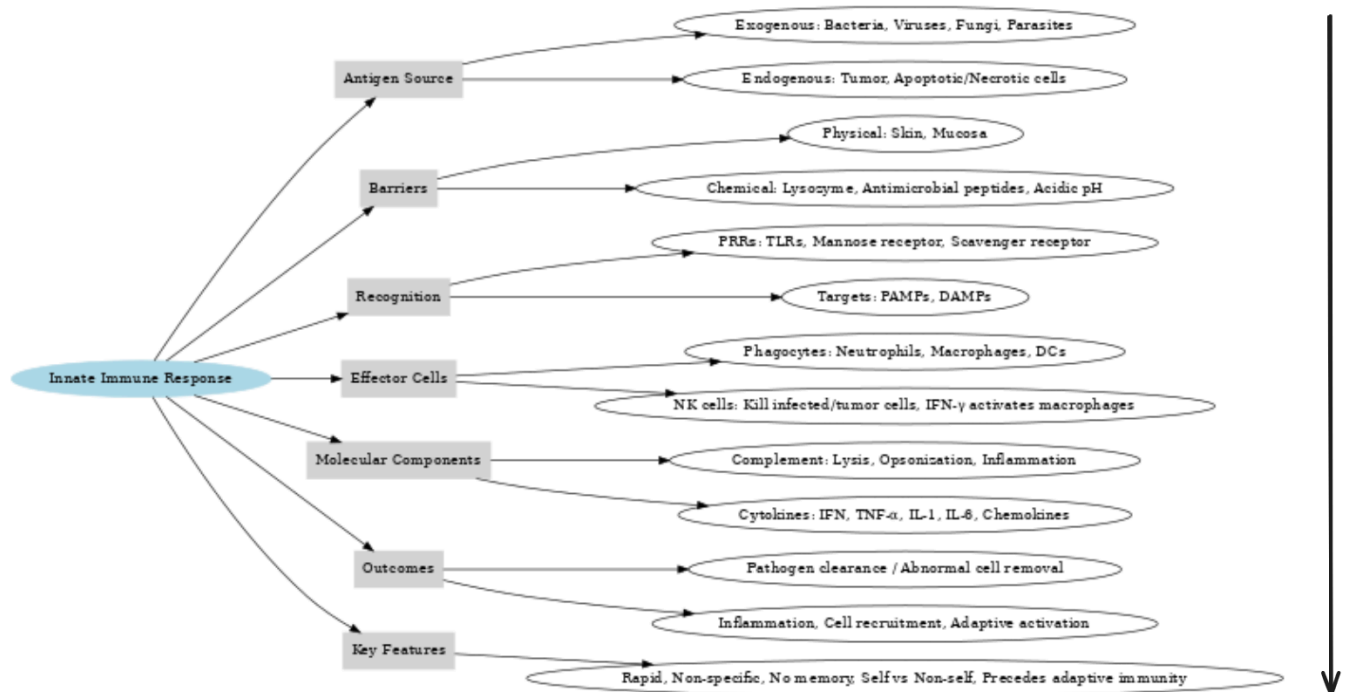


## 免疫学第二次作业

### main component of the innate immune system



Stage	Time scale (approx.)	Key components	Receptors & signals	Cellular events	Effectors	Assays & markers	Writing focus (what to emphasize)
Barrier defenses	Continuous / immediate	Skin, mucosal epithelium, normal microbiota, lysozyme, antimicrobial peptides	Physical / chemical blocking	Prevent pathogen entry; maintain microbial balance	Antimicrobial peptides, lysozyme, acidic pH	Histology, microbiology, pH testing	Describe the "first line of defense," include one or two molecular examples
Recognition	Minutes – hours	PRRs (TLRs, mannose receptor, scavenger receptor)	PAMPs / DAMPs → MyD88 / TRIF → NF-κB	Initiation of transcription, production of pro-inflammatory cytokines	TNF-α, IL-1, IFNs	qPCR/ELISA, receptor knockout models	Emphasize how PRRs detect exogenous/endogenous signals and activate downstream pathways
Soluble effectors (Complement / soluble factors)	Minutes – hours	Complement proteins (C3, C5, etc.), acute-phase proteins	Classical / alternative / lectin pathways	Bacterial lysis, opsonization, chemoattraction	C3b, C5a (chemoattractant)	Complement activity assays, C3b labeling	Highlight the role of complement in bridging phagocytosis and inflammation
Cellular effectors	Hours – days	Neutrophils, macrophages, dendritic cells, NK cells	FcγR, complement receptors, TLRs	Neutrophil extravasation and phagocytosis; macrophage phagocytosis and clearance; NK cytotoxicity (perforin/granzyme)	ROS, RNS, perforin, granzymes	Flow cytometry (Ly6G/CD11b, CD15/CD66), cytotoxicity assays, ROS probes	Write the chain of cellular actions (recruitment → recognition → killing → clearance) and note potential tissue damage/repair
Bridge to adaptive immunity	1 – 3 days	Dendritic cells, MHC I/II, costimulatory molecules (CD80/86)	Antigen processing and presentation → TCR recognition	DC maturation and migration to lymph nodes; activation of naïve T cells	Costimulatory molecules, IL-12	Lymph node cell analysis, T cell proliferation assays	Stress how innate immunity provides information and costimulation for adaptive immunity
Resolution / repair	Days – weeks	Anti-inflammatory cytokines (IL-10, TGF-β), scavenger macrophages	Damage signals → clearance of apoptotic cells	Clearance of apoptotic cells, tissue repair, resolution of inflammation	Anti-inflammatory cytokines, matrix metalloproteinases	Histology, cytokine profiling	Write about clearance/repair mechanisms, and mention that failure may lead to chronic inflammation

### An example when E.coli is involved

