Drug	mechanism	effect	clinically	Side effect
Glucocorticoid	- Inhibit genes codes for cytokines (IL-2) - causing B cells ↓ Produce IL-2 and its receptor	- Supress cell mediated immunity and humoral immunity - anti inflammatory	- first line Immunesuppressive for transplant → solid and HPS cells - GVHD - thrombocytobenic Purpura - RA - allergic Rxn (asthma) - Premedication.	- immune deficiency - Adrenal glands (↓ secretion) - Hyperglycemia (redistribution fats) - osteoporosis - ↓ growth → Delayed Puberity - excitatory → CNS - Cataracts - gastric ulcers (+⊖ omeprazole misoprostol)
Calcineurin Inhibitors Better: Cyclosporine, Tacrolimus	inhibit Calcineurin (cytosolic Phosphatase) which activat TF NFAT → ⊖ synthesis of IL [IL-2]	supress cell mediated immunity	- human organ transplantation - GVHD after hematobiotic stem cells - selected autoimmune diseases. ↳ uveitis, RA, Psoriasis, Asthmas - Dry eye syndroms, Ocular GVHD - Dematologic Diseases [Psoriasis Dermatitis]	- High dose: toxicity (nephro, mental, hyperglycema, hypertension) → narrow TW - low dose: rejection - Rare: cancers - Hyperlipidemia - Diabetes
mTOR inhibitor Sirolimus ↳ (Rapamune)	inhibit kinase activity of Rapamycin (mTOR) and decrease IL-2 activity	Inhibit immune cell growth	combined with cyclosporine increase plasma level of Sirolimus ← monitor	- narrow TW * High dose: Toxicity (nephro, mental) * low dose: rejection
Anti-metabolites methotroxate Azathioprine mycophenolate more effective in Prevention of acute Rejection	at low doses for immune therapy [High dose → anti cancer] - folic acid analogue → bind dihydrofolate reductase → Prevent synthesis of Tetrahydrofolate → Depletion of Purines. - Reversible inhibitor of Inosine monophosphate D.H [IMPDH] → Depletion of G nucleotides.	affect the Proliferation of B and T cells. - main immunosuppressive cytotoxic substance - anti proliferative effect of B, T cells.	treatment of autoimmune (RA, Bahcet's Disease) and in transplantations. - extensively used in control transplant rejection Reactions - used in combination with cyclosporine and Prednisolne - mycophenolate mofetil → solid transplantation for refractory rejection - mycophenolate with Pred... → Don't work if cyclosporine don tolerate it - low dose cyclosporin with myco, in renal transplant use cyclosporin ↓ its nephrotoxicity.	
Immunesupresive - antibodies muromonab (anti CD3) Anti IL-2 R Better: ↳ Basiliximab, ↳ Daclizumab anti TNFα ↳ Infliximab ↳ Adalimumab Retuximab Omalizumab	anti CD3 in T cell anti IL-2 R → Block Proliferation T cells Half life: 7 days : 20 days, Blockade 120 days. anti TNF α anti B cell [CD 20] anti Ig-E	- suppressive the activity of T cells - Block co stimulatory signals. - rapid depletion of mature T cells	- Deplete Tcells from bone marrow Prior the transplantation. - treat acute rejection of renal allograft - corticosteroid-resistance acute allograft rejection of cardiac and hepatic transplant Patients. - Prevent acute rejection in renal trans. - treat bone marrow before trans. - 2 doses: 1st Before 2H of ↓ , 2nd after 4 days of ↓ to Patient with expected Delayed graft function and in higher risk of rejection for people not respond to methotroxate, to slow RA combined with methotroxate to treat RA when anti TNF α fail with some Patients. give in atopic asthma as alast choice	initially activate T cells → cytokine storm ← treat By Premedicate: methyl Prednisolne, Diphenhydramine, acetaminophen - major toxicity in GI - latent TB - worsening the congestive heart failure

normal case consist of
- Tacrlimus → 2 doses means Half life short
- Prednisolne → 1 dose " " " long
- Azathioprine → 1 dose " " " "

when increase risk of rejection
- Tacrolimus led triple therapy, but with MMF substituted for Azathioprine. → given 2 doses

Immunostimulant

Interferon
- INF α, β → antiviral
- INF γ → immunomodulating

side effect: Flu-like symptoms, fatigue, malaise

IL-2
Help in T cell proliferation and other cells.
treat melanoma, Renal cell carcinoma, Hodgkin disease.

Cancer immunotherapy
- anti PD-1 → nivolumab
- anti CTLA4 → Ipilimumab.

Trough levels هو اقل تركيز في

→ indicate the eliminating rate of the Drug

يدلنا على مراقبة تركيز الدواء

Tacrolimus و cyclosporine لهذا خطير يجب

cyclosporine → metabolise in liver P450 A3 system.