



# HIV Treatment: monitoring, adherence and resistance

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February 2016

# HIV Testing

## Antibody test

- Antibody tests
  - Rapid tests and home tests
    - Antibodies are produced by the immune system which is what the test looks for. Can be used in blood and oral fluid
    - 3 – 12 weeks after infection before detection
    - Rapid antibody screening test takes 30 minutes
    - OraQuick HIV test swab from the mouth takes about 20 minutes
    - Home testing kits involves a finger prick blood sample can take 7 – 10 days for results
- All positive test results will require a second conformation test

# HIV testing

## Fourth generation tests

- Fourth generation tests look for
  - HIV antibodies and antigens
  - Antigens are foreign substances that cause your immune system to activate
  - Antigen is part of the virus and present during acute infection
  - Antigen p24 is produced before antibodies are produced
- 2 – 6 weeks for the body to make enough antigens and antibodies for the test to detect HIV

# HIV testing nucleic acid test (NAT)

- Nucleic acid test
  - Does not look for antigens or antibodies
- It looks for the virus
- Gives a positive or negative result
  - And the actual amount of the virus

Takes 7 – 28 days for NAT to detect the virus

Very expensive and rarely used

# Monitoring

- Viral load
- CD4 count
- Resistance tests
- Drug levels
- Viral tropism
- Renal function test
- Liver function tests
- Full blood count



# Viral load

- The most important test once started on treatment!
- Shows how much virus is in the blood
- Result may look like 100 000 copies/mL for someone not on ART
  - For someone on ART it may look like 3 copies/mL (undetectable)
- Viral loads show if the ARV therapy is working or not

# CD4 Count

- This measures how your immune system is functioning -
  - A high CD4 count means its good
    - A low CD4 count is not
      - Anything under 250 is dangerous
      - The most important test before commencing ARV therapy
- CD4 cells are lymphocyte cells (white blood cells) sometime known as T-cells
- Two types of T-cells – CD4 are helper cells and lead against infection and CD8 cells “suppressor” cells. These are also killer cells
- A normal CD4 count range would be 400 – 1600 cells per cubic millimeter
- CD4% is the total lymphocytes (white blood cells) that are CD4 cells
- Starting ARV will increase the CD4 count as the immune system recovers



# Resistance test

- This shows if the HIV virus is resistant to HIV drugs
  - It shows if the chosen drug will work
- A virus that has mutated may cause drug resistance to occur
  - K103N will stop EFV and NVP from working
  - M184V will stop 3TC and FTC working
- Missing medication can cause resistance to develop
- An detectable viral load while on treatment can cause a mutation to occur





# Therapeutic Drug Monitoring

- Drug level testing
- This should be done once commenced on ARV
- Detects how much drug the body is absorbing
  - For ARV's to work properly there has to be a set level of drug in the body
- Sometimes a dose adjustment maybe needed or a change of therapy if the body does not absorb the drug correctly
  - Many reasons why drugs are not absorbed
  - Adherence level is the biggest reason why drug levels maybe low....

# Viral tropism

- HIV attaches to CD4 cell it uses molecules on the cell surface receptors or chemokine co-receptors
- The first receptor HIV uses is the CD4 molecule  
it then uses a co-receptor CCR5 or CXCR4 molecule
- Usually uses one type of co-receptor  
CCR5 co-receptor is called CCR5 tropic or R5 tropic
- R5 tropic test used for Maraviroc



# Renal function tests

- HIV Associated Nephropathy (HIVAN)  
damage caused by HIV to kidneys
- Nephrotoxicity  
toxicity or injury to the kidneys  
side effects of ARV's
- Up to 30% of HIV+ people have kidney disease
- Measures the levels of urea, creatinine and salts  
dipstick urine tests often pick up increased protein levels  
which indicate potential kidney damage

# Liver function test

- Liver function tests check the liver is working properly
- Some drugs use the liver pathway for metabolism
  - Alanine aminotransferase (ALT).
  - Aspartate aminotransferase (AST).
  - Alkaline phosphatase (ALP).
  - Gamma glutamyl transferase (GGT).
  - Bilirubin.
  - Albumin.
- Ultrasound
- Liver biopsies
- Fibro scan

# Adherence

- What is adherence?
- How much is enough?
- How can adherence be improved?
- What about missed or forgotten tablets?



# Resistance

- What is it?
  - A mutation of the virus structure
  - Low levels of drug in the body can cause resistance
  - A person can be infected with with drug resistant HIV
- When does resistance occur?
  - Most common when detectable virus levels while on ART
  - After stopping treatment if not done properly
- Cross resistance
  - When a resistance occurs with one class of drug then usually the other drugs in the same class wont work also

# Treatment failure

- Virological failure
  - Never reaches undetectable or rebounds
    - The drugs are not working!
- Clinical failure
  - The drugs are not stopping a person from becoming ill with other illnesses associated with HIV
- Managing treatment failure
  - It can be complex.
    - Important to understand why this has happened
      - Drug levels, adherence drug drug interactions other
- Viral blip – is not a treatment failure

# Test time!

- What does ARV stand for?
- How many drugs are usually used in ARV combination therapy?
- Name four families of drugs
- Which drug family is active before HIV enters a CD4 cell?
- How many combinations are recommended as first-line treatment by the WHO?
- Name the individual drugs used in the WHO combinations
- Give at least three reasons to delay starting treatment
- What can affect the levels of ARVs in the blood?
- What is adherence?
- Give six examples of things that could help with adherence.
- What is drug resistance?
- What is clinical failure?
- What is Virological failure?
- How low does viral load need to go to prevent resistance developing?



# Thanks to

- i-base
  - <http://i-base.info>
- Center for disease Control and Prevention
  - <http://www.cdc.gov/hiv>

