



## 30 January 2024: Recent Updates to Forensic Biology Procedures

### Sampling evidence to create extracts and Amplifying extracts to generate DNA profiles

The Alaska Scientific Crime Detection Laboratory Forensic Biology discipline has recently updated protocols affecting how much evidence is used to create extracts, and how much extract is amplified to generate a DNA profile. These changes are described in detail in the Forensic Biology Procedure Manual v12 Section 2 (evidence sampling) and Sections 4-5 (amplification decision making based on quantification results); this manual is published in the Quality Assurance section of the lab website.

#### Sampling evidence to create extracts

The lab routinely retains at least half of evidence to allow for possible future analysis. How this is accomplished has been updated for some evidence types.

Previously: Most swabs and stains were sampled in their entirety, with half of the extract retained.

Updated protocol: For stains and swabs likely to have DNA from body fluids (such as blood, semen, or saliva), half the original swab(s) or stain will be retained for possible future testing, and half the swab(s) or stain will be used to create an extract which may then be fully consumed. This protocol can't be used on all sample types – see limitations section below.

#### Advantages to the updated protocol:

- Preserves the option for future serology testing and/or use of a different extraction method
- Better alignment with other US forensic laboratories

#### Limitations of the updated protocol:

- Assumes that DNA is evenly distributed over the swab, and therefore is not suitable for swabs where all the DNA may be 'localized' to one area on a swab (e.g., contact swabs from objects like guns or steering wheels). Previous protocol will be used for these sample types.
- Only possible when the item of evidence/stain is easily visualized and large enough to be evenly cut, and therefore it is not suitable for all evidence types (e.g., hair roots and fingernail scrapings).
- Updated protocol eliminates the possibility of fully consuming the item of evidence when half the swab/stain is used to create an extract.

### Amplifying extracts to generate DNA profiles

Amplification of DNA requires careful selection of the target amount of DNA used – amplifying too much or too little DNA could result in unusable data. There is no single optimal DNA target value; optimization of target amount of DNA considers several factors, such as amplification kit used, number of contributors, and potential degradation of the DNA. While optimizing the DNA target does not guarantee that data will

be interpretable at all locations tested, it does maximize the chance of obtaining interpretable data at as many locations as possible. Reagents, instruments, and protocols underwent validation testing at the lab prior to use in casework; and those studies were used to determine how to optimize DNA targeting.

Previously: Goal was to obtain as much interpretable DNA information as absolutely possible. If the lab was not able to reach the optimal amount of DNA using only half the evidence/extract, then no amplification would be performed, and written permission for consumption of the entire sample/extract would be requested.

Updated protocol: Goal is to get any interpretable information using no more than half the evidence. Therefore, the range of what amount of DNA is considered amplifiable is now wider.

Advantages to the updated protocol:

- Amplifying lower amounts of DNA without obtaining permission to consume will result in fewer second rounds of analysis and faster overall turnaround time for completion of all DNA testing in a case.
- Minimal storage time for extracted DNA reduces the potential long-term impact of degradation of extracted DNA.

Limitations to the updated protocol:

- Amplification below optimized target values of DNA will result in greater mixture complexity and increased difficulty of interpretation.
- Amplification of less DNA is still likely to have interpretable result but is likely to result in less total information, which means greater potential for a partial profile that has less information available to distinguish between individuals and has a more common population frequency.
- Some extracts will still require permission to consume (such as when the evidence was consumed to make the extract *and* that extract contains very little DNA).

Extracts previously reported as requiring permission to consume:

These extracts can be re-assessed against the current amplification protocol on a case-by-case basis upon request. The updated protocol does not mean that every extract previously reported as requiring permission to consume is now a viable candidate for amplification. In addition to the updated protocol for newly created extracts, consideration will be given to factors such as:

- Age of extract
- Likely number of contributors
- Results obtained from other evidence in the same case
- Other possibilities for analysis (such as probabilistic genotyping)

Questions about a specific case: Please contact the reporting analyst to discuss the possibility of amplification. If the reporting analyst is not available, please contact case managers Michelle Collins (sexual assault cases) or Jennifer Foster (all other case types).

General questions about these changes: Please contact Cheryl Duda, DNA Technical Manager, at Cheryl.duda@alaska.gov

