Fast Facts: Acute HIV Infection – An Opportunity to Enhance Primary Prevention

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The acute phase of HIV varies among individuals, but lasts on average two months. Acutely infected persons may be more highly infectious, due to high HIV viral load, than during other phases of the disease and may belong to high risk social networks.[1,2,3,4] This combination creates a strong potential for viral spread and outbreaks, but also opportunities for new prevention strategies.

Estimates indicate that up to half of all HIV transmissions may stem from acutely infected individuals who are highly infectious and unaware of their disease status.[1]

There is potential for a greater number of exposures to occur concurrently with higher transmission during the acute phase.[1,2]

- **Biological Characteristics:** The acute phase is characterized by high viral titers in plasma, which are associated with higher transmission rates per exposure, when compared with later phases of HIV.[1]
  - Viral loads can rise from zero to millions of copies during the first two to five weeks of infection.[1,3,4]
  - Individuals are "biologically hyper-infectious" until seroconversion occurs, a period in the infection when antibodies develop and viral loads drop.[3]
  - Heterosexual exposures during the acute phase are 8-10 times more likely to result in transmission when compared to the latent phase of HIV.[1,3] Among homosexual males, transmission rates during the acute phase may be even greater.[5]
  - ***These characteristics lead to high transmission rates per exposure.***

- **Social Characteristics:** The social networks of acutely infected persons may increase the probability of exposures during the short but highly infectious acute phase.
  - Newly infected persons who have yet to change behavior, are more likely to repeat high risk behavior during the acute phase of disease.[2]
  - Acutely infected persons are more likely to be connected to high risk networks, whose members also exhibit high risk behavior.[2]
  - ***These characteristics can increase the number of exposures.***

This interaction between biological and social characteristics may contribute to a disproportionate spread of the virus during the acute phase (when compared to later phases).

Potential mechanisms for addressing acute phase prevention

► Acute HIV screening
► Acute phase HIV risk communication and educational messages
► Behavior modification programs targeting the acute phase

Acute HIV Screening

Nucleic Acid Amplification Testing (NAAT) is a promising non-antibody test that can assist in the identification of cases during the acute phase of HIV, which is 10-12 days earlier than the most sensitive antibody testing protocol, enzyme immunoassay with western blot confirmation.

- U.S. blood banks, and a limited number of state health agencies (SHAs) and local public health agencies (LPHAs) employ NAAT to screen pooled specimens for acute HIV infection (See chart for examples).
- These agencies use a pooled testing protocol, which requires fewer tests per sample and reduces the cost of NAAT screening.[6,7]
- Little standardization exists between current SHA and LPHA NAAT screening programs, which may account for the range in increased case yield (see table). These programs found that NAAT increased the number of cases identified (zero to ten percent) above that of enzyme immunoassay (EIA) based testing protocols.[6,8,9,10]
- NAAT shows potential to support prevention programs by affording public health officials the ability to recognize real-time HIV transmission, and thereby provides a tool to:
  1) Increase the diagnostic yield of testing programs
  2) Identify and describe nascent outbreaks
  3) Target social networks with actively occurring transmissions

SHA and LPHA Acute HIV Screening Results

PROGRAM RESULTS	DATE	NAAT TESTING POPULATION*	# NAAT	# Acute HIV(+)*	# HIV Ab(+)*	% Inc Yield
North Carolina[8]	11/02-10/03	All consenting HIV antibody negative persons in North Carolina seeking HIV testing at 110 publicly funded sites (n = 109,250)	108,667	23	583	**4**
Seattle - King County[9]	09/03-01/05	All consenting HIV antibody negative ***MSM*** seeking HIV testing through Seattle-King County (n = 3525)	3439	5	81	**6.2**
San Francisco[6]	10/03-07/04	All consenting HIV antibody negative persons seeking HIV testing at San Francisco Municipal ***STD*** clinic (n = 3075)	2722	11	105	**10.5**
Los Angeles[6]	02/04-04/04	All consenting HIV antibody negative men seeking HIV testing at three ***STD*** clinics (n = 1712)	1698	1	14	**7.1**
Atlanta[11]	10/02-01/04	2202 adults receiving HIV testing and counseling at three **high risk** urban sites in Atlanta, Georgia	2136	4	66	**6.1**
Maryland[10]	10/04-02/05	Preliminary data from an ongoing pilot program at the Maryland State Laboratory tested 15,000 antibody negative specimens and found no acute cases.*				**0**

*The testing populations, type of NAAT and type of EIA tests differ among programs and may account for variation in results. Comparisons must take into account these differences and should be made with caution.
NAAT = Number of Nucleic Acid Amplification Tests (NAAT) performed by that program during the period indicated.
Acute HIV (+) = Acute HIV infections discovered by NAAT.
#HIV Ab (+) = HIV infections discovered through antibody testing excluding rapid testing (EIA with Western Blot confirmation).
% Inc Yield = Percent increase in cases found [#acute HIV(+) ÷ # HIV Ab (+)] (i.e. by adding NAAT to their existing HIV testing, San Francisco increased the number of identified HIV positive cases by 10.5%).

Other Acute Phase Prevention Opportunities

- The use of infectious disease control models, typically underutilized in HIV prevention, may be more easily applied to the relatively short acute phase of HIV infection.
  - A focused approach concentrating on acutely infected persons and social networks with active transmissions may be a cost-effective means of breaking transmission chains.
- The inclusion of evidenced-based acute HIV information in risk communication and educational messages could improve the outcome of behavioral interventions.
  - A focus on the acute phase of HIV infection may impart a greater sense of urgency and immediate consequence for risk behavior, a key component of successful behavior modification programs.

Things to Consider

- Will the FDA clear NAAT to screen for acute HIV infection in HIV testing programs? (Currently under active consideration by FDA)
- Will EIA tests become increasingly sensitive and diminish returns on NAAT screening?
- How can available testing technologies (i.e. rapid testing and NAAT) best support prevention programs?
- What measures can best evaluate the cost-benefit of new testing programs? Programs have benefits beyond case finding (i.e. cases averted), though they may be difficult to measure.

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