HIV and Public Health: the Basics

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VCU HIV/AIDS Center

Epidemiology
Spectrum of HIV Infection & Testing
Risk Reduction & HIV Prevention
CD4 & Viral Load
Antiretroviral Therapy
Opportunistic Infections: Prophylaxis & Treatment
Immunizations

Adults and children estimated to be living with HIV/AIDS as of end 2003

UNAIDS, 2004

HIV - U.S. Trends

New HIV infection rate steady.
Decreasing pediatric infections.
Decreasing AIDS deaths.
Increasing cases in women, esp. in SE.
Heterosexual transmission increasing.
Minority populations disproportionately affected.
Substance abuse important co-factor.

Estimated Incidence of AIDS and Deaths among Adults and Adolescents with AIDS, 1985–2002—United States

Proportion of AIDS Cases, by Race/Ethnicity and Year of Diagnosis, 1985–2002—United States
**HIV Spectrum of Infection**

- Acute
- Asymptomatic
- Early Sx
- AIDS

- **4-6 wks**
- **10-12 years**
- **months-yrs**

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**HIV Seroconversion Syndrome**

- Acute seroconversion viral syndrome occurs in 30-50% of people infected.
- Occurs within 4-6 weeks after infection.
- Symptoms
  - Swollen glands, sore throat, rash on trunk, fever, myalgia
  - Rare: viral encephalitis
  - Oral: severe gingivitis

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**What Happens During Seroconversion?**

- Viral load is very high, then decreases to "set point" within 6 months after infection.
- Viral load set point is different for everyone.
- Research Question: Can beginning antiretroviral therapy during this phase DECREASE the viral load set point? Outlook not promising for long term.

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**Herpes Zoster**

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**Oral Candida**
Oral Leukoplakia can be differentiated from oral candida by its characteristic distribution along the lateral borders of the tongue and the fact that it cannot be scraped off. This condition is caused by the Epstein-Barr virus.

AIDS-Defining Illnesses and Conditions
- Opportunistic Infections and Cancers
- Wasting
- AIDS-Related Dementia
- T4 (CD4) count < 200

HIV Antibody Testing
- Tests for presence of ANTIBODY, NOT directly for virus.
- Many of those infected produce detectable antibody by 28 days after infection.
- 95% have detectable antibody in 3 months.
- CDC: By 6 months after infection, it would be rare for anyone infected not to have detectable antibody.

HIV Antibody Testing Sequence
- Tests are done on the same blood sample.
- 1st ELISA - if negative - test is negative
  - if positive - REPEAT
- 2nd ELISA - if negative - test is negative
  - if positive - do Western Blot
- Western Blot - if non-reactive - negative
  - if reactive - test is positive
  - if indeterminate - repeat blood test

HIV SPECTRUM OF INFECTION

<table>
<thead>
<tr>
<th>Acute</th>
<th>Asymptomatic</th>
<th>Early Sx</th>
<th>AIDS</th>
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<tr>
<td>4-6 wks</td>
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<td>(+)</td>
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HIV Antibody Testing Technology
- Blood Tests - "Gold Standard"
- "Home Access" Home Test Kit
- Orasure - Tests Oral Transmucosal Exudate
- Urine Tests - expensive
- NEW! Rapid Test Kits
  - Oraquick - ELISA only, positive test needs confirmation - FDA approved for blood and oral testing
  - "Reveal" - requires whole blood sample
OraQuick: Oral fluid, serum, whole blood

Positive

Negative

Reactive

Control

Positiv

HIV-

1/2

Read results

REVEAL Rapid HIV Test

Nonreactive

Reactive

Testing for HIV

Testing Choice:
- Anonymous
- Confidential

Reporting of Test Results

CDC Classification System - Adults

Clinical
- A - Asymptomatic
- B - Early Symptoms
- C - AIDS Defining Illness

Immunologic
- 1 - T4 (CD4) > 500
- 2 - T4 (CD4) 200 - 500
- 3 - T4 (CD4) <200

Association between virologic, immunologic, and clinical events and time course of HIV infection
HIV Risk Reduction Counseling

Broadly covers:
- Knowledge of Risk
- Personal Perception of Risk
- Readiness to Change
- Self-Efficacy
- Skill Development
- Reinforcements of Behavior Change
- Identification of Barriers for Risk Reduction behavior

John Kelly, 1992

HIV Risk Reduction - Sexual

- Male or Female Condom Use
- Dental Dams or condoms for Oral Sex
- Activities that avoid fluid exposure
- Decreasing Number of partners
- Unprotected Sex with monogamous uninfected partner
- Abstain from Sex

Occupational Exposure: Both Injury & Fluid Must be Present

- Percutaneous Injury
  - Needlestick
  - Cut with Sharp
- Mucous Membrane
  - Eyes, Nose, Mouth
- Nonintact Skin
- Intact Skin - Prolonged Contact
- Blood
- Semen
- Vaginal Fluid
- Internal Body Fluids
  - Synovial
  - Cerebrospinal
  - Pleural
  - Peritoneal
  - Pericardial
  - Amniotic

HIV Risk Reduction - Occupational

- Universal (Standard) Precautions
- Personal Protective Equipment
- Work Practice
- Engineering
- Housekeeping Controls
- Post-Exposure Prophylaxis with Antiretrovirals for High-Risk Exposures

HIV

- Single occupational exposure
- Risk of becoming infected:
  - Percutaneous - 0.3%
  - Mucous membrane - 0.09%
  - Skin - <0.09%
- Risk of becoming chronic carrier if infected - 100%

Hepatitis B

- Single percutaneous occupational exposure
- Risk of infection (if not vaccinated) - 25%
- Risk of becoming chronic carrier if infected - 10%
Hepatitis C

- Single percutaneous occupational exposure
- Risk of becoming infected - 2 to 10%
- Risk of becoming chronic carrier if infected - 85%

Post-Exposure Prophylaxis

- Potential Benefits - Prevent HIV Infection and Seroconversion
- Potential Risks - Drug Side Effects, Toxicity
- HCW given 3 drugs for 3 days to 6 weeks depending on source patient’s HIV status and what, if any, ARV medications they take.

HIV Risk Reduction - Perinatal

- ACTG 076 (1993) demonstrated giving zidovudine to pregnant HIV+ women decreased vertical transmission to 8% (control group had 25% vertical transmission rate).
- Ongoing research of combination therapies for further decreased perinatal prevention.
- HIV testing should be OFFERED to all women seeking prenatal care.

Results of ACTG 076 (1993)

- Efficacy was observed in all subgroups

<table>
<thead>
<tr>
<th>Mother</th>
<th>Baby</th>
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<tbody>
<tr>
<td>HIV Antibody +</td>
<td>100% HIV Antibody + MATERNAL Abs</td>
</tr>
<tr>
<td>NO ARV Therapy</td>
<td>30% HIV Infected</td>
</tr>
<tr>
<td>AZT Therapy</td>
<td>8% HIV Infected</td>
</tr>
<tr>
<td>Combination Therapy</td>
<td>&lt;8% HIV Infected</td>
</tr>
<tr>
<td>Cesarean Section +</td>
<td>0.6% HIV Infected (?)</td>
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<tr>
<td>Combination Tx</td>
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HIV Risk Reduction - Needle-Sharing

- Use Clean Needles (bleach for at least 60 secs.)
- Don’t Share Works
- Avoid Skin Popping
- Clean Works
- Change Drug of Choice
- Drug Treatment

HIV PREVENTION COUNSELING

- CDC Guidelines recommend that counseling around HIV focus on PREVENTION of new HIV infections (Primary Prevention)
- PREVENTION of reinfections or transmission of HIV from someone known to be HIV infected (Secondary Prevention)
- through behavior change

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- (-)
- (+)
- (+)
- (-/+)

Monitoring HIV Infection - CD4

- “Conductor” of Immune System “Orchestra”
- Normal Range: 600 - 1200
- Causes of normal variability: stress, infection, time of day
- Indirect measure of damage to immune system
- Lower CD4= more damage.
- Frequency of measurement: Every 3-6 months
- Measure at Baseline, then 3 months after any change in antiretroviral therapy

Monitoring HIV Infection - Viral Load

- Measures circulating HIV virus in plasma
- Indirect measure of virus replication in lymphoid tissues
- Measured at baseline, 4-6 weeks after initiating or changing therapy, then every 3 months
- Measured in logs or kilo equivalents: One thousand particles of virus per milliliter of blood
- Lower VL (<100,000)= less risk of disease progression
- Higher VL (>100,000)= more risk of disease progression
- Undetectable viral load means BELOW LIMITS of test, NOT that HIV is gone

Does an Undetectable Viral Load Mean HIV is Gone?

- NO!
- It means virus is below limits of test:
- <200 particles per ml for PCR test
- Medications are controlling HIV
- HIV CAN STILL BE TRANSMITTED!
- Viral Load will go up if medications are stopped.
Monotherapy is no longer the standard of practice. Combination therapy is better than monotherapy. HAART - Highly Active Antiretroviral Therapy - at least 3 drugs. CART - Combination Antiretroviral Therapy - term now being widely used. When viral load rebounds, resistance testing before changing therapy is recommended.

Structured Treatment Interruptions - some evidence that after period of effective treatment, if ARVs are stopped the immune system will be able to control HIV – but for how long? SMART Study Resistance Testing - If client has multidrug resistant virus, stopping all ARVs MAY result in reemergence of wildtype virus. Boosting of ARV drugs by giving fewer pills together.

When to start therapy & which drugs to use depends on:
- Lab values: CD4 & viral load
- Clinician preference
- Patient symptoms
- Patient desires
- Patient ability to tolerate drugs and adhere to regimen
- National Guidelines & Recommendations

CD4 Viral Load Recommendations
<200 Any Value Treat
200-350 Any Value Offer Treatment
>350 >55,000 (PCR) Offer vs. Monitor
>350 <55,000 (PCR) Defer & Monitor

10 Billion New Viral Copies Every Day
HIV Virus mutates rapidly
HIV Virus develops resistance
Poor Adherence to Therapy results in more rapid failure of regimen
Resistance to one drug in a class may mean resistance to all drugs in that class
Resistant strains of HIV can be transmitted to others

Guidelines for the Use of Antiretroviral Agents in HIV-Infected Adults and Adolescents
For the most recent revision of recommendations go to www.aidsinfo.nih.gov
Prophylactic Therapy

- Given to Prevent Opportunistic Infections
- Based on Patient’s CD4 count
- Should be encouraged even if patient does not want ARV therapy
- Properly taken can prevent illness and hospitalizations

Prophylactic Therapy

- Pneumocystic Carinii Pneumonia CD4<200
- Toxoplasmosis CD4<100
- Mycobacterium Avium Complex CD4<100
- Mycobacterium Tuberculosis if PPD+

Suppressive Therapy

Consider preventive/ suppressive therapy for:
- Herpes
- Fungal / Candidiasis
  - Oral, Esophageal, Vaginal
- Cryptococcal Meningitis
- Cytomegalovirus
- Toxoplasmosis

Immunizations

- Pneumococcal Pneumonia q 5 years
- Influenza - annually
- Hepatitis B
- Hepatitis A
- Tetanus
- For exposures to measles, chicken pox - immune globulin

Resources

- Virginia Department of Health
  HIV/STD/Viral Hepatitis Hotline
  800-533-4148

- VCU HIV/AIDS Center
  800-525-7605
  804-828-2210