36 – HIV Diagnosis

Speaker: Frank Maldarelli, MD

HIV Diagnosis

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Disclosures of Financial Relationships with Relevant Commercial Interests

- **None**

Question #1

A 26 year old otherwise healthy gay white man has his first HIV test as part of a new health plan. The fourth generation test is antibody reactive and antigen non-reactive. A supplemental third generation HIV-1/2 ELISA is non-reactive, and an HIV RNA test does not detect HIV RNA. The most likely explanation for these results is

A. This person HIV-infected and is an elite controller

B. This person is HIV-infected but is in the window period for HIV infection

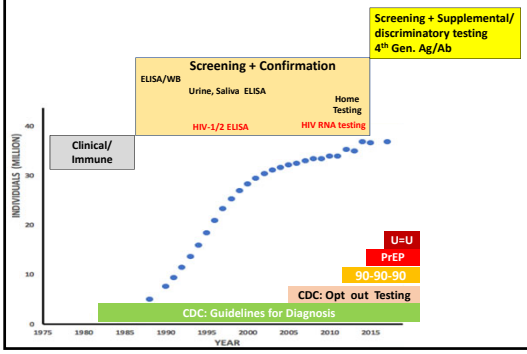
C. This person is infected with an HIV variant that is not detected by the supplemental test

D. This person is not HIV-infected

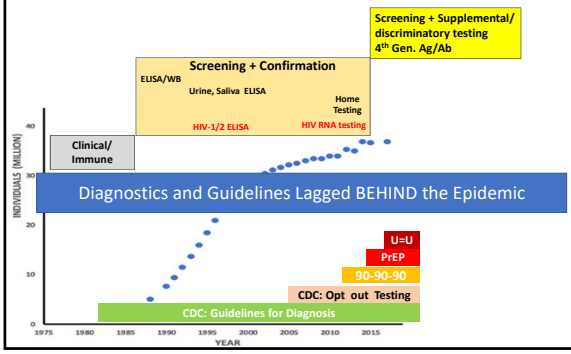
HIV Diagnosis: New Modalities and New Terminology Old Limitations Persist

- HIV Diagnosis
  - History
  - Physical
  - Laboratory testing
- Two Step Diagnostic Approach
- No Laboratory Test is Perfect
- False positive results require resolution

Evolution of the HIV Diagnostic Approach



Evolution of the HIV Diagnostic Approach



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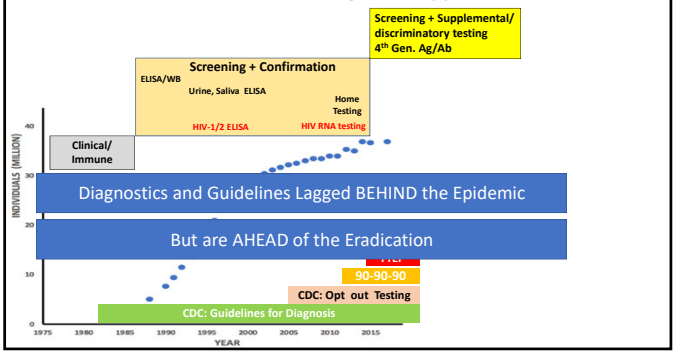
Evolution of the HIV Diagnostic Approach

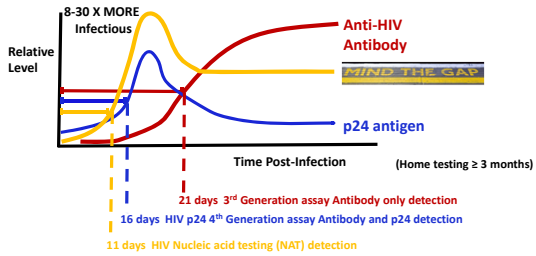


Question #2

27 year old female commercial sex worker working in Washington DC visits your clinic and requests PrEP. She shows you her home HIV test, which she took yesterday, and which is non-reactive. She has normal laboratory results and a negative pregnancy test. Which of the following is most appropriate next step?

A. She can immediately initiate PrEP with tenofovir-FTC with no additional testing
B. She requires additional testing with fourth generation Ag/Ab HIV test to determine whether she is infected with a non-B subtype of HIV-1 that is not detected by the home HIV test.
C. She requires additional testing with fourth generation HIV test to determine whether she has early HIV infection not detected by the home HIV test.
D. She should not initiate PrEP because PrEP does not work well in women

HIV Detection: There is always a Window Period



Detecting HIV Infection TWO STEPS

- Screening - Highest Sensitivity
  - 4th gen ELISA for HIV antibody + p24 antigen detection
  - Qualitative HIV RNA
- Supplemental/Discriminatory - Highest Specificity
  - GEENIUS
    - Confirms HIV-1 or HIV-2

Diagnosis of Early HIV Infection

- HISTORY, PHYSICAL, LABORATORY TESTING
- Most sensitive Modalities
  - 4th Generation
  - HIV RNA: APTIMA
- Less Sensitive Modalities
  - Oral or urine testing
  - Home testing (3 month window)
  - GEENIUS is LESS sensitive for EARLY infection compared with 4th gen testing
- FOLLOW UP and REPEAT testing
- Antiretroviral therapy may blunt serologic immune response from maturing

Evaluation for HIV Infection during PrEP

- Every three months
- Includes detailed history and physical examination
- Ag/Ab (4th generation) testing preferred
- Viral RNA
  - Qualitative assay – FDA approved
  - Quantitative assay
    - >3000 copies/ml plasma cutoff
- DELAYED antibody emergence POSSIBLE in individuals infected during PreP with extended release cabotegravir

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Question #3

You are following a couple who have had a planned pregnancy. The man is HIV positive and 100% adherent with first line therapy with Tenofovir+3TC+Dolutegravir; The woman has had monthly fourth generation HIV testing, which has been non-reactive throughout the first two trimesters; on the most recent visit the man has an HIV RNA was <20 c/ml, but the woman has shows HIV antigen negative and HIV antibody positive. The most appropriate next step is:

A. Obtain the HIV viral RNA test to find out how high the viral load is, and begin antiretroviral therapy immediately
B. Consider laboratory error, repeat the same 4th generation test
C. Perform supplemental testing with third generation discriminatory testing
D. Reassure the couple that the woman is not infected and the test is just a false positive

HIV Serologic Testing Pregnancy

- False positive results with antibody testing are possible in pregnancy
- May be specific for individuals tests and persist during pregnancy
- Testing with viral RNA testing can resolve most issues
  - Qualitative tests (e.g., APTIMA) ARE FDA-APPROVED for testing
    - Expensive and generally longer turn around
  - Quantitative testing are NOT FDA-APPROVED for diagnosis
    - Rapid turnaround but low level results are possible
- Rapid screening reactive during labor in previously untested
  - Initiate therapy
  - Do not wait for supplemental results

Question #4

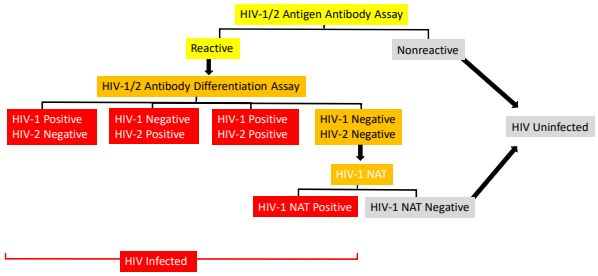
A 65 yo American male has had unprotected sex with men for many years. The HIV-1/2 ELISA is reactive and supplemental testing is positive for HIV-1. Viral RNA level is <50 copies/ml and CD4 count is 700 cells/µl. He has never been on antiretroviral therapy and has no history of travel outside the US. Which of the following is most likely:

A. The patient is in the window period of HIV-1 infection.
B. The patient is chronically infected with HIV-1 and has a viral load too low to be detected because he is a long term non progressor.
D. The patient is not infected with HIV-1 or -2, all tests are false positive.
E. The patient is infected with non-B subtype of HIV-1

HIV-1 Long Term Non-Progressors

- Represents authentic HIV infection
- ELISA REACTIVE
- SUPPLEMENTAL POSITIVE
- HIV RNA may not be detectable
- Slow disease progression
- Associated with specific HLA subtypes

HIV Diagnostic Algorithm



Question #5

A 68 year old man undergoing PrEP (cabotegravir) comes for routine PrEP visit. He reports multiple partners (male and female) and engages in receptive anal sex with partners who do not use condoms. His prior 4th generation test was 6 months ago and was nonreactive. He admits that he has been going out to clubs more frequently after COVID restrictions eased. He does not use condoms. Ten days ago, he developed fever 101° F, cough . A covid test was positive. He feels better but not back to his usual state of health. The 4th generation test is now reactive. His other laboratory results include

CD4: 250 cells/µl (14%; prior CD4 was 1000 cells/µl; 55%)

Which of the following is most correct?

A. Tell him the Covid test was a false positive, he has HIV, and should start TDF+FTC+ Rilpivirine
B. Tell him the HIV test is a false positive and continue PrEP
C. Tell him he may have HIV infection, send supplemental testing and continue PrEP
D. Tell him he may have HIV infection, send supplemental testing and switch to TDF+FTC+ Rilpivirine

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Question #6

A 42 year old woman has a reactive 4th generation test for HIV infection. She is 7 months pregnant, and had COVID-19 infection one month ago despite vaccination with Moderna COVID vaccine four months prior to testing. She had a nonreactive 4th generation screen 7 months ago at the beginning of her pregnancy, she denies any HIV exposures. Subsequent qualitative HIV RNA testing is negative. The most likely explanation for these results is:

A. **False positive 4th generation test for HIV infection due to pregnancy**
B. **False positive 4th generation test for HIV infection due to COVID vaccination**
C. **False positive 4th generation test for HIV infection due to COVID infection**
D. **False negative HIV RNA testing in the setting of recent HIV infection**

HIV Testing and False Positives

- Numerous recent examples for false positive results
  - Acute infection
    - African trypanosomiasis
  - Heterophile antibodies
    - Workers in pork processing plant
  - Rheumatologic diseases
  - Metastatic cancer
  - Pregnancy
  - COVID infection
  - …

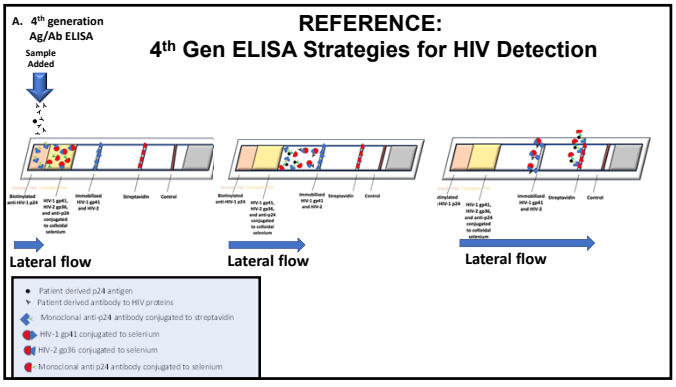
HIV Testing

- **Opt-out testing is Recommended by IDSA and CDC**
  - **Patients are informed that an HIV test will be conducted unless they explicitly decline to be tested.**
  - **Written consent in this setting is incorporated into intake**
  - **Counseling is available**
- **Opt-in: NOT Recommended by IDSA and CDC**
  - **Patients need to initiate the request for HIV infection**
- **Requirements for testing:FIVE C's:**
  - **Counseling**
  - **Consent**
  - **Confidentiality**
  - **Correct test results**
  - **Connection to prevention care and treatment**

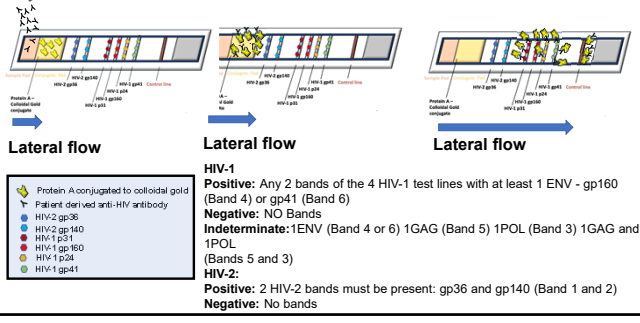
Pearls for Board Exam

- **HIV Testing is Comprehensive**
  - **Non-B Subtypes are all detectable**
  - **HIV-2 has an approved diagnosis**
  - **Long term Non-Progressor**
    - **ELISA reactive / Supplemental Positive**
- **Resources:**
  - **https://www.cdc.gov/hiv/guidelines/testing.html**
  - **Fmaldarelli3@gmail.com**
  - **Reference slides follow**
- **No test is perfect**
  - **4th Gen less sensitive**
    - **Acute**
    - **PEP/PrEP**
    - **Early Antiretroviral therapy**
  - **False Positives**
    - **Pregnancy**
  - **Mind the gap**
    - **Long gap for Home testing**
- **Board exam isn't perfect either**
  - **So don't overthink it**

REFERENCE:
4th Gen ELISA Strategies for HIV Detection



REFERENCE:
Supplementary Discriminatory HIV-1/2 assay ELISA



HIV-1
Positive: Any 2 bands of the 4 HIV-1 test lines with at least 1 ENV - gp160 (Band 4) or gp41 (Band 6)
Negative: NO Bands
Indeterminate:1ENV (Band 4 or 6) 1GAG (Band 5) 1POL (Band 3) 1GAG and 1POL
(Bands 5 and 3)
HIV-2:
Positive: 2 HIV-2 bands must be present: gp36 and gp140 (Band 1 and 2)
Negative: No bands