



Experiences and opportunities in the use of dried blood spot specimens in resource limited settings

Philip Cunningham
NSW State Reference Laboratory for HIV
St Vincent's Hospital Sydney Australia

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

Presentation



- Why Dried Blood Spots ?
- Screening newborns / childbearing women (EID)
- Needle Exchange Surveillance – ANSPS
- Future opportunities

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

Dried blood spot (DBS)



- Widely used in early infant HIV diagnosis
- Applicable to 'hard-to-reach' and remote settings
- Dried samples are stable at room temperature
- Simple transport via post possible
- Self-collection possible
- Conventional lab testing possible
- Seroprevalence surveys for HIV/HCV - ANSPS
- McLaws ML et al. *Prevalence of maternal HIV infection based on anonymous testing of neonates*, Sydney 1989. MJA 1990 Oct 1;153(7):383-6.



UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

Day/Month/Year

Footnote to go here

Page 2

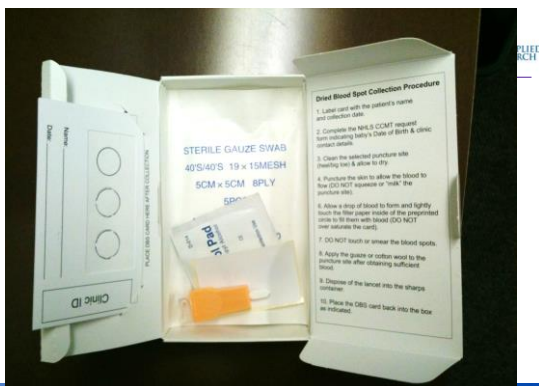
Comparison of plasma and DBS



Feature	Plasma	DBS
Requires venipuncture	Yes	No
Requires centrifugation	Yes	No
Stable at "room temperature"	No	Yes*
Biohazard for shipping purposes	Yes	No
Dry ice required for shipping	Yes	No*
HIV DNA PCR (EID)	No	Yes*
HIV RNA virus load	Yes	Not routine
HIV drug resistance (GART)	Yes	Yes*
Volume range	1-5 ml	0.25-0.5 ml

* if kept dry, for at least 2 weeks

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES



UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

Day/Month/Year

Footnote to go here

Page 3

Challenges in resource limited settings

Transport and Logistics



Laboratory Capacity



Health System Capacity

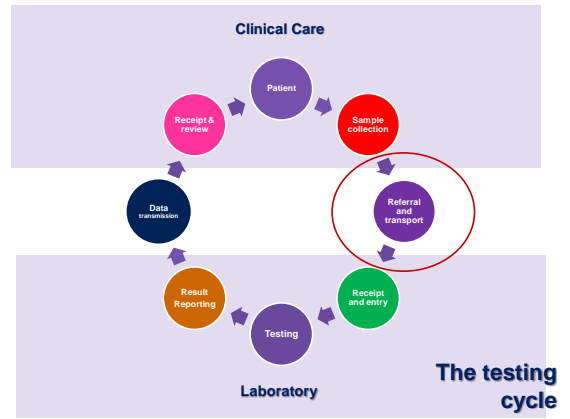


Common failures in regional laboratories



- Lack of Infrastructure – testing environment
- Lack of sustainable transport referral pathways
- Lack of or inadequate training
- Lack of proficiency testing
- Inconsistent availability of supplies, poor quality, inappropriate test kits
- Failures in management support

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES



Development of a DBS collection SOP



The document outlines the Standard Operating Procedure (SOP) for Dried Blood Spot (DBS) collection. It includes numbered steps from 1 to 14, such as 'Check the patient's temperature', 'Perform a heel stick', 'Collect the blood spot', and 'Packaging and storage'. Each step is accompanied by small photographs or diagrams illustrating the correct technique. The document also includes a 'Don't do this' section with icons for common errors like using the wrong lancet or not drying the spot properly.

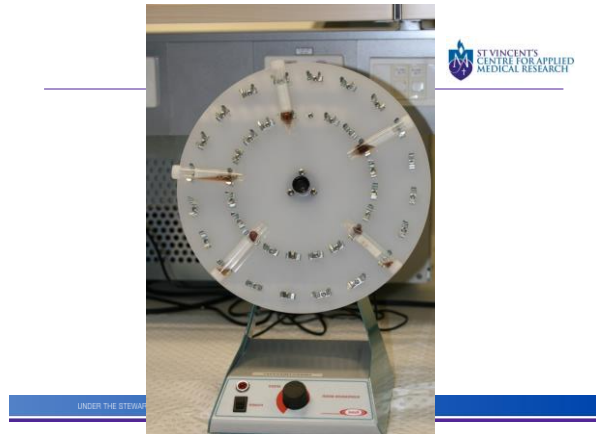
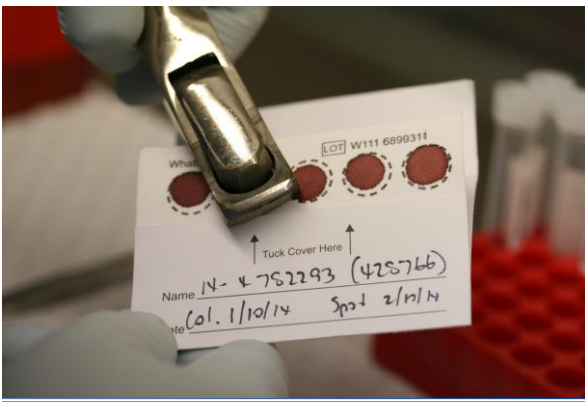
UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES



Early infant diagnosis – HIV nucleic testing

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

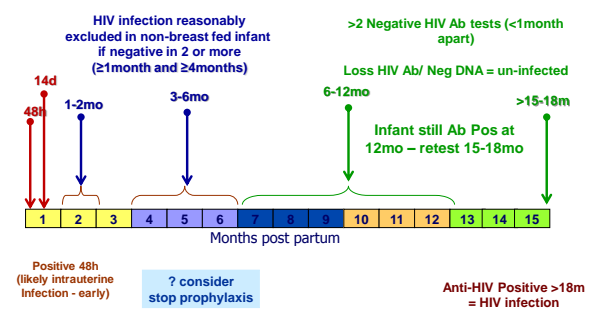




Typical EIA Assay Procedure for Dried Blood Spots

1. Add Kit Diluent (150 uL, 1:30)
2. Cover plate, incubate overnight at 4°C
3. Shake plate gently to mix
4. Add Diluent to assay plate (125 uL)
5. Transfer DBS eluate (25 uL) to assay plate (1:150 final serum dilution)
6. Add Substrate (150 uL)
7. Incubate 10 min at 25°C
8. Add Stop Solution (150 uL)
9. Read plate at 405 nm

CDC



HIV DNA testing in the infant blood



DBS and surveillance - ANSPS

- ANSPS conducted annually since 1995 and NSP attendees have participated on ~40,000 occasions.
- Majority of primary NSP services in Australia participate in the ANSPS.
- Serological surveillance using DBS (HIV and HCV) serology
- 2013 – HCV RNA PCR pilot
- Monitor blood borne viral infections and associated risk behaviour in PWID

Opportunities

- Conventional HIV antibody laboratory tests possible
- Full confirmation by western blot possible
- HIV DNA/RNA detection possible
- 'Window period' same as lab testing
- Access to 'hard-to-reach' or remote groups
- Personalizes the sample collection – 'no immediate test result'
- May appeal to people not wanting to engage with health provider / community testing settings
- May appeal to other priority populations



? Alternative to venous blood confirmation for PoCT 'reactives'?

- TGA approved are available for patient monitoring
- HIV viral tests load possible
- HIV genotypic resistance testing (RNA > 1,000 cpy) possible



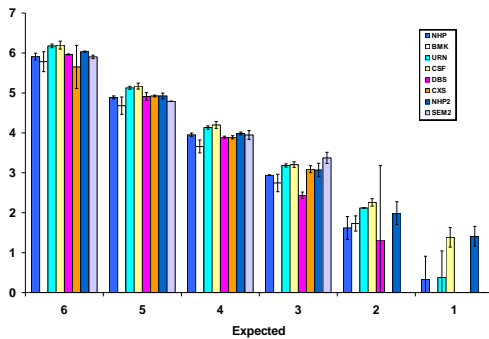
UNDER THE STEWARDSHIP OF MARY AIKEN-HEAD MINISTRIES

Day/Month/Year

Footnote to go here

Page 20

DBS and HIV viral load assays



A Loftis, R Kshatriya, K McCall-Culbreath, S Fiscus and J Nelson. IAS 2009

Emerging technologies for DBS



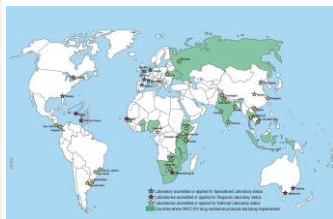
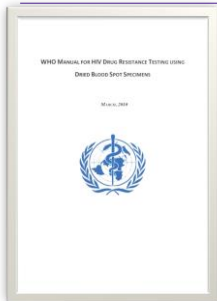
UNDER THE STEWARDSHIP OF MARY AIKEN-HEAD MINISTRIES

Day/Month/Year

Footnote to go here

Page 21

WHO HIVResNet – global resistance



UNDER THE STEWARDSHIP OF MARY AIKEN-HEAD MINISTRIES

Potential considerations



- Regulatory – few approved tests make DBS sample claims
- How are DBS collection kits distributed ?
- Non-return rates may be costly (wasted kits) ?
- DBS not a familiar venous specimen
- Labs not familiar or set up for DBS processing and testing
- Turn around time for results (batched) ?
- Separates HIV testing from other STI tests – eg bacterial STI and syphilis ?
- Loss to follow up ?

UNDER THE STEWARDSHIP OF MARY AIKEN-HEAD MINISTRIES

Day/Month/Year

Footnote to go here

Page 24

Costs



- DBS collection kit ~ \$5.00
- Australia Post pre-paid envelope for DBS return ~ \$5.46
- Processing and testing by conventional lab test - \$12.00
- Supplemental HIV testing for DBS:
 - HIV western blot \$70
 - HIV DNA/RNA PCR = \$50

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

Day:Month:Year

Footnote to go here

Page 25

Active projects



- HIV DBS included in clinical trials
- NSW HIV Strategy - new means to improve testing uptake
- PNG and Western Pacific EID and confirmatory testing
- Indonesia – HIV DR country threshold survey for HIV drug resistance and test and treat implementation research
- HCV simplified monitoring pre and post Rx

UNDER THE STEWARDSHIP OF MARY Aiken-HEAD MINISTRIES

