

## Chapter 19 Disorders Associated with the Immune System

### Immunodeficiencies

- Congenital: Due to defective or missing genes
- Acquired: Develop during an individual's life
  - Due to drugs, cancers, and infections
  - Hodgkins' disease lowers cell-mediated response
  - Damage to or removal of certain organs can decrease immunity (e.g., the spleen)

### Check Understanding

- Is AIDS an acquired or a congenital immunodeficiency?

### AIDS

- 1981: In United States, cluster of Pneumocystis and Kaposi's sarcoma was discovered in young homosexual men
  - The men showed loss of immune function
- 1983: Discovery of virus causing loss of immune function

### HIV and The Origin of AIDS

- Crossed the species barrier into humans in Africa in the 1930s
- Patient who died in 1959 in Congo is the oldest known case
- Spread in Africa as a result of urbanization
- Spread worldwide through modern transportation and unsafe sexual practices
- Norwegian sailor who died in 1976 is the first known case in Western world

### HIV Virus and disease cycle

#### Clades (Subtypes) of HIV

- HIV-1
  - M (main)
- A to D, F to H, J, and K
- O (outlier)
- N (non M or O)

#### Clades (Subtypes) of HIV

- Clade B
  - North and South America and Europe
- Clade C (half of all HIV infections)
  - Central Africa down to South Africa
  - India and southeast Asia
  - Parts of China
- Clade E
  - Southeast Asia

### The Stages of HIV Infection

- Phase 1: Asymptomatic or chronic lymphadenopathy
- Phase 2: Symptomatic; early indications of immune failure
- Phase 3: AIDS indicator conditions

### Diseases Associated with AIDS

- *Cryptosporidium hominis*
- *Toxoplasma gondii*
- *Isospora belli*
- Cytomegalovirus
- Herpes simplex virus
- Varicella-zoster virus
- *Mycobacterium tuberculosis*
- *M. avium-intracellulare*
- *Pneumocystis jirovecii*
- *Histoplasma capsulatum*
- *Cryptococcus neoformans*
- *Candida albicans*
- Kaposi's sarcoma
- Hairy leukoplakia
- Cervical dysplasia

### Survival with HIV Infection

- Exposed, but not infected
  - CCR5 mutation
  - Effective CTLs
- Long-term nonprogressors
  - Mechanism not known

### Check Understanding

- On what continent did the HIV-1 virus arise?
- What is the primary receptor on host cells to which HIV attaches?
- Would an antibody against the coat of HIV be able to react with a provirus?
- Would a CD4+ T-cell count of 300/?l be diagnostic of AIDS?
- Which cells of the immune system are the main target of an HIV infection?

### Diagnostic Methods

- Seroconversion takes up to 3 months
- HIV antibodies detected by ELISA
- HIV antigens detected by Western blotting
- Plasma viral load (PVL) is determined by PCR or nucleic acid hybridization

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### HIV Transmission

- HIV survives 6 hours outside a cell
- HIV survives less than 1.5 days inside a cell
- Infected body fluids transmit HIV via
  - Sexual contact
  - Breast milk
  - Transplacental infection of fetus
  - Blood-contaminated needles
  - Organ transplants
  - Artificial insemination
  - Blood transfusion

### AIDS Worldwide

- Heterosexual intercourse (85%)
- Injected drug use (IDU)
- Women comprise 42% of infected

### Preventing AIDS

- Use of condoms
- Use of sterile needles (IDUs)
- Circumcision
- Health care workers use Universal Precautions
  - Wear gloves, gowns, masks, and goggles
  - Do not recap needles
  - Risk of infection from infected needlestick injury is 0.3%

### Vaccine Difficulties

- Mutations
- Clades
- Antibody-binding sites “hidden”
- Infected cells not susceptible to CTLs
- Proviruses
- Latent viruses

### Chemotherapy

- Nucleoside reverse transcriptase inhibitors
- Non-nucleoside reverse transcriptase inhibitors
- Protease inhibitors
- Fusion inhibitors

### HAART

- Highly active antiretroviral therapy
- Combinations of nucleoside reverse transcriptase inhibitors plus
  - Non-nucleoside reverse transcriptase inhibitor or
  - Protease inhibitor

### Check Understanding

- What form of nucleic acid is detected in a plasma viral load test for HIV?
- What is considered to be the most dangerous form of sexual contact for transmission of HIV?
- What is the most common mode, worldwide, by which HIV is transmitted?
- Does circumcision make a man more or less likely to acquire HIV infection?