



The Implementation of Dried Blood Spot Collection in the Field for Supplemental HIV Testing – National HIV Behavioral Surveillance

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ISSUE

- Dried blood spot (DBS) specimens have been used in international settings to allow HIV testing when venipuncture blood collection is not feasible.
- DBS can be collected in the field without special laboratory processing, the filter collection paper is inexpensive and easily stored, and DBS can be shipped at ambient temperature as non-hazardous material by regular mail.
- An alternative to venipuncture may become increasingly beneficial as HIV testing in field settings expands, although FDA-approved tests for DBS are limited.

PROJECT

- National HIV Behavioral Surveillance (NHBS) monitors HIV infection and HIV-associated behaviors among key populations at highest risk of HIV, including men who have sex with men (MSM), people who inject drugs (PWID), and heterosexuals at highest risk of HIV infection (HET). Individuals within these populations are recruited in annual, rotating cycles every 3 years in 23 U.S. cities.
- Participants have been offered voluntary, anonymous HIV testing since NHBS began in 2003.
- Beginning in 2012, PWID and MSM participants were asked for their consent to store DBS specimens for future testing, such as HIV recency and viral load; DBS are not collected for HET due to low HIV prevalence.
- Field staff were trained in DBS collection, packaging, storage and shipping at the annual NHBS Field Operations Training and regular staff evaluations were conducted to assess procedure adherence and the need for retraining.
- DBS could be collected by fingerstick or prepared from blood tubes collected via venipuncture; most areas collected fingerstick specimens.

DBS COLLECTION AND HANDLING

In the field

- Blade lancets, NOT needle lancets, are used to obtain sufficient blood volume.
- The hand is set against a hard surface to ensure a deeper stick with the lancet. **(photo 1a)**
- Each circle on the collection card is completely filled with blood specimen; During collection, one circle should be completely filled with blood before moving onto the next circle and the blood should not be layered within each circle; the finger should not touch the card. **(photos 1b-d)**
- DBS are dried horizontally at ambient temperature avoiding contact of the blood to any surface. **(photo 2)**
- Dried DBS are packaged within a minimum of 4 to a maximum of 24 hours of collection.
- Packaging is done in specimen storage bags with a humidity indicator card and at least 10 desiccant packs; all air is pressed out of the bag to create an air-tight seal. **(photo 3)**
- The humidity indicator in the bag is monitored on a daily basis; if humidity is indicated the desiccants are discarded and replaced with new desiccants.
- DBS are shipped via regular mail at ambient temperature to CDC within 10 days of collection.

In the lab

- Laboratory staff check the quality of each specimen and provide feedback to field staff.
- Packaging is assessed and noted for each shipment if humidity >30% is indicated as RNA integrity is compromised with exposure to high humidity.
- To preserve the integrity of RNA and other molecules, specimens are re-bagged individually and placed in - 20° C freezer for long-term storage at CDC.
- The Abbott *RealTime* HIV-1 RNA and Bio-Rad Avidity assays were validated for DBS for viral load and recency testing.
- The Abbott assay is less sensitive with DBS than with plasma (LOQ 2.92 vs. 1.6 log (copies/mL)).

RESULTS

- The collection of DBS proved to be feasible to expand HIV testing across multiple cities and recruitment settings.
- Acceptance of DBS collection by participants was high among PWID (2012: 93%; 2015: 97%) and MSM (2014: 91%; 2017: 94%).
- DBS were rarely deemed insufficient for testing. At least 3 full circles were deemed sufficient and measured by obtaining 4 6mm hole punches from each circle. **(photos 4 and 5)**
- To date, 5160 MSM DBS and 1668 PWID DBS have been tested at CDC for HIV recency or viral load.¹⁻²

Photos 1 a-d. Fingerstick and DBS Collection

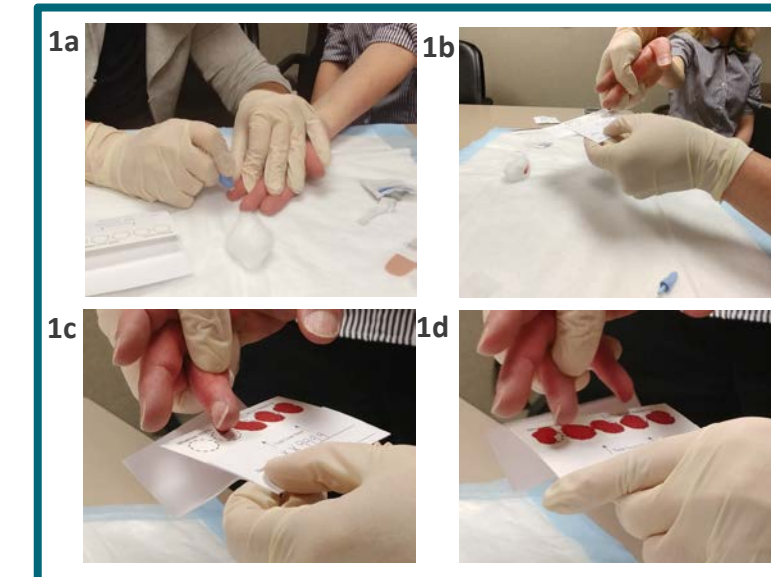


Photo 2. Example DBS Drying Container



Photo 3. DBS Packaging



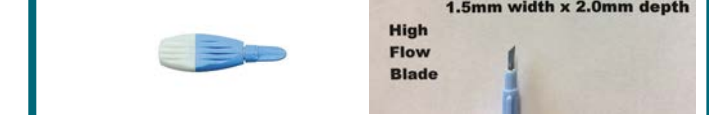
Photos 4 and 5. Sufficient DBS



LESSONS LEARNED

- Proper training, practice and the use of blade lancets **(photo 6)** allows for sufficient blood volume for DBS collection.
- Even with blade lancets, the finger must be placed on a hard, flat surface to ensure a deeper stick; it is important for field staff to distinguish between the blade lancets needed for DBS collection vs. needle lancets that are sometimes used for rapid HIV testing, which requires a smaller volume of blood.

Photo 6. Blade Lancet



- While collecting, handling, and storing DBS in the field is simple, following standard procedures is key to specimen integrity and standardization across settings.
- Avoiding long-term exposure to humidity and storage at minus 20° C or lower is recommended to preserve integrity of the specimens.
- DBS testing can be further expanded to monitor other HIV prevention efforts such as uptake of PrEP and adherence to antiretroviral medication.

REFERENCES

- ¹Hoots B et al. Undisclosed HIV infection among men who have sex with men in National HIV Behavioral Surveillance, 2014. *AIDS* 2019.
- ²Chapin-Bardales J et al. Characteristics of Persons Who Inject Drugs with Recent HIV Infection in the United State: National HIV Behavioral Surveillance, 2012. *AIDS Behavior* 2019.

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