DATE: 17/02/22
PAGE:

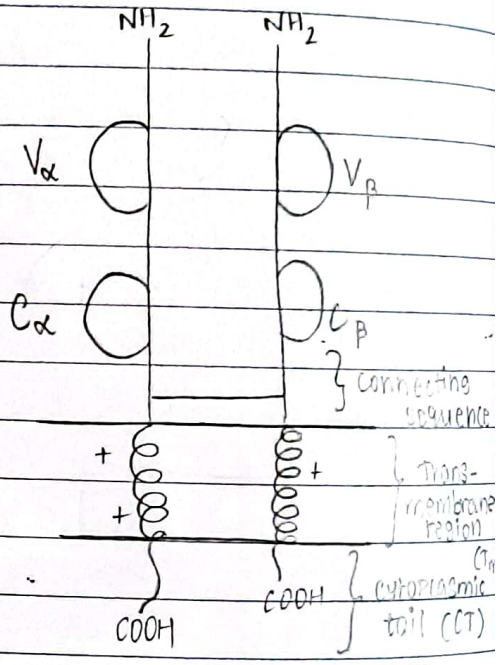
# T-CELL RECEPTOR

T-cell receptors are present in heterodimeric forms.
Made of 2 diff. protomers

2 Types - • αβ (most) → restricting study to only αβ type
• γδ (few)

## Structure of T-cell receptor:

αβ TCR
α-chain β-chain




αβ T-cell receptor -
2 Polypeptide chains (α, β chains)
↳ Similar to Heavy chains of MIg
↳ Towards end of N-terminal these are variable regions containing 3 Hypervariable regions
↳ Highly specific to Antigenic Peptides bound to MHC on the surface of an APC.
unlike B-cells receptors that can recognise free antigens.
↳ Also contains constant regions towards C terminal
↳ T-cell receptor has a transmembrane domain that anchors it to the T-cell.
It has several +vely charged AA residues.
↳ It also has a cytoplasmic tail

DO not undergo SOMATIC HYPERMUTATION

There are genetic recombinations that takes place in T-cells as well that allows diversity in T-cells.
Genes for α & β of T-cell receptor are in chromosome 14 & 7 respectively.
Similarly δ & γ are present in chromosome 14 & 7 resp.

DATE: / /
PAGE:

NOTE: αβ has more degree of variation than γδ.

| Gene | Chromosome location | No. of Gene segments | | | |
|---|---|---|---|---|---|
| | | V | D | J | C |
| α chain | 14 | 50 | - | 70 | 1 |
| δ chain | 14 | 3 | 3 | 3 | 1 |
| β chain | 7 | 57 | 2 | 13 | 2 |
| γ chain | 7 | 14 | - | 5 | 2 |

TCR- CD3 complex -

TCR → recognises antigenic peptides
CD3 → activates downstream signalling pathways

CD3 complex:
- Made up of 5 diff polypeptide chain
- γ, ε (gamma-epsilon) forms one heterodimer, ε δ (epsilon-delta) forms another heterodimer ~~ε ε~~ & two ζ ζ (zeta) chains makes a homodimers.
- All 3 dimers of the CD3 complex (transmembrane domains) have -vly charged AA residues. These residues interact with the +vly charged AA residues of the transmembrane domain of TCR.
- The downstream signalling pathways get activated by the ~~cytoplasmic motifs~~ via phosphorylation & dephosphorylation ITAM (motifs) of the cytoplasmic tails of the CD3 complex

ITAM → immunoreceptor tyrosine-based activation motif

T-cell Accessory Membrane Molecules -

The interaction b/w Antigen & Ab or mIg is very strong but interaction b/w Antigen & TCR is weaker. Therefore, T-cells requires other molecules so that overall interaction b/w

DATE: / /
PAGE:

antigen & T-cell is strong. These molecules are T-cell Accessory Molecules.

eg: CD4 ⟶ Class II MHC } co-receptors
eg: CD8 ⟶ Class I MHC }

18/02/22 Some of these receptors also takes part in Downstream Processing Pathways.
eg: CD28, CD48

ROLE of co-receptors in TCR binding affinity -

Binding Affinity

Weak ⟶ Strong

T-cell receptors | Adhesion molecules | Growth Factor Receptor | Antibodies

These co-receptors help the APC ~~to~~ to remain in close affinity with the T-cell, so that the Antigenic peptide (Ligand) interacts with the T-cell receptor for sufficient time to activate the T-cell's Downstream signalling cascade.

- APC → class II MHC —recognised by→ CD4 co-receptor of $T_H$ cell
- All nucleated cells → class I MHC —recognised by→ CD8 co-receptor of $T_C$ cell

NOTE: All accessory molecules involve in TCR binding!

Since BCR has higher affinity to Antigens, they don't require as ~~much~~ many accessory molecules as TCR.