

# Plasma HIV-1 RNA Levels (Viral Load)

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MTN-009 Training  
Durban, South Africa  
May 7, 2010



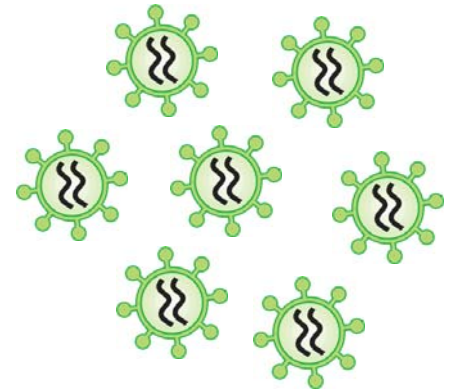
# What is VIRAL LOAD (VL)?

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- Estimation of the amount of virus in a body fluid
  - Generally RNA copies/ml in plasma
  - Each HIV particle contains two strands of RNA, so the level of actual virus is half the RNA count

## Why do it?

- Monitor severity of infection
- Track viral suppression
- Evaluate treatment efficacy or failure



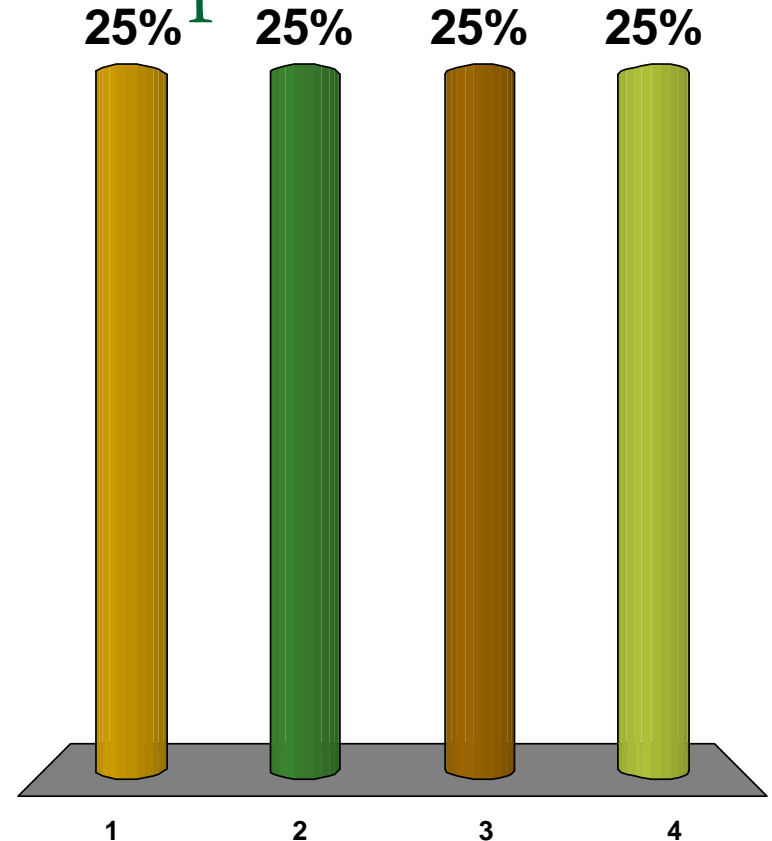
# History of Viral Load

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- **Multicenter AIDS Cohort Study (MACS)** (Mellors 1996)
    - Measured virus in stored plasma samples collected from ~1,600 untreated HIV-infected men
    - Prognosis depended on level of virus
      - VL > 30,000 c/ml: 70% died in 6 yrs (avg 4.4 yr)
      - VL < 500 c/ml: < 1% died in 6 yrs (avg > 10 yr)
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# Which test is more important for monitoring an HIV-infected patient?

1. **Viral Load**
2. **CD4+ T cell count**
3. **They are both very important**
4. **They are both unnecessary; just asking the patient how they feel is enough**



However, only CD4+ T cell count results are used for care in Durban clinics.

# Monitoring VL is important

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- Viral load influences the rate of disease progression
- Lowering viral levels as much as possible for as long as possible with therapy is essential to prolonging life.



# Monitoring VL is important

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- **Standard Assay: <400 copies/ml**
    - Goal of treatment is to maintain viral load to undetectable in standard assay
  - **Ultrasensitive Assay: <50 copies/ml**
    - Offers better protection against developing drug resistance
    - MTN-009 will use this type of assay
    - Viral load range: 50 – 10,000,000 RNA copies/ml
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# Viral Load Results

- Each participant will get a PDF report for viral load sent by email by Network Lab.
  - Participant should be called in for a visit when results are received.
  - Do not wait for viral load results to give CD4+ T cells results.
  - Viral load results can be given at the same time as resistance results if both are available
  - VL report can be given to the participants primary care physician.
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# Who should get a viral load?

- **ONLY HIV INFECTED** MTN-009 participants should get a viral load test
  - There is no such thing as a “negative” viral load – this is why HIV-negative people should not get a viral load done
  - Viral load for an HIV positive person can be “undetectable”
    - The current assay used cannot detect any virus in the plasma
    - It does not mean virus is not there – the person is still HIV infected
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# Viral Load Report - Top

## LDMS - Abbott Realtime HIV-1 Patient Report

Patient: 308000 [REDACTED]

Group / Protocol: MTN 015.0

SID:

Specimen Date: 06/Apr/2009

Visit:

Clinic Info:

Fax:

Testing Lab Info: MTN Core Virology Lab  
S804 Scaife Hall  
3550 Terrace St  
Pittsburgh PA, 15213 United States  
Phone: Fax:

# Viral Load Report – Middle

**Sample Condition:** SAT Satisfactory

**Run ID:** 12132

**Other Spec ID:**

**Specimen ID:** 308 [REDACTED]

**Global Spec ID:** C920 [REDACTED]

**Received Date:** 08/Oct/2009

**Primary:** BLD Blood (Whole)

**Assay Date:** 16/Oct/2009

**Derivative:** PL1 Plasma, Single-Spun

**Type of Assay:** Abbott Realtime HIV-1 with Calibrators

**Input Volume:** 0.6 mL

# Viral Load Report - Bottom

## Abbott Results:

Actual Kit Copies / mL	Interpretation	Log Base 10 Value
Not detected	Target not detected	No log Calculated

## Comments:

Per the package insert, test results less than 40 copies/mL are below the lower limit of quantitation of the Abbott Real-time HIV-1 RNA assay.

Lab Report Date: 01/Dec/2009

Sample Prep Tech: KAE

Amplification Tech: KAE

## Undetectable

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# Counseling Messages

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Lab Report Date: 01/Dec/2009

Sample Prep Tech: KAE

Amplification Tech: KAE

**You are HIV infected, but your viral load is undetectable.**

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# Counseling Messages

Abbott Results:		
Actual Kit Copies / mL	Interpretation	Log Base 10 Value
147		2.17
Comments:		
Lab Report Date:	01/Dec/2009	Sample Prep Tech: KAE
		Amplification Tech: KAE

**“Low” Viral Load: 147 copies/ml**

**~~“Undetectable” by Standard Testing~~**

# Counseling Messages

Abbott Results:		
Actual Kit Copies / mL	Interpretation	Log Base 10 Value
147		2.17
Comments:		
Lab Report Date: 01/Dec/2009      Sample Prep Tech: KAE Amplification Tech: KAE		

**You are HIV infected, but your viral load is very low.**

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# Counseling Messages

## Abbott Results:

Actual Kit Copies / mL	Interpretation	Log Base 10 Value
102,292		5.01

Comments:

Lab Report Date: 28/Sep/2009

Sample Prep Tech: KAE

Amplification Tech: KAE

**“High” Viral Load**

**102,292 copies/ml**



# Counseling Messages

## Abbott Results:

Actual Kit Copies / mL	Interpretation	Log Base 10 Value
102,292		5.01

Comments:

Lab Report Date: 28/Sep/2009

Sample Prep Tech: KAE

Amplification Tech: KAE

**Your viral load is very high. Please ask your primary care physician for possible referral to ARV treatment.**

# VL, CD4 and HIV Infection

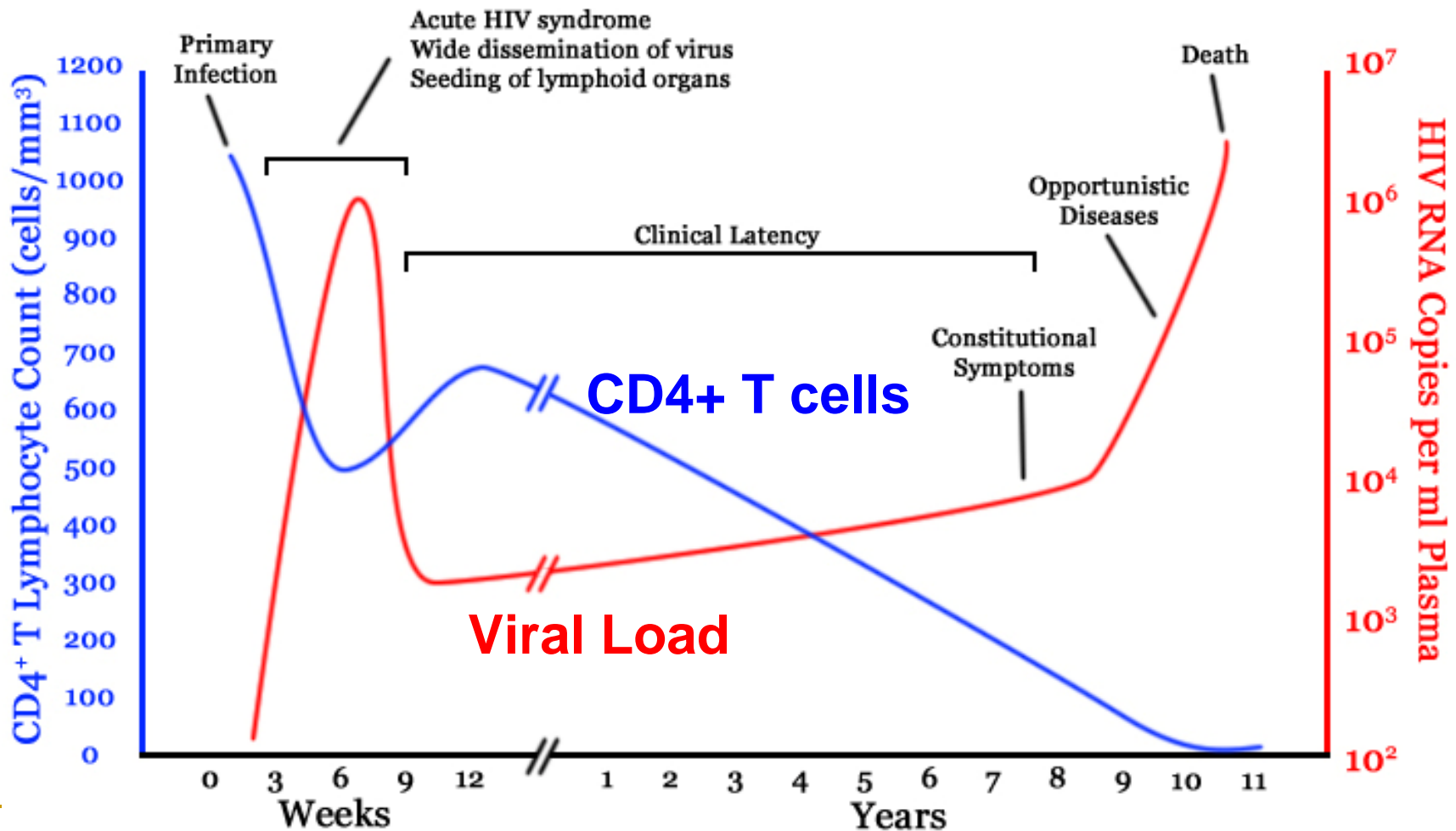
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- Each day, viral population in a patient:
  - Generates billions of new HIV particles
  - Destroys millions of CD4 T lymphocytes
- The body tries to compensate for the loss by making new CD4 T cells, but AIDS happens when the immune system eventually fails to keep up.

-From Mellors, Scientific American 1998

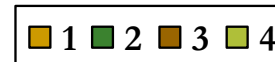
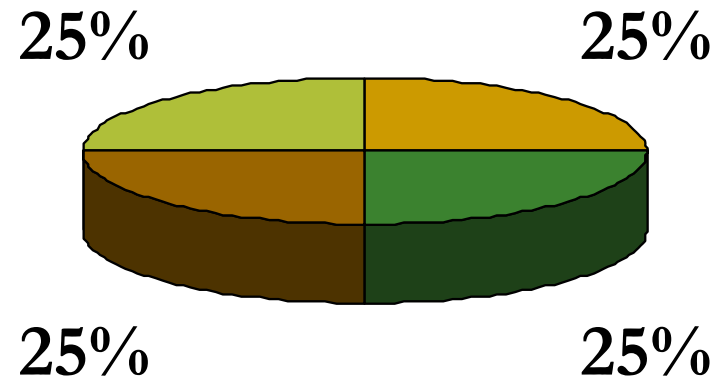
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# Viral Load and CD4+ T Cells



# In general, when viral load goes up:

1. **CD4 T cell count goes down**
2. **CD4 T cell count stays the same**
3. **CD4 T cell count goes up**
4. **There is no relationship between viral load and CD4 T cells**



# QUESTION

- Classify each VL/CD4 result combo as:
  - GOOD, NOT GOOD, BAD or UNUSUAL
  - Give reason for choice

**VL <50 copies/ml**

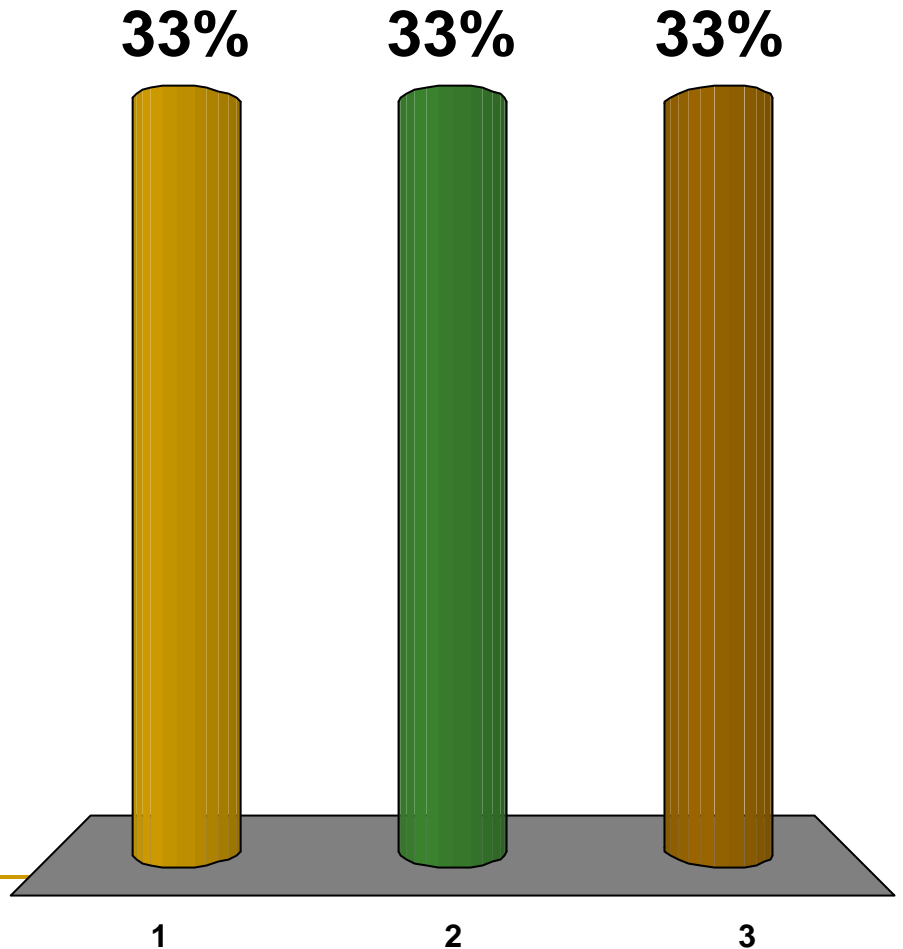
**CD4 = 1000**

**GOOD**

Undetectable viral load and healthy CD4 T cell count

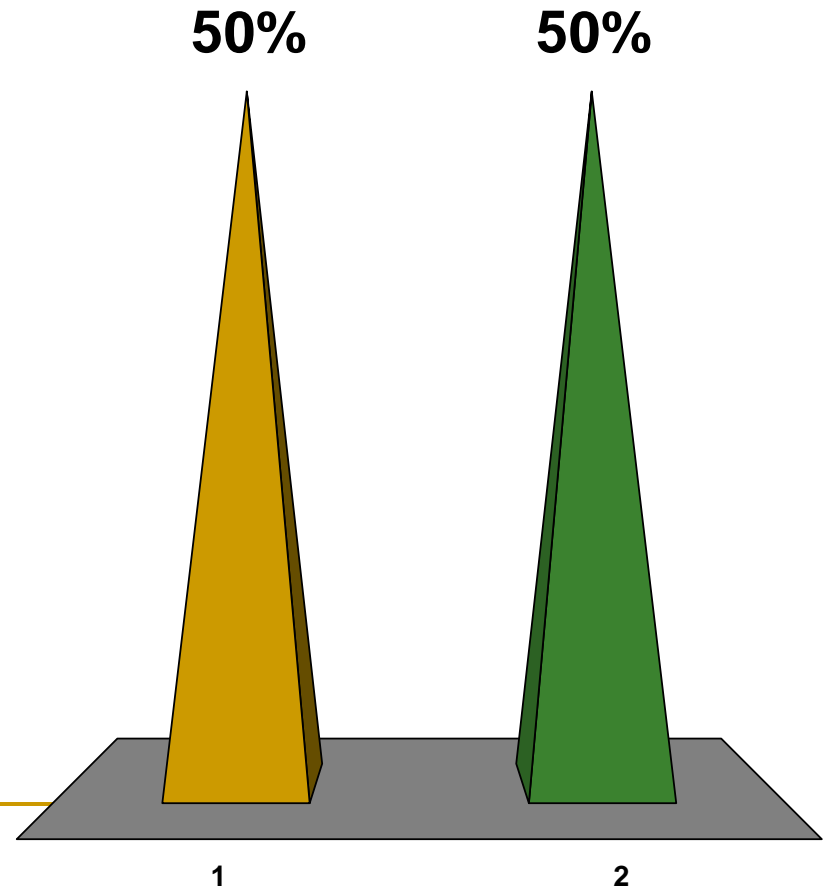
# What viral load test measures?

1. Measures the amount of HIV in the blood
2. Measures the number of immune systems cells in the blood
3. Measures how much HIV is being transmitted



If the viral load is undetectable, the participant is no longer infected

1. True
2. **False**



# QUESTION

- Classify each VL/CD4 result combo as:
  - GOOD, NOT GOOD, BAD or UNUSUAL
  - Give reason for choice

**VL <400 copies/ml**

**CD4 = 150**

**UNUSUAL**

If CD4 count is very low, viral load may be off.  
Check with network lab.



# QUESTION

- Classify each VL/CD4 result combo as:
  - GOOD, NOT GOOD, BAD or UNUSUAL
  - Give reason for choice

**VL 2,000,000**

**CD4 = 600**

**UNUSUAL**

Both CD4 and viral load are high. These results are still valid. May be acute infection.

# QUESTION

- Classify each VL/CD4 result combo as:
  - GOOD, NOT GOOD, BAD or UNUSUAL
  - Give reason for choice

**VL 10,000 copies/ml**

**CD4 = 400**

**NOT GOOD**

Viral load is high, CD4 T cell count may be declining.

# QUESTION

- Classify each VL/CD4 result combo as:
  - GOOD, NOT GOOD, BAD or UNUSUAL
  - Give reason for choice

**VL 6,455,000**

**CD4 = 150**

**BAD**

Viral load is very high and CD4 is very low.  
Progression to AIDS is likely.

# QUESTION

- Classify each VL/CD4 result combo as:
  - GOOD, NOT GOOD, BAD or UNUSUAL
  - Give reason for choice

**VL 95,780,455,879**

**CD4 = 0**

**UNUSUAL**

Cannot have viral load this high – above all assay linear ranges. CD4 count cannot be 0. Re-check labs and/or consult network lab.