

Immune response to infections

Factors influencing the extent and severity of infection

- **Pathogen factors**
 - **Dose**
 - **Virulence of organism**
 - **Route of entry**
- **Host factors**
 - **Integrity of non-specific defences**
 - **Competence of the immune system**
 - **Genetic influences**
 - **Previous exposure to antigen**
 - **Existence of co-infection**

Immune response to viral infections

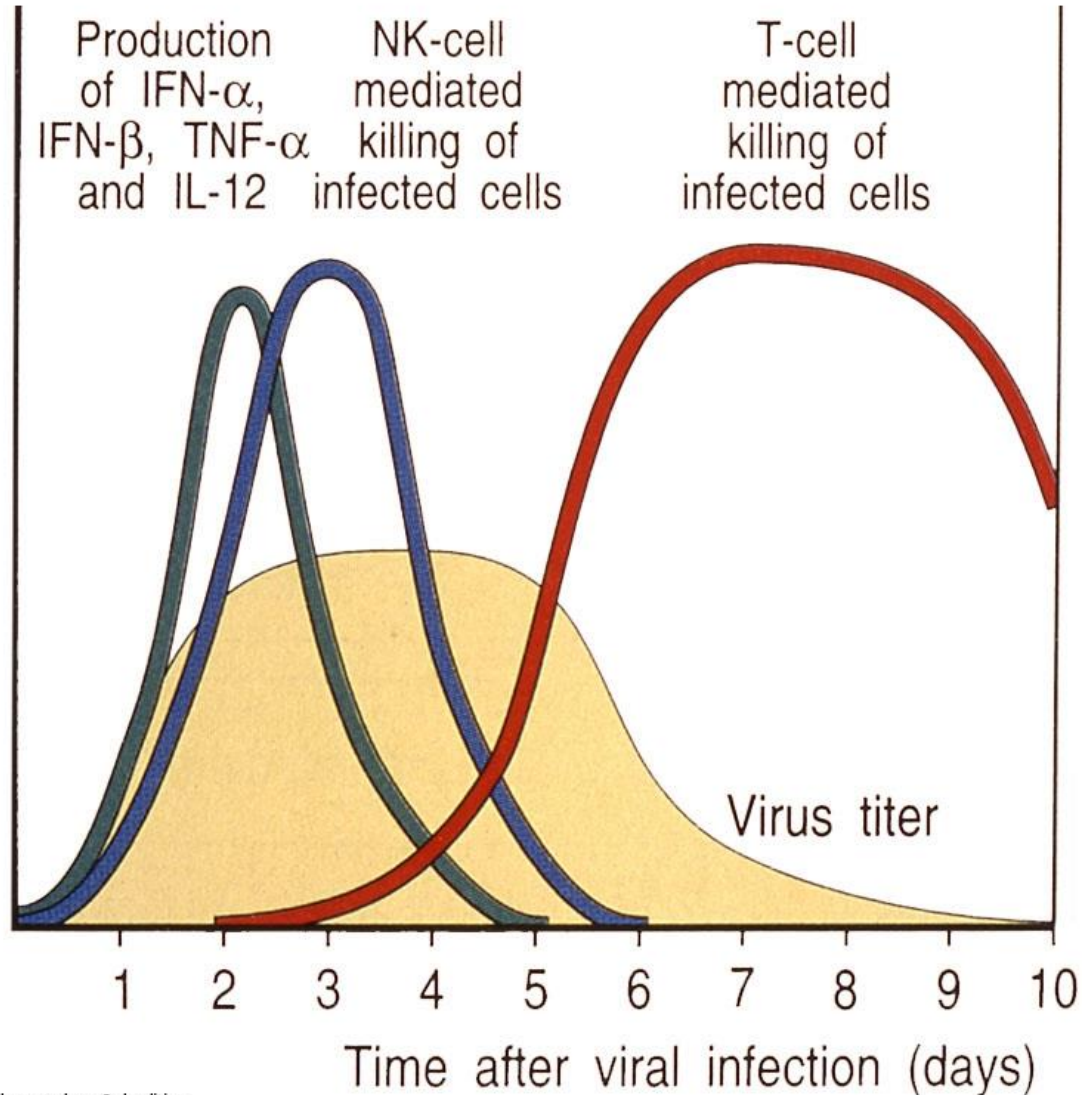
– Non-specific immunity

- Interferons (α and β)
- Natural killer cells (NK cells)
- Receptor-like molecules in various secretions
- In some situations also:
 - Activation of the complement system (EBV)
 - Phagocytosis

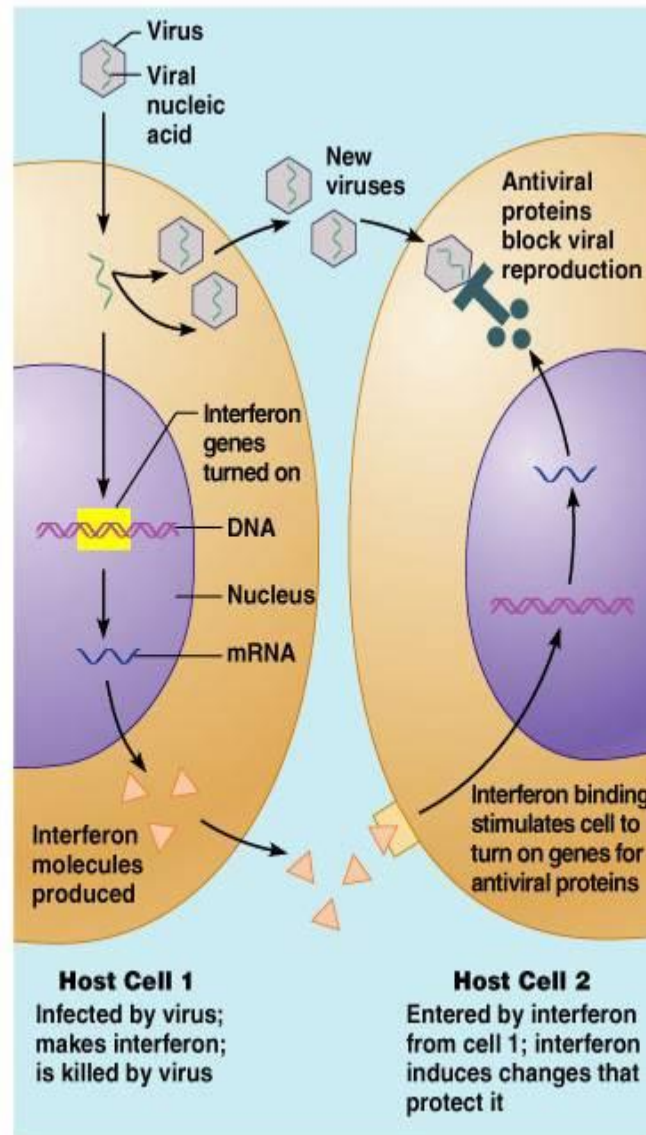
– Specific immunity

- Antibodies – neutralization of extracellular viruses
- Tc lymphocytes – elimination of virus-infected cells

Mechanisms of antiviral immunity

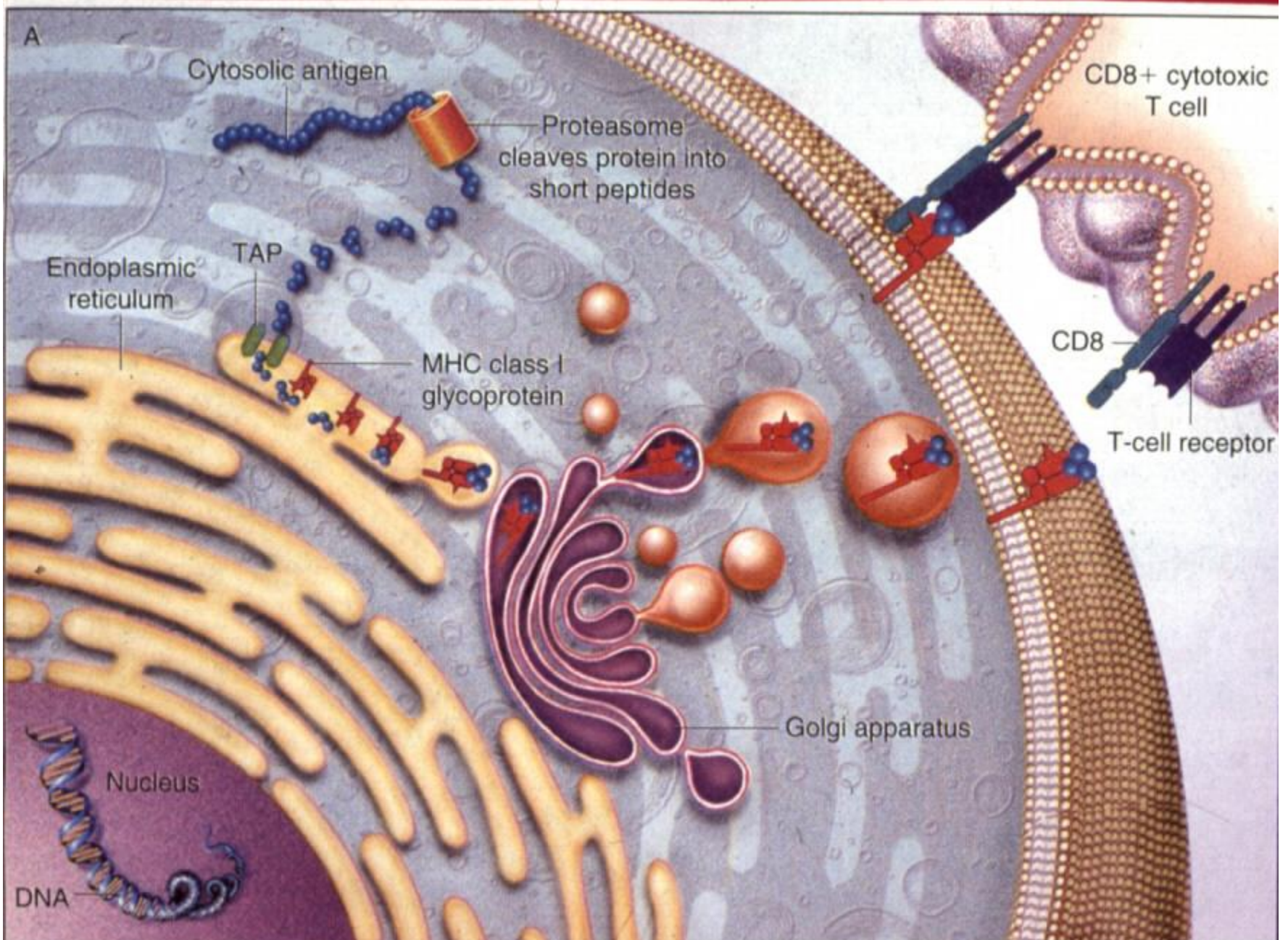


The action of interferon (IFN)



Natural killers (NK cells)

- Originate in non-T non-B lymphocyte lineage.
- Morphologically: large granulated lymphocytes (LGL).
- Recognition of target cells in antigen non-specific.
- Virus infected and tumor cells are killed.
- Target cells are recognised mainly by decreased HLA-I expression.
- Cytotoxic mechanisms are similar to Tc cells: perforin and induction of apoptosis.



A

Cytosolic antigen

Proteasome cleaves protein into short peptides

Endoplasmic reticulum

TAP

MHC class I glycoprotein

CD8+ cytotoxic T cell

CD8

T-cell receptor

Golgi apparatus

Nucleus

DNA

Viral strategies to evade the immune response

- **Antigenic variations**
 - antigenic drift - minor changes
 - antigenic shift - major changes
- **Long-term survival in a host**
 - Viral persistence
 - Viral latency
 - Oncogenic transformation
- **Immunosuppressive effect of viruses**

Immunosuppressive effects of viruses

- Suppression of T-cells : HIV, morbilli, CMV,
- Inhibition of MHC antigens expression:
CVM (binds β -2 microglobulin),
Adenoviruses, RSV - decreases expression of HLA antigens
- Production of inhibitory cytokines: EBV (IL-10 - like factor)

Damage of a host caused by anti-viral immune response

- Autoimmune diseases: hemolytic anemia after EBV infection, autoimmune hepatitis induced by hepatitis-B virus
- Immune complex diseases: arthritis in hepatitis B, vasculitis
- Tc - mediated diseases: rash in exanthematic viral diseases, myocarditis caused by coxsackie virus

Immune responses to bacterial infections

- **Non-specific immunity**
 - **Mechanical barriers**
 - **Phagocytosis**
 - **Complement system**
- **Specific immunity**
 - **Antibodies - opsonisation, complement-activation, neutralisation of toxins, binding to receptors**
 - **T-lymphocytes - against intracellular parasites**

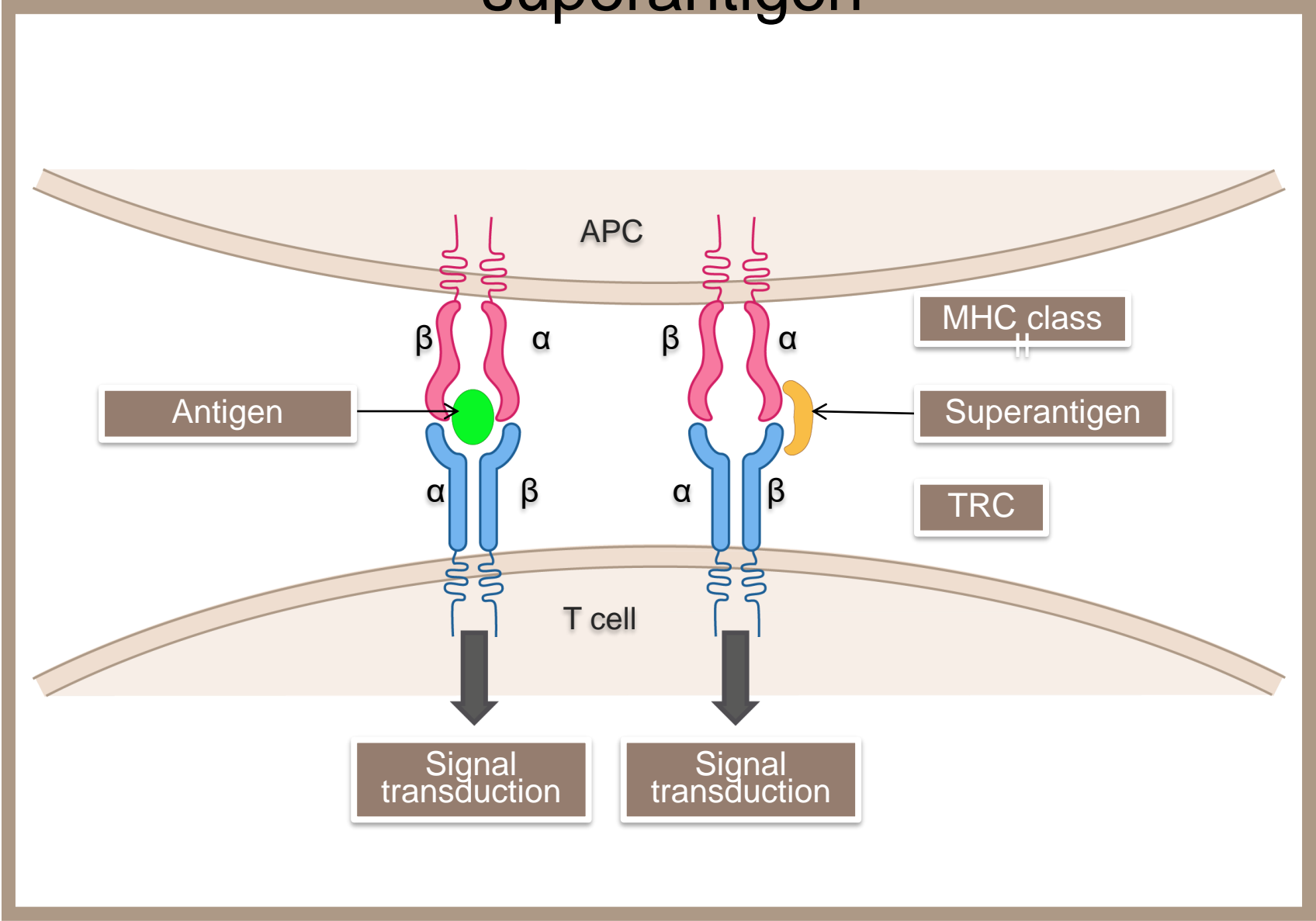
Bacterial evasions of immune defences

- Antiphagocytic mechanisms: toxins, capsular polysaccharides
- Inhibition of the complement system: *Str. pyogenes*, *E. coli*, *N. meningitidis*
- Antigenic variations: *Borrelia recurrentis*
- Proteases lysing IgA - *Neisseria*, *Haemophilus*
- Sequestration in avascular regions- *Salmonella typhi* in the gall bladder and urinary tract
- Intracellular parasitism

Bystander damage caused by the immune response to bacterial infection

- **Autoimmune diseases**
 - **Cross-reactivity of bacterial and corporal antigens - rheumatic fever**
 - **Type-II hypersensitivity - autoimmune hemolytic anemia caused by *Mycoplasma* infection**
 - **Heat shock proteins**
 - **Superantigens (streptococcal, staphylococcal)**
- **Immunocomplex diseases**
- **Type IV hypersensitivity- cavitation in pulmonary tuberculosis**

Activation of TCR by antigen and superantigen



Mechanisms of anti-fungal resistance

- **Normal bacterial flora**
- **Phagocytic cells**
- **T-lymphocytes - probably most important**
- **Antibodies - usually present, but no protective effect**

Immunity against parasites

- Different mechanisms involved against different parasites.
- Immune response frequently leads to premunition – the situation when the parasite persists, however it does not lead to dissemination and new infections.
- IgE and eosinophils play a significant role.

Role of IgE and mastocytes in protection against parasites

