EQAs for enhanced COVID-19 laboratory surveillance in Africa and Europe

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COVID-19: Limited infrastructure in Sub-Saharan Africa

Sander, Yadouleton, Moreira-Soto et al., mSphere 2020
Overload of laboratories at cost of routine work

Example Benin

Sander, Yadouleton, Moreira-Soto et al., mSphere 2020
SARS-CoV-2 in Africa: High genetic diversity!

Delta in Benin: 3% May - 60% July!

Source: MoH Benin

Yadouleton, Sander, Moreira-Soto et al. EID, 2021
Commercial tests not validated for use in African settings!

→ Up to 25% unspecific ELISA Results in pre-pandemic sera from Benin...

Yadouleton, Sander, Moreira-Soto et al. EID, 2021
…potentially due to Malaria!
European reference laboratories: Variable EQA performance

Method assessed in the EQA

Good results (%)

PCR

Serology

http://www.enivd.de; ENVID EQAs between 1999-2014, Own graphic
Own EQA background

Zika virus EQA, Brazil (qPCR, 2018)

SARS-CoV-2 EQA, ECDC (qPCR, 2020)

SARS-CoV-2 EQA, ECDC (qPCR+Typing, 2021)
Zika virus PCR EQA 2018 in Brazil

→ Potential implications on abortion requests

→ >100% increase, illegal in most countries

Fischer et al., EID 2020
Variable performance among laboratories
SARS-CoV-2 detection depends on RNA concentration

Fischer, Mögling et al., JCM 2021
Improved performance in second SARS-CoV-2 EQA

**Correct samples**

**2020:** 90.3%

**2021:** 96.1%

Mögling, Fischer, Stanoeva et al., unpublished 2022
Typing success depends on RNA concentrations

![Bar chart showing typing success rates for different RNA concentrations.](chart.png)

- **Sample ID**: 3, 11, 6, 12
- **Cps/μL**: 2.5, 3, 11, 290
- **Variant**: α, α, α, α

Möging, Fischer, Stanoeva et al., unpublished 2022
HTS is laborious but more precise than typing qPCRs

Mögling, Fischer, Stanoeva et al., unpublished 2022
“...90% of laboratories had adequate technical skills to function as neglected tropical diseases reference laboratory, almost all lacked systems for external verification...” Dean et al., F1000R, 2018

→ Challenges in EQA preparation
Virus growth and inactivation requires BSL3 conditions
Selection of tubes
Shipment

Country-specific requirements:

- Donation declarations
- Customs invoices
- Importation restrictions

→ Lengthy delays during shipment and at customs can occur
Need for lyophilization

Not technically trivial: Blow out
Sample matrix

E.g., DMEM or PBS – or biological sample

Affects lyophilization speed and RNA stability
Lyophilization: RNA loss in general…

1-15 fold variable concentration change

Fischer, 2022
...and according to sample inactivation

Darnell et al., JVM 2004; SARS-CoV-1
Need to expand transnational EQA programmes

→ Comparability

→ Cost-efficiency

Need to expand transnational training programmes
Drexler Lab – Virus epidemiology

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