Assuring Quality and Building Trust: Providing High Quality, Low Cost EQAS

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Talk Overview

- Quality Assurance – Defining Terms
- Responsibilities
- Considerations for making EQAS “Low Cost”
- Examples of “Low Cost” EQAS

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Quality Assurance - Terms

- Quality Assurance (QA) = many different components, including:
  - Test kit validation
  - Staff training
- Quality Control (QC)
- External Quality Assessment Schemes (EQAS) = Proficiency Testing Programmes

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EQAS & QC are different?

- Quality Assurance Programmes (QAP), QC, and EQAS (or PT) are used “interchangeably” by most organisations BUT they are very different

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How is EQAS different to QC?

EQAS

- Monitors integrity of entire testing process
- At a specific point in time (e.g. 3 times per year)
- Numerous samples tested in one batch
- Includes reactive and non-reactive samples
- Sample composition is not known

QC

- Monitors single part of process (test run)
- Continual – e.g. Daily
- Potential to detect trend towards systematic error prior to aberration
- Composition of sample is known (e.g. contains HBV at 50 IU/mL)

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Where does EQAS and QC fit in?

Specimen Collection

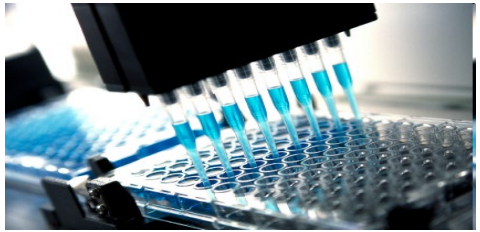
Test selection

Patient preparation

Specimen collection

Specimen preservation

Laboratory



Specimen reception

Unique lab identifier

Analysis

Analytical validation

Clinical validation

QC

Reporting & Interpretation

Results dispatched

Results interpreted

Clinical management

EQAS

Quality Assurance

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Participant Responsibilities

- Participating in an EQAS is a requirement for ISO 15189 accredited laboratories
  - Testing at point-of-care or community sites also requires participation in EQAS[1]
  - Useful for troubleshooting issues, assuring testing processes and operator competency

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[1]NPAAC PoC Testing Guidelines, 2015

EQAS Provider Responsibilities

- For ISO 17043 accredited providers:
  - Design schemes with wide-ranging assay compatibility
  - Ensure homogeneity and stability of material
    - at point of manufacture & during shipment
    - for the duration of the testing & reporting period
  - Provide scientifically robust analyses

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MAKING “LOW COST” EQAS

“Low Cost” for:
Manufacturer?
Participant?

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Participant Roadblocks

- Cost of Subscription
  - Multiple analytes, shipping cost
- Panel Design
  - Allows for multiple tests (for algorithm)
  - Contains strains relevant to the region
- Difficult to find (or none available)
  - Specialised analytes e.g. Zika

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EQAS Provider Roadblocks

- Participants in resource-limited settings
  - Intermittent access to energy (storage and testing becomes difficult)
  - Shipping logistics (especially for NAT)
- Community testing sites
  - Lack of specialist equipment
  - Access to correct storage e.g. freezer

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An Ideal EQAS Sample

- Looks like what you receive in the laboratory
- Behaves in the same way as clinical material
  - Validated sample type in most assays
- Represents strains/genotypes that are relevant in your region
- Stability of material established (journal articles, etc)

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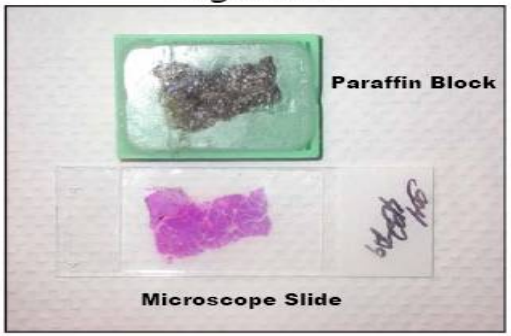
Figure 1



Paraffin block tissue samples

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“Low Cost” EQAS samples

- Deviates in appearance & material from a patient sample
- Needs validation on assays to determine compatibility
- Stability unknown

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Cost of “Low Cost” EQAS

- Increased testing
  - Proof of concept
  - Assay compatibility
  - Long-term stability
- Mimic testing conditions at the testing site
- Recreate sample type e.g. Whole Blood

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MAKING "LOW COST" EQAS

"Low Cost" for:

Manufacturer?

Participant?

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EXAMPLES OF LOW COST EQAS

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Dried Tube Samples (DTS)

- Described by CDC in 2013[2]
  - Sample is air dried inside a tube
  - DTS is reconstituted with a buffer
  - DTS is tested according to manufacturer's Instructions for Use for plasma/serum
- In a community setting, this format does not require special reagents or equipment

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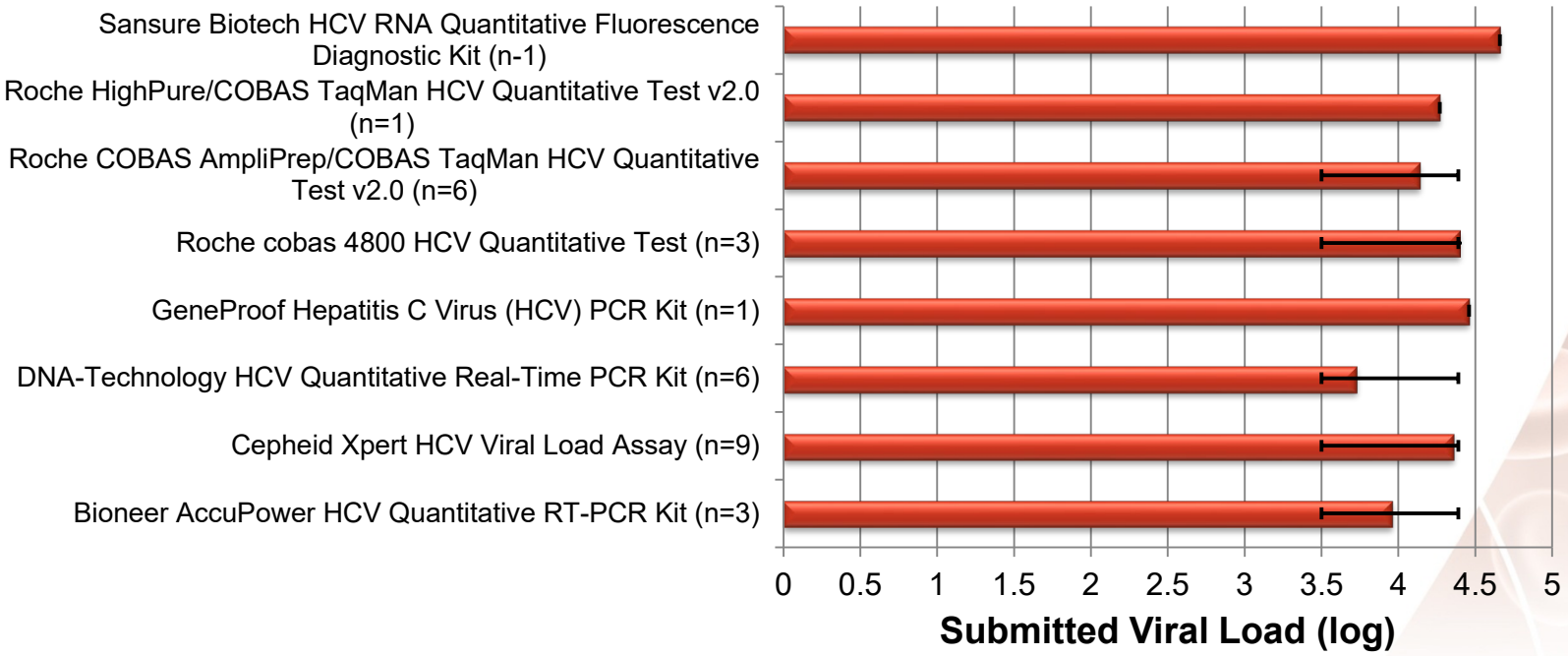
[2]Ramos et al, *J. Virol Methods.* 188:1-5, 2013

DTS HCV Viral Load (DTSC)



Sample C. Test Event 2, 2018 ≈4.0 $\log_{10}$

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DTSI (HIV viral load & EID)

- Test event 2, 2018
  - Samples A & D
  - Infected PBMC
  - Group M(B)
  - ≈$1x10^4$ cells/mL
  - Results log_{10}
  - Seven participants

Assay	Sample A	Sample D	Difference
Abbott RealTime HIV-1 RNA PCR	4.51	4.22	0.29
Abbott RealTime HIV-1 RNA PCR	4.24	4.19	0.05
Abbott RealTime HIV-1 RNA PCR	4.2	4.33	0.13
Abbott RealTime HIV-1 RNA PCR	4.19	4.07	0.12
Abbott RealTime HIV-1 RNA PCR	Inhibition	Inhibition	Not Assessed
HOLOGIC Aptima HIV-1 Quant Assay	4.56	4.69	0.13
Roche COBAS AmpliPrep/COBAS TaqMan HIV-1 Test V2.0	2.13	2.18	0.05

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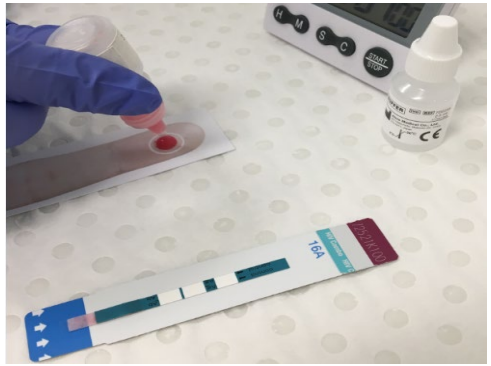
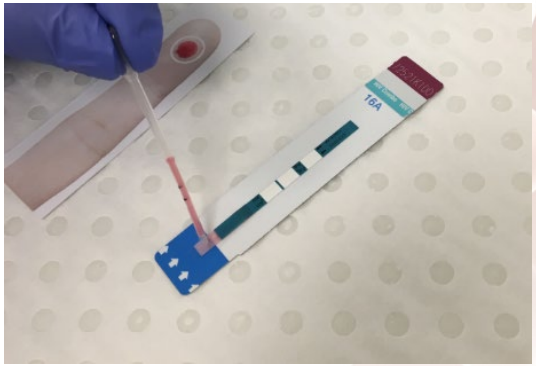
Whole Blood POC Serology

- Extended stability to 3 months at RT°C using a synthetic red cell matrix
- In 2018: added more analytes (multimarker)





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POCS Analysis

- Test Event 2, 2018
  - Received 140 results from 63 participants

		% Concordant				
Sample ID	**Analyte**	**anti-HCV**	**anti-HIV-1/2**	**anti-*Treponema***	**HBsAg**	**HIV p24**
A	HIV p24	100	95	100	100	100
B	HBsAg	93	100	100	94	100
C	anti-HIV-1/2	100	99	100	100	100
D	anti-HCV	93	97	100	94	100
E	anti-*Treponema*	93*	98*	64*	94*	100

*Invalid results received

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Other EQAS examples

- *Mycobacterium tuberculosis* (± drug resistant mutations) molecular EQAS in a synthetic respiratory material
- Molecular EQAS for sexually transmitted infections in a dry swab format

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Low Cost EQAS - summary

- NRL Australia recognises changes to testing environment
  - Designed EQA optimised for POC but suitable in other assays
    - Initial work up is very expensive
    - Have good Quality Management Systems in place

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Low Cost EQAS - summary

- Apply format to other organisms
- Expand the peer groups for data analysis
  - Confirm homogeneity & stability of material
  - Providing robust analysis
    - Improved processes, troubleshooting
    - staff training (or re-training)

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