

**Title :** Determination of Probability of Sibship Threshold for Full-Sibling Relationship Testing Using Autosomal Short Tandem Repeat (STR) Markers

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## ABSTRACT

Kinship testing plays a critical role in forensic science and legal medicine. To determine full-sibling relationships, forensic laboratories have generally relied on the probability of sibship threshold. A 90% threshold is currently used by the Forensic Genetics and Evidence Laboratory, Department of Forensic Medicine, Faculty of Medicine, Chiang Mai University. However, it is imperative to reevaluate the suitability of this criterion given the intrinsic complexity of inheritance patterns and the growing genetic diversity within the Thai population. This study aims to establish an optimized confidence threshold for full-sibship testing using 15 autosomal STR markers. The dataset comprised 128 confirmed families who required paternity testing services (father-mother-child). Families with at least two children whose biological relationships to both parents were verified were necessary to meet the inclusion criteria. Random pairings between members of various families were created for the non-sibling group. DNA profiles were analyzed to calculate the Combined Paternity Index (CPI) and the Probability of Sibship using GenoProof 3 software. The results revealed that 125 pairs of confirmed full siblings (97.65%) yielded a probability of sibship within the range of 95.00–99.99%, indicating an extremely high level of confidence. In the ranges of 75.00–79.99%, 85.00–89.99%, and 90.00–94.99%, which corresponded to moderate to high confidence levels, only one pair was discovered. Conversely, the non-sibling group predominantly fell into the low-probability ranges: 115 pairs in the 0.00–4.99% range, 4 pairs in the 5.00–9.99% range, and 5 pairs in the 10.00–14.99% range. Single pairs were also observed in the 15.00–19.99%, 30.00–34.99%, 35.00–39.99%, and 65.00–69.99% ranges. In conclusion, this study suggests that the decision threshold for full-sibship relationships should be adjusted to the 95.00–99.99% range to ensure maximum accuracy and reliability in forensic interpretations.

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