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Toward Near-Patient HIV Drug Level Feedback: Implementing an Enzymatic Assay on a Portable Reader

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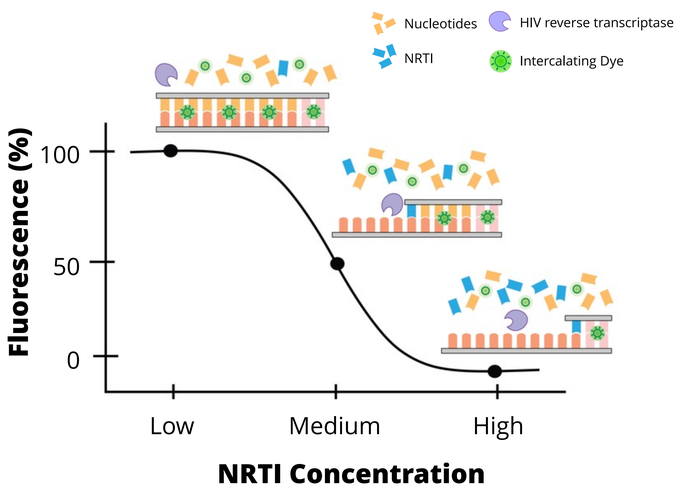
Drug level feedback (DLF) improves medication adherence and care, but is inaccessible

- Tenofovir diphosphate (TFV-DP) is the backbone of oral HIV prevention and treatment regimens
- Providing DLF of TFV-DP levels to patients leads to higher adherence and improves care
- The gold standard for DLF is highly centralized and expensive, limiting routine use

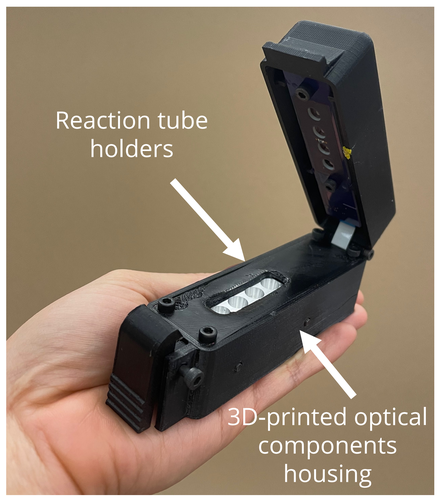
There is an urgent need for DLF that is rapid, low-cost, and easily implemented in HIV care settings

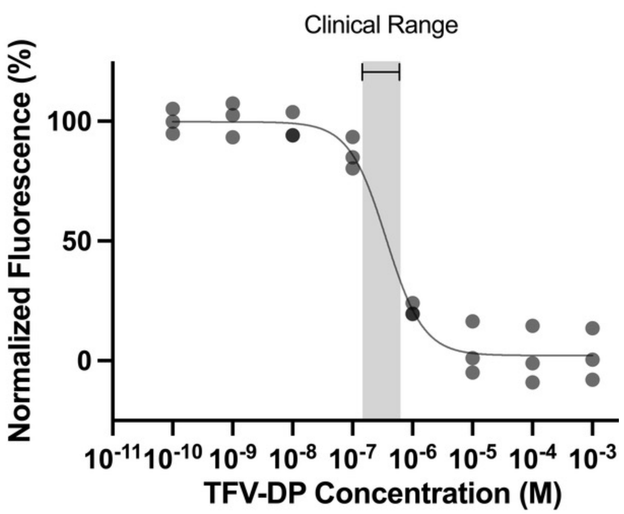
The REverSe TRanscIptase Chain Termination (RESTRICT) assay measures TFV-DP and other NRTI levels in blood



Rapid enzymatic measurements of tenofovir diphosphate on a ***low-cost***, ***portable*** reader could support real-time medication monitoring and adherence, thus accelerating global HIV prevention and treatment efforts.

RESTRICT fluorescence measurements by Harmony, a 3D-printed, USB-powered reader, can identify TFV-DP at clinically relevant concentrations for men and women





RESTRICT+Harmony could be more clinically useful than traditional methods for DLF

Desired Criteria for HIV DLF Test	Indirect measures	LC-MS/MS	Lateral flow assays	RESTRICT + Harmony (this work)
Inexpensive	✓	✗	✓	✓
Rapid	✓	✗	✓	✓
User-friendly	✓	✗	✓	✓
Minimally instrumented	✓	✗	✓	✓
Portable	✓	✗	✓	✓
Tunable to multiple RT inhibitors	✓	✓	✗	✓
Distinguishes between short- and long-term adherence	✗	✓	✗	✓
Quantitative	✗	✓	✗	✓

Next steps

- Integrate whole blood sample preparation
- Perform clinical validation

Acknowledgements

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References

(1) Saag, M. S et al. JAMA 2020, 324 (16), 1651–1669. (2) Roberts ST, Mancuso N, Williams K, et al. Journal of the International AIDS Society. 2023;26(11):e26189. (3) Olanrewaju, A et al. Bioengineerint & Trans. Med, 2022; 8(1): e10369. (4) Panpradist N, Kline EC, Atkinson RG, et al. Science Advances, 2021;7(51):eabj1281. (5) Castillo-Mancilla JR, Zheng JH, Rower JE, et al. AIDS Research and Human Retroviruses . 2013;29(2):384-390. (6) Moore M, Stansfield S, Donnell DJ, et al. Nat Med 2023; 29:2753-2762.