

Griffithsin and HIV

HIV Stats

- An HIV diagnostic cost up to **\$1367 USD**
- 2.9 million** new cases each year
- Only **45% of patients** know their status
- HIV glycan shield prevents antibody targeting and neutralization

Griffithsin is an anti-HIV binding protein.

GRFT Monomers can be linked together to increase affinity

HIV is bound by GRFT before it can infect patients. This same binding can be utilized to detect HIV virions in blood

HIV

Our goal is to produce a more stable GRFT from *E. coli* and use it in a diagnostic test to detect HIV virions

Human Impact: Affects of a New Rapid Test (RDT)

HIV Deaths and New Infections

- 1.1 million HIV related deaths in 2015
- 44% of new HIV infections in Sub Saharan Africa (SSA)

41% of HIV+ patients on ART

ARTs could prevent 21 million deaths & 28 million new infections by 2030

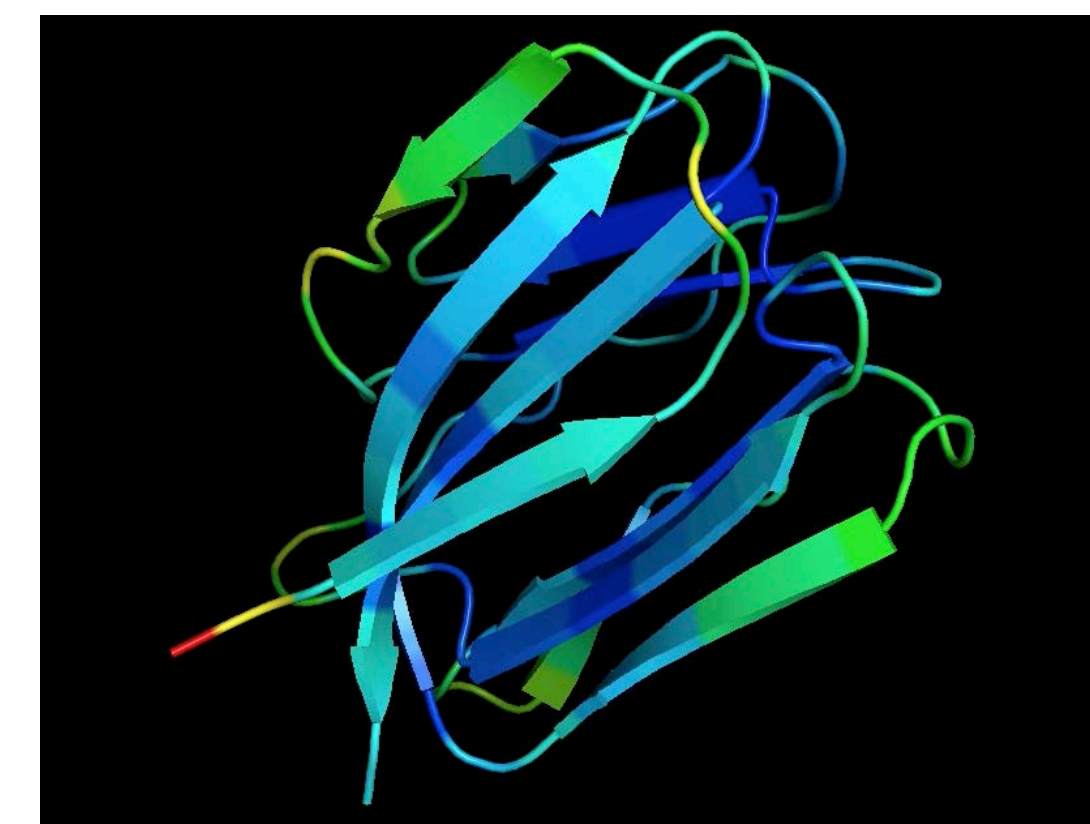
75% uptake in rapid test usage in SSA

Projected 435 million users

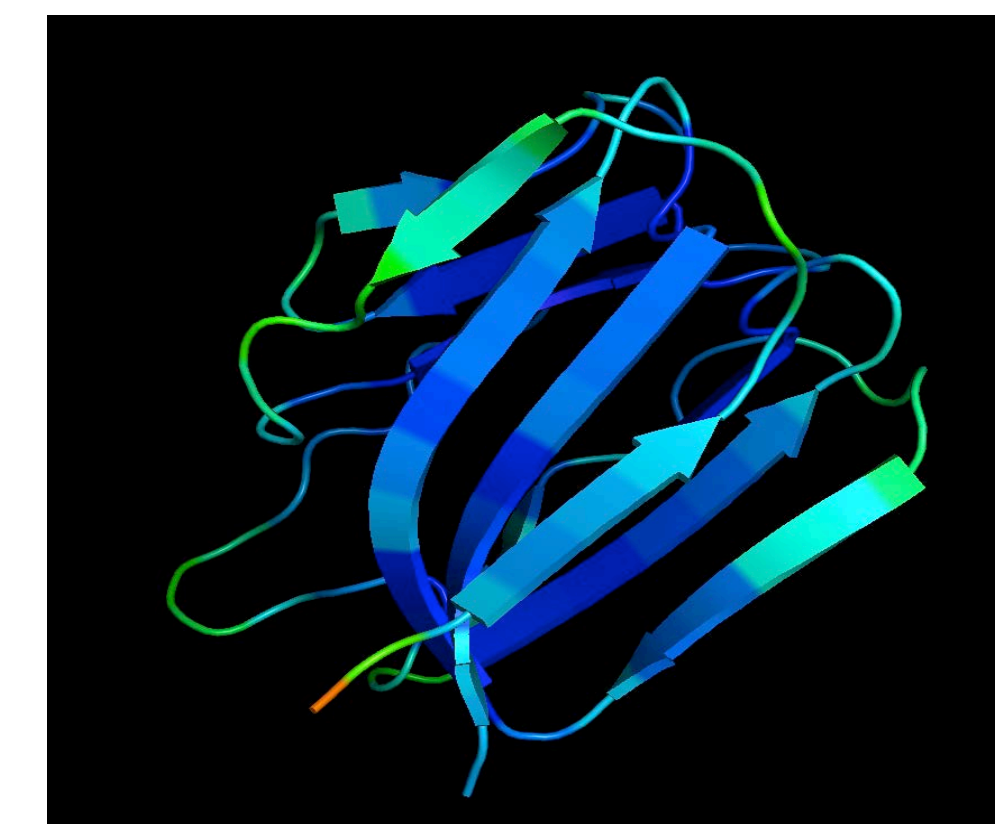
Rapid Test and Antiretroviral Therapy (ART) Use

Thermoengineering Modeling

Purpose: Create a more stable GRFT at transport/storage temperatures common in Sub-Saharan Africa using YASARA



Wild Type Monomeric GRFT

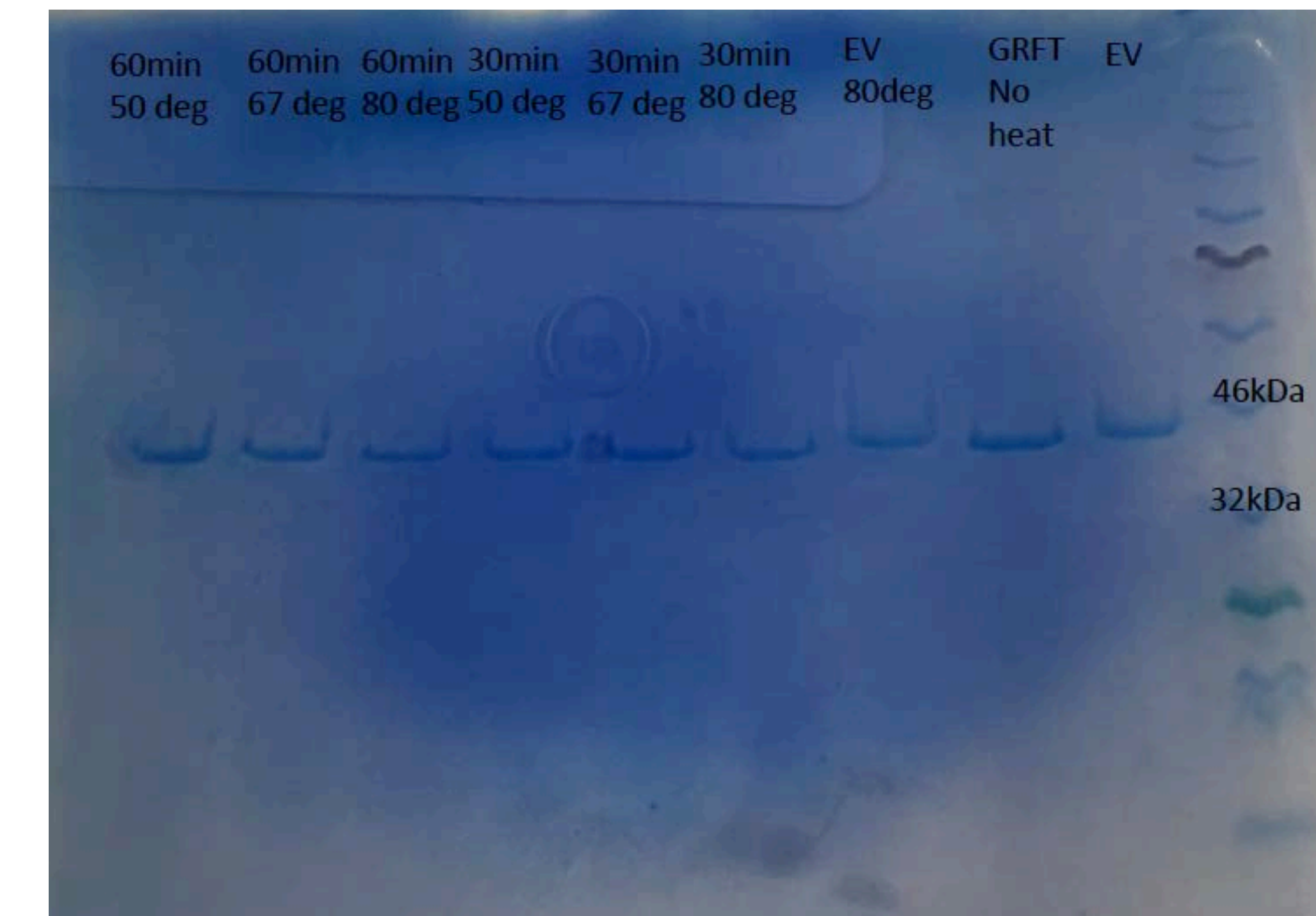
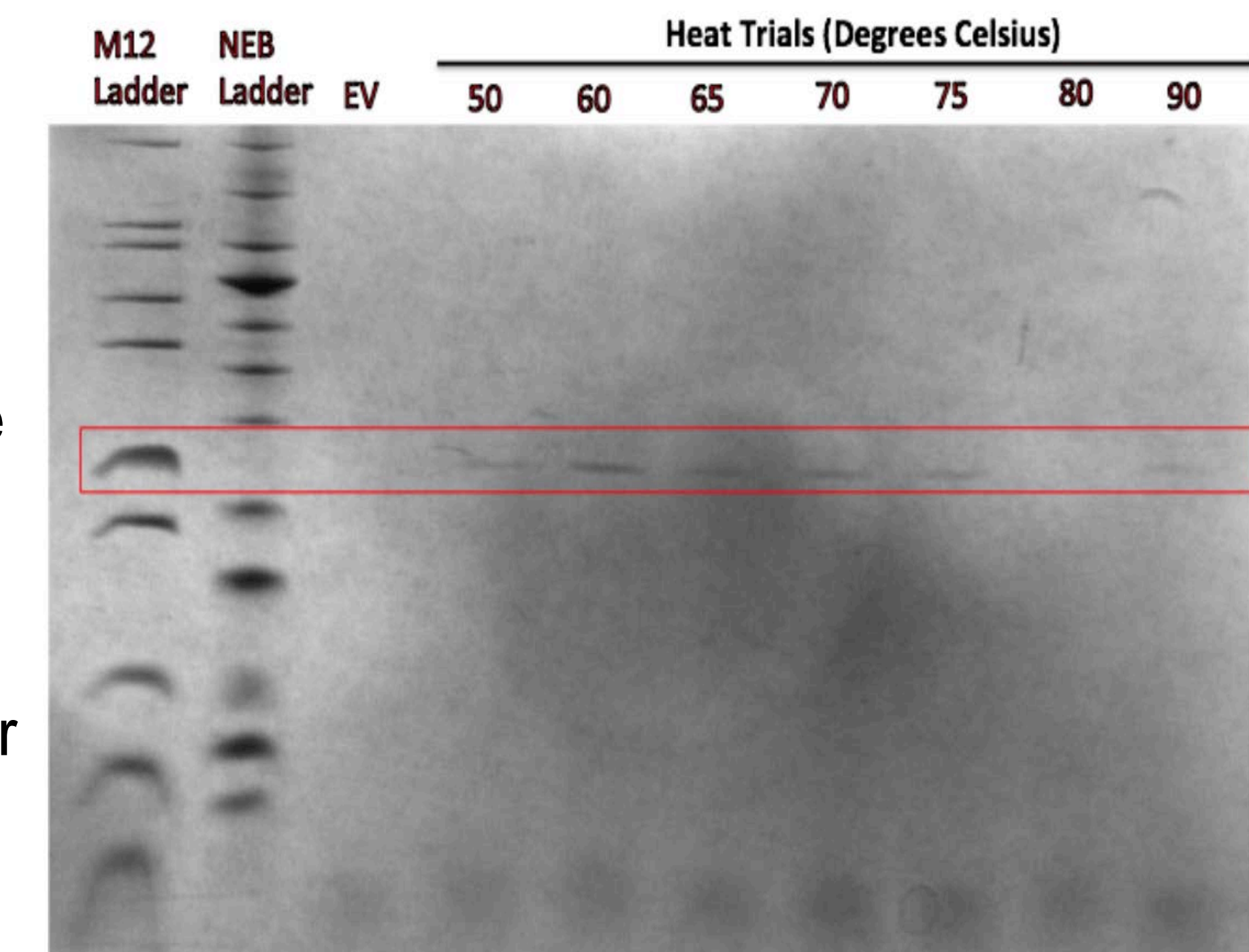


Thermostable GRFT

Figure 1: Visualizations of GRFT and thermo-GRFT

Results & Conclusions

Figure 2: SDS Page Gel after staining. Samples heated for 30 minutes at variable temperatures up to 90°C. The band at 90°C (red box) indicates stability of the engineered variants at 90°C in comparison to 70°C. The band is currently at 35 kDa (~2X wild type) due to higher negative charge associated with the hydrophobicity added to the variant.

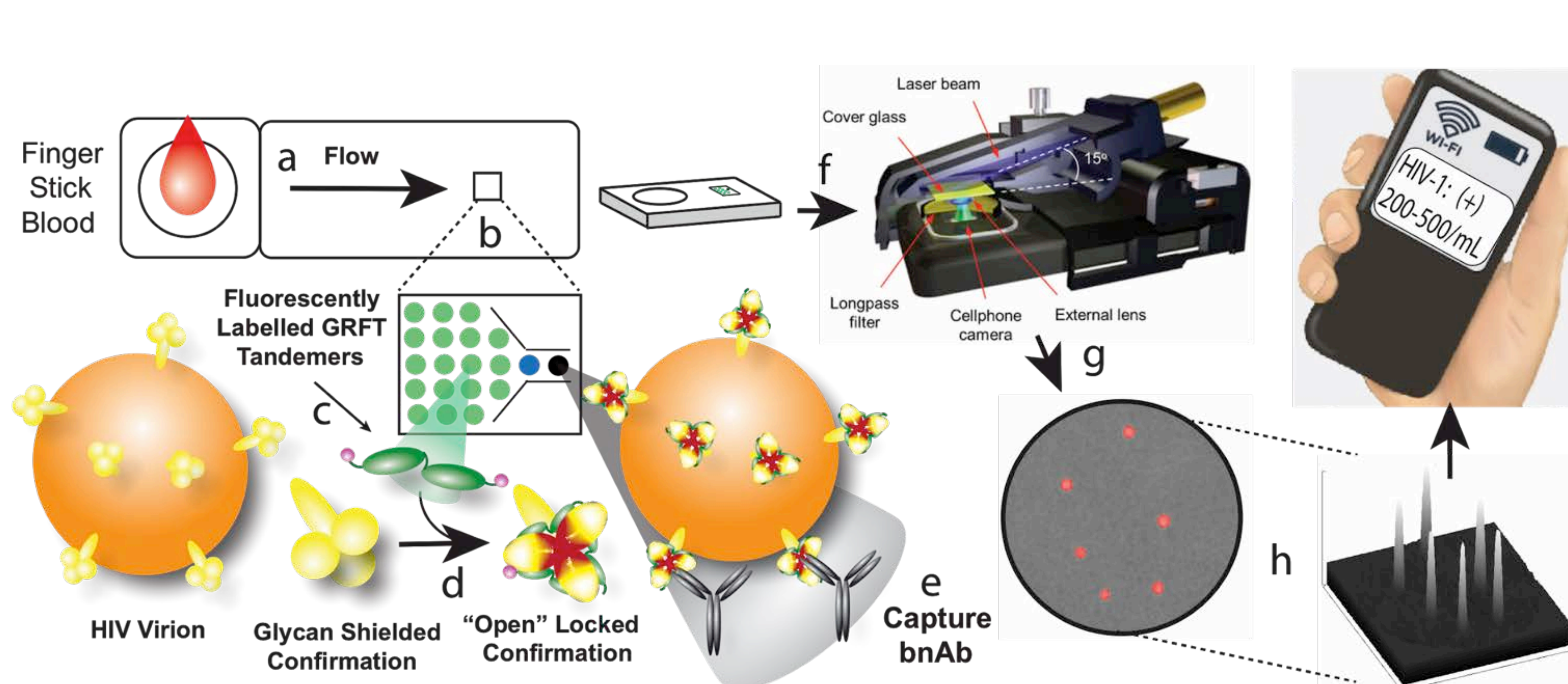


Ongoing project as a design team

Production of chip is in progress

Figure 3. Novel Thermostability Testing for GRFT variant: SDS Page Gel. Samples heated for 60 minutes at temperatures ranging from 50 to 80°C.

Rapid Test Assay Design



- Allows for viral detection
- Grant was submitted to NIH in December
- Affordable:** low-cost materials bring price of test down which increases global access
- Viral Load:** allows for direct quantification of viral load
- Early Detection:** does not require patient seroconversion which allows for more patients to know their status in a single sweep as well as help pregnant mothers and newborns
- Mobile:** stable at temperatures associated with storage and transportation of rapid tests without cold storage in Sub-Saharan Africa which reduces costs

Education



- Science Lessons at Marbles Kids' Museum
- On campus forums
- Exploring science ethics and policy
- YouTube Channel (Duke iGEM) for educating the public
- Interviews with experts and fellow scientists

Sponsors & References

Lord Foundation of North Carolina