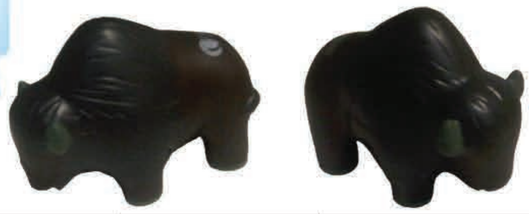
Bold = Immunoregulatory Functions (they modulate immune responses, because you can definitely have too much a good thing when it comes to immune responses!)
Red = Designates TH1 or T_H2 Response



Study Buffalo Tip: You probably won't need most of this information, but Study Buffalo are wary of trusting professors, so they have provided extra information just in case!

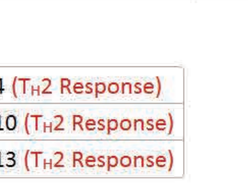
Knowing the names and functions are probably the most important followed by the other details, so if you are short for time, skip the other stuff!

	Functions	Therapeutic Uses	Side Effects	Formulations
IL-2 (T_H1 Response)	• Produced by CD4+ T Cells • Expansion and proliferation of lymphocytes (B-, T- and NK Cells) • Expression of pro-inflammatory cytokines • Induces Anti-viral/bacterial responses • **Selection of Tregs**	• Metastatic Renal Carcinoma • Acute Myeloid Leukemia	• Autoimmune Disorders • Capillary Leak Syndrome • Cardiac, CNS, Renal and Liver Toxicity	
TNF (T_H1 Response)	• Pro-inflammatory response			
INF-α & INF-β (Type I Interferons)	• Promote TH1 Response • Induce expression of IL-15 (Promotes differentiation of NK and memory T cells) • Induces expression of IFN-γ • **Induce expression of IL-10 (promotes TH2 Response)** • **Decrease IL-12 (Pro-inflammatory cytokine)**			
INF-α2a	• Anti-viral (decreased replication of virus-infected cells) • Anti-cancer (decreased cell proliferation)	• Acute and chronic Hep C • Chronic Hep B • Leukemia • Lymphoma	• Immunosuppression • Myelosupression • Auto-immune diseases • Flu-Like Symptoms	• Uncoated and PEGylated INF-α1a
INF-β	• Anti-viral • **Immunoregulatory**	• Relapsing MS	• Cardiovascular • Myelosuppression • Hypersensitivity	• INF-β1a & INF-β1b
INF-γ (T_H1 Response)	• Activates APCs • Increases proliferations of cells involved in TH1 Responses • **Immunoregulatory**	• Treatment of infectious diseases, cancers, autoimmune disease (Hep B, C, hairy cell leukemia)	• Autoimmune disorders	
G-CSF & GM-CSF	• G-CSF - Stimulates granulocyte production • GM-CSF - Stimulates granulocyte and macrophage production	• Neutropenia • Harvesting of peripheral blood stem cells	• Nausea & Vomiting • Bone pain • Hypersensitivity	• Filgrastim (Uncoated G-CSF) • PEG-Filgastim (PEGylated G-CSF) • Sargramostim (Uncoated GM-CSF)
Erythropoietin	• Produced in the kidney • Colony stimulating factor for RBC	• Anemia • Chronic Renal Failure	• Pure Red Cell Aplasia (RPCA) • Congestive Heart Failure, myocardial infarction, Deep Vein Thrombosis, Pulmonary Embolism, Stroke and Seizure	• Epoetin-α • Darbepoetin-α

Tregs are T cells that regulate immune responses

Renal Carcinoma is cancer of the liver

Autoimmune disorders are commonly things like thyroiditis, rheumatoid arthritis and sometimes even Lupus (I know, it's never lupus)



Flu-like symptoms include everyone's favourite symptoms of headaches, fatigue and fever!

Neutropenia means your body is low on neutrophils (they might of gone on vacation... or kicked the bucket)

The nausea/vomiting symptom is debatable; every other drug given to chemo patients has the same side effect. I say G-CSF and GM-CSF are innocent until proven guilty!

IL-4 (T_H2 Response)
IL-10 (T_H2 Response)
IL-13 (T_H2 Response)

You probably won't be tested on these, but just in case, here are the TH2 cytokines!

RPCA is when your erythroblasts go poof! They probably all grew up and became erythrocytes, and left no progenitors behind!

All these CV symptoms are because your body went over board with RBC production and it is mucking everything up!

Now, I know what you are thinking: "Study Buffalo, how the heck do you expect me to remember what all these anti-cytokine drugs do?"
Worry not, here is a simple naming table that may help you!

-mab	Monoclonal antibody
Xi	Chimeric (part mouse/human)
U	Human antibody
Mu	Mouse antibody (don't confuse with U)
Zu	Humanized antibody
Li	Acts on cytokine system
Tu	Acts on a tumour

It is also unlikely you will be tested on this, but we think it is pretty cool

	Structure	Indication	Mechanism of Action	Adverse Effects
Etanercept (Anti-TNF)	• Fusion of TNF-receptor +Fc region of an Ig	• Ankylosing spondylitis • Plaque psoriasis • Rheumatoid arthritis • All are Auto-immune	• Each molecule of etanercept binds to a single molecule of TNF-α or TNF-β • Fc mediates uptake and destruction by immune cells	• Secondary Cancer • Reactivation of latent infections • Hypersensitivity
Infliximab & Adalimumab (anti-TNF-α)	• Infliximab (Chimeric mAb) • Adalimumab (Human mAb)	• Auto-immune	• Bind to two molecules of TNF-α	• Reactivation of latent infections • Opportunistic infections • Lymphoma & Malignancies • Infusion reaction for Infliximab • Hypersensitivity
Daclizumab (anti IL-2) (Replaced by Basiliximab)	• Humanized mAb	• Acute organ rejection prophylaxis for kidney transplants	• Binds to Tac-α (CD25) of the IL-2 receptor • Prevents IL-2 binding on ACTIVATED lymphocytes	• Hypersensitivity • Induces diabetes
Basiliximab (anti IL-2)	• Chimeric mAb	• Acute organ rejection prophylaxis for kidney transplants • Off-label use with other transplants/grafts	• Binds to Tac-α (CD25) of the IL-2 receptor • Prevents IL-2 binding on ACTIVATED lymphocytes	• Hypersensitivity • Opportunistic infections, secondary malignancies • Hypertension • Diabetes • Electrolyte changes
Future Agents				
Ustekinumab (anti IL-12, IL-23)	• Human mAb	• Plaque psoriasis		
Certolizumab (Anti-TNF)	• PEGylated Fab' fragment	• Crohn's Disease		
Mepolizumab (anti IL-5)	• Humanized mAb	• Asthma as a result of an allergic condition • Eosinophilic esophagitis		
Toclizumab (anti IL-6)	• Humanized mAb	• Rheumatoid arthritis		

TNF is important in prevent cancer, so removing it is like putting out the welcome mat for cancer (especially skin cancer!)

Removing TNF also leaves makes your immunocompromised, so some of those sleeper-cell (or latent) infections will be triggered

They have to be activated lymphocytes because otherwise there is no Tac-α to bind!

Eosinophilic esophagitis means that your eosinophils pretty much got tired of the blood stream and decided to migrate into the esophagus