

DNA: Statistical Calculations

Introduction

The following are examples for calculating statistics for profiles.

RMP calculations

- The laboratory will use the expanded “ $2p$ ” formula, $2p - p^2$. If the “ $2p$ ” formula is used more than once at a locus, the frequency of one of the duplicated heterozygote genotypes will be removed.
 - Example: If the interpretation is 10+/12+ at a locus, the frequency of the 10, 12 genotype will be incorrectly counted twice. To correct this, the frequency of one of the 10, 12 genotypes will be removed.
- When the interpretation at a locus includes only one genotype, the appropriate formula from the table below is used to calculate the genotype frequency.
 - Example: The following 3-loci profile was detected in a single-source sample. The appropriate RMP formulas are listed in the table below:

Locus	Interpreted genotypes	RMP formula
D8S1179	10, 13	$2pq$
D21S11	28, 28	$p^2 + p(1 - p)\theta$
D7S820	11+	$2p - p^2$

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RMP calculations (continued)

- When the interpretation at a locus includes more than one genotype, the RMP is the sum of the individual frequencies for the genotypes included following mixture interpretation. Adding the frequencies of each genotype provides a frequency of A genotype or B genotype.
 - Example: The following 5-locus profile was detected for the major contributor in a two-person mixture. The appropriate RMP formulas are listed in the table below:

Locus	Results of interpretation	Included genotypes	RMP formula
D8S1179	11+, 11, 14	11, 11 11, 14	$p^2 + p(1 - p)\theta + 2pq$
D21S11	27, 29	27, 29	$2pq$
D7S820	10, 12 / 10, 13 / 12, 13	10, 12 10, 13 12, 13	$2pq + 2pq + 2pq$
CSF1PO	13+	13, anything	$2p - p^2$
D3S1358	[15, 16]	15, 15 15, 16 16, 16	$p^2 + p(1 - p)\theta + 2pq + p^2 + p(1 - p)\theta$

+ Obligate allele

/ List of reasonable genotypes

[] All combinations of alleles

Haplotype calculations

Refer to www.usystrdatabase.org or Butler's Advanced Topics in Forensic DNA Typing: Methodology (2012) for detailed examples of haplotype calculations.