HIV Diagnostics and Testing Update

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US Preventive Services Task Force

- 2005 Recommendation for HIV screening:
  - All pregnant women - Grade A
  - Persons at increased risk for HIV – Grade A
  - Persons not at increased risk – Grade C

- 2012 Draft Recommendation statement
  - Adolescents and adults ages 15 to 65 years – Grade A
  - All pregnant women – Grade A

http://www.uspreventiveservicestaskforce.org/draftrec.htm

Why USPSTF Grades Matter

- **Health Care Reform:**

SEC. 2713. COVERAGE OF PREVENTIVE HEALTH SERVICES.

(a) IN GENERAL.—A group health plan and a health insurance issuer offering group or individual health insurance coverage shall, at a minimum, provide coverage for and shall not impose any cost sharing requirements for—

(1) evidence-based items or services that have in effect a rating of 'A' or 'B' in the current recommendations of the United States Preventive Services Task Force;

HIV Tests
Recently Approved
by the FDA

INSTI

- FDA-approved
  November 29, 2010

- CLIA-waived
  July 23, 2012

- Whole blood, serum, or
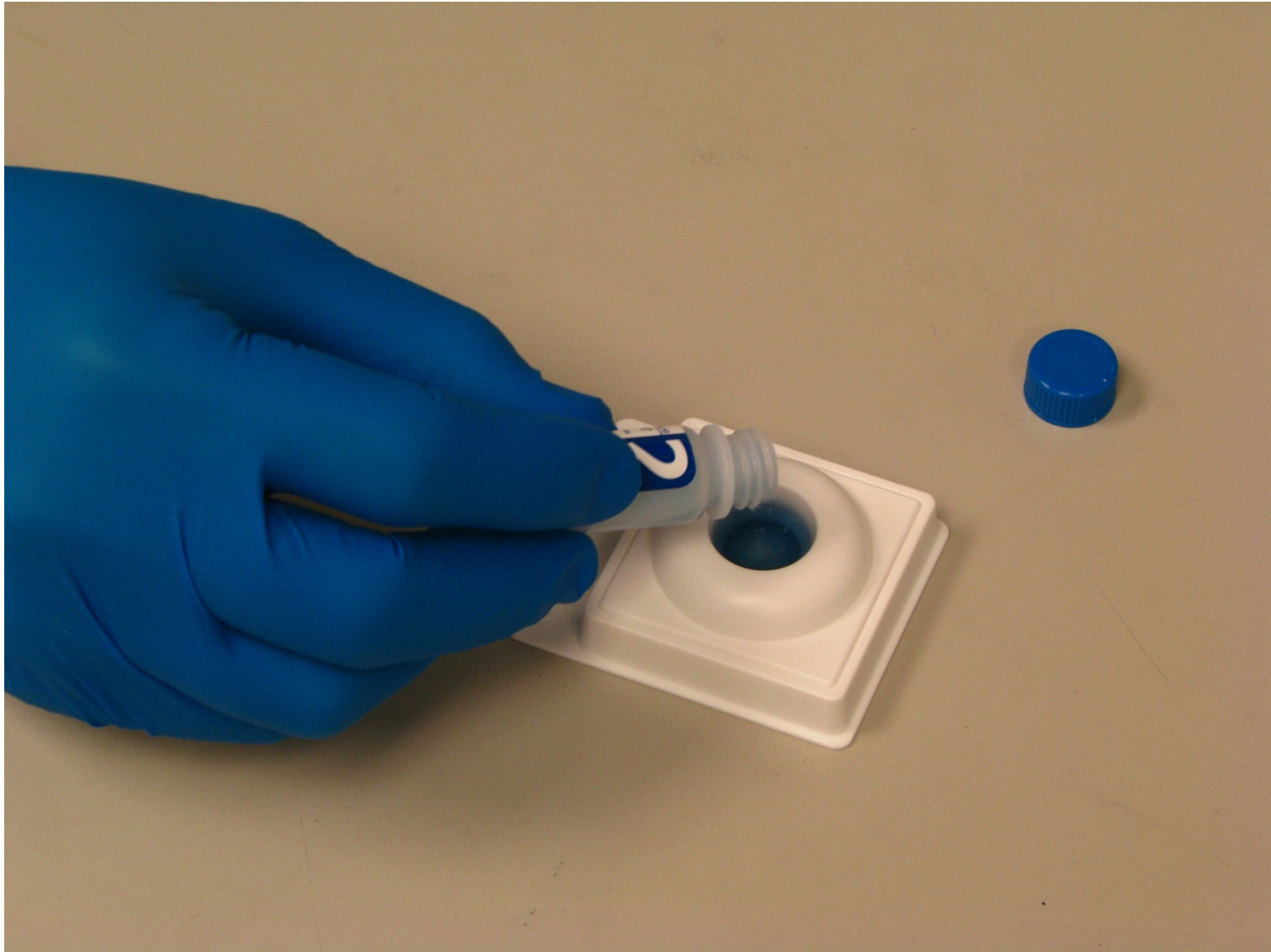 plasma

- Results < 1 minute

Perform fingerstick

Add 1 drop (50 ul) whole blood to diluent (vial 1)

Add specimen to membrane unit

Add color developer solution

Add clarifier solution

Reactive Control

Positive HIV-1/2
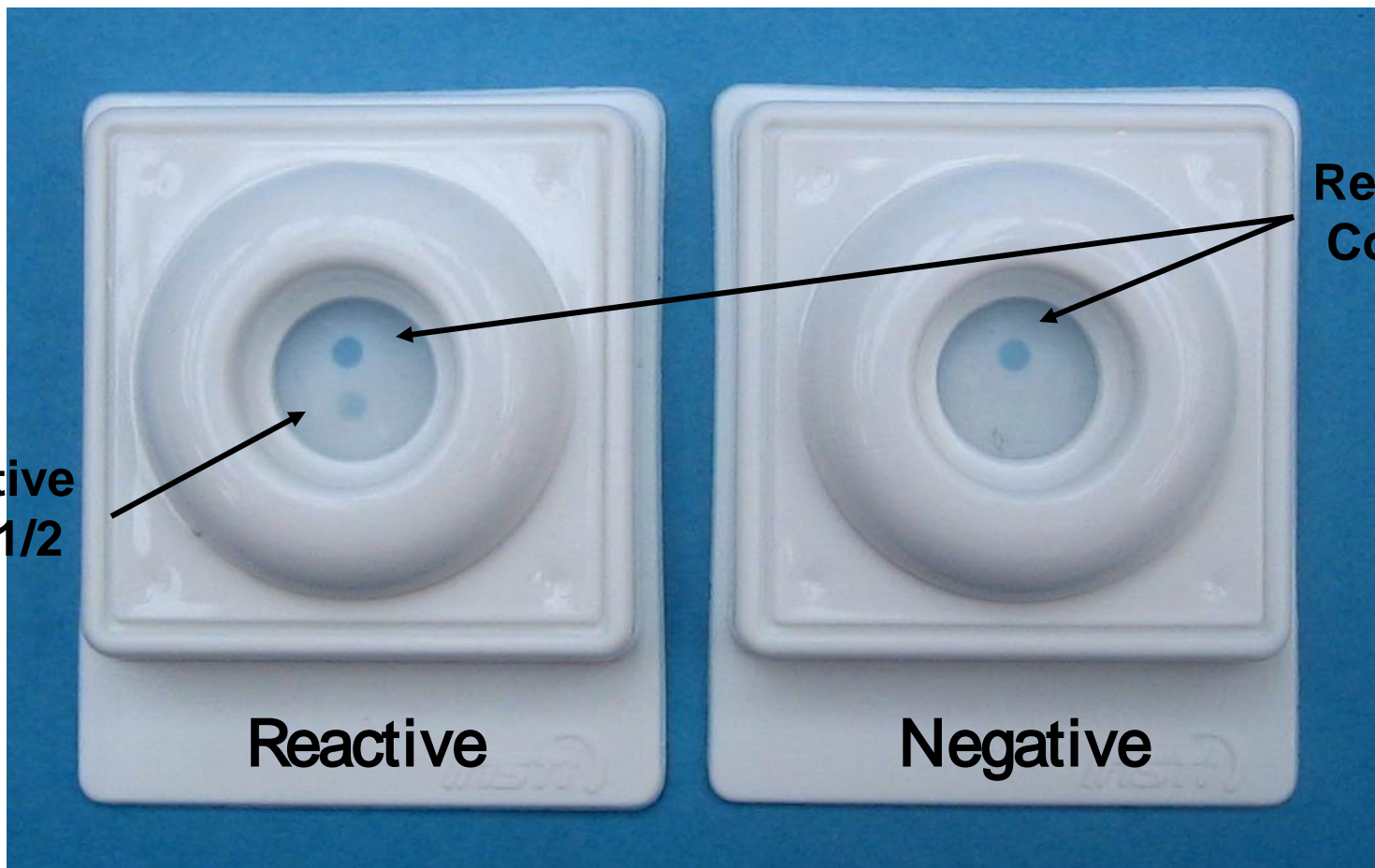
Reactive

Negative

Read results immediately

OraQuick In-Home HIV Test

Sensitivity: 91.7%
Specificity: 99.9%

$39.99

FDA-approved July 3, 2012

Abbott Architect 4th Generation Ag/Ab Combo Assay
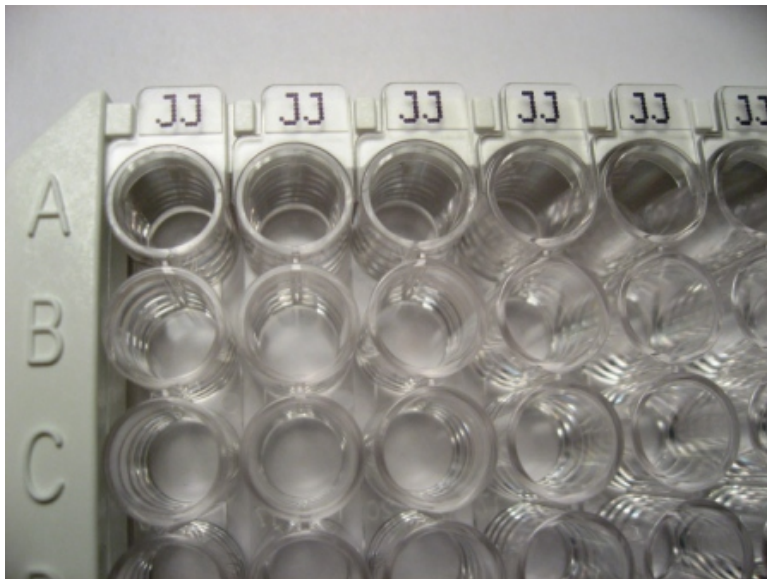
- Chemiluminescent immunoassay

- Detects p24 antigen and HIV antibody

- Time to result: 29 minutes
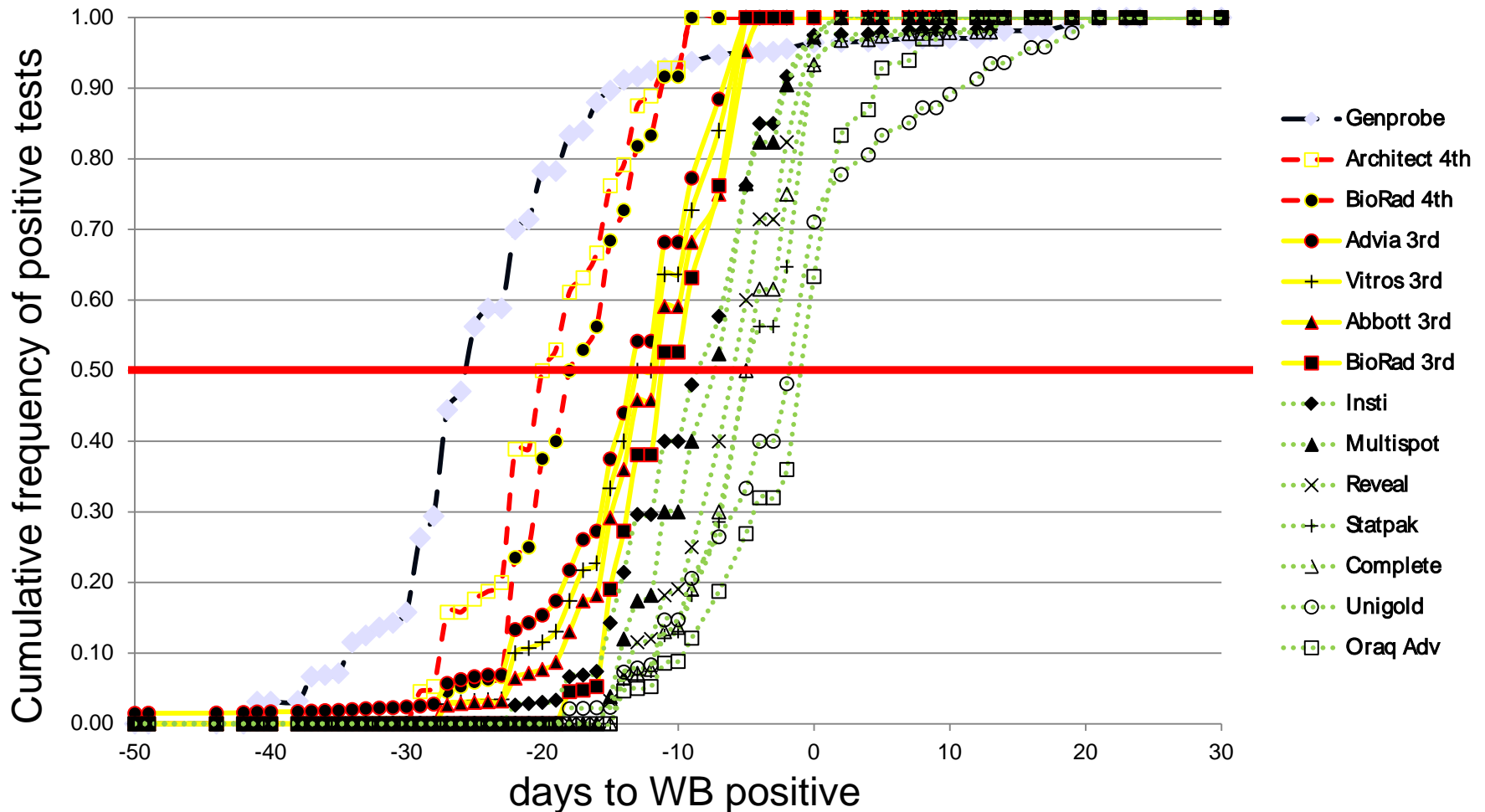
- FDA-approved June 22, 2010

Bio-Rad GS HIV Combo Ag/Ab EIA

- Microwell plate EIA

- 4th generation:
  - HIV-1: gp160
  - HIV-2: gp36
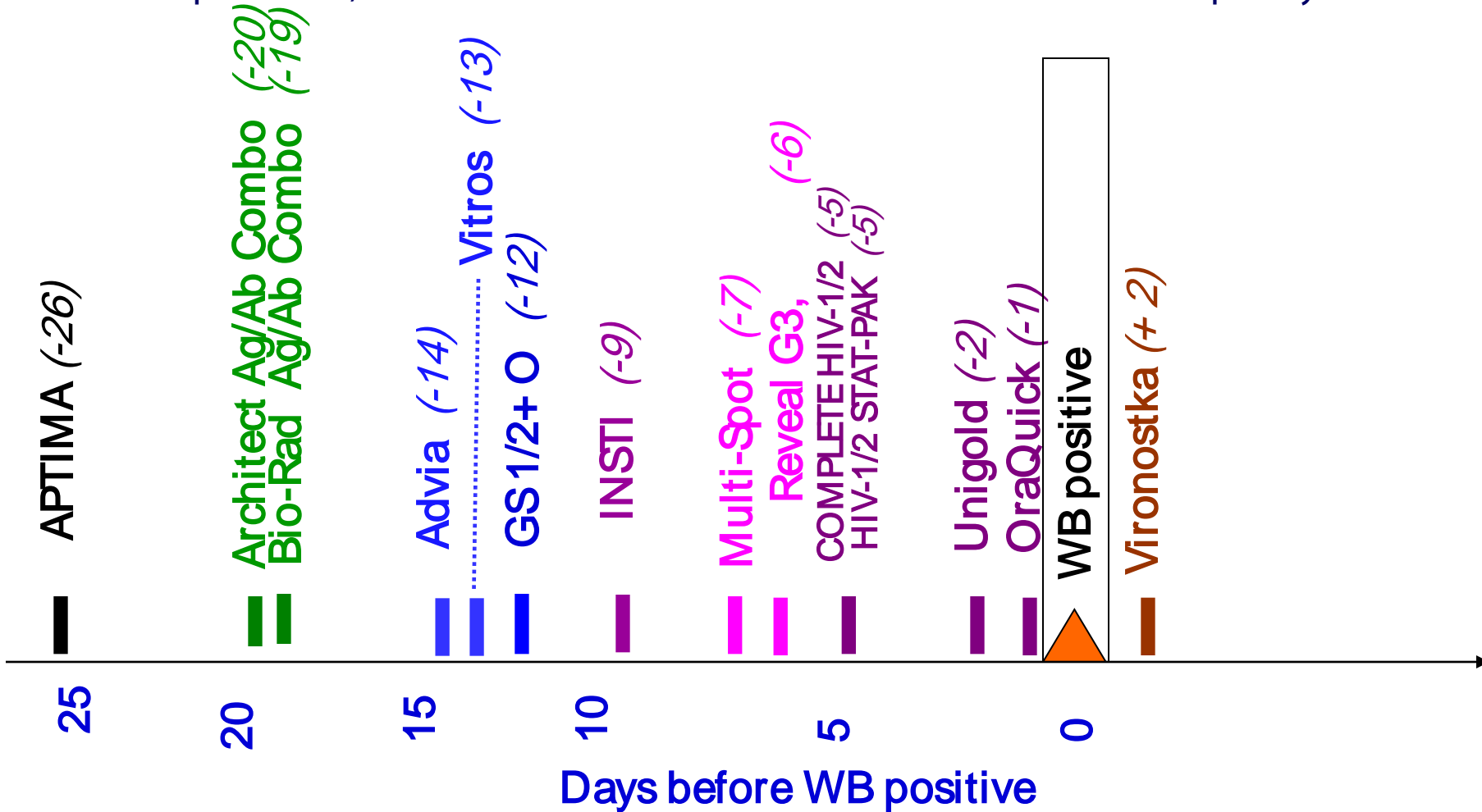 - Group O
- p24 antigen

- FDA-approved July 25, 2011

Relative Seroconversion Sensitivity

- 26 seroconverters were analyzed with 14 tests
- 17 seroconverters with WB positive used for cumulative frequency analysis

Sequence of Test Positivity Relative to WB

166 specimens, 17 Seroconverters - 50 % Positive Cumulative Frequency

APTIMA (-26)

Architect Ag/Ab Combo (-20)
Bio-Rad Ag/Ab Combo (-19)

Vitros (-13)

Advia (-14)

GS 1/2+ O (-12)

INSTI (-9)

Multi-Spot (-7)

Reveal G3, (-6)

COMPLETE HIV-1/2 (-5)
HIV-1/2 STAT-PAK (-5)

Unigold (-2)

OraQuick (-1)

WB positive

Vironostka (+ 2)

Days before WB positive

25 20 15 10 5 0

Modified from *Masciotra et al, JClin Virol 2011*
and *Owen et al, JClin Micro 2008*

CDC/APHL Proposed New HIV Testing Algorithm

New HIV Diagnostic Algorithm

4th generation HIV-1/2 immunoassay

(+) →

(-) → Negative for HIV-1 and HIV-2 antibodies and p24 Ag

HIV-1/HIV-2 antibody differentiation immunoassay

HIV-1 +
HIV-1 antibodies detected
Initiate care
(and viral load)

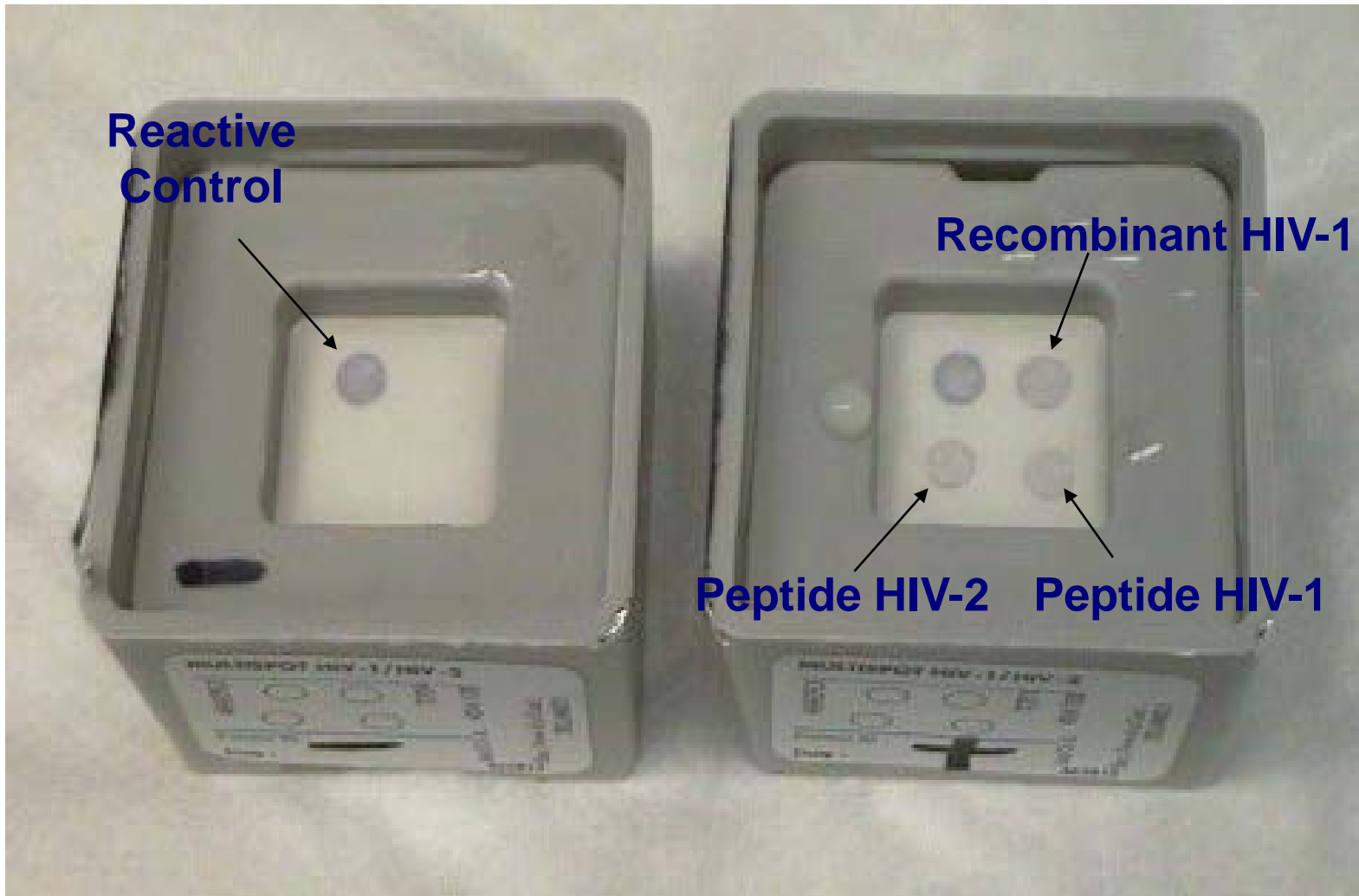**HIV-2 +**
HIV-2 antibodies detected
Initiate care

HIV-1&2 (-)
RNA

RNA
Acute HIV-1 infection
Initiate care

RNA
Negative for HIV-1

FDA-approved HIV-1/HIV-2 Antibody Differentiation Assay

Validation Results – NY State

38,257 specimens – 1,659 GS HIV-1/2 Plus O (3rd gen) EIA repeatedly reactive

Current Algorithm

- 1,546 HIV-1 positive
  - *32 discrepant specimens:*
    - *28 indeterminate WB*
    - *4 negative WB*

New Algorithm

- 1,579 HIV-1 positive (MS)
  - *32 discrepant specimens:*
    - *29 RNA+*
    - *3 follow-up specimens +*

-Styer et al, J Clin Virol, 2011

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New Algorithm

- 1,579 HIV-1 positive (MS)
  - *32 discrepant specimens:*
    - *29 RNA+*
    - *3 follow-up specimens +*
- 75 required RNA
  - 3 RNA detected
  - 63 RNA-negative

-Styer et al, J Clin Virol, 2011

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38,257 specimens – 1,659 GS HIV-1/2 Plus O (3rd gen) EIA repeatedly reactive

Current Algorithm

- **1,546 HIV-1 positive**
  - *32 discrepant specimens:*
    - *28 indeterminate*
    - *4 negative*

- **48 indeterminate**

New Algorithm

- **1,579 HIV-1 positive (MS)**
  - *32 discrepant specimens:*
    - *29 RNA+*
    - *3 follow-up specimens +*

- **75 required RNA**
  - 3 RNA detected
  - 63 RNA-negative

- **9 indeterminate** (RNA unsuitable)

-Styer et al, J Clin Virol, 2011

Validation Results – NY State

38,257 specimens – 1,659 GS HIV-1/2 Plus O (3rd gen) EIA repeatedly reactive

Current Algorithm

- 5 HIV-2
  - *112 HIV-2 EIA on WB-neg or indeterminate specimens*
  - *5 Multispot supplemental*

- 36,649 (99.95%) correctly reported negative

New Algorithm

- 5 HIV-2 (Multispot)

- 36,661 (99.98%) correctly reported negative

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-Styer et al, J Clin Virol, 2011

Abbott Architect Ag/Ab Evaluation: Specimens from 4 CDC studies

Result	HIV-1 infected n= 3386	Sensitivity	HIV-1 uninfected n= 7551	Specificity
Repeatedly Reactive	3384	99.94%	38	99.5%
	Acute Infections n= 58			
Positive	48	82.76%		
Negative	10			

-Chavez et al, JClin Virol 2011

Implications

- Ability to detect acute HIV infection
  - Focus for partner services and intervention efforts

- Ability to detect HIV-2 infections
  - Do not respond to many ARVs, e.g. NNRTI's and several protease inhibitors

- New surveillance case definitions
  - Stage 0, HIV-2