**Immuno Exam II – Recall Checklist**

|  |  |
| --- | --- |
| VDJ recombination (random) | Heavy chain recombination (light C only has VJ) |
| Pro B cell | Where Heavy C recombines = VDJ |
| Pre B cell | Following Pro B 🡪 light C recombine = VJ |
| Cμ | Ig heavy chain that VDJ attaches 🡪 IgM |
| Junctional diversity | Remove/add nucleotides from VDJ 🡪 ↑ diversity |
| Cobinational diversity | VDJ random gene combination 🡪 ↑ diversity |
| BTK (Bruton’s tyrosine kinase) | = signal 🡪 Pre B cell development advances (rearrange light chain) + allelic exclusion. Defficiency 🡪 XLA |
| Allelic exclusion | 2nd Ch. recomb shutdown of Ig CH |
| Positive selection | TC with ↓ affinity to MHC I & II (thymic epithelial) 🡪 selected |
| Negative selection (central tolerance) | TC with ↑ affinity to MHC I & II(thymic APC) 🡪 apoptosis |
| Adenosine deaminase (ADA) | Removes toxic purine metabolites in developing TC & BC. Defect 🡪 SCID |
| RAG (recombination activating gene) | 🡪 enzymes rearrange/recombine Ig genes (VDJ). Mutation 🡪 absence of BC & TC = another form of SCID |
| ARTEMIS | Gene for endonuclease = resolves hairpin during VDJ recombination. Mutation 🡪 another form of SCID |
| Receptor editing | Reactivate RAG 🡪 new CL to replace self-recognizing Ag receptor |
| X-linked agammaglobulinemia (XLA) | BTK deficiency 🡪 no mature B cells 🡪 recurrent resp pyogenic (encapsulated) infections |
| IL-7 | TC & BC development signal. Deficiency 🡪 SCID = no TC & immature BC (in humans) |
| Double-negative CD4-CD8- (flow cytometry) | Pro TC = no expression of CD4 nor CD8 |
| Double-positive CD4+CD8+ (flow cytometry) | Immature TC (pre-selection) = express both |
| AIRE (autoimmune regulator) | Transcription factor 🡪 tissue-specific genes transcribed & translated 🡪 present for selection |
| Autoimmune polyendocrine syndromes (APS -I) | AIRE gene mut. 🡪 autoreactive T cells. (🡪 triad disorders) |
| LFA-1 (leukocyte function-associated antigen) | Integrin expressed by TC (interacts with ICAM-1) |
| ICAM-1 (intercellular adhesion molecule) | Ligand expressed on APC (binds LFA-1) |
| CD28 | Naïve TC co-stimulatory receptor for CD80 (B7-1) and CD86 (B7-2) – CD28 = TC “on” switch. |
| IL-2 | Activated TC growth factor 🡪 proliferate/differentiate |
| Anergic T cell | Unresponsive TC to Ag even w/ costimulation (🡨 due encountering Ag in absence of costimulation) |
| CTLA-4 (CD152) | TC inhibitory receptor for B7🡪TC suppression. “off” switch |
| PD-1 | TC inhibitory receptor like CTLA-4 but for different ligands |
| ITAM | CD3 cytoplasmic domain. (When ζ chain ITAM gets phosphorylated by Lck 🡪 Zap-70 docking site) |
| Lck | Tyrosine kinase = phosphorylates tyrosine residues on ITAM and Zap-70 |
| Zap-70 (zeta-chain associated protein) | Binds to (p)-ITAM 🡪 RAS/Rac MAP kinase cascade |
| RAS/RAC MAP kinase cascade | (p)-Zap-70🡪RAS/RAC🡪ERK/JNK (MAPs)🡪 AP-1 |
| AP-1 | Transcription factor. Important in TC prolif/differentiation |
| Calcium-NFAT pathway | (p)-Zap-70🡪phospholipase Cγ🡪↑Ca2+🡪calcineurin🡪NFAT |
| NFAT | Transcription factor. Important in IL-2 production pathway |
| DAG | Activates PKC. PKC activates NFκB |
| NFκB | Transcription factor. Important in TC prolif/differentiation |
| CD40L (ligand) | Activated CD4 binds CD40 (receptor) on macs, B cells, DC |
| TH1 (CD4+ subset) | 🡪 IFNγ cytokine 🡪 activates macs & IgG1, IgG3 production.   * IL-12 by macs/DC + IFNγ = key cytokines 🡪 TH1 subset |
| DTH (delayed type hypersensitivity) | 🡪 tissue damage. E.g. MTb or type I diabetes (pathogenic) |
| TH2 (CD4+ subset) | 🡨 In response to IL-4 (IL-5, IL-10, IL-13). Responds to Helminth. 🡪 IgE = allergic reaction |
| Th17 | 🡨In response to TGF-β, IL-1, IL-6, IL-23. Secrets IL-17,  IL-22. Responds to EC bacteria & fungi. Maintains mucosal epithelial barrier |
| Tuberculoid leprosy | Th1 dominant response 🡪better infection clearing |
| Lepromatous leprosy | Th2 dominant response 🡪 inhibits mac activation 🡪 poor infection clearing |
| Fyn, Lyn, Blk | Kinases. Phosphorylates Tyr residues on BC ITAM |
| Syk | Recruited by Phos. Tyr residues 🡪 BC effector function |
| C3d (complement by-product) | Costimulation for BC (when deposited on microbe) |
| X-linked hyper IgM syndrome | TC defect in CD40L. Recurrent pyogenic & intracellular inf. |
| IL-2 | Activates T cells 🡪 clonal expansion |
| FcγRI | Receptor on neutrophils/macs for IgG opsonization |
| FcγRIIB (CD32) | On B cells. Engagement 🡪 feedback inhibition of BC |
| FcγRIIIA | On NK cells. Activates ADCC |
| FcεRI | Binds to IgE on mast cells, basophils, eosinophils |
| FcRn | Neonatal receptor. For IgG transfer mom 🡪 fetus (placenta) |
| CD62L | L-selectin for TC migration through HEV |
| TdT (Terminal deoxynucleotidyl transferase) | Enzyme 🡪 adds random nucleotides to VDJ recombination |
| Cyclosporin A | Inhibits IL-2 🡪 no TC proliferation (in transplant/AI) |
| γδ TC | More like innate. Enhance first line of defense. |
| CD11b | Effector DC (in gut) 🡪 stimulate protective TC response |
| CD103 | Regulatory DC induce regulatory TC to suppress immunity |
| Tregs (regulatory TCs = CD4+CD25+) | Suppress inflammation via IL-10 & TGFβ production. |
| α4β7 (integrin) & CCR9 (chemokine) | Expressed on activated TCs from PP/mLN (circulating in blood) to draw back to effector GALT sites |
| MAdCAM-1 (mucosal vascular addressin cell adhesion molecule) | GALT ligand for α4β7 integrin. (Also found in vasculature of respiratory mucosa) |
| CD25 | IL-2 receptor α-chain |
| CD45RA+/CD45RO+ | Naïve/effector & memory TCs |
| Memory CD4 maintenance cytokine | IL-7 |
| Memory CD8 maintenance cytokines | IL-7 & IL-15 |
| Indirect ELISA | Tests individual’s serum for specific Ab to Ag |
| Promotes IgA response | IL-5 & TGFβ |
| Autoimmune polyendocrine syndrome-I (APS1) | Autoimmume adrenalitis (AAD) + Autoimmune hypoparathyroidism. Due to AIRE gene mutation. |
| Foxp3 | Transcription factor (turns on genes) for TC 🡪 Treg |
| IPEX (Immune dysregulation, Polyendocrinopathy, Enteropathy, X-linked) | Rare. Mutation in Foxp3 🡪 no Tregs 🡪 autoimmunity. Neonates develop type 1A diabetes (2 days). Treat: BMT |
| Autoimmune lymphoproliferative syndrome | Defect in AICD (Activation Induced Cell Death) pathway (apoptosis for self-recognizing) |
| Bcl-2 protein | Anti-apoptotic protein |
| NOD2 | PRR in cytoplasm. Mutation 🡪 Crohn’s |
| MLR (mixed lymphocyte reaction) | Tests patient’s TC response to donor’s tissue (radioactive) |
| HLA | Genes that code for MHC. HLA type I (**A**,**B**,C) 🡪 MHC-I. Type II (DM, DQ, **DR** & more) 🡪MHC-II. A, B, DR = graft matching. HLA-DR = most important |
| T-bet & GATA-3 | Transcription factor 🡪 Th1 & Th2 differentiation. In allergic reaction = ↓ T-bet & ↑ GATA-3 |
| H1 | Histamine receptor 🡪 ↑ vascular permeability + smooth muscle constriction (airway) |
| Type I (immediate) hypersensitivity | Allergic reaction. Th2, IgE, mast cells, eosinophils. |
| Type II hypersensitivity | Cell surface/EC matrix/tissue bound Ag. Complement (classic), IgM, IgG. Neutrophils, macs. |
| Type III hypersensitivity | Soluble = immune complex of circulating Ag & IgM, IgG. Fc-receptor & complement (classic) mediated |
| Type IV (delayed = DTH) hypersensitivity | Cell mediated via CD4 (Th1 + Th17) & CD8. Macs/cytokines & cell killing. E.g. Tuberculin rxn, poison ivy. |
| IL-3 | 🡪 Mast cell proliferation |
| IL-5 | Contributes to Eosinophil activation |
| Grave’s disease | Type II = Ab binds TSH receptor. |
| Myasthenia gravis | Type II = Ab binds Ach receptor. |
| Hemolytic anemia | Type II = like penicillin binds to RBCs 🡪 immune response |
| Goodpasture’s disease | Type II = Ab binds to type IV collagen in lung/kidney basement membrane 🡪 cough/urine blood |
| Farmer’s lung | Type III = inhaling Ag 🡪 immune complex = block alveoli gas exchange |
| Systemic lupus erythematosus | Type III = DNA/Ab complexes |
| Arthus reaction | Ag injected subcutaneously 🡪 immune complex 🡪 Platelets accumulate 🡪 occlusion/rupture of vessel 🡪 erythema. |
| Allergic Contact Dermatitis (ACD) | Type IV = Hapten/carrier complex. E.g. poison ivy |