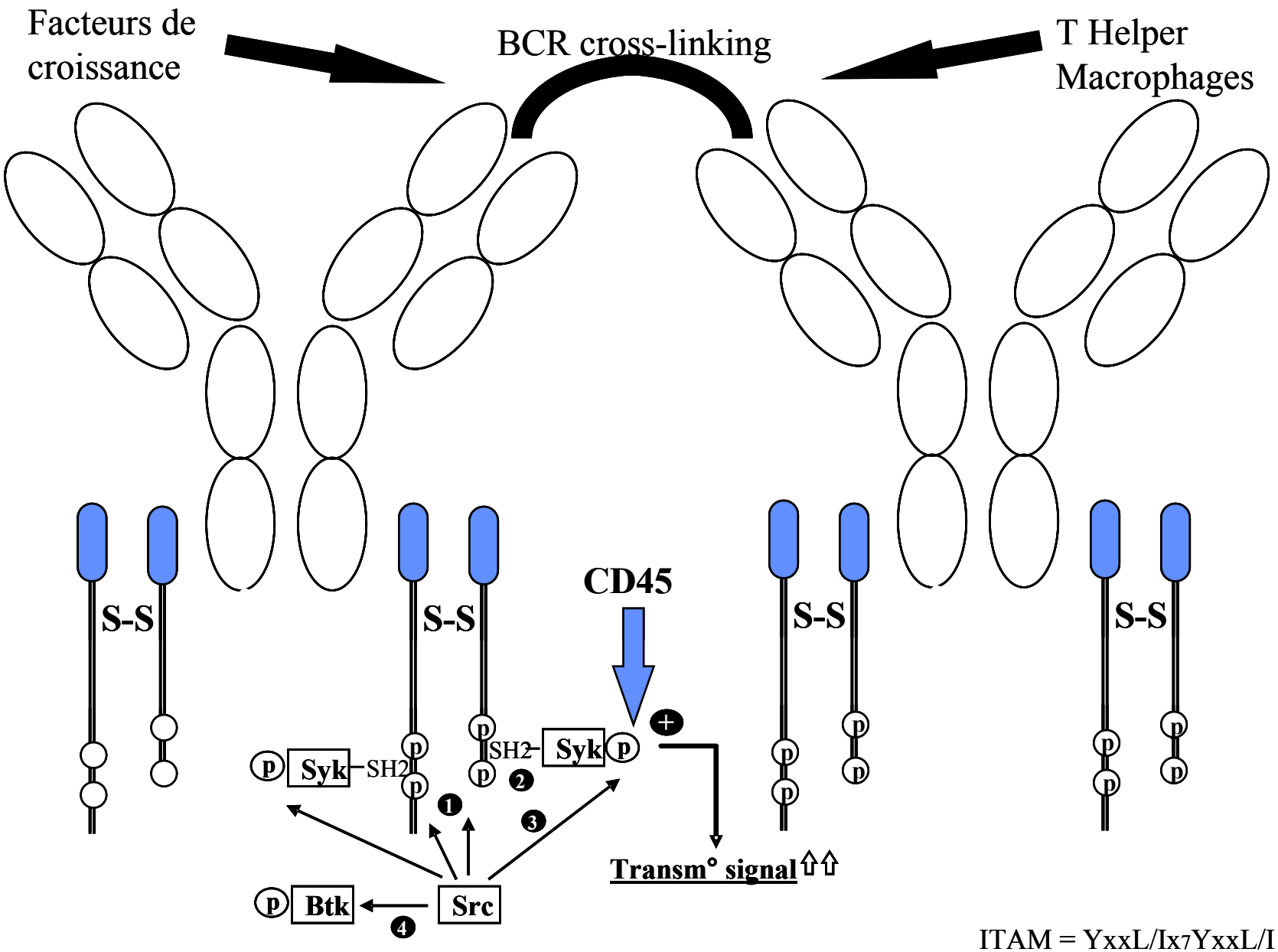

Régions
hypervariables
(CDR1 à CDR3)
NH2
Fab
Médiateur de
la liaison antigénique
CH1
VL
chaîne légère L
CL
CH2
zone charnière
site de
liaison du complément
sucres
Fc
Médiateur des
activités biologiques
CH3
chaîne lourde H
COOH

5 isotypes : IgG, IgA, IgM, IgD, IgE

sous-classes : IgG1, IgG2, IgG3, IgG4, IgA1, IgA2


L
H
CDR3
CDR3
CDR2
CDR2
CDR1
CDR1
épitope
Ag

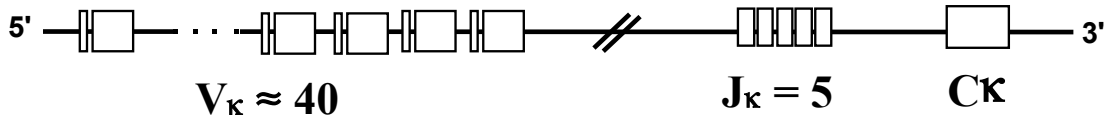

BCR
H
L
mIg
S-S
S-S
mb
Igα
Igβ
Igα
Igβ
protéine kinase
signal



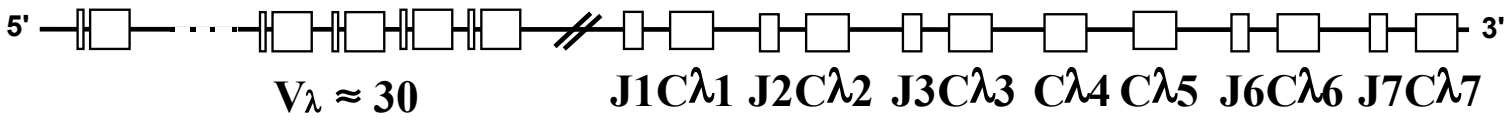
ITAM = YxxL/Ix7YxxL/I

Protéines kinases intra-¢ | Src = Lyn, Blk, Fyn, Fck, Lgr
Syk, Btk

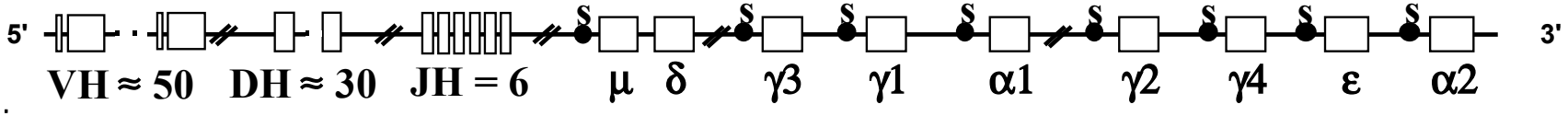
Chromosome 2p12 : chaîne légère κ

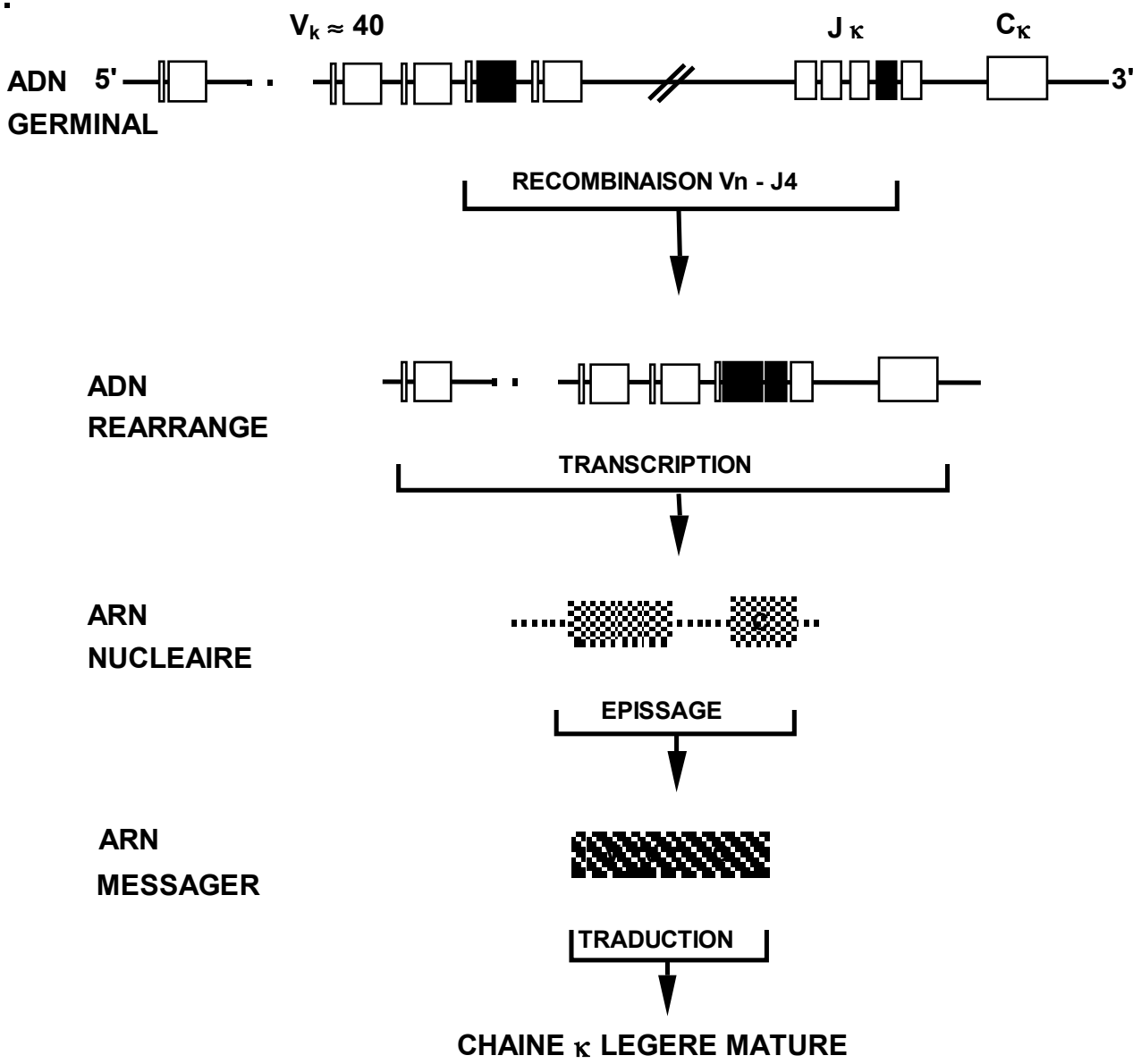


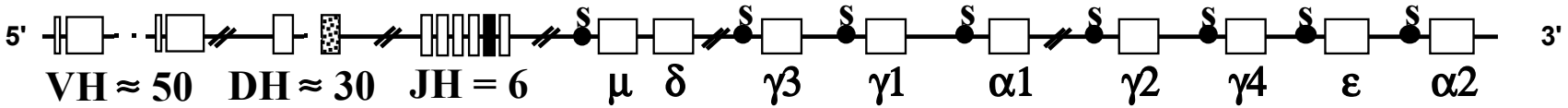
Chromosome 22q11 : chaîne légère λ



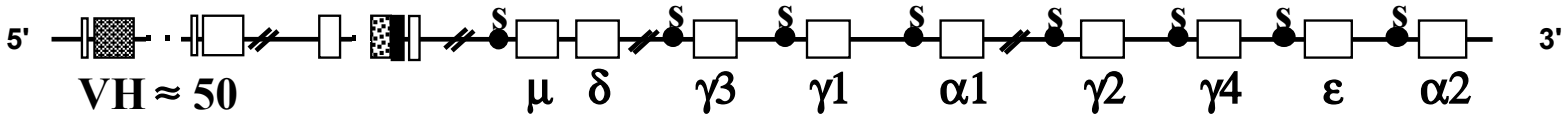
Chromosome 14q32 : chaîne lourde H



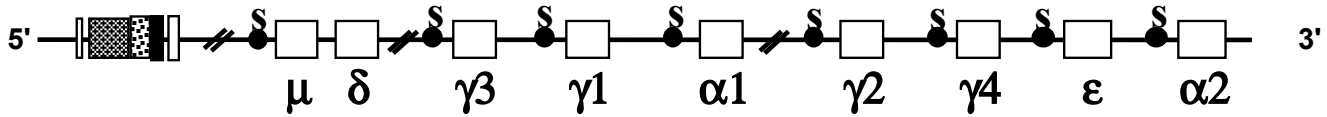

$V_k \approx 40$
$J\kappa$
C_κ
ADN 5'
3'
GERMINAL
RECOMBINAISON Vn - J4
ADN
REARRANGE
TRANSCRIPTION
ARN
NUCLEAIRE
EPISSAGE
ARN
MESSAGER
TRADUCTION
CHAINE κ LEGERE MATURE



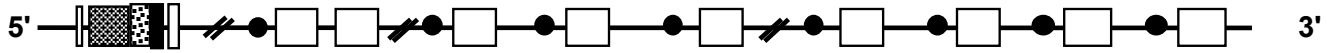
Recombinaison D-J



Recombinaison V-DJ



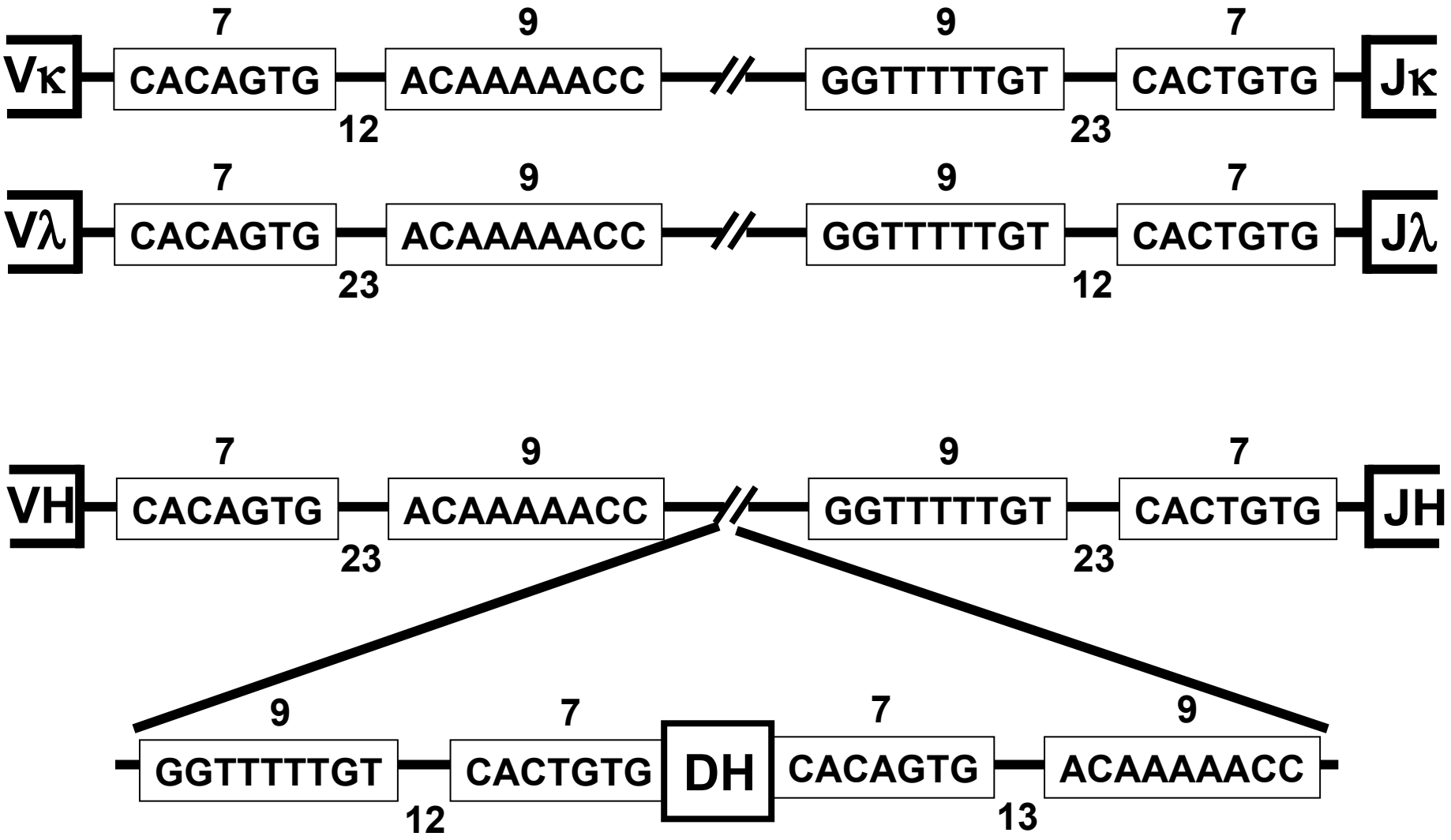
Transcription



Epissage

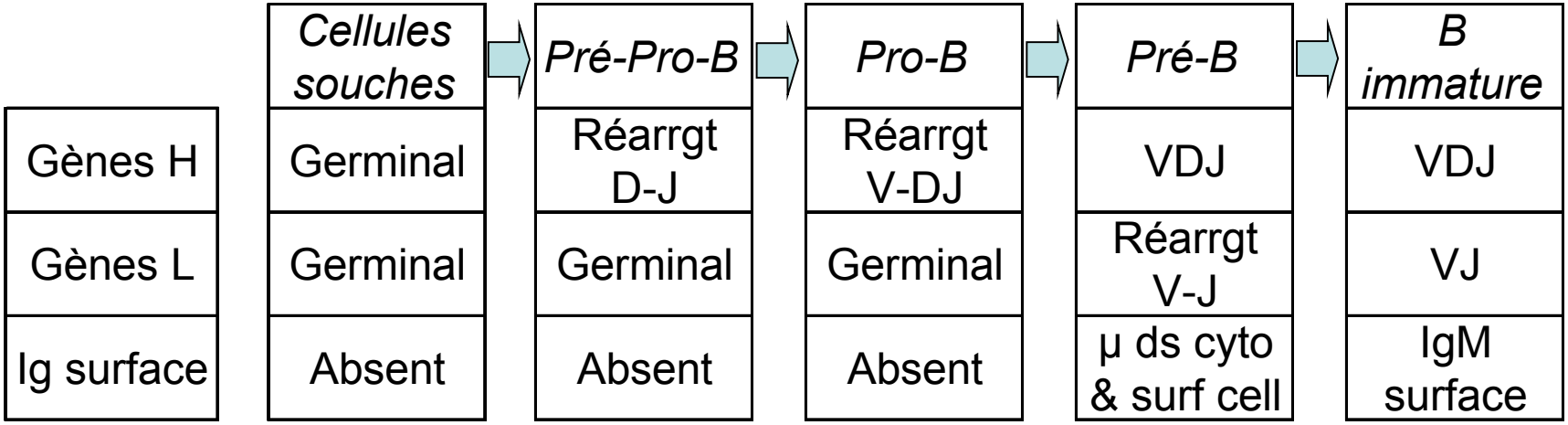
Traduction

Chaîne lourde mature

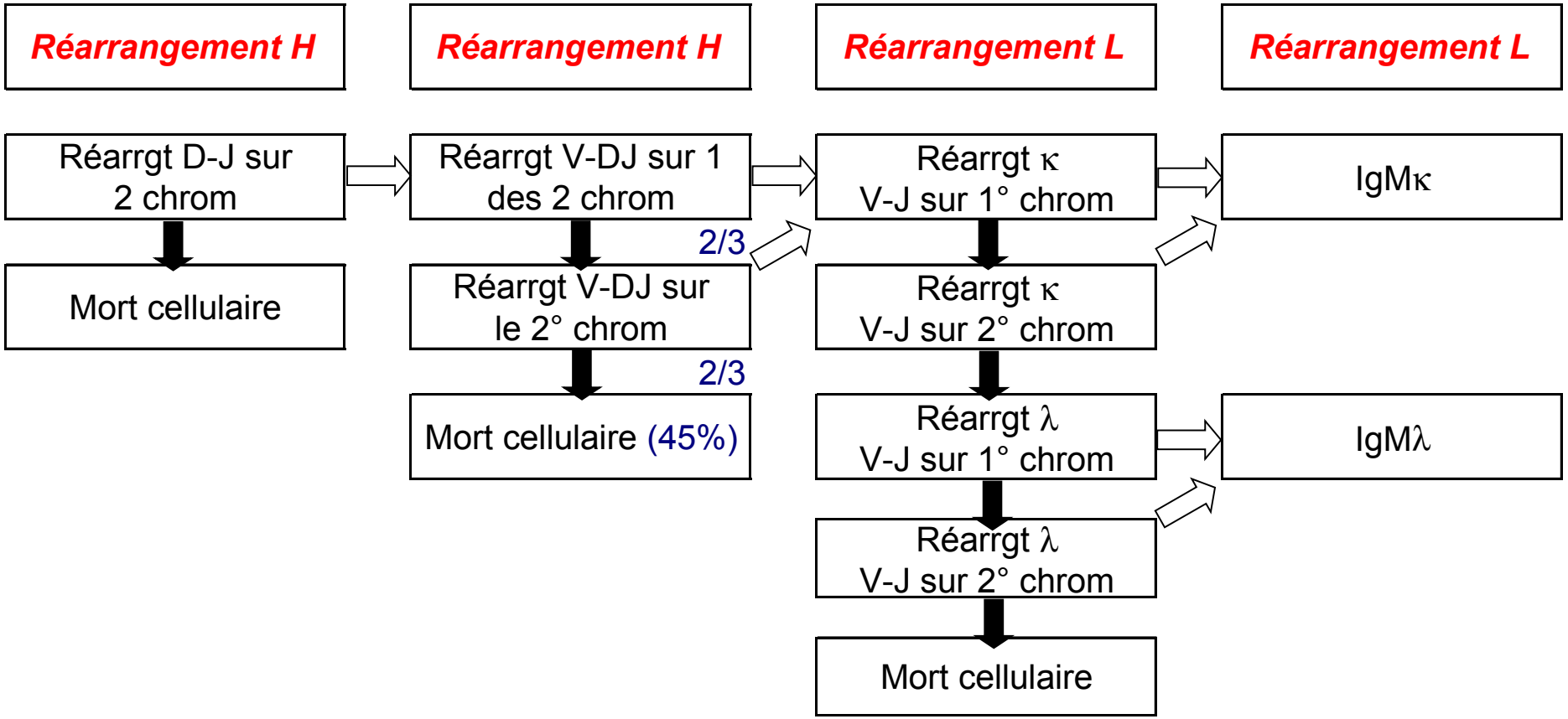


12 : 1 tour de la double hélice ADN
23 : 2 tours de la double hélice d'ADN

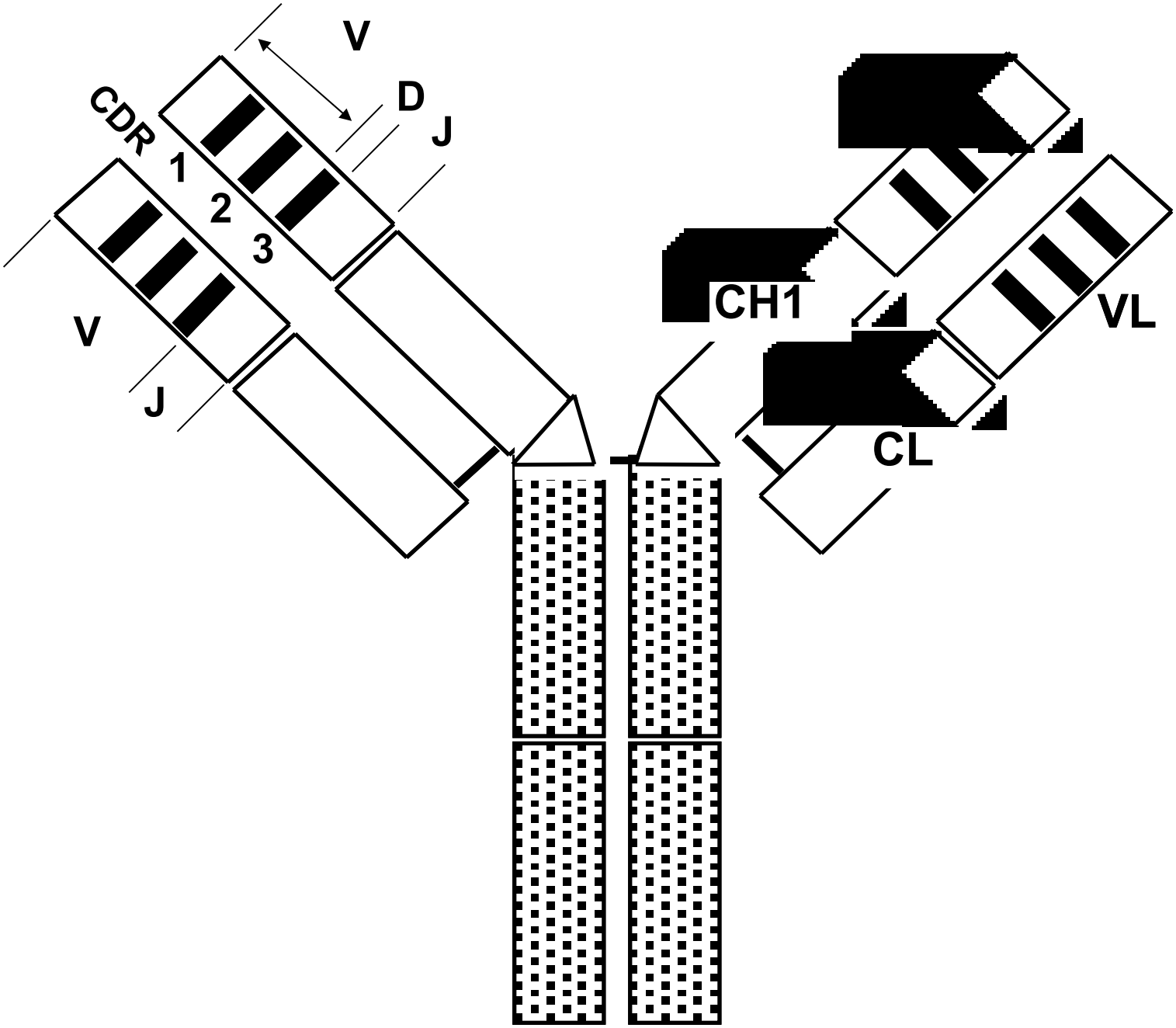
Chronologie des réarrangements



Haploïdie fonctionnelle



⇨ **Réarrangement fonctionnel**
➡ **Réarrangement abortif**


V
D
J
CDR
1
2
3
V
J
CH1
VL
CL

Origine de la diversité

Diversité combinatoire: V,D,J, appariement H+L

VH (50), DH (30), JH (6) = 9180
Vκ (40), Jκ (5) = 200
Vλ (35), Jλ (4) = 140

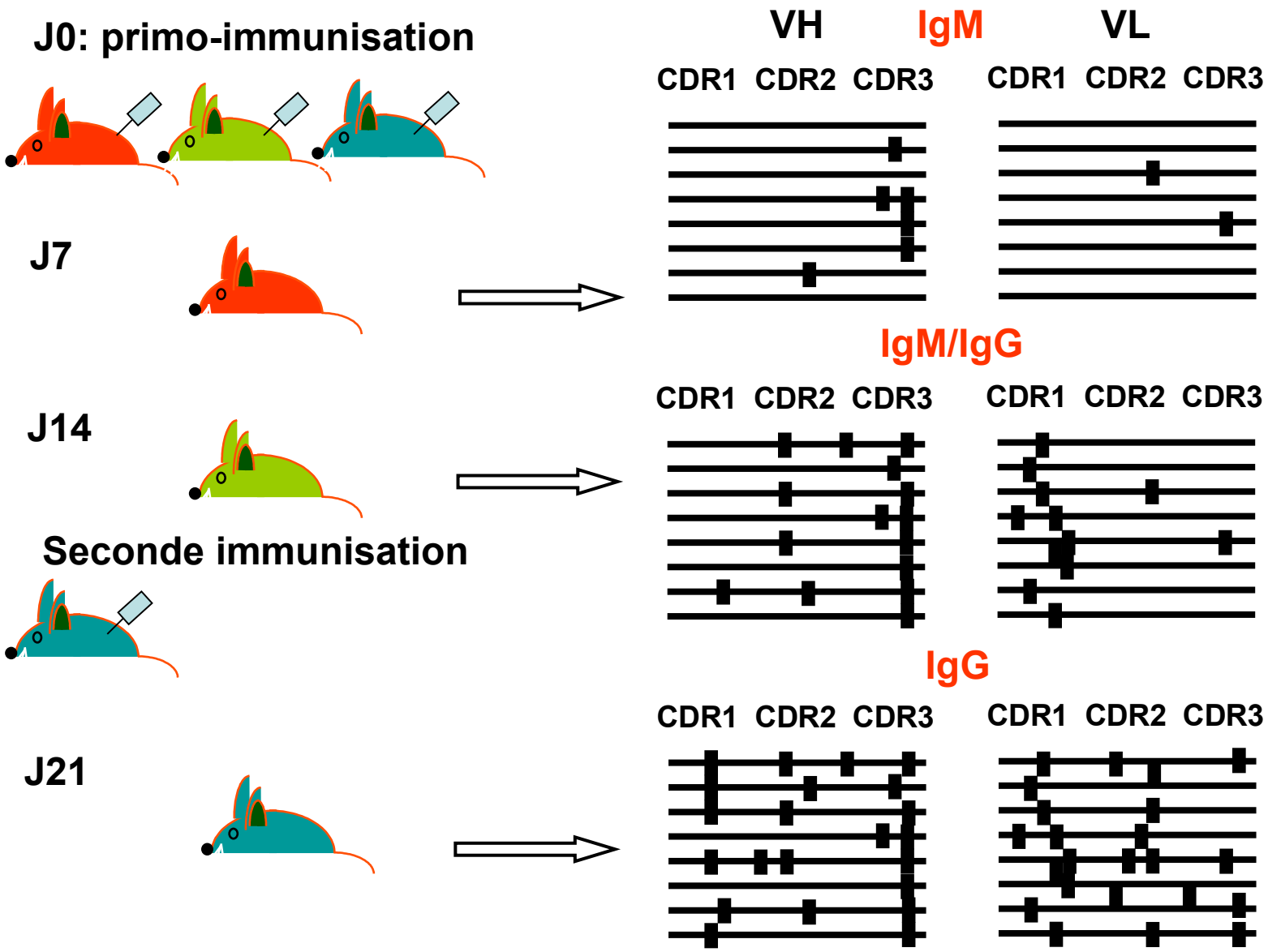
≈ 3.10^6 paratopes ≠
(en fait moindre)
50+30+6+40+5+35+4=170

N-diversité

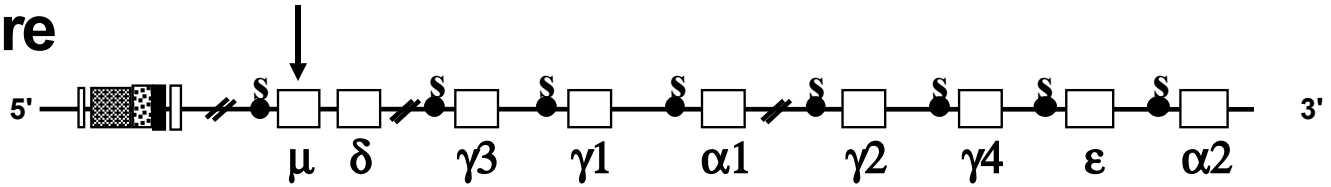
Diversité jonctionnelle

	95	96	97		95	96	97
V	CCT	TGG	ACG	*J*	Pro	Trp	Thr
V	CCT	C GG	ACG	*J*	Pro	Arg	Thr
V	CCT	CC G	ACG	*J*	Pro	Pro	Thr
V	CCT	CCC	ACG	*J*	Pro	Pro	Thr

Mutations somatiques (Ig)



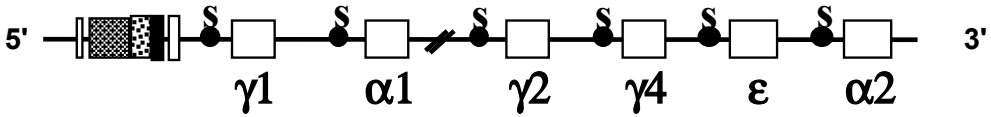
Réponse primaire



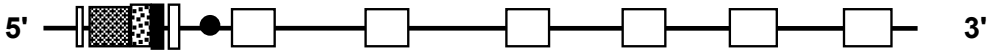
Traduction

Chaîne μ mature

Réponse secondaire



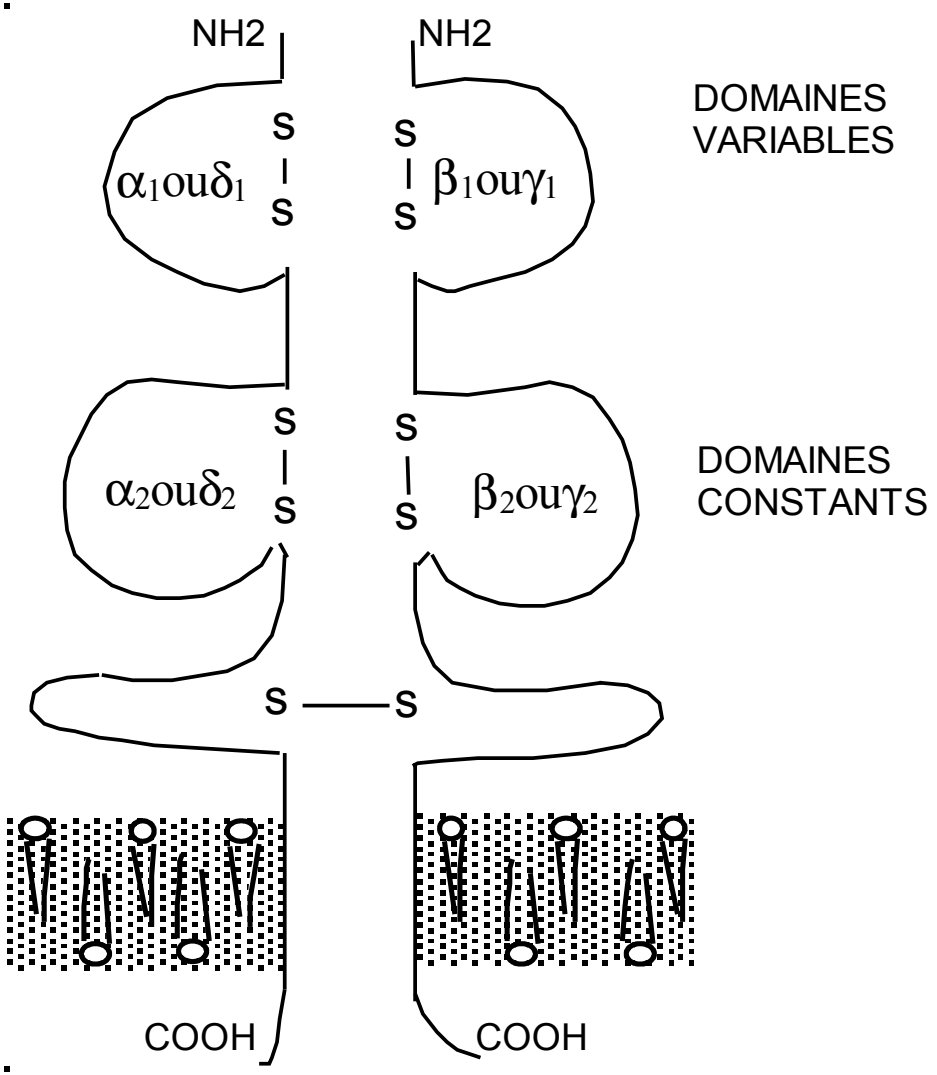
Transcription



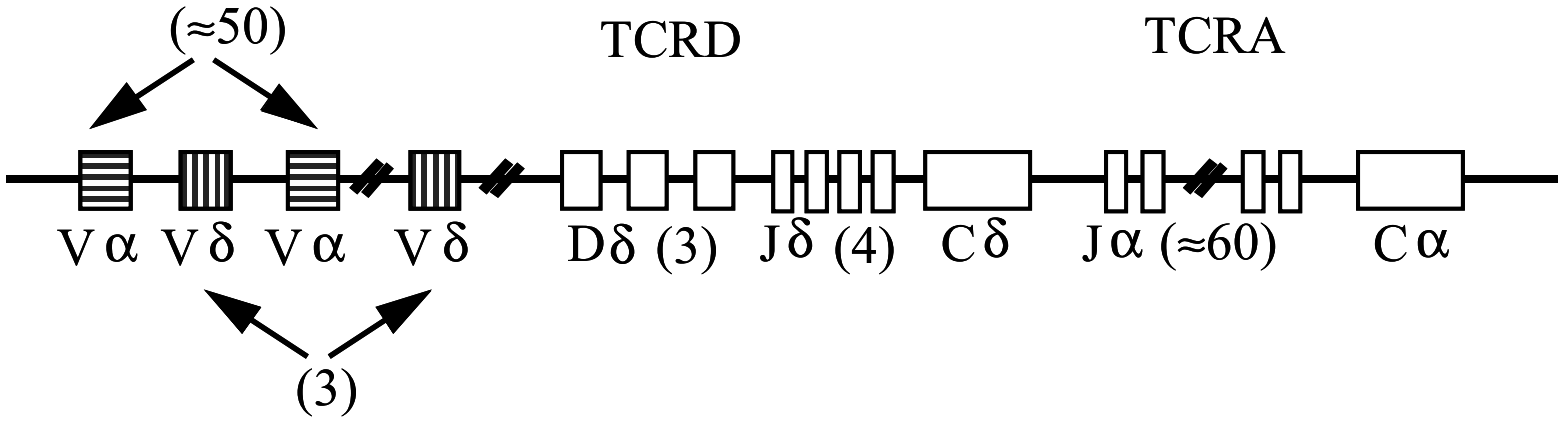
Epissage

Traduction

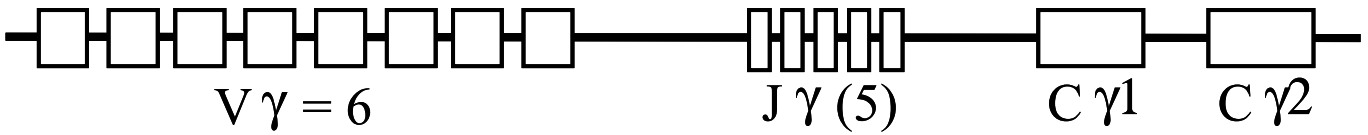
Chaîne γ1 mature


NH2
NH2
DOMAINES
VARIABLES
S
S
S
S
$\alpha_1$ouδ_1
$\beta_1$ouγ_1
S
S
S
S
$\alpha_2$ouδ_2
$\beta_2$ouγ_2
DOMAINES
CONSTANTS
S
S
COOH
COOH

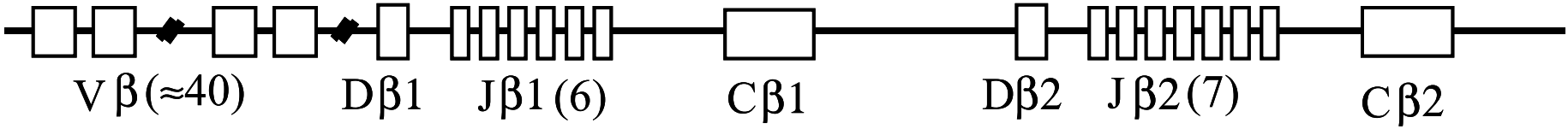
Chromosome 14q11 : gènes des chaînes α et δ



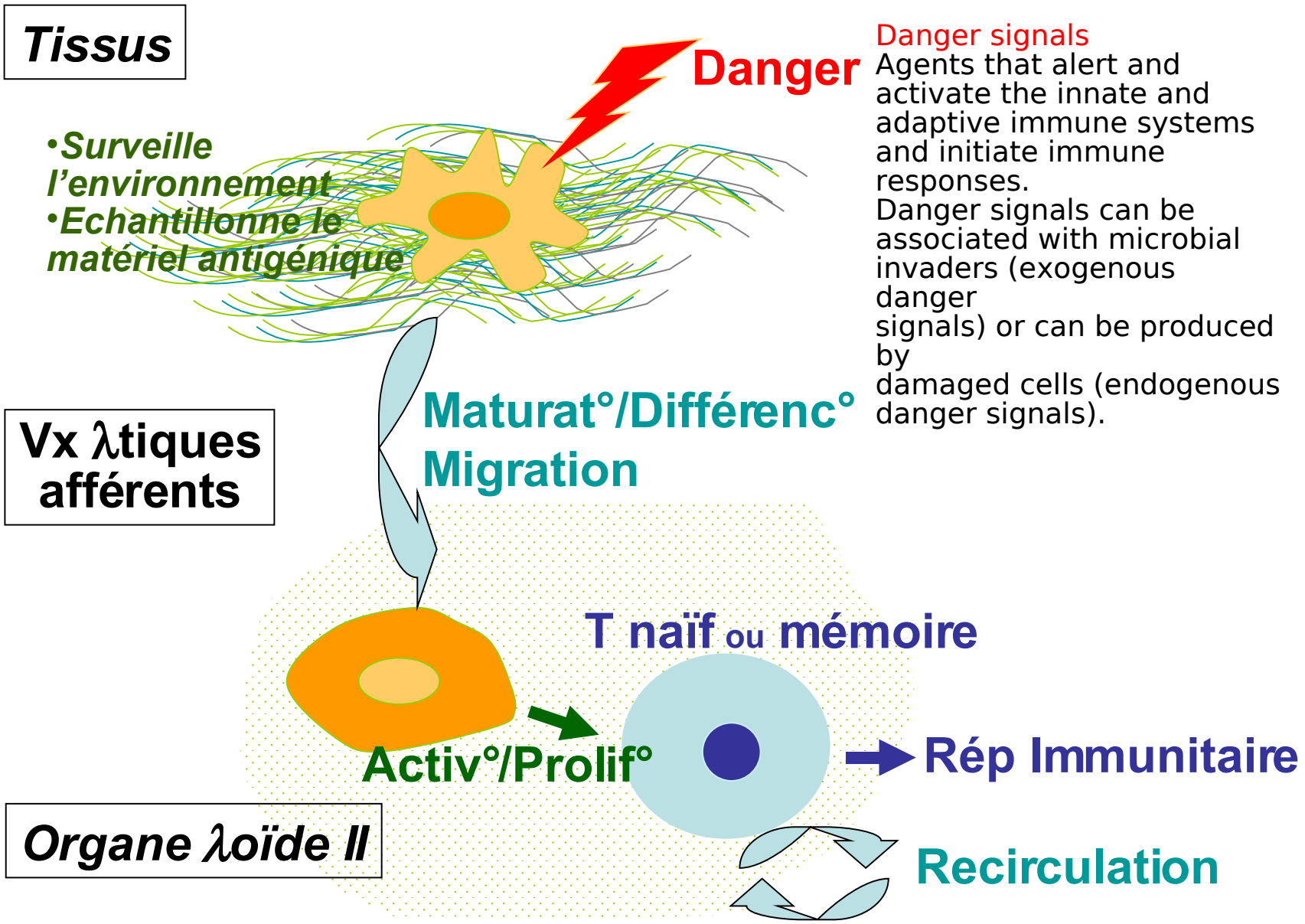
Chromosome 7p15 : gènes des chaînes γ



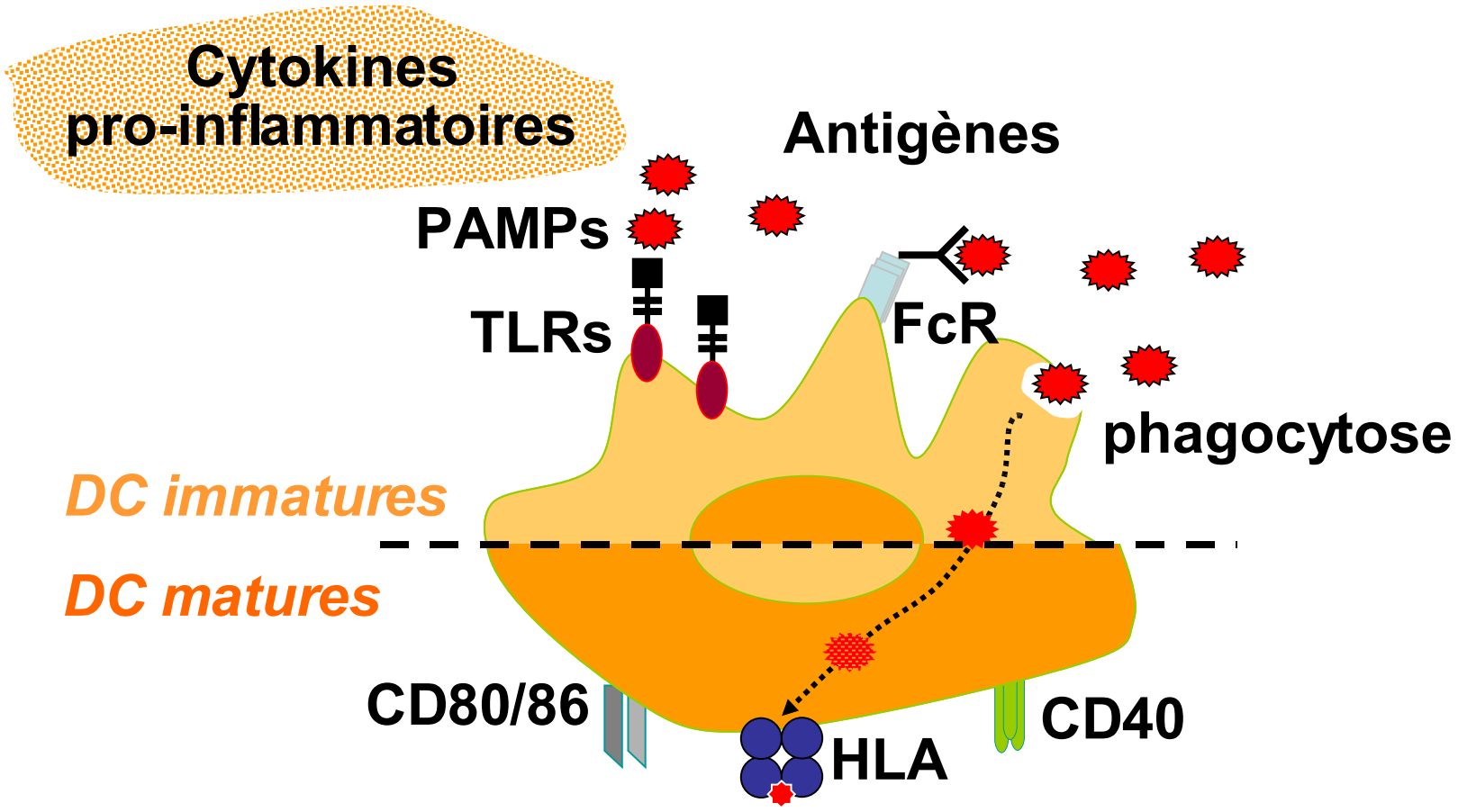
Chromosome 7q35 : gènes des chaînes β



Cellules dendritiques

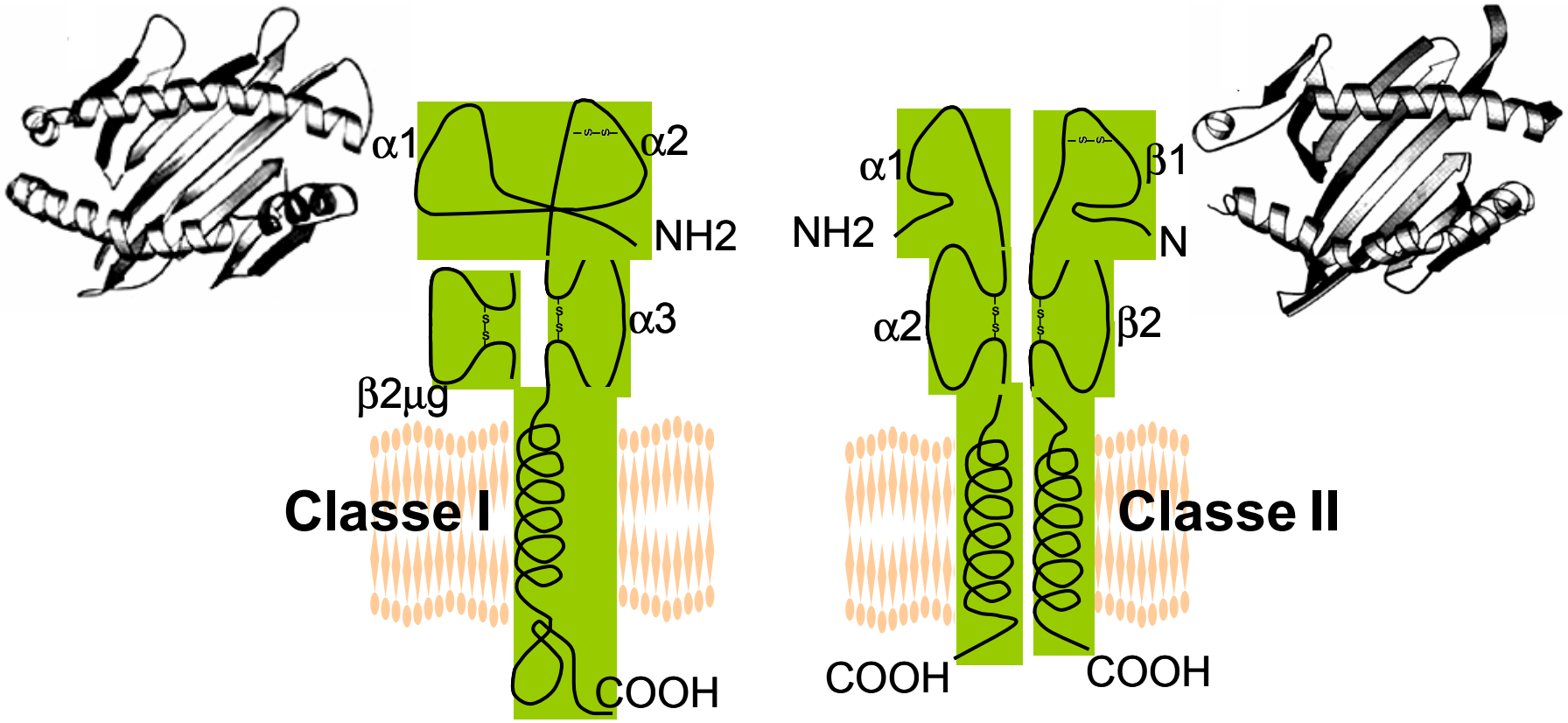


Cellules dendritiques



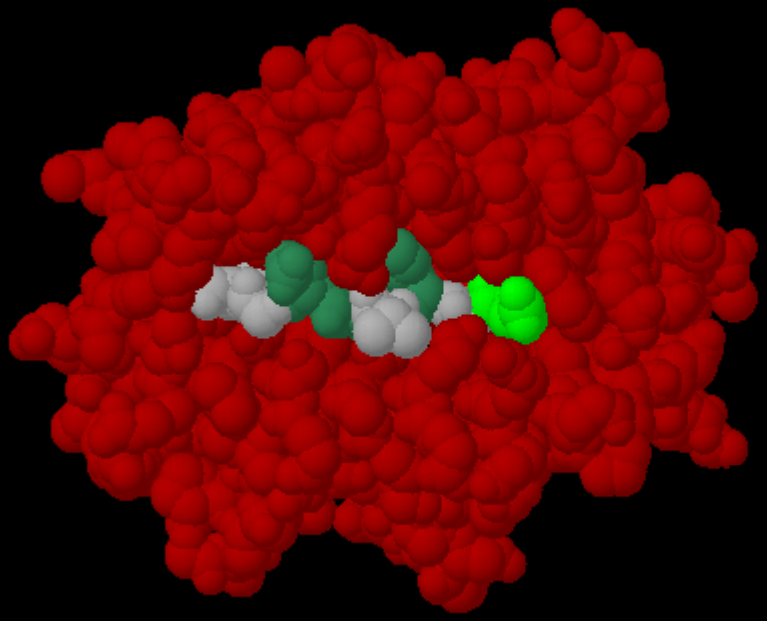
PAMPS: pathogen-associated molecular patterns

Gènes/Molécules HLA

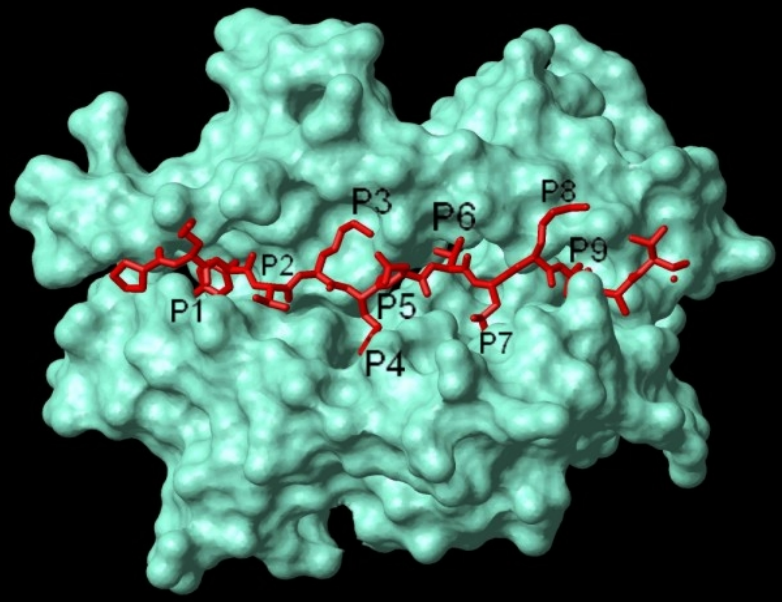


chromosome 6p

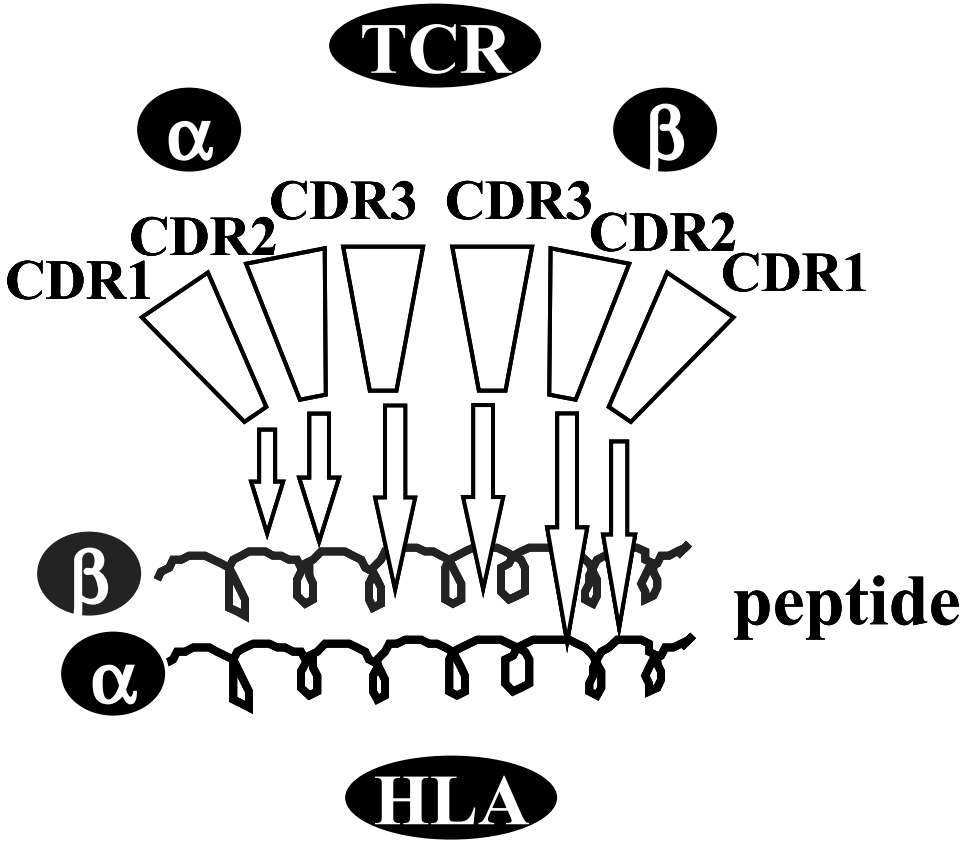
Site peptidique des molécules HLA

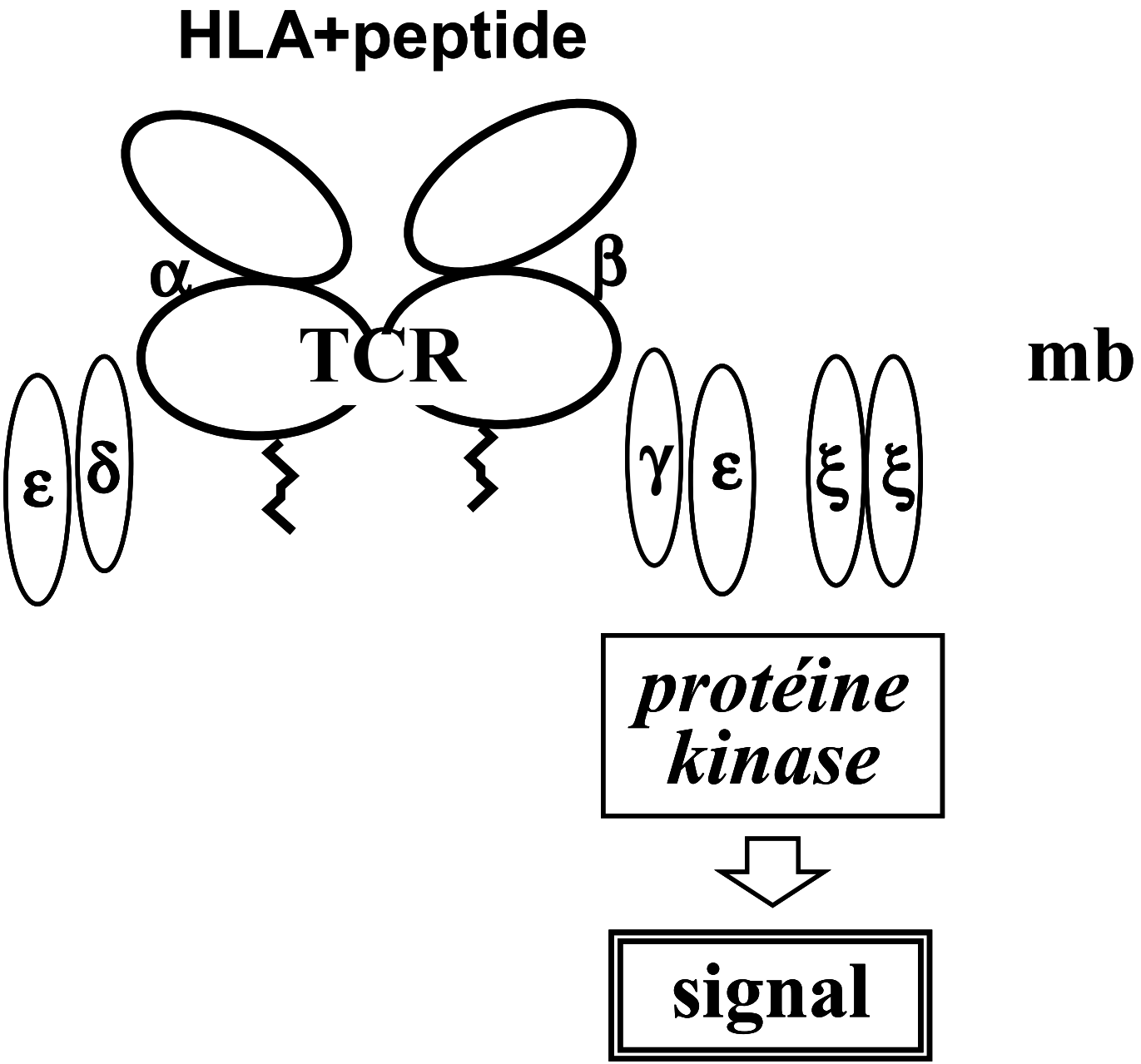


Classe I

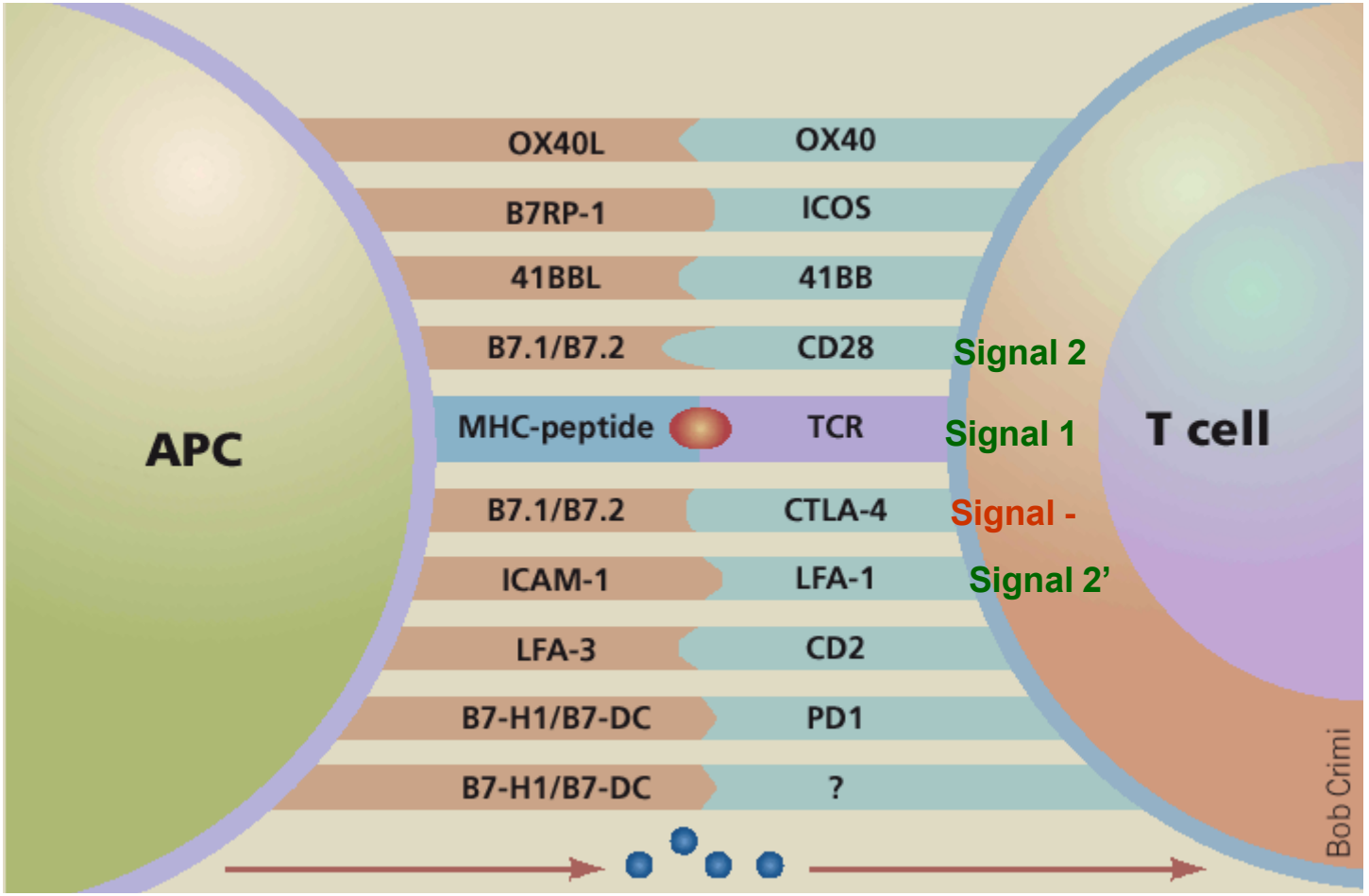


Classe II


TCR
α
β
CDR3
CDR3
CDR2
CDR2
CDR1
CDR1
β
α
peptide
HLA


HLA+peptide
α
β
TCR
ε
δ
γ
ε
ξ
ξ
mb
protéine kinase
signal

Interface LyT-APC

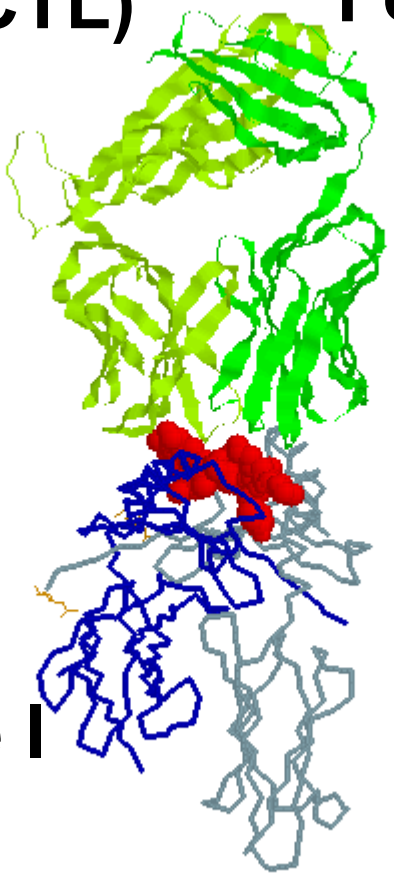


IL2, IL7, IL15: expansion de LyT, formation des LyT CD8 mémoire
IL12: activation des LyT CD4 avec production γIFN et fonction helper
IL18,IL21: augmentation activité CTL

Nature Biotechnology 22, 403 - 410 (2004)

Production cytokines
Fonction helper

Cytotoxicité (CTL)



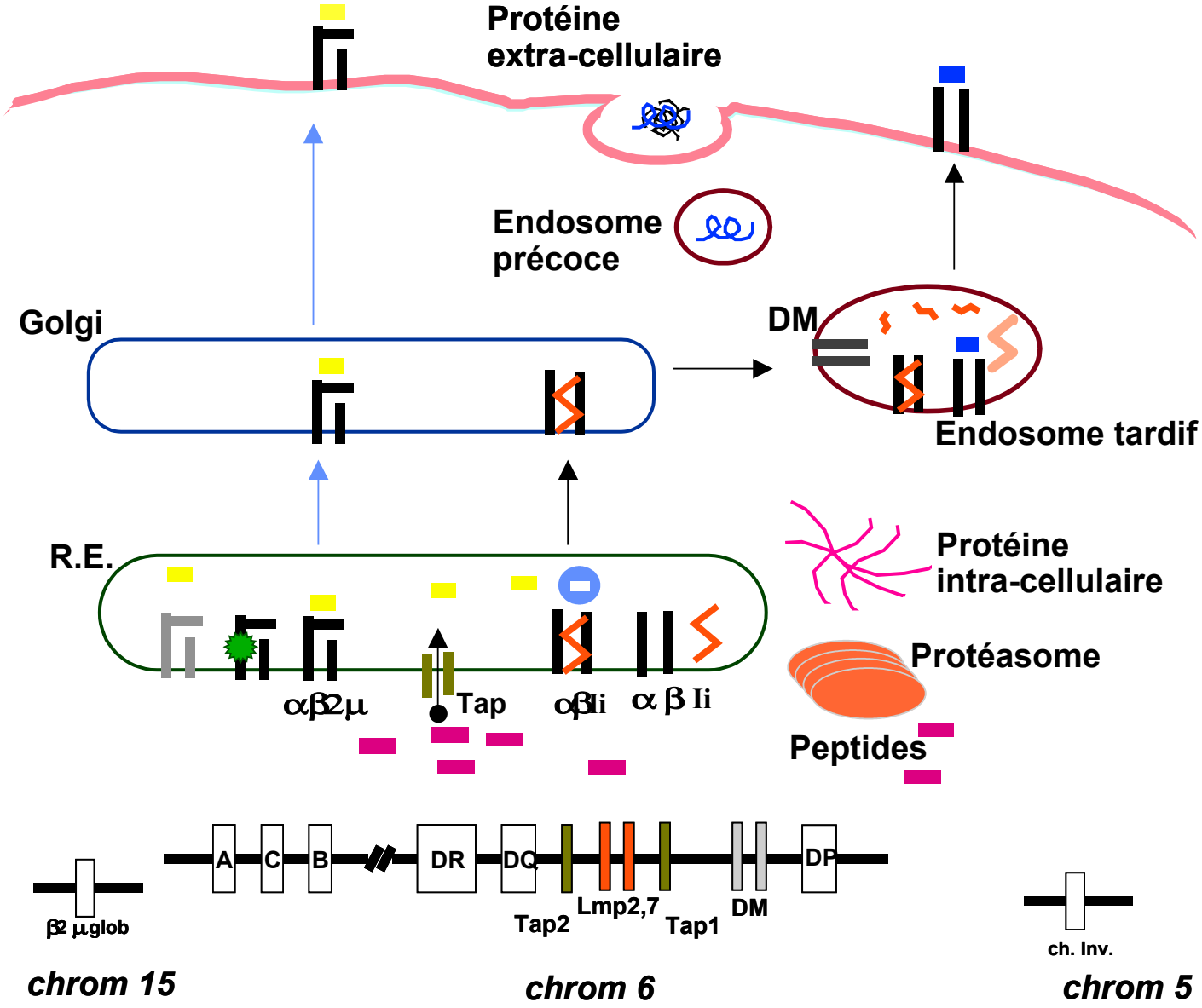
LyT CD8

LyT CD4

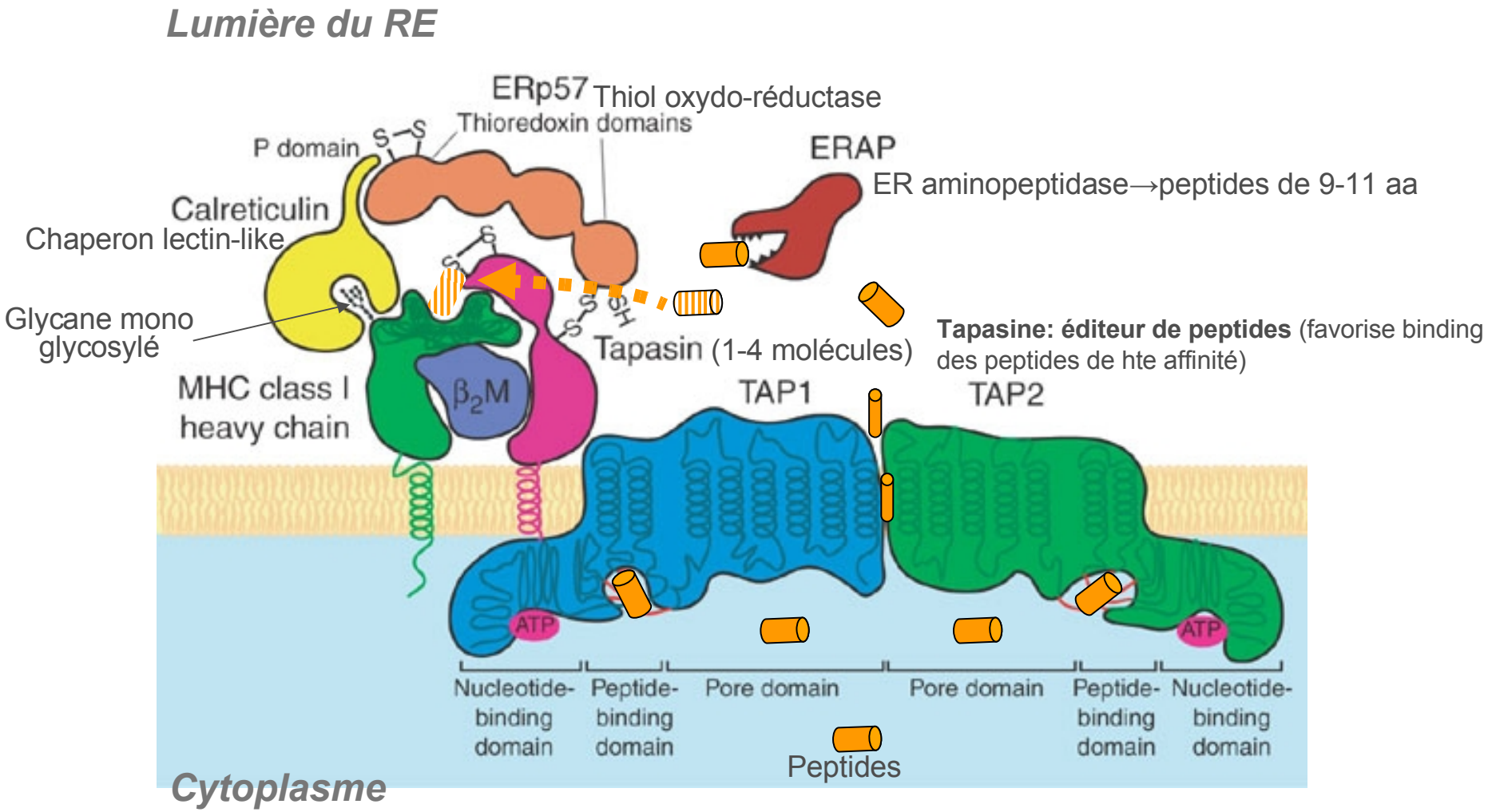
HLA classe I

HLA classe II

Présentation de l'antigène par les molécules HLA

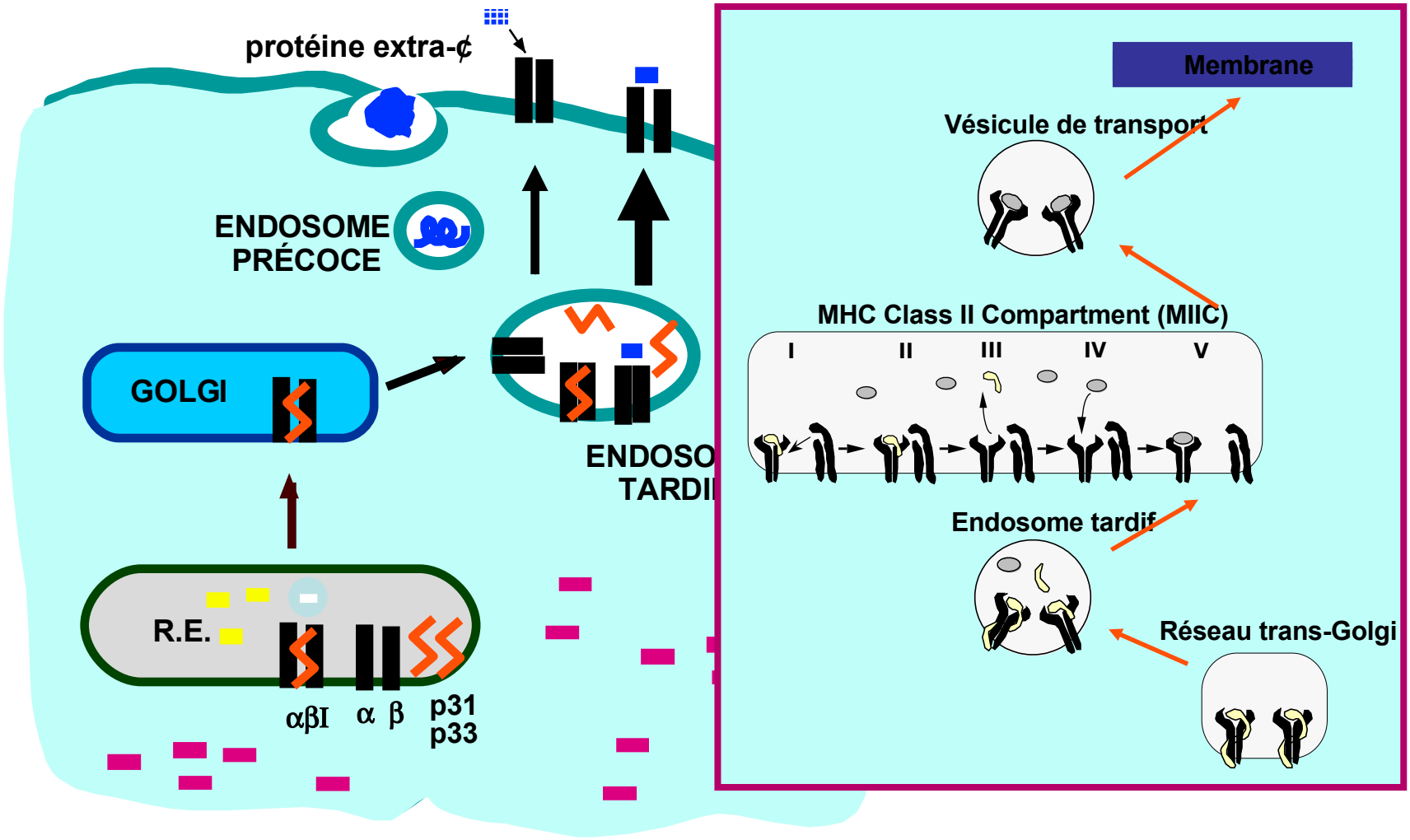


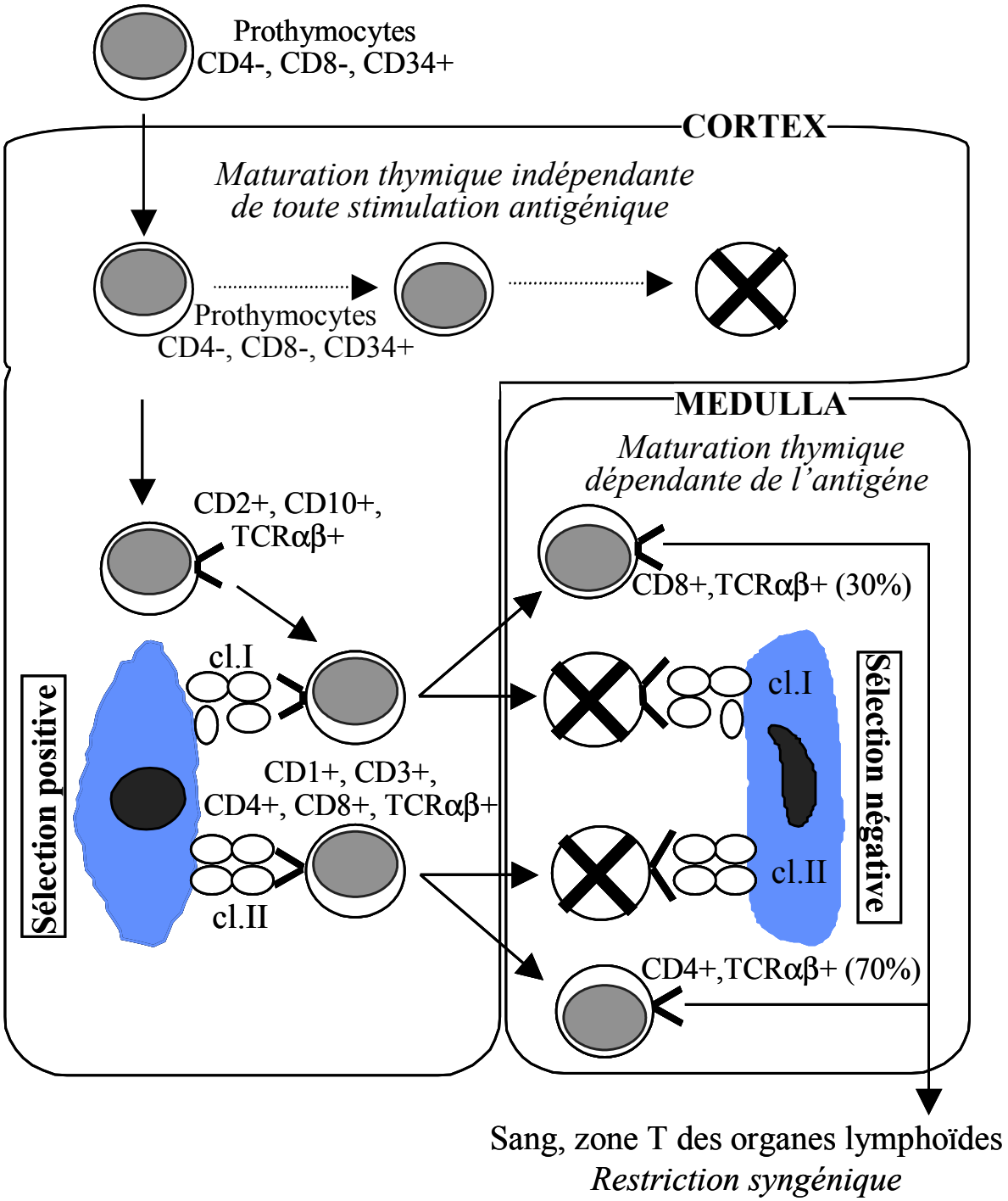
Complexe de chargement peptidique HLA classe I dans le RE



Nature Immunology 5, 678 - 684 (2004)

Complexe de chargement peptidique HLA classe II




Prothymocytes
CD4-, CD8-, CD34+
CORTEX
Maturation thymique indépendante
de toute stimulation antigénique
Prothymocytes
CD4-, CD8-, CD34+
MEDULLA
Maturation thymique
dépendante de l'antigéne
CD2+, CD10+,
TCRαβ+
CD8+,TCRαβ+ (30%)
cl.I
Sélection positive
CD1+, CD3+,
CD4+, CD8+, TCRαβ+
cl.II
cl.I
cl.II
Sélection négative
CD4+,TCRαβ+ (70%)
Sang, zone T des organes lymphoïdes
Restriction syngénique