

Report Wording Suggestions

The following information resources have been produced and reviewed by members of the Mixture Committee of the Scientific Working Group on DNA Analysis Methods (SWGDAM) and are available at <http://www.cstl.nist.gov/strbase/mixture.htm>.

This document is meant to provide suggestions for laboratories to utilize as starting points to establish report writing statements for autosomal STR DNA conclusions. The statements provided are based upon the use of analytical and stochastic thresholds. Differences may exist in report writing statements when using a probabilistic genotyping analysis method.

Laboratories are encouraged to formalize their own report writing statements to provide uniformity within their reports.

Due to the scientific nature of the report wording, it may be beneficial to provide or maintain a glossary of scientific terms utilized in the report.

Labs may need to modify these statements as appropriate to their protocols.

Conclusion statements should encompass the following:

- 1) any statements as to the quality of the DNA profile obtained
- 2) any statements as to assumption of number, or minimum number, of contributors
- 3) any statements as to gender of contributors (based upon sex typing and / or quantitation information)
- 4) any statements as to assumption of any assumed known references
- 5) any statements of resolution of mixture into contributor components
- 6) any statements of inclusion / non-exclusion, including statistical support of the probative statements of the inclusion / non-exclusion
- 7) any statements of exclusion
- 8) any inconclusive statements, including reason for such

Multiples of the above elements may be combined into single statements.
Not all conclusions need to follow the exact order listed above.

Examples of reporting statements

1) Statements for quality of DNA profile obtained

- * A partial DNA profile was obtained from this item.
- * A low level DNA profile was obtained from this item.
- * A DNA profile was obtained from this item at 12 of the 15 loci tested.
- * A DNA profile was obtained at all genetic loci tested except FGA.
- * A profile indicating the presence of degraded DNA was obtained from this item.
- * Not all loci are suitable for matching purposes. The statistics provided are based upon loci with conclusive data.
- * The following loci were used / not used in the statistical calculation (CSF, TH01, ...).

2) Statements for number of contributors

- * DNA from (or “consistent with originating from”) two individuals was obtained from the evidence.
- * DNA from more than two individuals was obtained from the evidence.
- * DNA from at least two individuals was obtained from the evidence.
- * DNA from two or more individuals was obtained from the evidence.

3) Statements for gender of contributors

- * Human male / female DNA was detected on the item.
- * The sex typing results indicate the presence of male / female DNA.
- * The sex typing results are inconclusive to determine the gender of the contributor(s).
- * The DNA profile obtained from this item is consistent with originating from an individual who genetically types as male / female.
- * The presence of male DNA in this mixture may limit the ability to conclude the presence of a female contributor.
- * The results obtained are consistent with a mixture of at least one male and one female.

4) Statements for assumed known references

(e.g., evidence is intimate to Betty Bloggs; the presence of her DNA in the evidence is non-probative)

- * Betty Bloggs cannot be excluded as one of the contributors of the DNA profile obtained from this item.
- * The following conclusion is based upon an assumption that Betty Bloggs is one of the contributors of the DNA profile obtained from this item.
- * Assuming the presence of Betty Bloggs, ...
- * The DNA profile foreign to Betty Bloggs...

5) Statements for resolution into contributor components

- * A major / minor contributor to this DNA profile was able to be distinguished.
- * A mixture of (or “consistent with originating from”) two major contributors to this DNA profile was able to be distinguished.
- * A mixture of at least two major contributors to this DNA profile was able to be distinguished.
- * A DNA profile foreign to Betty Bloggs was able to be determined.

6) Statements of inclusion / non-exclusion, including statistical support of probative statements

(e.g., evidence is not intimate to John Doe; the presence of his DNA in the evidence is probative)

Statement of inclusion / non-exclusion:

- * No DNA foreign to Betty Bloggs was detected.
- * The DNA profile from the known standard of John Doe matches the DNA profile obtained from this item.
- * This DNA profile from this item matches / is consistent with the DNA profile of John Doe.
- * The DNA profile from the known standard of John Doe matches the DNA profile of the major / minor contributor obtained from this item.
- * There is a major / minor contributor to the DNA profile which can be accounted for by John Doe.
- * John Doe cannot be excluded as one of the major / minor contributors.
- * John Doe cannot be excluded / is included as one of the contributors to the DNA profile.
- * The DNA profile foreign to Betty Bloggs matches the DNA profile of John Doe.
- * The DNA profile is consistent with a mixture of Betty Bloggs and John Doe. All of the alleles detected can be accounted for by a mixture of their DNA profiles.
- * The DNA profile from items 1, 2, and 3 is consistent with originating from a common source. The unknown (male / female) profile is hereafter referred to as “unknown (male / female) 1”.
- * The DNA profile from item 1 matches the DNA profile from item 2.

Random Match Probability to a single source profile:

- * The probabilities of selecting an unrelated individual at random having a DNA profile matching (the major contributor of / minor contributor of / the profile foreign to Betty Bloggs from) the DNA profile obtained from this item are approximately: (list of profile probabilities for populations utilized).
- * To a reasonable degree of scientific certainty, John Doe is the source / major contributor / minor contributor / foreign contributor of the DNA detected on this item.
- * With the exception of the possibility of identical twins, John Doe is the source / major contributor / minor contributor / foreign contributor of the DNA detected on this item.

CPE / CPI:

- * Based on the Caucasian population it is estimated that 1 in X individuals is a potential contributor / would not be excluded as a potential contributor to this mixed profile. (this statement could be repeated for each additional appropriate population)
- * The probabilities of selecting an unrelated individual at random who cannot be excluded / that can be included as one of the possible sources of the DNA profile obtained from this item are approximately: (list of profile probabilities for populations utilized).
- * The probabilities of selecting an unrelated individual at random who cannot be excluded / that can be included as one of the possible major contributors of the DNA profile obtained from this item are approximately: (list of profile probabilities for populations utilized).

Likelihood Ratio:

- * The DNA profile is approximately # times more likely to occur if it originated from Betty Bloggs and John Doe than from Betty Bloggs and an unknown individual in the Caucasian population.
- * The DNA profile is approximately # times more likely to occur if it originated from John Doe and an unknown Caucasian individual than from two unknown individuals in the Caucasian population. (these statements could be repeated for each additional appropriate population)

Random Match Probability to a mixture:

- * The probabilities of selecting an unrelated individual at random who cannot be excluded as one of the possible sources of the DNA profile obtained from this item are approximately: (list of profile probabilities for populations utilized).

7) Statements of exclusion

- * John Doe is excluded as the source of the DNA profile obtained from this item.
- * John Doe is excluded as one of the contributors of the DNA profile obtained from this item.
- * John Doe is excluded as the major contributor of the DNA profile obtained from this item.
- * John Doe is excluded as one of the contributors of the major mixture of the DNA profile obtained from this item.
- * John Doe is excluded as the contributor of the DNA profile present that is foreign to Betty Bloggs.

8) Inconclusive statements, including reason for such

- * No further DNA testing was performed on this item because no DNA was detected.
- * No male DNA was detected on this item, therefore no autosomal STR testing was performed.
- * Human male DNA was detected on this item. Due to the high concentration of female DNA, no autosomal testing was performed. Y-STR (Y-chromosome short tandem repeat) analysis may be best suited for analysis of this item.
- * Since the only profile obtained is the same as that of Betty Bloggs, no further conclusion can be reached concerning this item.
- * Human male DNA was detected on the item. However, no autosomal DNA profile foreign to Betty Bloggs was obtained. Therefore, Y-STR analysis was conducted on this item and the reference standard of John Doe.
- * Due to the complexity of the genetic information available and the possibility of other genetic information being present that may be undetected by this testing procedure,
 - no conclusions were made concerning the DNA profile obtained from this item.
 - no further conclusions were made concerning the DNA profile obtained from this item.
 - John Doe can neither be excluded nor included as one of the possible sources of the DNA profile obtained from this item.
 - the DNA profile obtained from this item does not satisfy the laboratory's inclusionary reporting criteria. No further conclusions were made regarding this item OR however, this profile may be used for exclusionary purposes.
- * The DNA profiles of Betty Bloggs and John Doe do not account for all of the genetic information obtained from this item.
- * Due to limited information obtained, it cannot be determined if the DNA profiles obtained from the evidentiary items that cannot be attributed to Betty Bloggs could have originated from a common source.
- * The DNA profile obtained from this item matches the DNA profile from a quality control database sample.

The following statements are only applicable to use for a probative statement of inclusion after a statistic has been provided based upon at least one locus.

- * Genetic loci [list appropriate loci] are consistent with John Doe being a contributor of the DNA profile obtained from this item. However, because the profile of the major contributor /minor contributor / foreign contributor could not be distinguished at these loci, these loci were not used in the statistical calculations.
- * Due to the possibility of additional genetic information being present, the genetic loci [list appropriate loci] were not used in the above calculations. However, it must be noted that John Doe cannot be excluded as one of the possible sources of the DNA profile obtained at these genetic loci.
- * The mixture of major contributors was not able to be determined at genetic loci [list appropriate loci]. These loci are consistent with John Doe being a contributor of the DNA profile obtained from this item. However, for technical considerations, these loci were not used in the above calculations.

Examples of conclusions for given scenarios

Scenario #1

Evidence is an apparent single source profile matching John Doe, with no issues in the evidence of the potential for dropout. This match is probative to the investigation and is supported with a Random Match Probability statistic that exceeds the laboratory's threshold for a source identity statement.

The DNA profile from the known standard of John Doe matches the DNA profile obtained from this item. To a reasonable degree of scientific certainty, John Doe is the source of the DNA detected on this item.

Scenario #2

Evidence is an apparent mixture of only two sources. Betty Bloggs is assumed to be a known, non-probative, contributor to the mixture. After mixture deconvolution, it is determined that a DNA profile suitable for comparison can be obtained. There is no reference standard available for comparison to this deconvoluted profile.

DNA consistent with originating from two individuals was obtained from the evidence. Assuming the presence of Betty Bloggs, the male DNA profile foreign to Betty Bloggs is suitable for comparative purposes pending the submission of additional reference samples. The unknown male profile is hereafter referred to as "unknown male 1."

Scenario #3

Evidence is an apparent mixture of only three sources. Betty Bloggs is assumed to be a known, non-probative, contributor to the mixture. She reports to have had a recent consensual sexual partner (whose sample has not been submitted for analysis). No suspect standard has been submitted for analysis.

DNA consistent with originating from three individuals was obtained from the evidence. Assuming the presence of Betty Bloggs, the remaining DNA profile foreign to Betty Bloggs may be suitable for comparative purposes pending the submission of additional reference samples.

Scenario #4

Evidence is an apparent single source profile matching John Doe, with not all loci having reportable alleles. This match is probative to the investigation and is supported with a Random Match Probability statistic. Betty Bloggs is excluded as the source of the evidence.

A DNA profile was obtained from this item at 12 of the 15 loci tested. The DNA profile from the known standard of John Doe matches the DNA profile obtained from this item. The probabilities of selecting an unrelated individual at random having a DNA profile matching the DNA profile obtained from this item are approximately 1 in 10 billion for Caucasians and 1 in 30 billion for African Americans. Betty Bloggs is excluded as the source of the DNA profile obtained from this item.

Scenario #5

Evidence is an apparent mixture of only two sources. Betty Bloggs is assumed to be a known, non-probative, contributor to the mixture. After mixture deconvolution, it is determined that John Doe matches the remainder of the mixture except at locus FGA where the data cannot be deconvoluted into a single unambiguous genotype for the second contributor, but there is no proof of John Doe being excluded based upon FGA. This match is probative to the investigation and is supported with a Random Match Probability statistic.

DNA consistent with originating from two individuals was obtained from the evidence. Assuming the presence of Betty Bloggs, the DNA profile foreign to Betty Bloggs matches the DNA profile of John Doe. The probabilities of selecting an unrelated individual at random having a DNA profile matching the profile foreign to Betty Bloggs are approximately 1 in 50 trillion for Caucasians and 1 in 70 trillion for African Americans. Genetic locus FGA is consistent with John Doe being a contributor of the DNA profile obtained from this item. However, because the profile of the foreign contributor could not be distinguished at this locus, this locus was not used in the statistical calculations.

The below approach of combining multiple elements into a single statement may be applied to any of the scenarios.

The DNA mixture profile obtained from this item is consistent with DNA from Betty Bloggs admixed with DNA from John Doe. The probabilities of selecting an unrelated individual at random having a DNA profile matching the profile foreign to Betty Bloggs are approximately 1 in 50 trillion for Caucasians and 1 in 70 trillion for African Americans. Genetic locus FGA was not utilized in the statistical calculation.

Scenario #6

Evidence is an apparent mixture of only two sources. Betty Bloggs is assumed to be a known, non-probative, contributor to the mixture. After interpretation, it is determined that John Doe cannot be excluded as the second contributor to the mixture. This non-exclusion is probative to the investigation and is supported with a Likelihood Ratio statistic.

DNA from two individuals was obtained from the evidence. The DNA profile is consistent with a mixture of Betty Bloggs and John Doe. The DNA profile is approximately 100 million times more likely to occur if it originated from Betty Bloggs and John Doe than from Betty Bloggs and an unknown individual in the Caucasian population. The DNA profile is approximately 150 million times more likely to occur if it originated from Betty Bloggs and John Doe than from Betty Bloggs and an unknown individual in the African American population.

Scenario #7

Evidence is an apparent mixture of more than two sources. A distinct major mixture can be distinguished. This major mixture is an apparent mixture of only two sources. It is determined that John Doe cannot be excluded as one of the contributors to the major mixture. This non-exclusion is probative to the investigation and is supported with a Combined Probability of Inclusion statistic. No other reference standards are submitted for comparison. The minor contributor(s) are not suitable for inclusionary purposes.

DNA from at least three individuals was obtained from the evidence. A mixture consistent with originating from two major contributors to this DNA profile was able to be distinguished. John Doe cannot be excluded as one of the major contributors. Based on the Caucasian population, it is estimated that 1 in 50 million individuals is a potential contributor to this mixed major profile. Based on the African American population, it is estimated that 1 in 90 million individuals is a potential contributor to this mixed major profile. John Doe does not account for all of the genetic information obtained from the major mixture from this item. The minor contributor to this mixture is not suitable for inclusionary purposes; however, it may be used for exclusionary purposes.

Scenario #8

Evidence is an apparent mixture of more than two sources, but a definitive number cannot be determined. No distinct major profile or major mixture can be distinguished. The potential for dropout exists at all loci due to low level data. The DNA profile of John Doe is present at all loci in the evidence, and a statement of inclusion would be probative to the investigation. It is noted that this conclusion would also be appropriate if the DNA profile of John Doe is not present in the evidentiary profile.

A profile indicating the presence of degraded DNA was obtained from this item. DNA from more than two individuals was obtained from the evidence. The sex typing results indicate the presence of male DNA. The presence of male DNA in this mixture may limit the ability to conclude the presence of a female contributor. Due to the complexity of the genetic information available and the possibility of other genetic information being present that may be undetected by this testing procedure, the DNA profile obtained from this item is not suitable for comparison.