# Establishment of HIV-1 VL PT Providers

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# Outline

- **Quality Assurance**
- **CDC HIV-1 Viral Load (VL) Proficiency Testing (PT) Program**
- **Countries with VL PT Programs through Tech Transfer**
- **CDC VL PT Panel Production: Lyophilized Virus**
- **Accomplishments and Next Steps**

# UNAIDS's Fast-Track strategy

## Fast-Track Targets

| by 2020 | by 2030 |
|---|---|
| **90-90-90** Treatment | **95-95-95** Treatment |
| **500 000** New infections among adults | **200 000** New infections among adults |
| **ZERO** Discrimination | **ZERO** Discrimination |

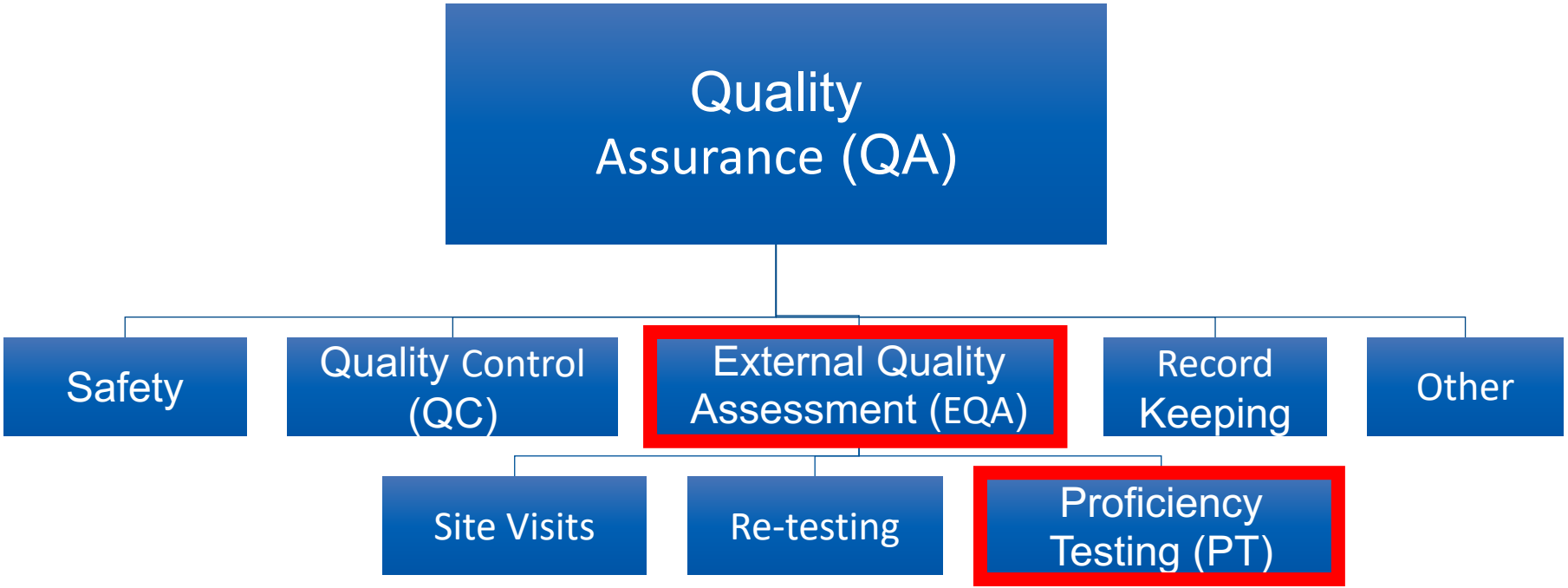
*Ref: https://www.unaids.org/sites/default/files/media_asset/JC2686_WAD2014report_en.pdf*

# 3rd 95: 95% Viral Suppression Rate

The WHO recommended **Viral Load monitoring of treatment efficacy** at 6 and 12 months after initiating ART and annually thereafter for people with suppressed VL (<1000 copies/mL)

*https://www.who.int/hiv/pub/guidelines/arv2013/intro/rag/en/index5.html*

# Quality Assurance Activities



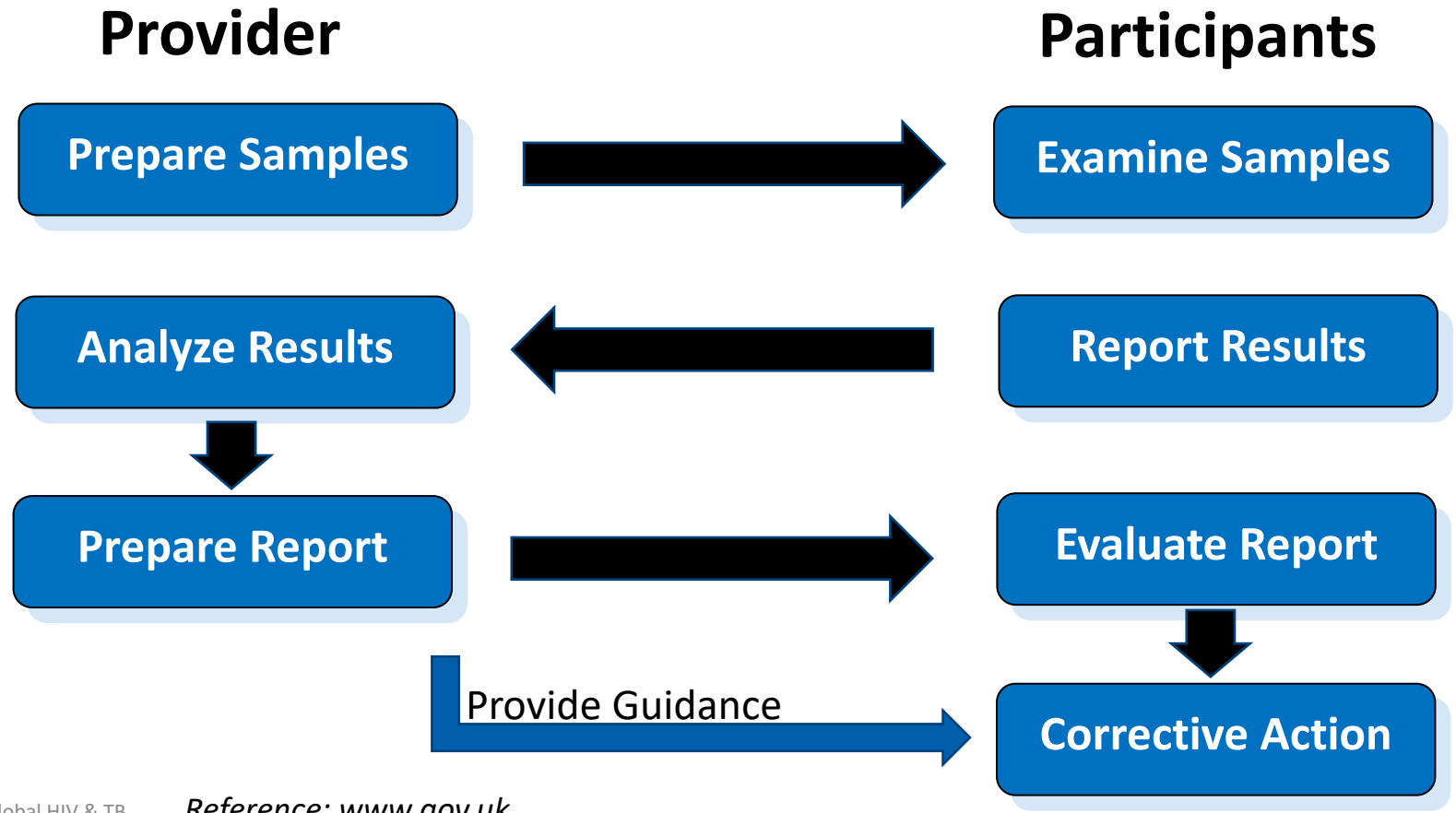
# External Quality Assessment Activities

| Site Visits | Retesting | Proficiency Testing |
| --- | --- | --- |
| A team of supervisors assesses site and provides feedback report for improvement | Random selection of clinical samples collected by testing sites and sent to NRL for verification | Testing of blinded samples at regular interval by all participants |
| **Supervisory Visit** | **All Pos and 10% Neg** | **5 Samples 2 or 3x/year** |

# Proficiency Testing Benefits

- Provide early warning for systematic problem
- Increase confidence in the quality of a laboratory's performance
- As a quality indicator for stakeholders at various levels
- Quality evaluation and improvement of the testing process
- Demonstrate employee competency
- To monitor trends in results quality

# Proficiency Testing Process




*Reference: www.gov.uk*

# Proficiency Testing Sample Types

| Sample Type | Characteristics for PT |
|---|---|
| Liquid (Serum/plasma) | • Requires cold chain transport<br>• Risks of spills<br>• **Expensive**<br>• Biohazard |
| Dried blood spot (DBS) | • Transported at room temperature<br>• Inexpensive<br>• HIV-1 VL and Early Infant Diagnosis (EID) |
| Dried tube specimen (DTS) | • Transported at room temperature<br>• **Inexpensive**<br>• HIV-1 RNA Viral Load testing [polymerase chain reaction (PCR) based assays] |

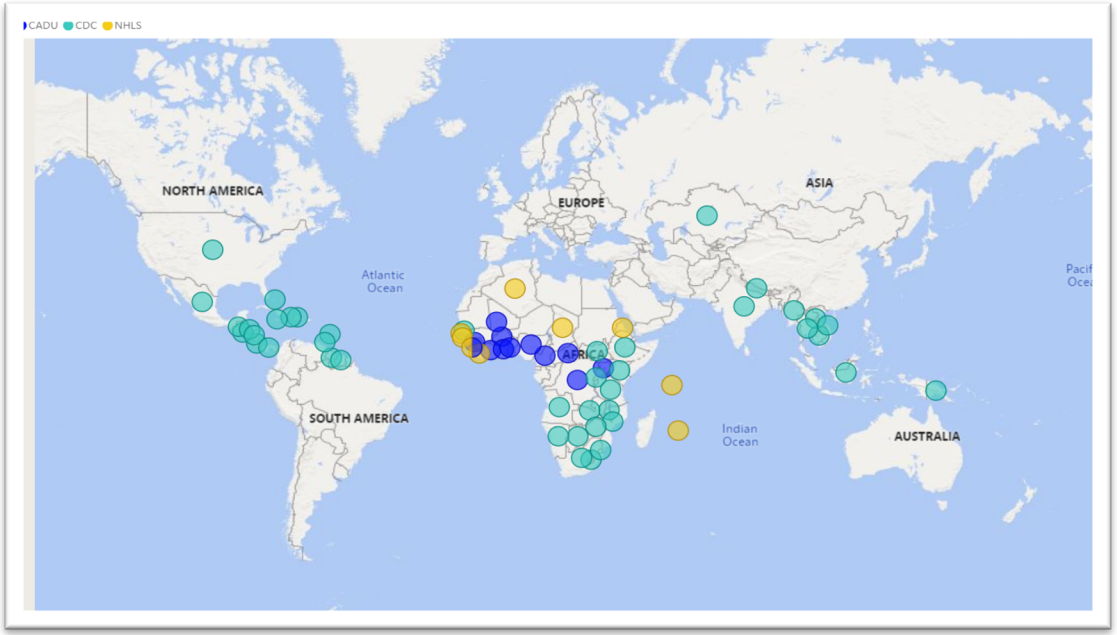
# Proficiency Testing for HIV-1 VL Tests

**DTS VL PT works on all existing HIV-1 VL Tests**
**Nucleic acid amplification tests (polymerase chain reaction based assays)**



*The use of trade names is for identification only and does not constitute endorsement by CDC.*

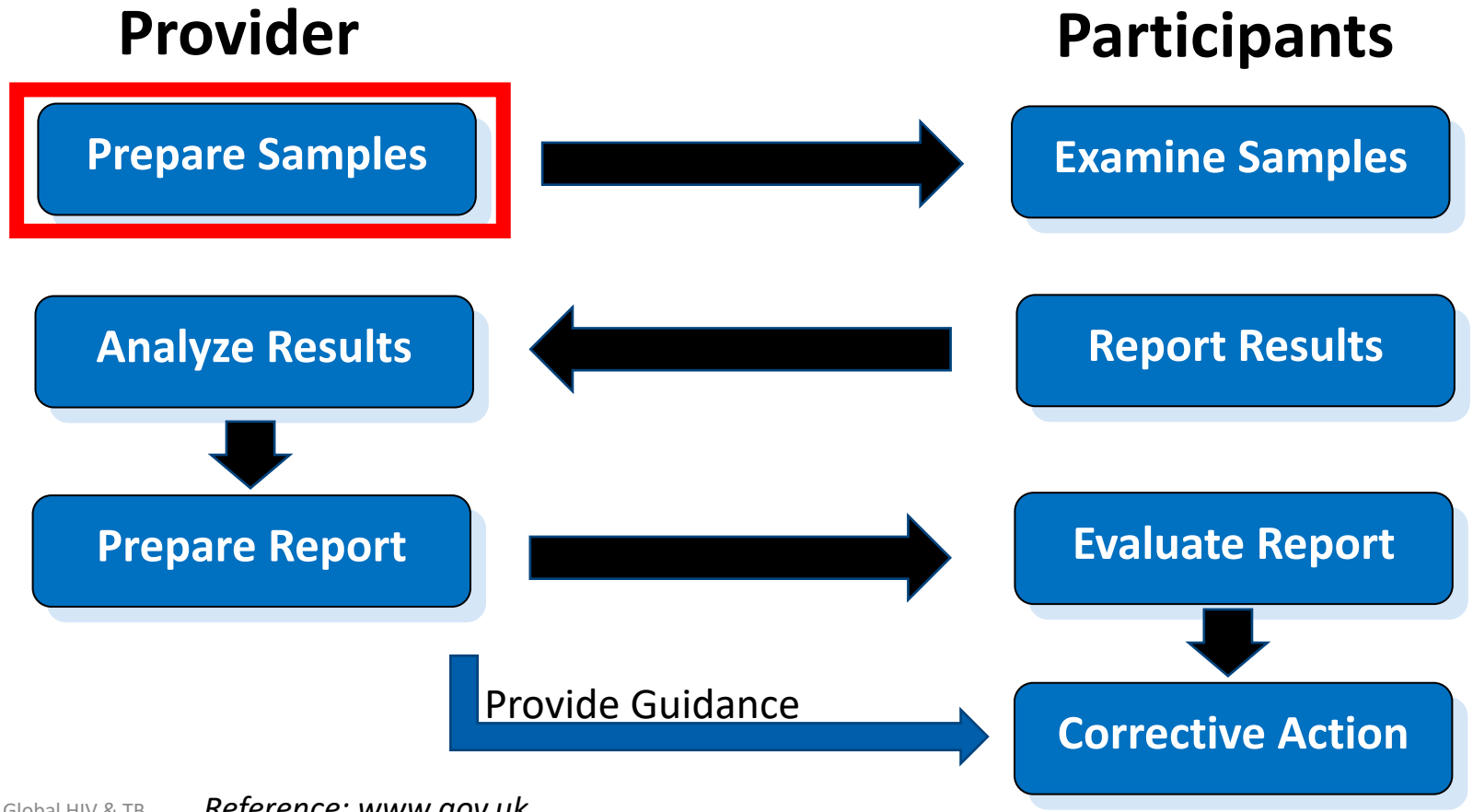
# CDC VL PT Program





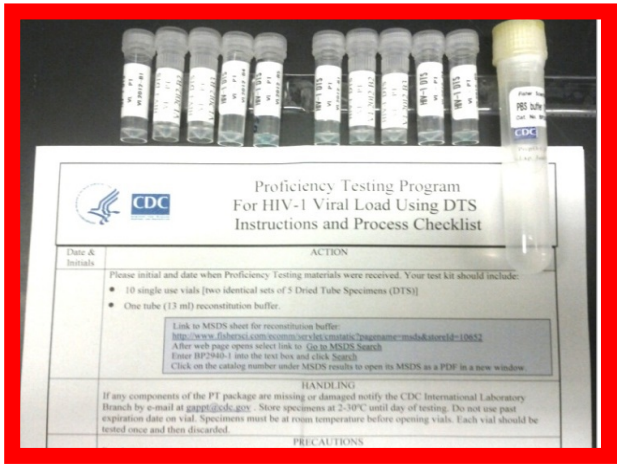

- VL PT program supported 388 laboratories in 56 countries in 2019
- PT Impact: 94.8% of enrolled laboratories reported improved performance

# Proficiency Testing Process




*Reference: www.gov.uk*

# CDC VL PT Program





- CDC VL PT Program uses **Dried Tube Specimen (DTS)**
- DTS panel members are prepared by diluting a virus culture sample with a high VL concentration (>$10^8$ copies/mL )
- HIV-1-infected cell culture supernatant is the only source available for ILB

# VL PT Program Expansion Limitations

- Usage of frozen live virus stock for DTS preparation is a major limitation to establish an in-country HIV-1 VL PT program
- Many countries do not have virus culturing capacity
- Shipments containing live virus are expensive and hazardous


- Need an alternate source of sample with a high VL concentration to transfer DTS VL PT technology to the field to expand the program for **building in-county capacity and sustainability** for continuous monitoring of laboratory performance to **help ensure high quality results**

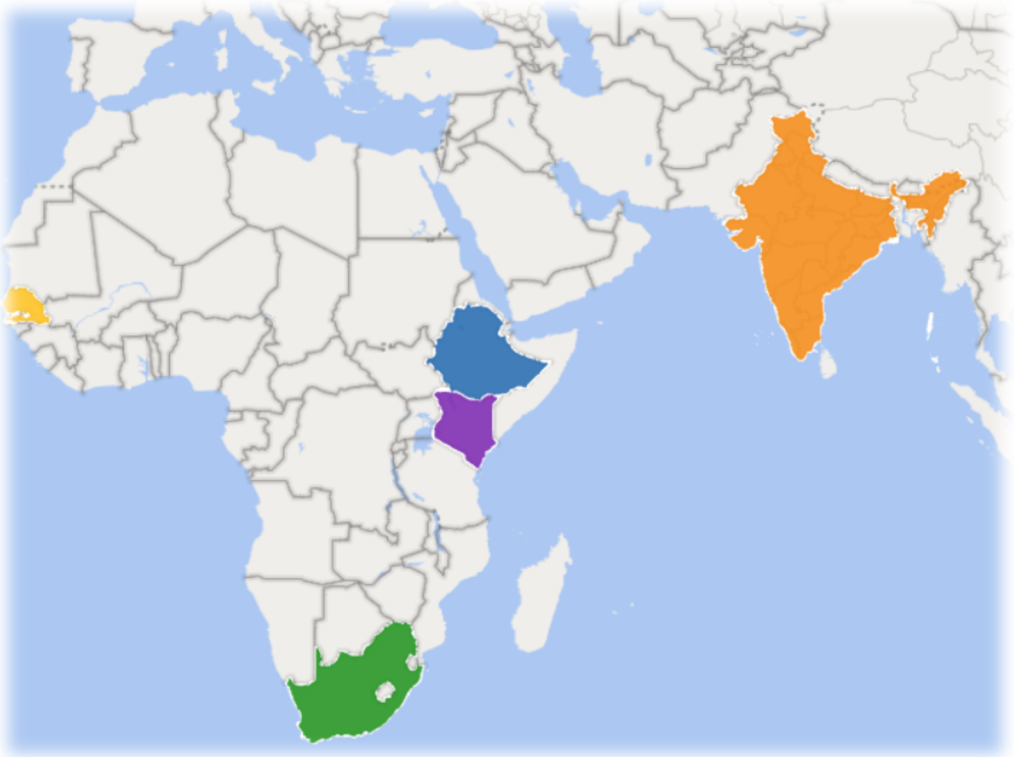
# Lyophilized Virus:  an Alternative Source

- A good alternative virus source for PT panel production
- Facilitates DTS VL PT technology transfer


- Benefits of in-country PT program establishment:
  - **Building in-country capacity/ownership for program sustainability**
  - **Reduce** results **turn-around-time**
  - **Reduce** program logistic **costs**

# Countries with Established VL PT Programs

- List of countries with established VL PT programs through technology transfer provided by TA and TDY from ILB
  - Senegal- CADU (2015)
  - Kenya - NHRL (2017)
  - India - NARI* (2018)
  - South Africa - NHLS (2018)
  - Ethiopia - EPHI (2019)



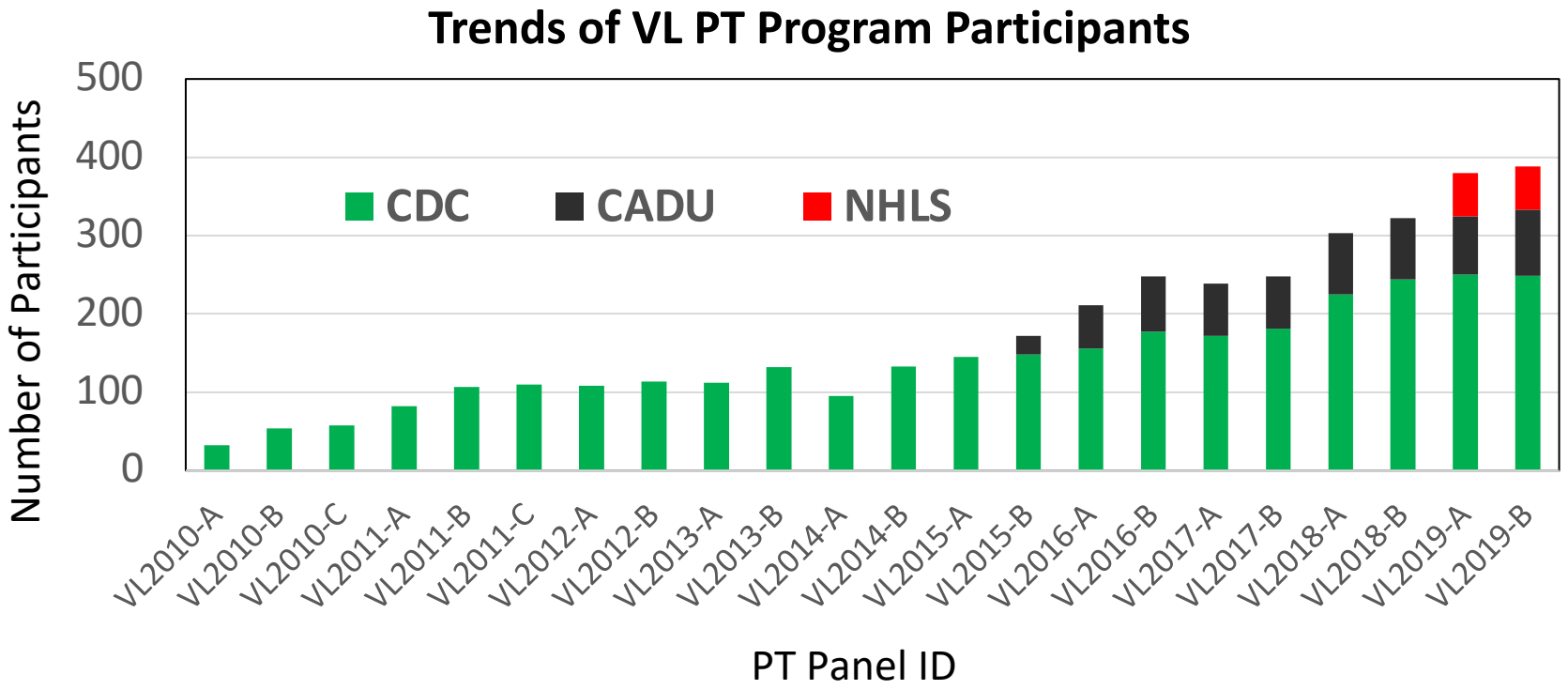
*** ILB provides the lyophilized virus for all sites except India.**

# Countries Requesting VL PT Programs

Countries that have requested the need to establish a VL PT program through technology transfer:

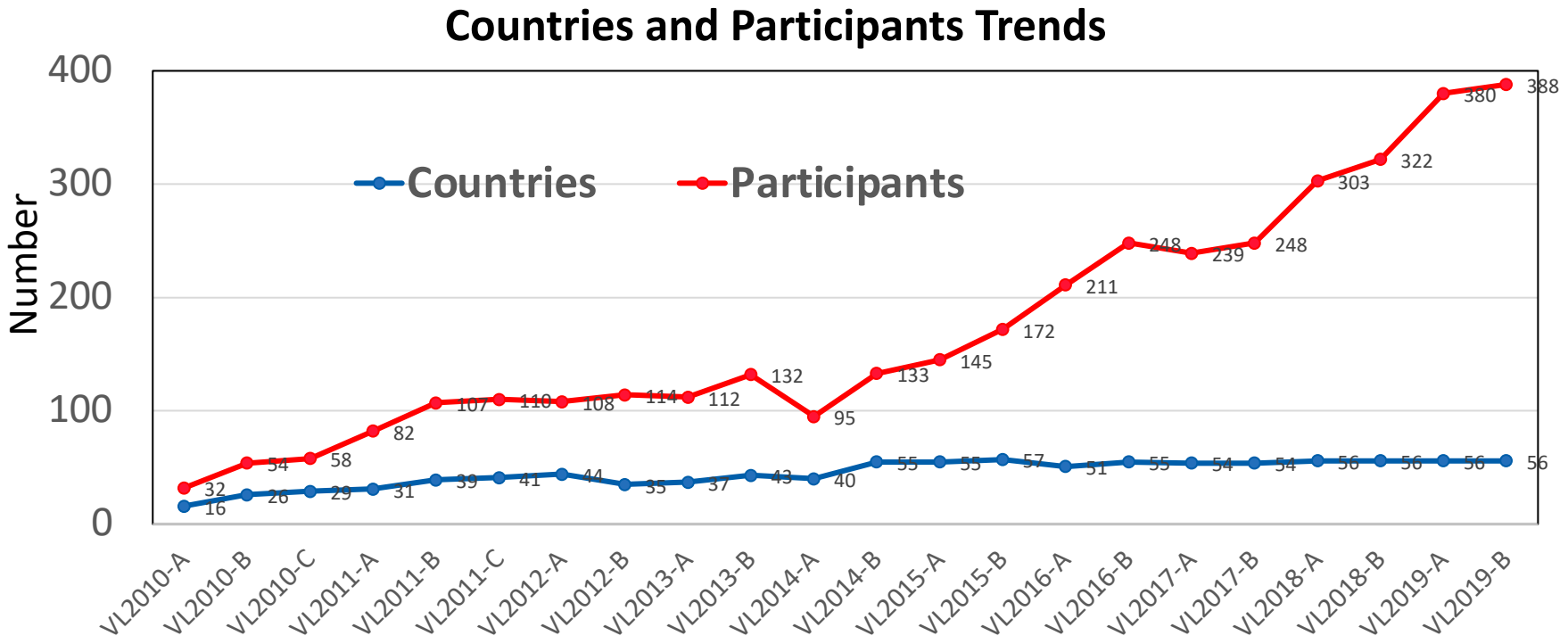
- Burma
- Cameroon
- Kazakhstan
- Nigeria
- PNG – already completed training

# CDC VL PT Program



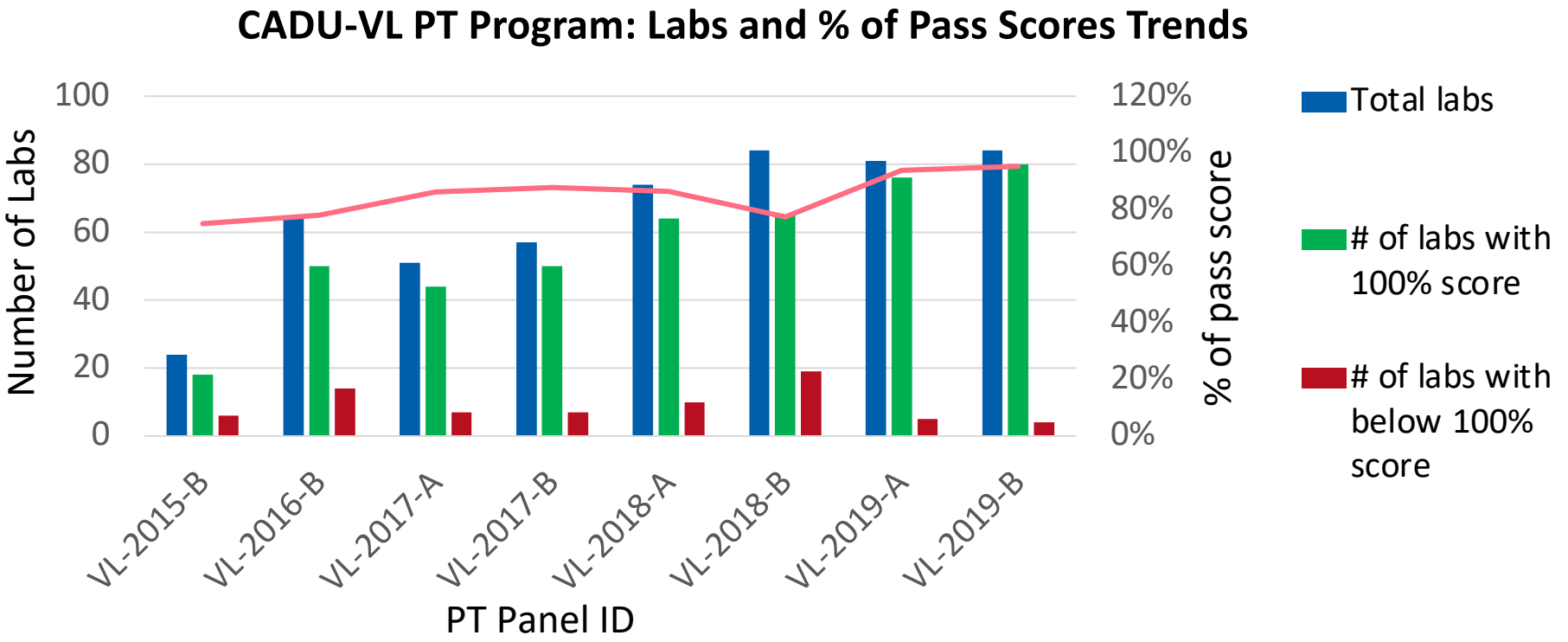

- Number of participants has increased exponentially

# CDC VL PT Program - continued



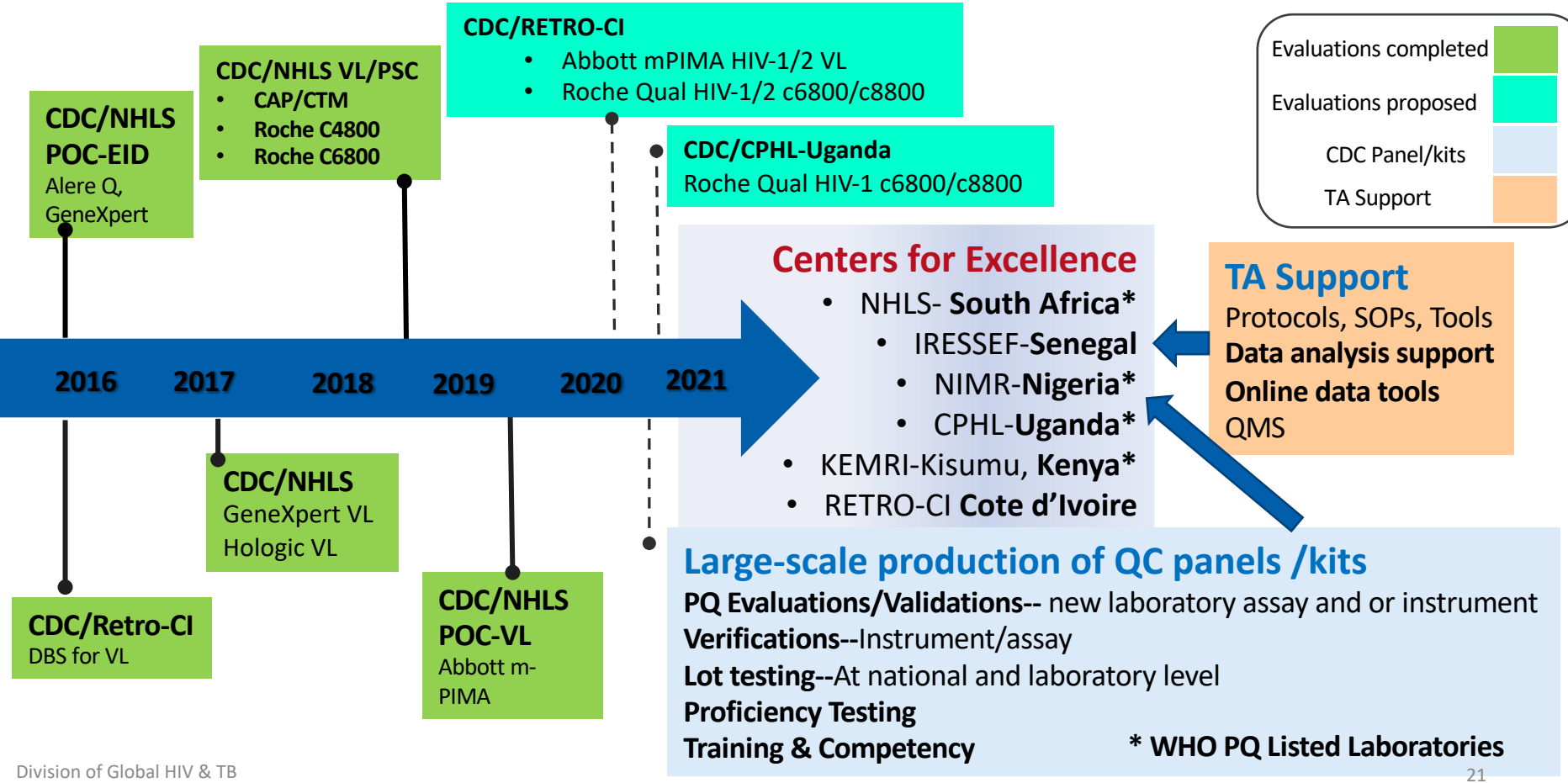

Number of participants & countries have increased from 32 participants from 16 countries in 2010 to 388 participants from 56 countries in 2019.

# Results from In-Country VL PT Program




Majority of participating laboratories received pass score (100%) in each enrolled PT cycle.

# Accomplishments and Next Steps



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# Thank you for your attention!

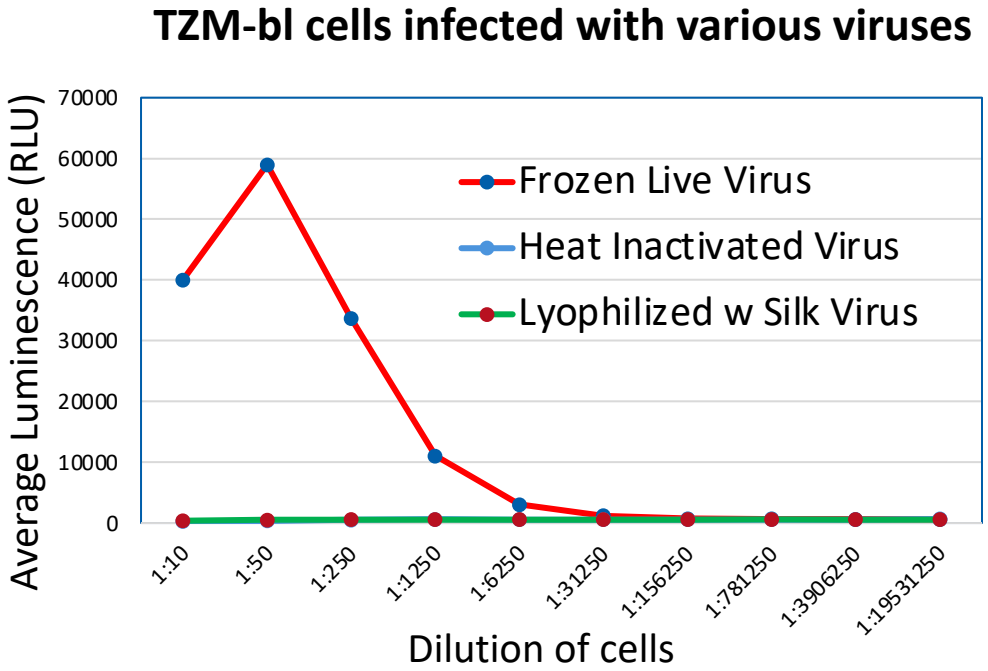
**Questions?**

# Supplemental Slides

- NOTE: slide 24 to 28 are supporting data for **lyophilized virus as a good alternative virus source** for PT Panel production to facilitate establishment of in-country VL PT providers

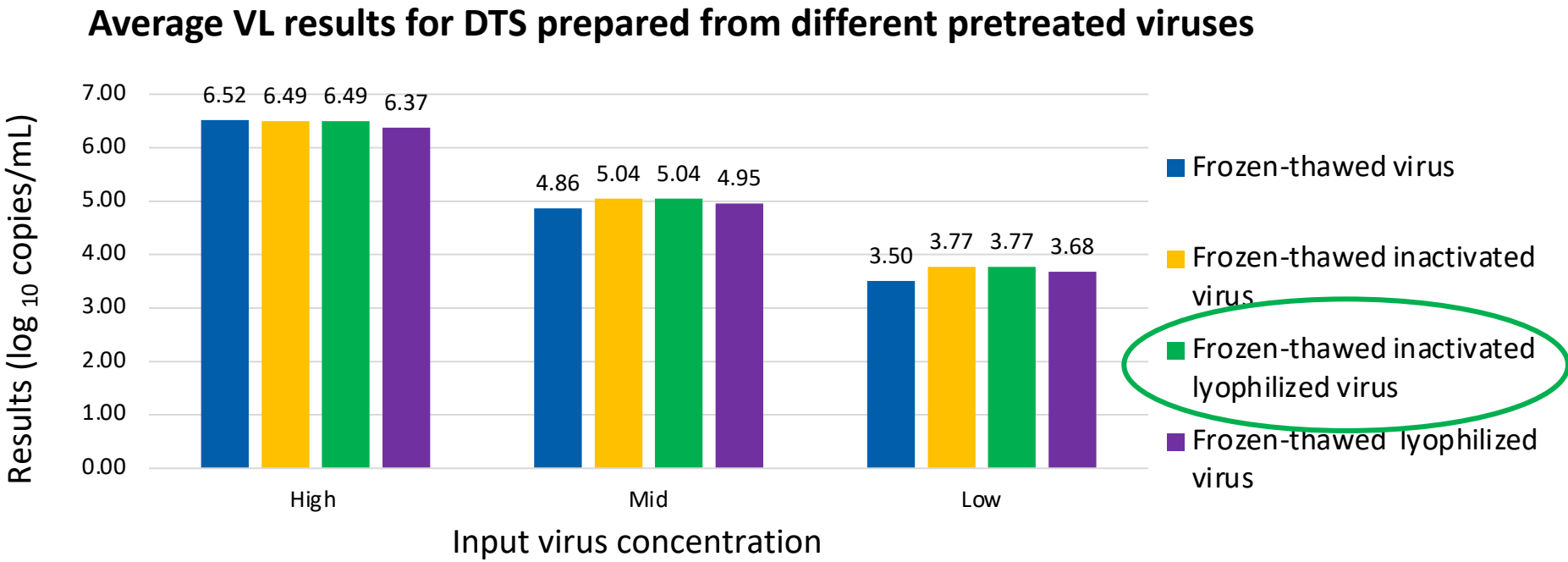
# Lyophilized Virus: Non-Infectious

| 10,000 cells/well | Frozen Live Virus | Heat Inactivated Virus | Lyophilized w Silk Virus |
|---|---|---|---|
| 1:10 | 39991 | 257 | 384 |
| 1:50 | 58988 | 372 | 534 |
| 1:250 | 33687 | 542 | 587 |
| 1:1250 | 11048 | 637 | 569 |
| 1:6250 | 3053 | 591 | 574 |
| 1:31250 | 1185 | 581 | 553 |
| 1:156250 | 726 | 589 | 597 |
| 1:781250 | 701 | 594 | 598 |
| 1:3906250 | 618 | 553 | 570 |
| 1:19531250 | 607 | 660 | 597 |



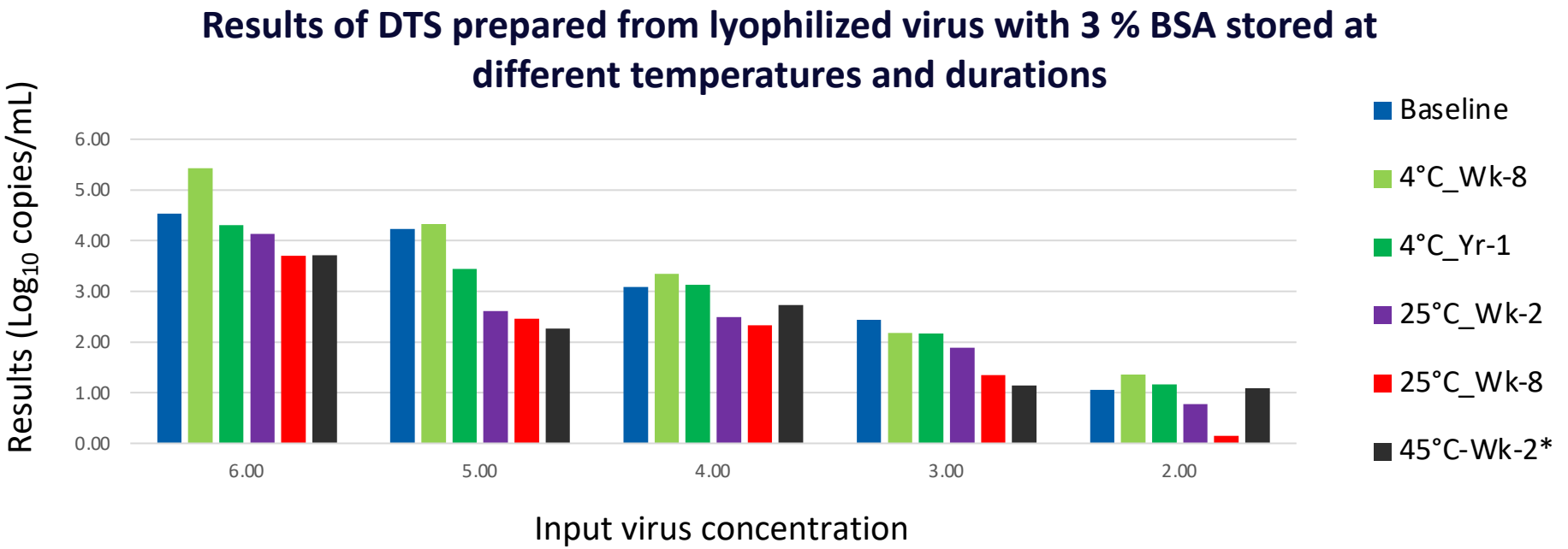

*britelite plus Reporter Gene Assay System: https://www.perkinelmer.com/product/britelite-plus-10ml-testkit-6066766*

# Frozen Virus vs Lyophilized Virus




- Results were comparable for DTS samples prepared from different pretreated viruses
- Chose “Frozen-thawed inactivated lyophilized virus” for DTS preparation

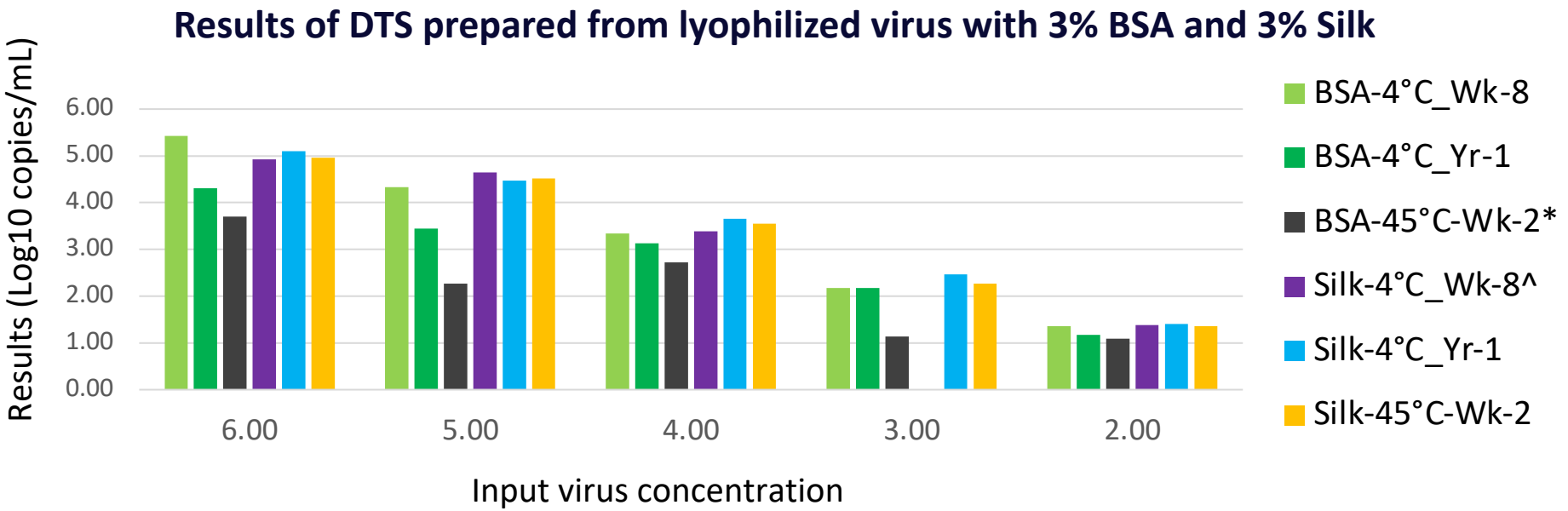
# Stability of Lyophilized Virus with 3% BSA




*For 45°C-Wk-2 required heating to dissolve the lyophilized sample.

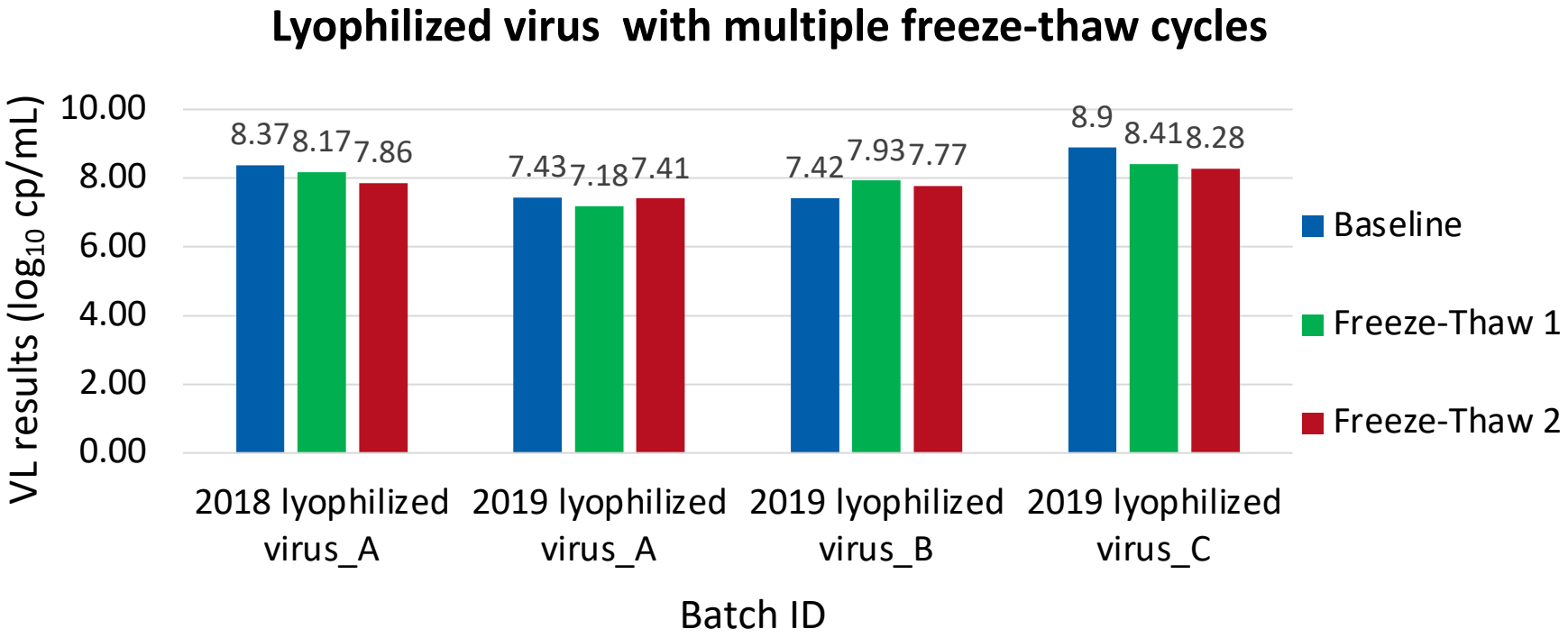
Lyophilized virus with 3% BSA were stable at storage at 4°C up to 1 year and 25°C up to 2 weeks.

# Stability of Lyophilized Virus with 3% BSA vs 3% Silk




^ Only one replicate was tested of each sample at this condition. No data for one sample.
Results of DTS prepared from lyophilized virus with 3% silk showed consistent values at different storage temperatures and durations.

# Freeze/Thaw Tests of Lyophilized Virus with 3% Silk




Results were comparable for all 4 batches of lyophilized virus with 3% silk after 2 freeze/thaw cycles at -20°C storage