



Towards Rapid Dapivirine Measurement with a Portable, Low-Cost Platform

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Need for Drug-Level Feedback (DLF)

Both Clinicians and PrEP Recipients have Expressed
Desire for DLF

- Facilitate candid discussions • Spur timely interventions

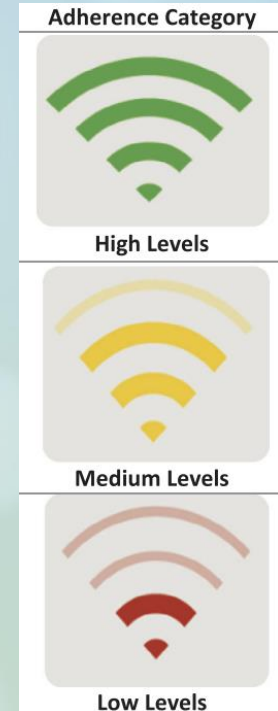
REACH Study

- DLF provided monthly with additional support options
- Higher adherence to the ring **73%–89%**

56 days
Turnaround time

DLF available at
55% visits

Significant logistical hurdles to providing prompt DLF





Drug-Level Feedback Tools

Liquid Chromatography-tandem Mass Spectrometry LC-MS/MS

- Expensive (>\$200/test)
- Long turn around time (>1 month)
- Requires highly trained personnel
- Bulky equipment in centralized labs



LC-MS/MS Setup



Drug-Level Feedback Tools

Urine Lateral Flow Assay



- Measures only recent adherence
- May be vulnerable to “white coat” effect
- Primarily focuses on tenofovir (TFV)-based regimens

Gandhi et al., 2019, J Acquir Immune Defic Syndr. DOI 10.1097/QAI.0000000000001971

Drain et al., 2020, JMIR Research Protocols DOI: 10.1016/j.eclinm.2018.09.003

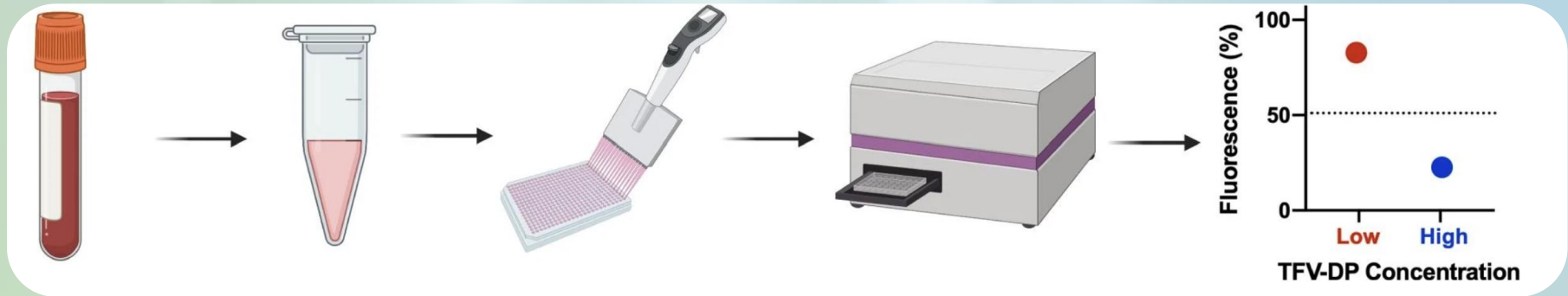
Koenig et al., 2017, HIV Medicine DOI:10.1111/hiv.12518

Spinelli et al., 2020, Current HIV/AIDS Reports DOI:10.1007/s11904-020-00502-5



REverse TRanscriptase Chain Termination Assay

Assay inspired by the mechanism of action of reverse transcriptase inhibitors



Dilute blood in water
For easy sample prep

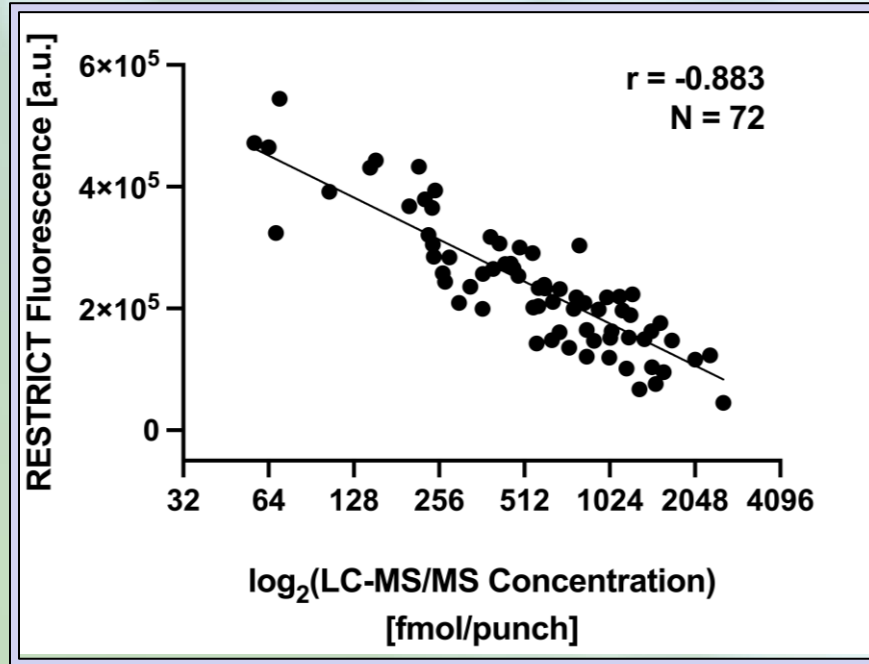
Add components needed
for DNA synthesis

Incubate at 37°C
for 30 min

Add intercalating dye and
fluorescence readout



RESTRICT Measurements Correlate with LC-MS/MS Results



- Rapid test (30 min)
- Simple workflow
- High correlation with LC-MS/MS measurements

TFV-DP in Dried Blood Spots from people on oral PrEP
Samples are diluted and heated for easy sample prep



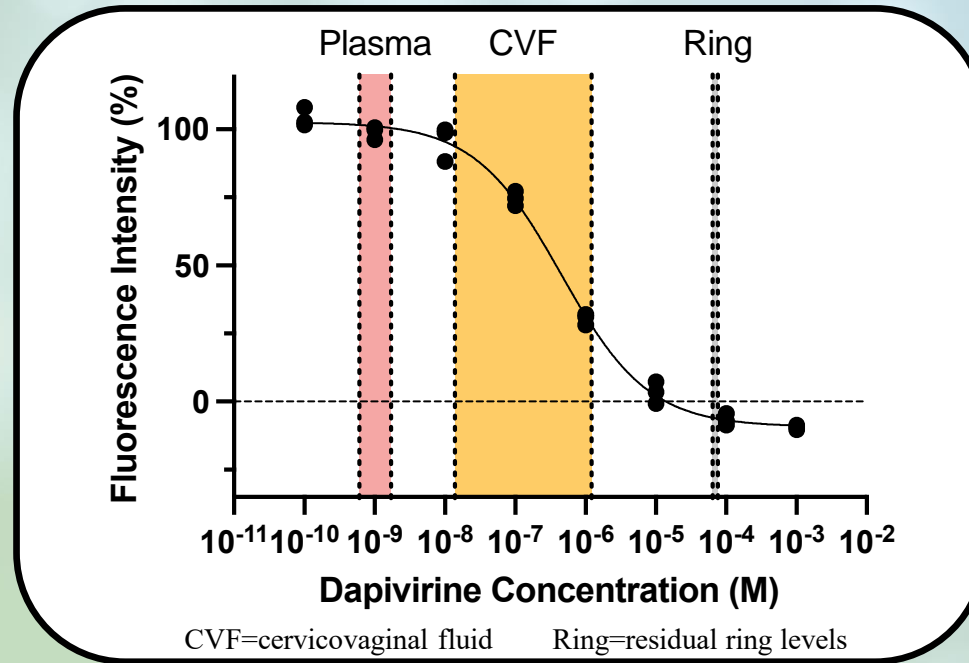
Innovations in this Presentation

Expand RESTRICT to measure reverse transcriptase inhibitors used in extended-release HIV prevention and treatment

Validate use of portable reader suitable for point-of-care settings



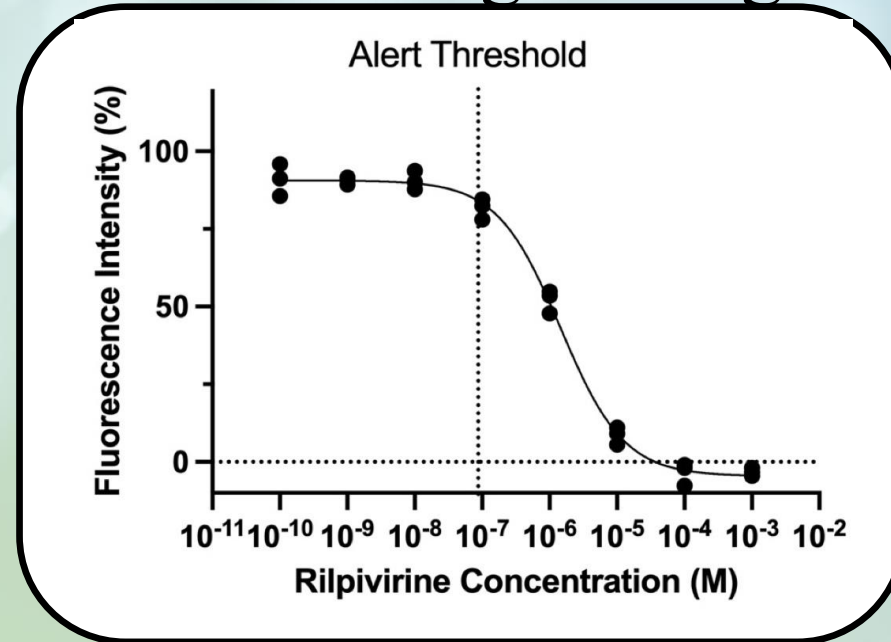
RESTRICT Measures Clinically Relevant Concentrations of Dapivirine



*Reported clinically relevant DPV concentrations
by sample type*



RESTRICT Measures Clinically Relevant Concentrations of Long-Acting Rilpivirine



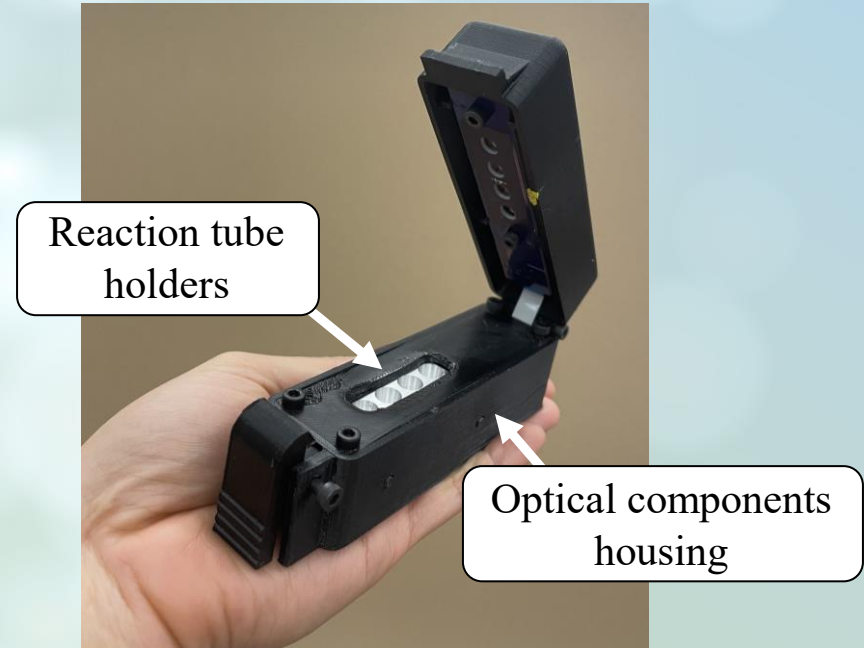
Alert Threshold for Long-Acting Injectable Rilpivirine: 32ng/mL



Expanding RESTRICT to a Portable Platform

Harmony Reader

- Developed for point-of-care COVID-19 diagnostics
- Integrated portable heater and fluorescence reader



Harmony portable reader



Practical Advantages of Portable Reader

Needs Less Space

1% of the bench space

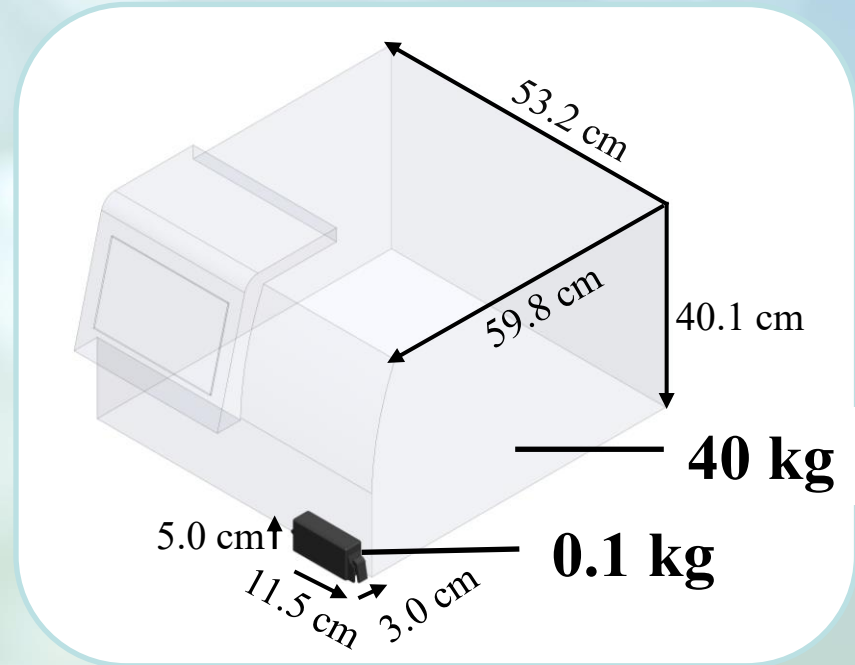
Easily Moved

40 kg vs 0.1 kg



Less Expensive

~\$30,000 vs ~\$300



Harmony portable reader compared to traditional benchtop plate reader (SpectraMax iD3)




RESTRICT Workflow in Portable Reader

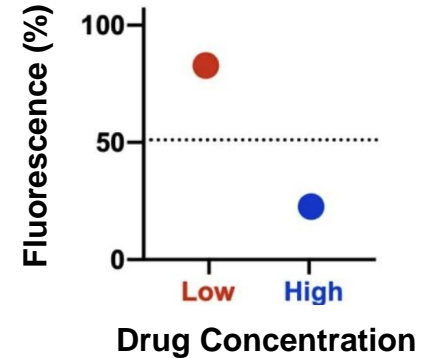
DNA synthesis reagents and
drug sample



 37 °C

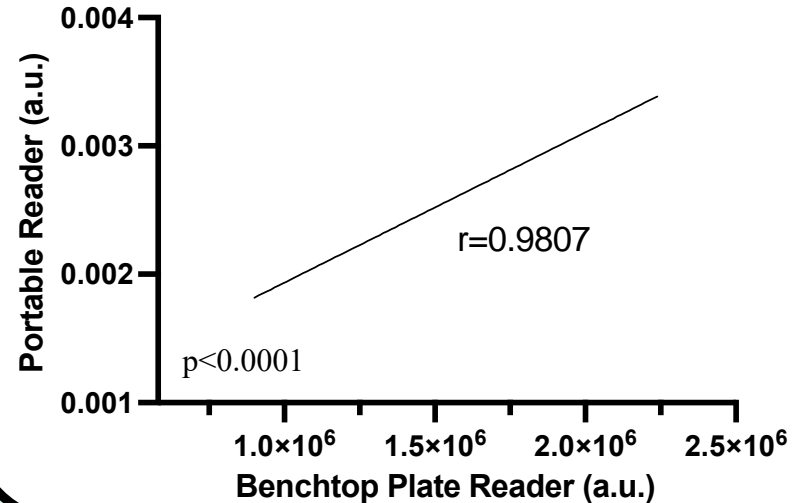
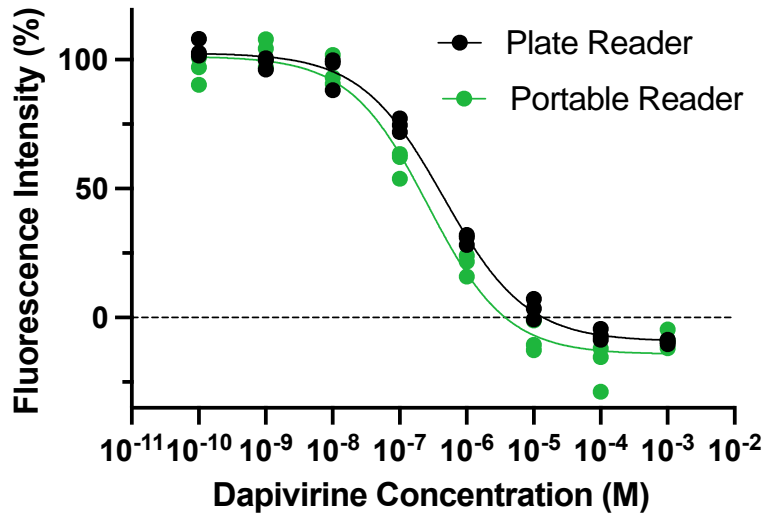
 30 min

Fluorescent Dye





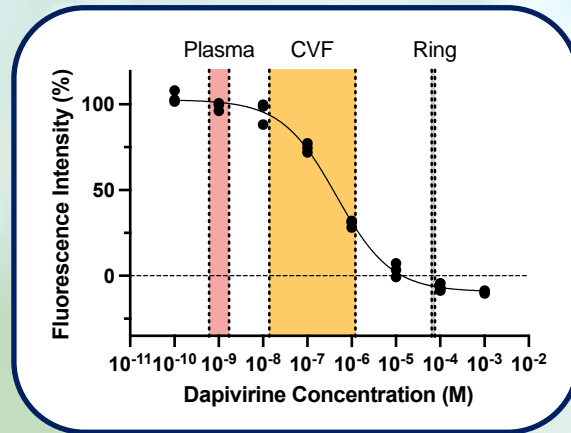
The Harmony and Plate Reader Output have Excellent Agreement in Buffer





Summary and Future Work

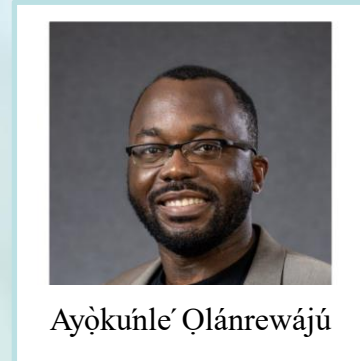
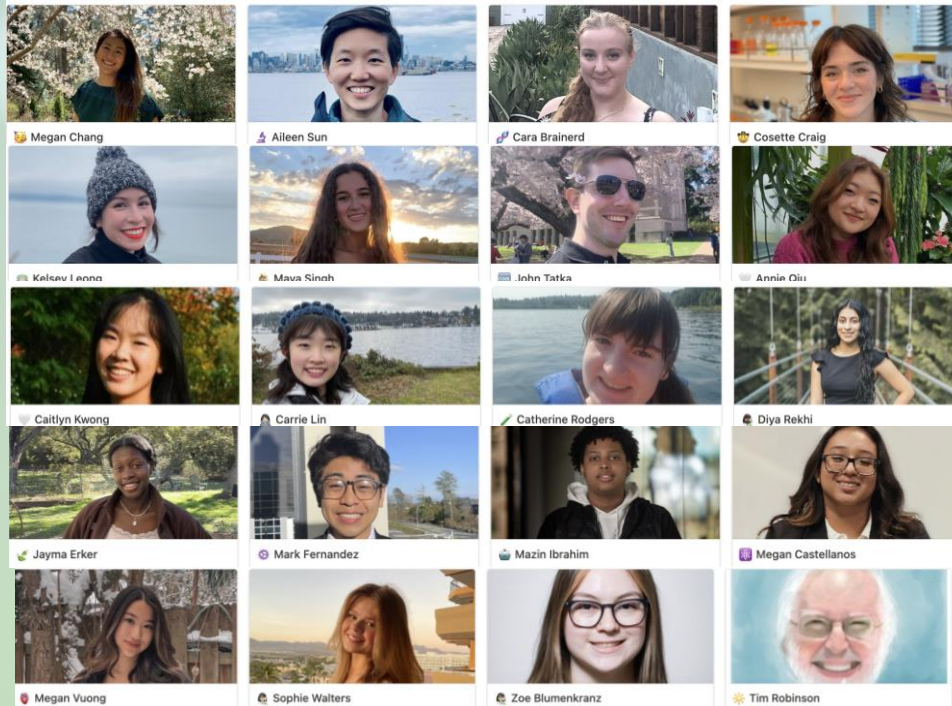
RESTRICT can measure clinically relevant DPV concentrations in buffer on an inexpensive, portable reader



Future work includes validation with clinical samples

Acknowledgements

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Ayòkunlé' Olánrewájú

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