Achievable

USMLE STEP 1 DUMP SHEET

Immunology

Hypersensitivity

Type	Mediator	Mechanism	Examples
I	IgE on mast cells, basophils	Allergen cross-links IgE: histamine, leukotrienes in minutes; late phase (eosinophils) 6—12 h	Anaphylaxis, asthma, allergic rhinitis, urticaria, atopic dermatitis
II	IgG or IgM against a cell or matrix	Complement, phagocytosis, ADCC; or antibody stimulates or blocks a receptor	Drug hemolytic anemia, Goodpasture, Graves, myasthenia gravis, pernicious anemia
III	IgG—antigen complexes	Complexes deposit in vessels and tissue, fix complement	Serum sickness (7—10 days: fever, rash, arthralgia), Arthus reaction, SLE, farmer's lung
IV	T cells	Delayed 24—72 h; Th1 cytokines or CD8 killing	PPD test, contact dermatitis (nickel, poison ivy), celiac disease

Immunodeficiencies

Disorder	Defect	Clues
Bruton (XLA)	BTK, X-linked	No B cells, all Ig low; infections once maternal IgG wanes (about 6 months)
Selective IgA	Most common one	Sinus, lung, gut infections; autoimmunity; anaphylaxis to IgA in blood products
Common variable (CVID)	B cell maturation	Two or more Ig classes low, later onset; autoimmunity, lymphoma
Hyper-IgM	CD40 ligand, X-linked	No class switch: high IgM, low IgG, IgA, IgE
DiGeorge	22q11 deletion; pouches 3, 4	Thymic aplasia, hypocalcemia, heart defects, cleft palate (CATCH-22)
Job (hyper-IgE)	STAT3; few Th17 cells	Cold staphylococcal abscesses, eczema, very high IgE
SCID	IL-2Rγ, ADA, RAG, JAK3	T and B failure; IL-2Rγ form X-linked; low TRECs; no live vaccines
Wiskott-Aldrich	WAS, X-linked	Thrombocytopenia with small platelets, eczema, infections
Chronic granulomatous	NADPH oxidase; X-linked or AR	Catalase-positive infections (S. aureus, Serratia, Aspergillus); NBT test negative
Chédiak-Higashi	LYST, AR	Phagosomes and lysosomes fail to fuse: giant granules, albinism, neuropathy

T and B cells

- **Thymus cortex:** positive selection (binds self-MHC). **Medulla:** negative selection; AIRE defect → autoimmune polyendocrinopathy
- **CD4** binds MHC II; **CD8** binds MHC I
- **Signal 2:** CD28—B7; without it, anergy. **CTLA-4** binds B7, inhibits
- **Calcineurin** → IL-2 → autocrine proliferation
- **Class switch:** CD40—CD40L, then IL-4 → IgE; TGF-β, IL-5 → IgA; IFN-γ → IgG
- **Th1** (IL-12): IFN-γ, macrophages. **Th2** (IL-4): IL-4, 5, 10, 13; B cells, eosinophils. **Th17:** IL-17, neutrophils. **Treg:** CD25, FoxP3
- **NK cells** (CD16, CD56) kill cells lacking MHC I
- **Live vaccines:** MMR, varicella, rotavirus, yellow fever, intranasal flu, oral polio. **Toxoids:** diphtheria, tetanus

Immunoglobulins

IgG	Most in serum; crosses placenta; opsonizes; secondary response
IgM	Pentamer; primary response; best complement activator
IgA	Dimer with secretory component; mucosa, milk
IgE	Mast cells; allergy, helminths
IgD	Naive B cell receptor, with IgM

- **Papain** → 2 Fab (antigen binding) + Fc (effector)

MHC

	Class I	Class II
On	All nucleated	APCs
To	CD8	CD4
Loci	HLA-A, B, C	DP, DQ, DR
Loads	Via TAP	Swaps CLIP

Complement deficiencies

- **C1q, C2, C4:** SLE-like disease
- **C3:** recurrent pyogenic infections
- **C5—C9:** Neisseria infections
- **C1 esterase inhibitor** (AD): hereditary angioedema, bradykinin
- **PNH:** PIGA → no GPI anchor → CD55, CD59 lost → hemolysis, dark morning urine, thrombosis

Transplant and transfusion

- **Hyperacute** (minutes): preformed anti-ABO or HLA antibodies, thrombosis
- **Acute** (weeks—months): T cells, antibodies. **Chronic:** intimal thickening, fibrosis
- **GVHD:** donor T cells attack skin, liver, gut
- **Transfusion:** febrile (anti-WBC), anaphylaxis (IgA deficiency), hemolytic (ABO), lung injury (donor anti-HLA)