

EMPIRICAL STUDY OF DONOR RATIOS TO ASSESS GUIDELINES FOR MIXTURE DECONVOLUTION.

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Forensic science is under increasing pressure to provide scientific support for its analytical methods^{1,2}. While much of the focus has been on pattern and impression evidence (e.g., fingerprints and toolmarks), calls have been made for additional research into the foundational elements of DNA mixture interpretation². Previous work has outlined models for mixture deconvolution^{3,4}, and software packages exist to aid in this interpretation^{5,6,7}. A key feature of these models is the use of the donor ratio, which is the proportional contribution of each donor to a mixture. A 1:1 donor ratio, for example, would be a two-person mixture with both donors present in approximately equal amounts. When deconvoluting a mixture, genotypes that are not consistent with the observed donor ratio may be excluded from consideration. However, observed donor ratios can vary within a mixture, and a mixture that appears as a 1:1 donor ratio at one locus may present as a different donor ratio at other loci. Empirical data is needed to determine how much donor ratios vary within actual mixtures, and if an acceptable range of donor ratios can be found. Variations in peak height ratio and contributions from stutter must also be considered as they can also impact observed donor ratios. Donor ratios and peak height ratios from approximately 300 known mixtures including analyst training sets, instrument validation studies, and forensic casework were examined in this study. Observed ranges in donor ratios and peak height ratios will be presented, and possible causes for such variation in will be discussed. Example guidelines for mixture interpretation based on this data will also be presented.

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