A New Generation of Rapid Assays: Detection of HIV and Syphilis Simultaneously

Niel T. Constantine, Ph.D., MT (ASCP)
Professor of Pathology
University of Maryland School of Medicine
Institute of Human Virology
Director, Laboratory of Viral Diagnostics

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No conflict of Interest

VENOJECT

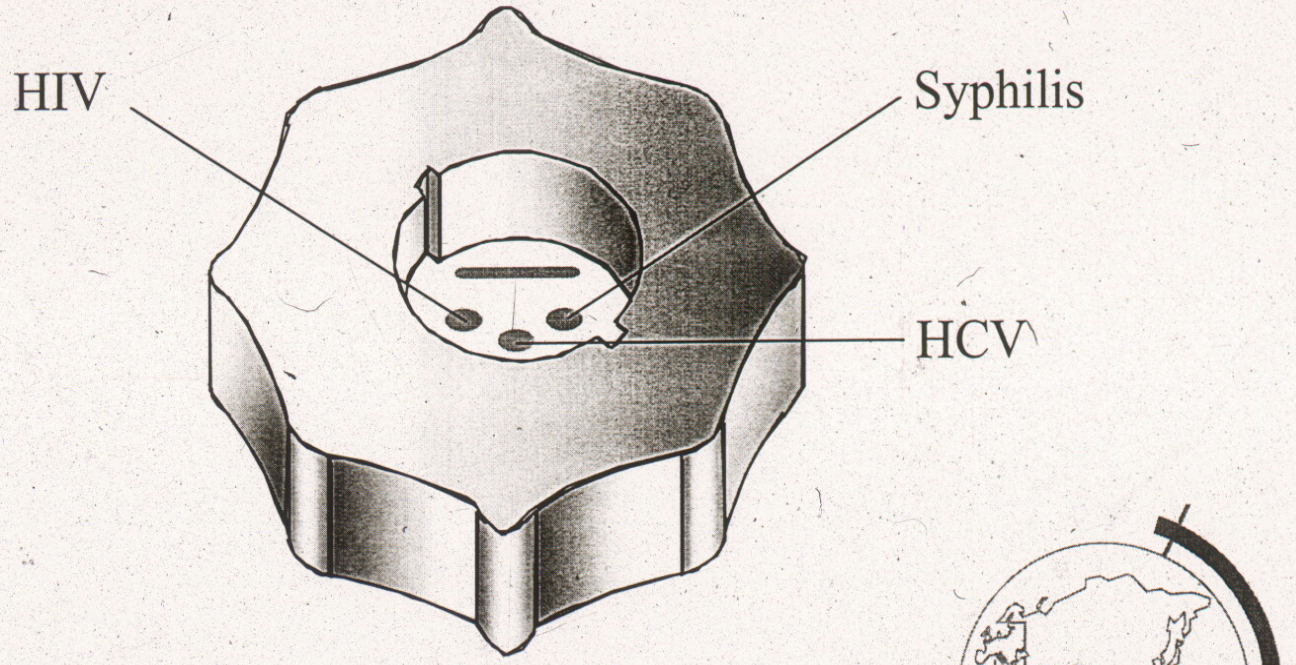
Rapid Tests: Advantages

- Rapid results
- Appropriate for Resource-limited Countries
  - No stable electricity required
  - No cold chain required for shipment
  - Robust – storage up to 30C
- Simplified training of staff & “no training necessary”
- Only a single finger-stick or oral fluid required

History

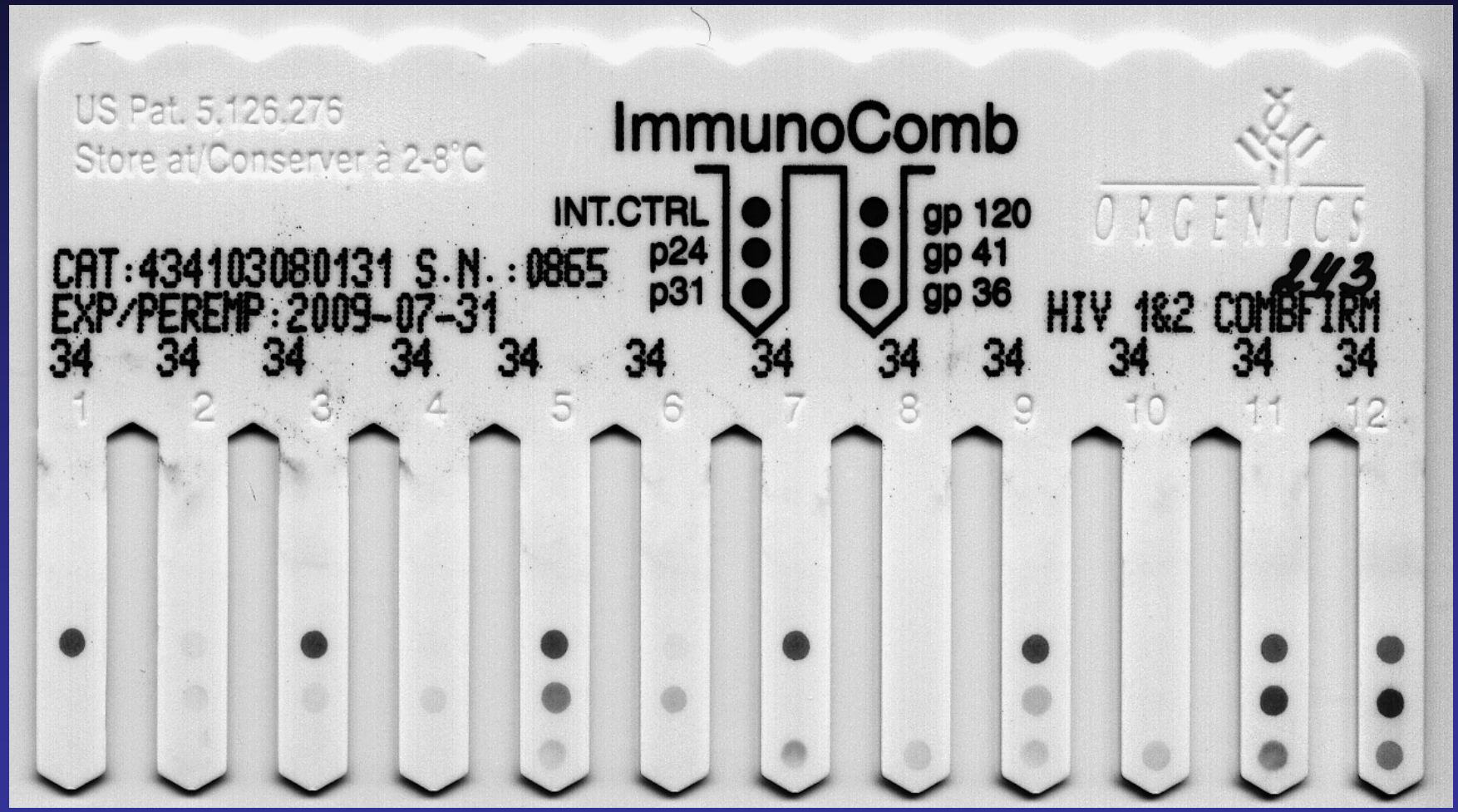
Multiplex
Rapid Tests

Platform Device
Other Applications

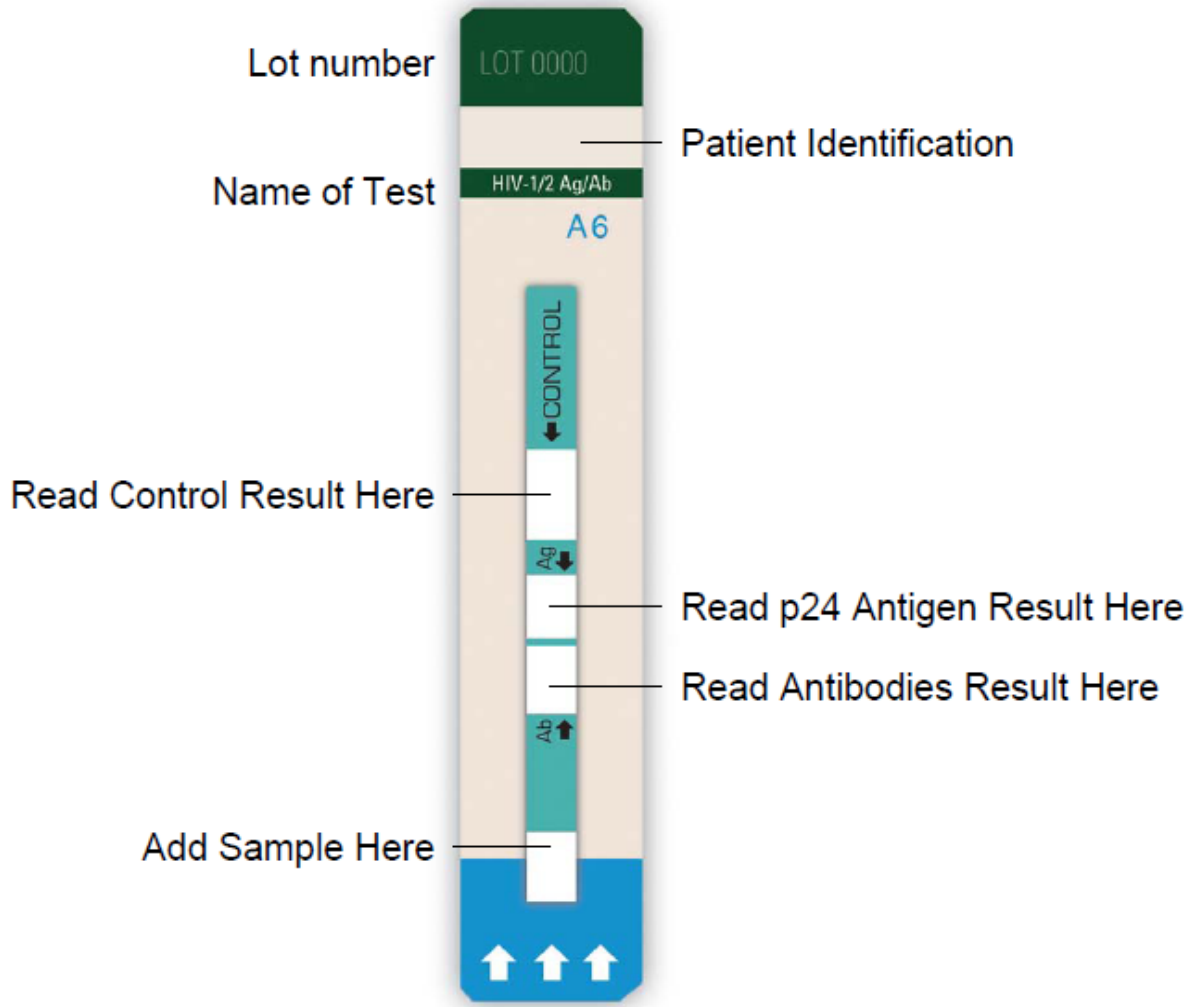


Universal HealthWatch
Diagnostics Corp.

Rapid Confirmatory Test



Determine® HIV-1/2 Ag/Ab Combo



inverness medical innovations

Multiplex Rapid Assays

- DPP HIV-Syphilis System (Chembio Diagnostic Systems)
- INSTI Multiplex HIV-1/2 Syphilis Ab Test
- SD Bioline HIV/Syphilis Duo (Standard Diagnostics, Alere)
- First Response HIV1+2/Syphilis COMBO Card Test (Premier Medical)
- First Response HIV1+2/HCV COMBO Card Test (Premier Medical)
- SD Bioline Roto/Adeno (Standard Diagnostics)
- HIV/HCV/HBsAg/Syphilis Combo Rapid Test (Healgen)
- Others:

HBsAg
Syphilis
HIV
HCV
HIV/HCV/HBsAg/Syphilis Combo
Rapid Test
20 tests For in vitro Diagnostic Use Only
HEALGEN®

World Health Organization

Recommendations for Use of Dual HIV/Syphilis Rapid Diagnostic Tests (2017)

- First Dual HIV/Syphilis test listed on WHO list of Prequalified *in vitro* diagnostic products in 2015
- Final sensitivity/specificity for HIV: 100 / 99.5
- Final sensitivity/specificity for Syphilis: 87 / 99.5
- WHO recommends HIV and syphilis testing for woman at least once, preferably in the first trimester, and WHO states that “the use of the Dual HIV/Syphilis RTD would facilitate implementation of this recommendation”.

Clinical Trial

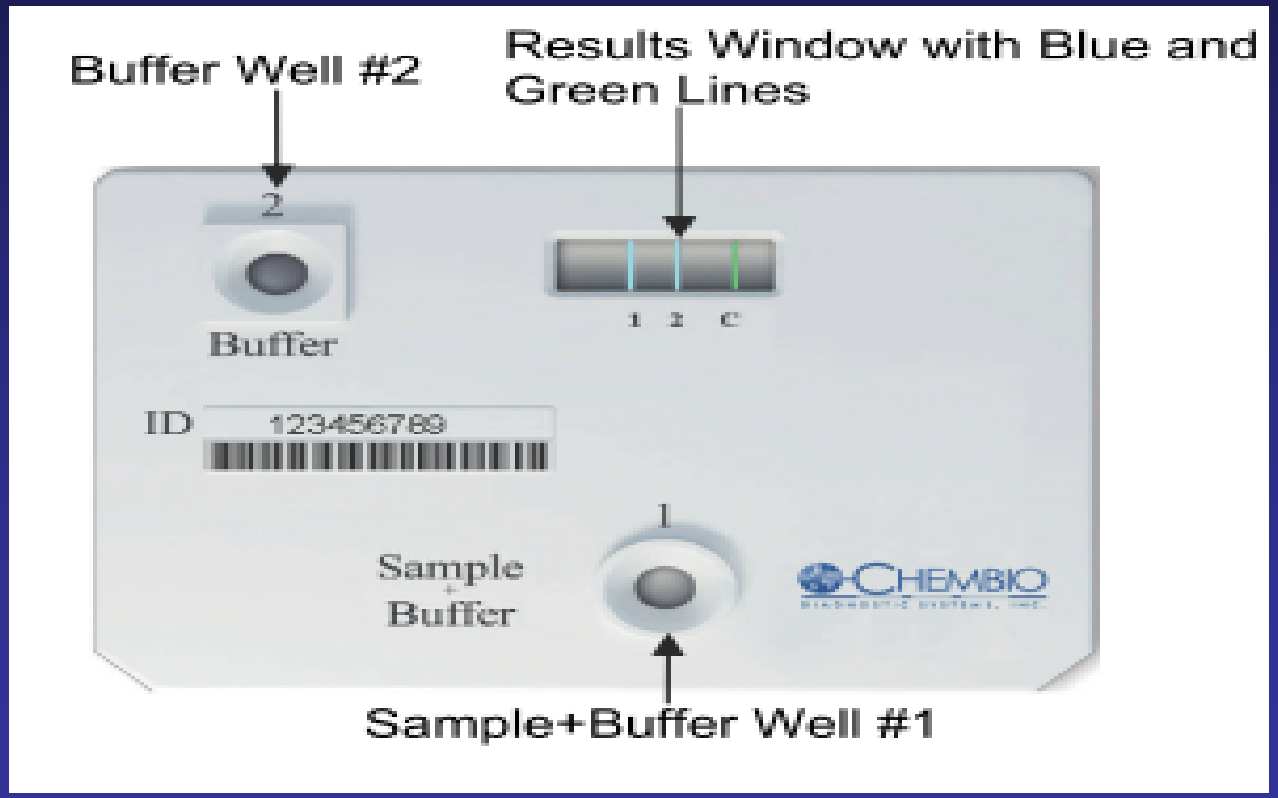
Evaluation of the DPP HIV-Syphilis System

DPP® HIV-Syphilis System
2017-2018

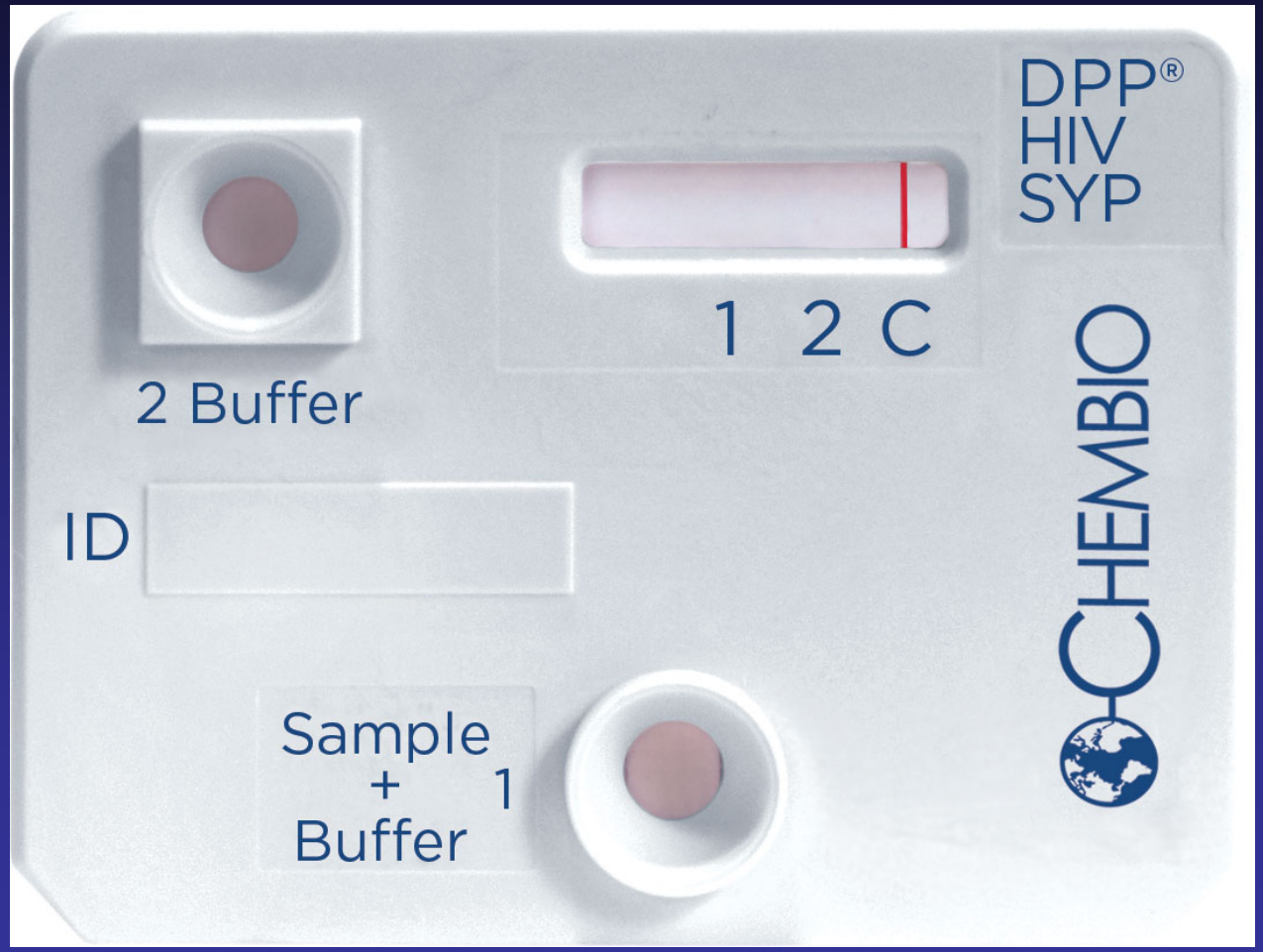
Manufacturer: Chembio Diagnostics Systems, Inc.

The DPP HIV-Syphilis System

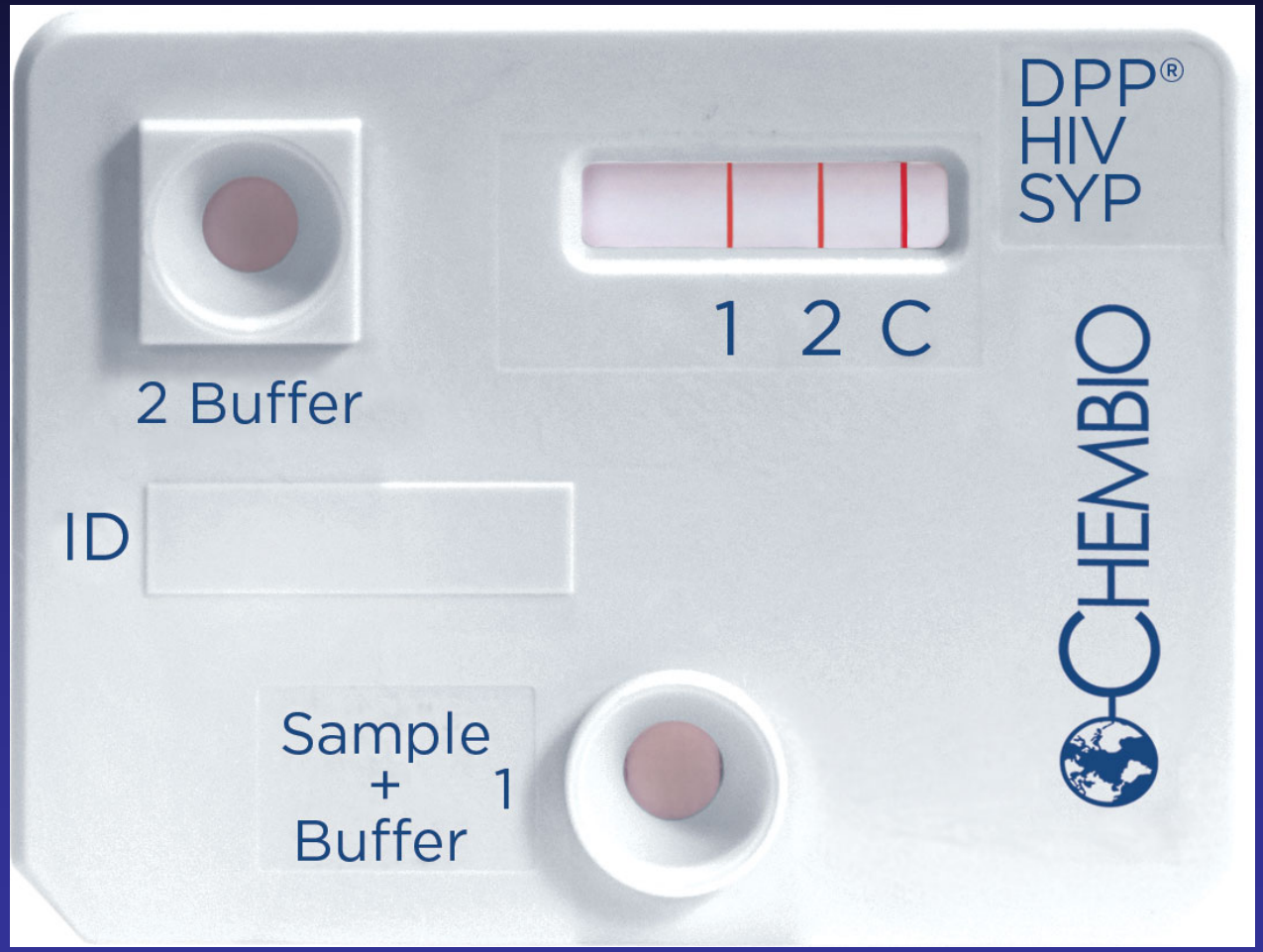
10-30 minutes total time



Negative for HIV and Syphilis



Positive for HIV and Syphilis



DPP Micro reader

DPP® Micro Reader

DPP Micro Reader

Test Device Holder

DPP Micro Reader With Test Device Holder and Test Device

Procedures

- Gather subject information
  - Hard copy (eligibility, contact information)
  - Directly enter demographics and history into interactive database
- Collect 4 tubes of blood
  - Centrifuge within 2 hours
- Collect fingerstick specimen and test on DPP
- Test whole blood and plasma on DPP
- Ship tubes of blood to reference laboratory

Samples Tested on Site

- Whole Blood
- Fingerstick
- Plasma

Reference Testing at Central Laboratory

- HIV Ag/Ab 4th generation test (Abbott)
- Multispot Rapid HIV-1/2 differentiation test or Geenius HIV-1/2 (Bio-Rad)
- HIV RNA if two tests were discordant (Gen-Probe Aptima)

- Syphilis Screen: Bio-Rad Bioplex 2200 Syphilis IgG EIA (treponemal)
- Syphilis RPR (non-treponemal) with titer
- Syphilis TP PA test (treponemal)

Population

- 2 sites:
  - University of Maryland, Baltimore, Maryland
  - Fanno Creek Clinic, Portland, Oregon

- Total Sample Size with all matrices: 803
  - UMB: 324
  - Fanno Creek Clinic: 479

HIV Known positives

Syphilis Known Positives

Known Co-infected

High risk unknown status

Low risk

Results
Reference Tests

HIV Positive:	351
Syphilis Positive:	119
Co-infected:	91
Negative:	
HIV	427
Syphilis	672

Results HIV

DPP HIV-Syphilis System: Summary of Overall HIV Sensitivity and Specificity (n=778)

Sample Matrix	HIV Sensitivity (95% CI)	HIV Specificity (95% CI)
Fingerstick Blood	348/350[1] = 99.4% (97.9% - 99.8%)	421/424[2] = 99.3% (97.9% - 99.8%)
Venous Whole Blood	350/351 = 99.7% (98.4% - 99.9%)	425/427 = 99.5% (98.3% - 99.9%)
Plasma	350/351 = 99.7% (98.4% - 99.9%)	424/427 = 99.3% (98.0% - 99.8%)

[1]Fingerstick Whole Blood Results not collected from one (1) subject.

[2] Fingerstick Whole Blood Results not collected from three (3) subjects.

Results Syphilis

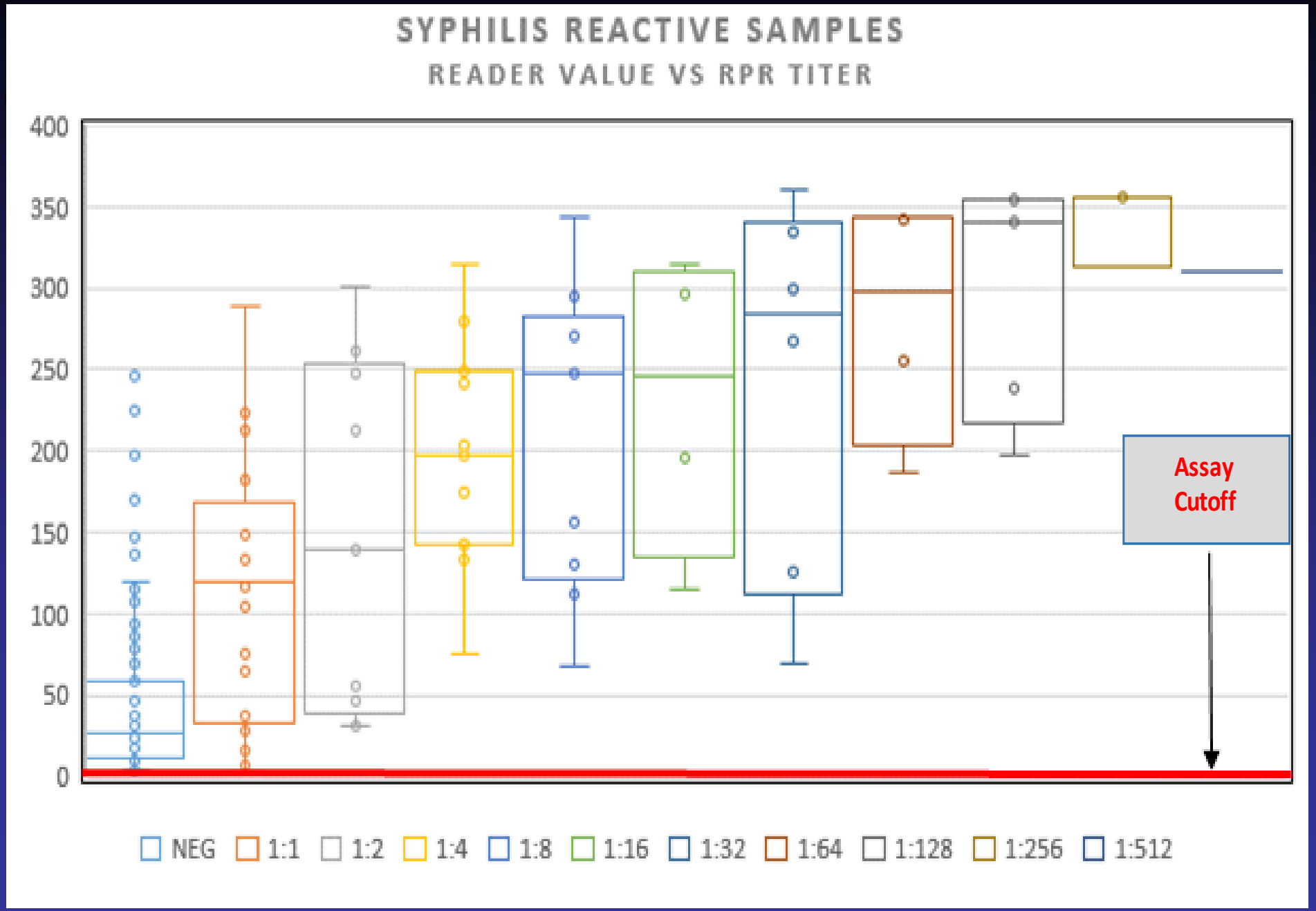
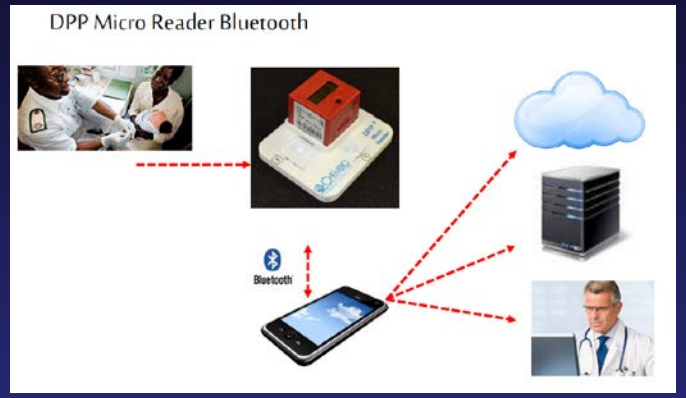
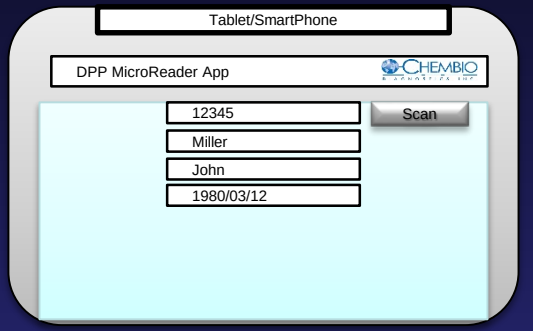
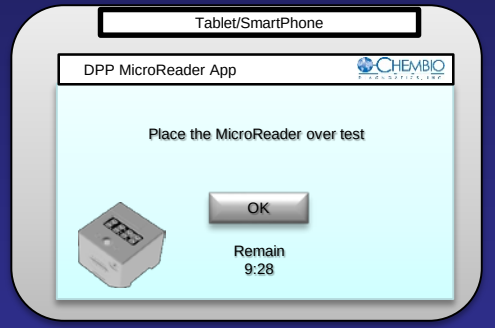
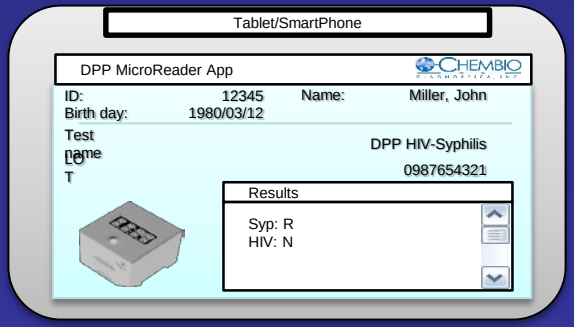
DPP HIV-Syphilis System: Summary of Overall *T. pallidum* Sensitivity and Specificity (n=791)

Sample Matrix	Syphilis Sensitivity (95% CI)	Syphilis Specificity (95% CI)
Fingerstick Blood	111/119 = 93.3% (87.3% - 96.6%)	646/668[1] = 96.7% (95.1% - 97.8%)
Venous Whole Blood	115/119 = 96.6% (91.7% - 98.7%)	646/672 = 96.1% (94.4% - 97.3%)
Plasma	116/119 = 97.5% (92.9% - 99.1%)	647/672 = 96.3% (94.6% - 97.5%)

[1]Fingerstick Whole Blood Results not collected from four (4) subjects.

False Negatives: Seroreversion?

Comparative Percent T. pallidum Reactivity in Plasma with Previously Diagnosed Syphilis Subjects	
DPP® HIV-Syphilis System (Rapid Test)	**Bio-Rad Bioplex 2200** (Automated Multi-test Platform)
85/107 = 79.4% **95% CI: 70.8–86.0%**	**85/107 = 79.4%** **95% CI:70.8–86.0%**


SYPHILIS REACTIVE SAMPLES
READER VALUE VS RPR TITER
400
350
300
250
200
150
100
50
0
Assay Cutoff
NEG
1:1
1:2
1:4
1:8
1:16
1:32
1:64
1:128
1:256
1:512

Future Applications of the DPP Reader