



B110 Standardized Kinship Data Test Set for Rapid DNA Validation

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After attending this presentation, attendees will understand how the development of a standardized kinship data test set can be a simple and effective tool to aid in the validation of Rapid DNA kinship software. Attendees will also learn the planning and design strategies required for developing such a test set, enabling them to develop a test set for their own validation needs.

This presentation will impact the forensic science community by serving as a tool for a quick, simple, and effective method to validate the kinship software associated with Rapid DNA technology in preparation for field or laboratory DNA analysis operations. This validation tool will create standardization of the Rapid DNA platform's kinship functionality across all laboratories and fieldwork locations.

The Department of Homeland Security's (DHS's) mission is to protect America by preventing terrorism and enhancing security, managing the borders, administering immigration laws, securing cyberspace, and ensuring disaster resilience. While DNA is a powerful biometric, currently DHS does not have in-house DNA testing capabilities. Rapid DNA, a recent and important technology advancement in DNA testing, is designed to be utilized as a lights-out system with the ability to provide results within 90 minutes. This technology provides DHS with a portable, robust, in-house DNA capability. Rapid DNA technology for DHS kinship analysis was developed through a DHS Science and Technology Directorate (S&T) research and development effort that was part of a collaborative effort with the Departments of Defense and Justice. Through the use of Rapid DNA technology, DHS components may be able to prevent illegal and fraudulent immigration, deter human trafficking, identify disaster victims and reunite families, and identify criminals or terrorists attempting to enter the country. For this reason, the Rapid DNA kinship determination functionality will be of particular use to DHS.

The Rapid DNA kinship functionality will require validation and verification before the technology is put into operation and occasionally when the Rapid DNA software is updated or modified. In order to make the Rapid DNA kinship software validation and verification universal across all components of DHS, a robust kinship data test set has been created to enable quick and simple validation. When the Rapid DNA system is updated, the user can simply run the kinship data test set to ensure no errors or issues have occurred in the kinship analysis and statistical calculation process. When a kinship test is run on Rapid DNA, the results will show either inclusion or exclusion and the calculated relationship indices. The Rapid DNA user will be able to detect potential changes applied to the Rapid DNA kinship application and determine if the statistical analysis for the DNA profiles are reported properly.

Expanding on the National Institute of Standards and Technology's Standard Reference Family Data approach (<http://www.cstl.nist.gov/strbase/kinship.htm>), Common Message Format (CMF) files containing profiles associated with ten artificial pedigrees have been created. These pedigrees are specifically designed to include a wide number of alleles, including off-ladder alleles and microvariants. The kinship cases include biological relationship/kinship claims commonly encountered by the United States Citizenship and Immigration Services (USCIS) and Customs and Border Protection (CBP): standard mother/father/child trios, motherless, fatherless, grandparent-grandchild, siblings, and aunt/uncle to niece/nephew cases. The cases also include other DNA profile complexities (e.g., parent-wrong gender, mutations, null alleles, and rare alleles). The kinship data test sets incorporate the 20 common paternity index formulas identified by the American Association of Blood Banks (AABB). Testing of paternity index formulas for paternity trios and motherless cases are in accordance with the 2014 Appendix 4 of the AABB *Guidance for Standards for Relationship Testing Laboratories* 11th Edition.

Overall, this kinship data test set will provide not only DHS but all Rapid DNA users with a standardized validation tool allowing for easy implementation and validation of Rapid DNA technology as well as providing a resource for users to create their own kinship test set.

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