



### **B35 A Cost-Benefit Analysis of Kinship Testing Involving Siblings and Half Siblings**

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After attending this presentation, attendees will understand the current status of kinship testing in forensic science, the costs and benefits associated with testing an increasing number of siblings in order to more accurately establish a biological relationship, and the effect of substituting half siblings for full siblings for the identification of a biological relationship in question.

This presentation will impact the forensic science community by improving knowledge regarding kinship testing involving siblings and by informing a variety of agencies of the most cost-effective approach for kinship testing involving full siblings and half siblings. The results from this study will be utilized to inform the Department of Homeland Security of the costs and benefits of testing multiple members of a family and will indicate if this practice can offer greater success in the identification of a biological relationship. Depending on the results of this research project, some agencies and organizations may alter their current practices to attain a higher success rate for the identification of biological relationships in question.

A DNA kinship test assesses the relatedness between two or more individuals. A kinship test is used as a method for confirming the presence of a biological relationship between two individuals for immigration purposes, parentage testing, forensic casework, and the identification of victims of mass disasters; however, the testing of siblings in kinship testing can become complicated, since siblings can share between 0% and 100% of their DNA. Since there is a high level of variation among the amount of DNA shared between two siblings, this research investigates whether kinship testing should be performed on more than two siblings when possible. Additionally, the effect of substituting half siblings for full siblings is examined in order to assess if less information is obtained using half siblings in a kinship test. With this information, the cost-benefit relationship of utilizing an increased number of siblings in kinship testing was examined. Many factors, such as the cost of the DNA testing, the access to more than two family members for kinship testing, and the variation in the amount of DNA shared between siblings, are discussed in the examination of this cost-benefit relationship.

In order to study this cost-benefit relationship, 415 known DNA samples sourced from the Applied Genetics Technology Corporation (AGTC) in Denver, CO, were provided by the Department of Forensic Science at The George Washington University. The samples were collected from 96 total families from Caucasian, Hispanic, African American, and Asian populations, with 24 families belonging to each ethnic group. The previously extracted DNA samples were quantified using the Quantifiler® Duo DNA Quantification Kit and amplified using the GlobalFiler™ and VeriFiler™ Direct Polymerase Chain Reaction (PCR) amplification kits. The samples were analyzed using an Applied Biosystems® 3130 Genetic Analyzer and GeneMapper® ID-X software version 1.4. Using the likelihood ratios obtained from statistical calculations between the biological full siblings and half siblings, the strength of the biological relationship in question was determined. By comparing the likelihood ratio calculations between siblings, it was determined whether the biological relationship is strengthened when using an increasing number of siblings in the kinship test, and if there is a significant difference in the strength of a biological relationship when substituting half siblings for full siblings.

This presentation will provide a cost-benefit assessment of kinship testing using multiple siblings, will examine if using a greater number of siblings in kinship testing yields a more accurate identification of a biological relationship, and will determine the effect of substituting half siblings for full siblings. With this knowledge, more cost-effective approaches for kinship testing involving siblings can be adopted and practiced.

This research was funded by the Department of Homeland Security.

#### **Kinship Analysis, Sibship Testing, Siblings**