Prokaryotic Biology

VIRAL STDs, HIV-1 AND AIDS
Prokaryotic Biology
FROM THE CDC

Indicates human disease case(s).
Avian, animal or mosquito infections.

[Map showing disease cases across the United States]
A. GENITAL HERPES & COLD SORES

1. HERPES SIMPLEX VIRUS-2 (HHV-2)
2. SYMPTOMS
3. LATENCY AND RECURRENT INFECTIONS
4. TREATMENT--ACYCLOVIR (ZOVIRAX)

B. WARTS & CONDYLOMA (CONDYLOMATA ACUMINATA)

1. PAPILLOMAVIRUS INFECTION
2. HPV-16 (OTHERS) ASSOCIATED WITH CERVICAL CARCINOMA
3. VIRAL PROTEINS “TRANSFORM” CELLS
VIRAL STDs, HIV-1 AND AIDS

HIV and RETROVIRUSES

A. RETROVIRUSES--RETROVIRIDAE
   1. MORPHOLOGY & LIFE CYCLE
   2. CLASSIFICATION - GENERA
      a. $\alpha$ - MAMMALIAN C TYPE VIRUS (MuLV)
      b. $\beta$ - MAMMALIAN B TYPE VIRUS (MMTV)
      c. $\gamma$ - TYPE D VIRUS (M-PMV, SRV)
      d. $\delta$ - ALV-RELATED VIRUS (ALV, RSV)
      e. $\varepsilon$ - PTLV-BLV (PTLV-1, THE CAUSE OF HUMAN ATL)
      f. LENTIVIRUS (SIV, HIV-1, HIV-2, VISNA, EIAV)
      g. SPUMAVIRUS (HUMAN, SIMIAN, FELINE FOAMY V)

B. CAUSE OF “SLOW” IMMUNOSUPPRESSIVE DISEASES
<table>
<thead>
<tr>
<th>GENE</th>
<th>PROTEIN</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>env</td>
<td>gp160</td>
<td>Precursor of envelope glycoprotein</td>
</tr>
<tr>
<td></td>
<td>gp120</td>
<td>CD4 receptor binding</td>
</tr>
<tr>
<td></td>
<td>gp41</td>
<td>Transmembrane anchorage</td>
</tr>
<tr>
<td>gag</td>
<td>P55</td>
<td>Precursor of gag proteins</td>
</tr>
<tr>
<td></td>
<td>p24</td>
<td>Major core protein</td>
</tr>
<tr>
<td></td>
<td>p17</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>p15</td>
<td>?</td>
</tr>
<tr>
<td>gag-pol</td>
<td>p140</td>
<td>Protease frameshift protein</td>
</tr>
<tr>
<td>pol</td>
<td>p66/51</td>
<td>Reverse transcriptase</td>
</tr>
<tr>
<td></td>
<td>p31</td>
<td>Endonuclease</td>
</tr>
<tr>
<td>sor</td>
<td>p23</td>
<td>Regulatory</td>
</tr>
<tr>
<td>3’-orf</td>
<td>p27</td>
<td>Regulatory</td>
</tr>
<tr>
<td>tat</td>
<td>p14</td>
<td>Transactivation</td>
</tr>
<tr>
<td>art/trs</td>
<td>p18</td>
<td>Antirepressor transactivator</td>
</tr>
</tbody>
</table>
VIRAL STDs, HIV-1 AND AIDS

HISTORY OF AIDS

A. FIRST APPEARANCES
B. FIRST RECOGNIZED
C. VIRAL ETIOLOGY
   1. ANTIGENS PRODUCED--TESTS-ELISA & WESTERN BLOT
   2. SEQUENCED
   3. MOLECULAR BIOLOGY
D. TREATMENTS--AZT, ddI & ddC PLUS PROTEASE INHIBITORS
E. VACCINES--ABOUT 15 TRIALS UNDERWAY
AIDS: Timeline

- 1959: First case, Belgian Congo
- 1969: U.S. Case
- 1981: AIDS Defined by CDC
- 1984: Isolation of AIDS Virus
- 1985: Virus Genome Sequenced
- 1986: AZT Approved
- 1986: 3TC and Saquinovir Approved
- 1995: Nelfinavir Approved
- 1995: Ritonavir and Indinavir Approved
- 1996: Highly Active Anti-retroviral Therapy Approved (HAART)

Highly Active Anti-retroviral Therapy (HAART)
A. RETROVIRUS LIFE CYCLE
   1. INFECTION & UNCOATING
   2.
   3.
   4.
   5.
   6.
   7.
B. THREE (FOUR) ENZYMATIC ACTIVITIES
Retrovirus replication
RNA HIV

Viral RNA

Viral DNA

REVERSE TRANSCRIPTASE

Nucleus

Cellular DNA

TRANSCRIPTION

Genome

mRNA

CAPSID PROTEINS

New HIV
Rétrovirus

capside
nucléocapside
enzymes (RT)
enveloppe (gp70, p15E)
The diagram illustrates the replication cycle of HIV, starting with the GENOME RNA which includes the gag, pol, and env genes. Gag and gag-pol proteins are translated after transcription. SPLICING occurs, resulting in Env proteins (vif, tat, vpu, vpr, rev, nef).
VIRAL STDs, HIV-1 AND AIDS

PATHOLOGY AND TRANSMISSION

A. INITIAL INFECTION
B. LATENCY
C. ARC & AIDS
D. STAGING--WALTER REED & CDC CLASSIFICATIONS
E. TRANSMISSION
   1. SEXUAL
   2. INTRAVENOUS DRUG USE
   3. BIRTH--PERINATAL
### HIV Progression

<table>
<thead>
<tr>
<th>TIME</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12 months</td>
<td>HIV antibody appears 1 to 18 weeks</td>
<td>Flu-like symptoms 2 to 4 weeks</td>
<td>immune thrombocytopenic purpura Mild anemia Mild leukopenia Some decrease in T4 Cell Count</td>
<td>Moderate anemia, leukopenia Low albumin Low cholesterol Decrease in T4 cell count +/- HIV antibody</td>
</tr>
<tr>
<td>1-8 years</td>
<td>p24 antibodies</td>
<td></td>
<td></td>
<td>Death on average now 2 to 3 years after diagnosis</td>
</tr>
<tr>
<td>9-15 years</td>
<td></td>
<td></td>
<td>Elevated p24 &amp; beta-microglobulin</td>
<td></td>
</tr>
<tr>
<td>Months/years</td>
<td></td>
<td></td>
<td>Drop in p24 antibody, rise in p24 antigen</td>
<td></td>
</tr>
</tbody>
</table>

**Diagnosis**

- **Group 1**: Asymptomatic HIV infection
- **Group 2**: Early HIV-related symptoms
- **Group 3**: Advanced HIV-related symptoms AIDS
- **Group 4**: Death on average now 2 to 3 years after diagnosis
HIV Progression

Group 1: 1-12 months
- Mild immune dysfunction
- Seborrheic dermatitis
- Herpes zoster (shingles), single dermatome
- Hairy leukoplakia
- p24 antibodies
- p24, g41 antigens appear 1 to 3 weeks (antigenemia)

Group 2: 1-8 years
- Moderate immune dysfunction
- Severe dermatitis
- Thrush
- Weight loss
- Diarrhea
- Recurring fever
- Pulmonary tuberculosis
- Bacterial infections
- Recurrent multidermatomal Herpes zoster

Group 3: 9-15 years
- Severe immune dysfunction
- Opportunistic infections
- Lymphoma
- Wasting syndrome

Group 4: Months/years
- Drop in p24 antibody, rise in p24 antigen
Kaposi’s sarcoma

(HHV-8)
Estimated Incidence of AIDS and Deaths of Adults and Adolescents with AIDS*, 1985 - 2001, United States

*Adjusted for reporting delays
VIRAL STDs, HIV-1 AND AIDS

PATHOLOGY AND TRANSMISSION

AIDS IS REAL!

KHOMAS REGION: JAN - SEPT 2000
People who are infected with HIV
AIDS Patients in Hospitals
People who died from AIDS

3711
1038
301

PROTECT YOURSELF AS FOLLOWS:
A - ABSTAIN FROM SEX
B - BE FAITHFUL TO A FAITHFUL SEXUAL PARTNER
C - USE CONDOMS EVERY TIME YOU HAVE SEX

UNITED NATIONS
SPECIAL SESSION
ON HIV/AIDS

Global Crisis – Global Action

25-27 June 2001 New York