Cytokine	Cell source	Target(s)	What It does at the Target
IL-1	Macrophages	Macrophages, Neutrophils, Endothelial Cells.	******Know that along with TNF, it has a huge role in inflammation. **Phagocytes**: Activates 'em, or enhances their activity. **Endothelial cells**: they get damaged when macrophages come "eat." IL-1 causes expression of ICAM-1, VCAM-1, E-Selectin. In addition, it causes them to secrete IL-8, and MCP-1. **Physiologically**, it induces low BP (possible shock), and on the hypothalamus to cause fevers (higher set-point)
IL-2	CD4+ T-cells, specifically Thp, Th0, and Th1 (notice no Th2)	CD8+ T-cells, NK Cells	**Naïve CD8+ T-cells (pCTLs):** along with IFNγ, IL-2 allows them to mature into Cytoxic T-cells (CTLs). **Natural Killer cells**: enahces their activity in killing virally infected cells (their KIR recognizes Class I MHCs of infected cells, while their FcγR recognizes viral antigens bound to IgG)
IL-3	T-cells (and mast cells)	Hematopoetic cells, and Myeloid Progenitors	Thus… **Hematopoeisis.** It helps when the Pluripotent Stem Cells (the cells you get during a bone marrow transplant) need to split into the 2 lineages of Myeloid progentor cells, and Lymphoid Progenitor Cells
IL-4	Mast cells, Th0 cells, and Th2 cells (CD4+)	B-cells, Th0 CD4+ T-cells, Th1 CD4+ T-cells, Phagocytes	**B-cells**: causes them to undergo isotype switching to IgE. **Th0 cells**: lotsa IL-4 prefers the Th2 CD4+ T-cell population. **Th1 cells**: inhibits/downregulates them (while increasing Th2 type). **Phagocytes**: downregulates the production of iNOS.
IL-5	Th2 cells, and Mast Cells	automatically think **Eosinophils!** and Bone Marrow too…	**Eosinophils:** Activates them for growth and differentiation, causing them to express the adhesion molecule VLA-4 (which is needed to bind to VCAM-1 of the endothelium so it can enter the endothelial cells), also to expresss the Chemokine Receptor CCR3 **Bone Marrow**: takes that 1st lineage of the Pluripotent Stem Cells, the Myeloid Progenitor and allows it to mature into either Eosinophils, Basophils, or GM Progenitor.
IL-6	Th2 cells, and Macrophages	Hepatocytes and Bone marrow	**Hepatocytes:** causes them to secrete C-Reactive Protein (CRP), which is an Opsonin for phagocytes. Bone Marrow: promotes Hematopoesis b/c it stimulates the Pluripotent Stem Cells to be more responsive to IL-3, IL-5, and GM-CSF which are all cytokines for Hematopoesis as well

IL-7	Bone Marrow Stromal Cells	Bone Marrow and Thymus	**Bone Marrow**: takes the 2nd lineage of the Pluripotent Stem Cells, the Lymphoid Progenitor and allows it to mature to either B-cell Progenitor, T-cell Progenitor, or NK Cells. Also, within the Bone Marrow, it promotes B-cell Maturation. **Thymus:** In addition, it allows the T-cell Progenitors to mature into their respective T-cells (that is, either they gonna be CD4+ or CD8+ after the maturation process.
IL-8	Endothelial Cells, activated macrophages	causes inflammation of tissues	It is a chemokine, and **NOT a cytokine**. Chemokines are chemoattractants, and thus IL-8 is **chemotactic** for Neutrophils.
IL-9	Th2 cells	Activated T-cells and Activated B-cells	????
IL-10	Th2 cells	Dendritic Cells and Macrophages	**Dendritic Cells**: causes them to secrete LESS IL-12. And thus less IL-12 leads to less Th1 proliferation (since both IFNγ and IL-12 are both needed for Th1 proliferation **Macrophages:** along with IL-4 and TNFβ, downregulate iNOS
IL-11	Bone Marrow again	Hepatocytes and Bone marrow	**same as IL-6**
IL-12	Dendritic Cells and Macrophages	NK Cells and Th0 cells	**NK Cells**: It activates NK cells so that they can secrete IFNγ. **Th0** cells: along with IFNγ allows Th1 cells to proliferate
IL-15	Epithelial Cells, Fibroblasts	CD8+ T-cells, NK Cells	????
GM-CSF	T-cells and Macrophages	Bone Marrow	**Bone Marrow-** allows the 1st lineage of Pluripotent Stem Cells, the Myeloid Progenitor to become the GM Progenitor. Easy enough… GM-CSF = GM Progenitor
all other CSF	GM-CSF is the only one secreted by both Macrophages AND T-cells. Otherwise, allllllllll CSF's (including GM-CSF) is secreted by Macrophages	Bone Marrow	**Bone Marrow**: all the CSF's are involved in Hematopoesis: **GM-CSF** --> said earlier it promotes Myeloid Progenitor (1st lineage) to mature into the GM Progenitor. Again think the letter "GM" promotes production of the GM Progenitor. **G-CSF** --> Think the letter "G" thus it promotes the GM Progenitor to mature into Granulocytes (neutrophils). **M-CS**F --> Think the letter "M" thus it promotes the GM Progenitor to mature into Monocytes.

IFNγ	NK Cells	Phagocytes and T-cells	**Phagocytes:** Activates iNOS (along with TNF. Both TNF and IFNγ are needed in order for iNOS to be activated), and also enhances activation of NADPH Oxidase **T-cells**: Along with IL-12, allows Th0 cells to become Th1, thus it also downregulates Th2 cells and Type 2 cytokines. AND when it is combined with IL-2, it promotes pCTLs to mature into CTLs
TNF	Th1 Cells and Macrophages	Endothelial cells	Know that is has the **EXACT SAME effects as IL-1** (they both work together anyway) Thus, Along with IL-1, it tells the endothelial cells to express VCAM-1 and ICAM-1. And again, the VCAM-1 is what the VLA-4 expressed by the Eosinophils will bind to in order to enter the endothelium. ****Main difference between TNF and IL-1** to know is that TNF is an activator of iNOS (along with IFNγ. In fact you need both TNF and IFNγ in order to iNOS to be activated)
TGFβ	Th2 Cells	Macrophages	**Macrophages**: just like IL-4 and IL-10. Job is to downregulate iNOS.
MCP-1	Endothelial Cells, activated macrophages	causes inflammation of tissues	**same as IL-8**
IFN α/β	all cells infected by a virus	allllllllllll cells	***aka Type 1 Interferons (but this is NOT a Type 1 Cytokine as the name would imply)**. A shitload of activity: 1) Inhibits T-cell proliferation (whereas IFNγ promoted T-cell proliferation and maturation [like with IL-2, it promoted pCTL--> CTL, and like with IL-12 it promoted Th0 --> Th1]) 2) Increase in number of soluble adhesion molecules 3) Triggers enzymes such as **2'-5' Oligoadenylate Synthetase**, which interferes with Viral reproduction 4) Decreases B-cells in one population 5) is therapeutic for Hairy Cell Leukemia, Genital Warts, Kaposi's Sarcoma, Multiple Sclerosis, and Hepatitis B and Hepatitis C

Pyrogenic Cytokines: IL-1, 6, TNF
IL – 13 – inhibits IL- 1, 6, 8, 10, MCP
Macrophages release : IL-1, 6, 12, TNF
Th1 – IL-2, TNF, IFN
Th2 – IL-4, 5, 6, 10, 13, TGF

Tho – IL-2, 4, IFN