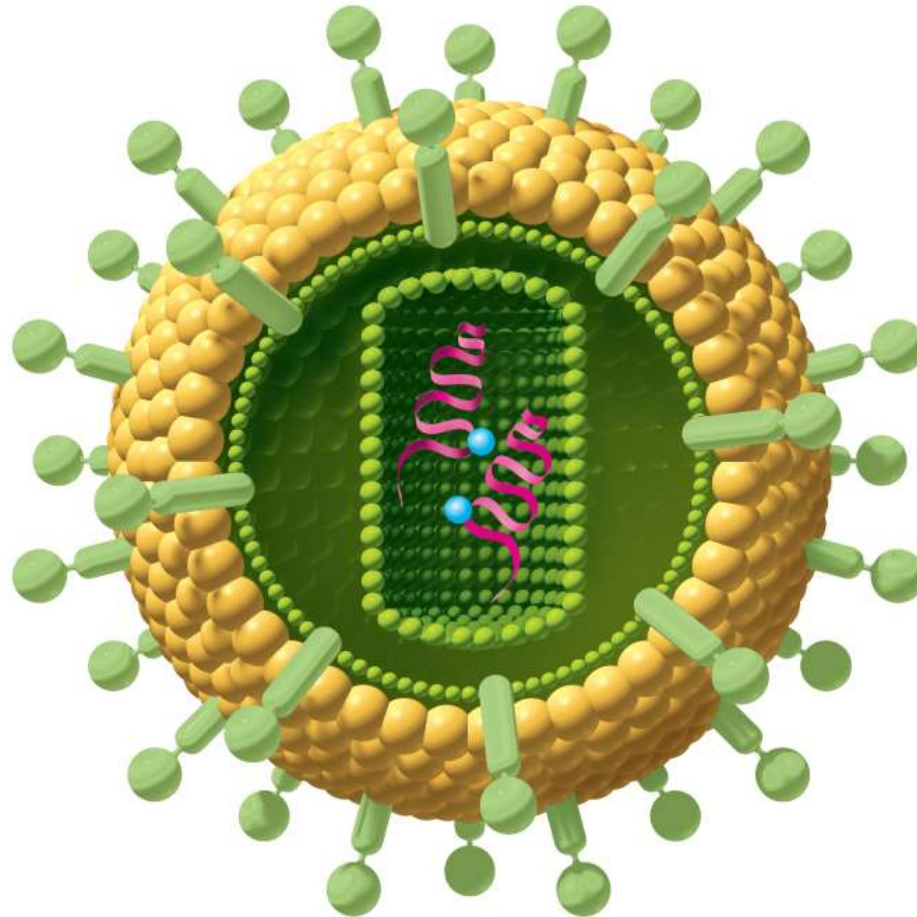


Autoimmune and Immunodeficiency Diseases



Autoimmune Diseases

- Failures of self-tolerance
- Immune system fails to recognize self-antigens
- Immune system produces **auto-antibodies** that attack the body's own tissues

Autoimmune Diseases

- Reasons for lack of self-tolerance:
 - cross-reactivity /// some antibodies against foreign antigens react to similar self-antigens /// rheumatic fever
 - streptococcus antibodies also react with heart valves
 - abnormal exposure of self-antigens in the blood /// some of our native antigens are not exposed to blood // blood-testes barrier isolates sperm from blood
 - changes in structure of self-antigens /// viruses and drugs may change the structure of self-antigens or cause the immune system to perceive them as foreign
- Self-reactive T cells /// not all are eliminated in thymus during development /// these “bad” T cells are normally kept in check by the regulatory T (T_R) cells

Immunodeficiency Diseases

- Immune system fails to react vigorously enough
- **Extreme Case: Severe Combined Immunodeficiency Disease (SCID)**
 - genetic disease which fails to make both T cells and B cells
 - vulnerability to opportunistic infection and must live in protective enclosures



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Immunodeficiency Diseases

- **Acquired Immunodeficiency Syndrome (AIDS)**
 - Nonhereditary diseases contracted after birth
 - Severely depress both cellular and humoral immunity
 - Also diminish some aspects of the second line of defense
 - Caused by the **human immunodeficiency virus (HIV)**
 - Aids Associated Diseases (syndrome) // group of conditions that develop because of the original viral infection

Immunodeficiency Diseases

- HIV invades helper T cells // use macrophages and dendritic cells to internalize viruses using receptor mediated endocytosis
- *Reverse transcriptase (retrovirus)* uses viral RNA as template to synthesize DNA
 - new DNA inserted into host cell DNA (may be dormant for months to years)
 - when activated, it induces the host cell to produce new viral RNA, capsid proteins, and matrix proteins
 - as virus are shed from host the virus are coated with bits of the host cell's plasma membrane
 - adhere to new host cells and repeat the process

HIV Structure

Envelope:

Glycoprotein

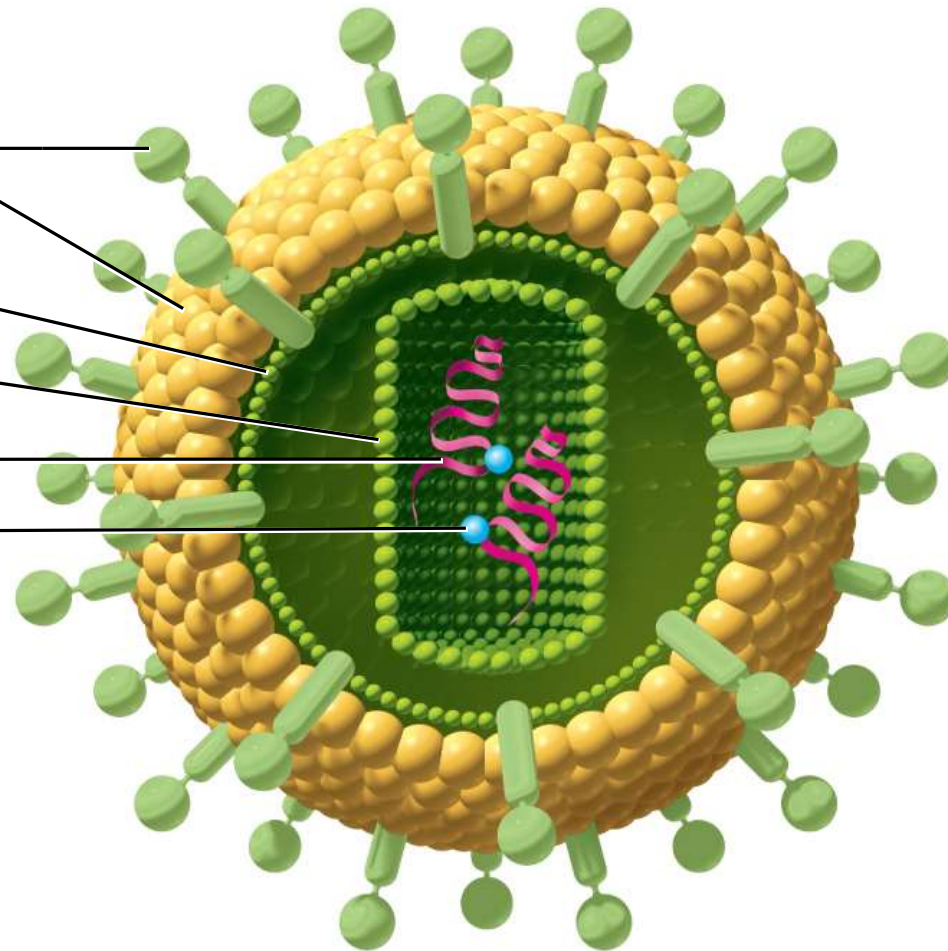
Phospholipid

Matrix

Capsid

RNA

Reverse
transcriptase



AIDS

- by destroying T_H cells, HIV strikes at the central coordinating agent of nonspecific defense, humoral immunity, and cellular immunity
- incubation period ranges from several months to 12 years
- signs and symptoms
 - early symptoms: flu like symptoms of chills and fever
 - progresses to night sweats, fatigue, headache, extreme weight loss, lymphadenitis
 - normal T_H count is 600 to 1,200 cells/ μ L of blood, but in AIDS it is less than 200 cells/ μ L
 - person susceptible to **opportunistic infections** (*Toxoplasma*, *Pneumocystis*, herpes simplex virus, cytomegalovirus, or tuberculosis)
 - Candida (thrush): white patches on mucous membranes
 - Kaposi sarcoma: cancer originates in endothelial cells of blood vessels causes purple lesions in skin

Kaposi Sarcoma



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HIV Transmission

- through blood, semen, vaginal secretions, breast milk, or across the placenta
- most common means of transmission
 - sexual intercourse (vaginal, anal, oral)
 - contaminated blood products
 - contaminated needles
- not transmitted by casual contact
- undamaged latex condom is an effective barrier to HIV, especially with spermicide nonoxynol-9

Treatment Strategies

- prevent binding to CD4 proteins of T_H cells
- disrupt reverse transcriptase to inhibit assembly of new viruses or their release from host cells
- Medications /// none can eliminate HIV, all have serious side-effects
 - HIV develops drug resistance /// medicines used in combination
 - AZT (azidothymidine) /// first anti-HIV drug - inhibits reverse transcriptase
 - protease inhibitors /// inhibit enzymes HIV needs to replicate
 - now more than 24 anti-HIV drugs on the market