

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need:

Describe the need:

Extra cellular, or cell-free DNA has been widely acknowledged as a potential source of DNA on evidentiary items. The presence and quantity of this may be most substantial in cases involving “touch DNA” – where the sample may be composed of nucleated cells and cell-free DNA. However, there is limited information as to which is more prevalent and differences between donors. Often times the questions at court for this type of evidence focus on activity level propositions. (i.e. Suspect handled the gun directly vs. the gun came in contact with some intermediary person or item.) A better understanding of this could lead to improved recovery and storage techniques resulting in better DNA profiles. This need is related to, but different than, “touch” DNA issues and collection issues.

Keyword(s):

Submitting subcommittee(s): **Date Approved:**

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

3. Key bibliographic references relating to this research need:

- 1) Burrill, J., Kombara, A., Daniel, B. & Frascione, N. Exploration of cell-free DNA (cfDNA) recovery for touch deposits. *Forensic Sci. Int. Genet.* 51, 102431 (2021)
- 2) Vandewoestyne, M., Van Hoofstat, D., Franssen, A. E., Nieuwerburgh, F. Van & Deforce, D. Presence and potential of cell free DNA in different types of forensic samples. *Forensic Sci. Int. Genet.* 7, 316–320 (2013)
- 3) Kumar, M., Choudhury, Y., Ghosh, S. K. & Mondal, R. Application and optimization of minimally invasive cell-free DNA techniques in oncogenomics: <https://doi.org/10.1177/1010428318760342> 40, 1–12 (2018)

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

Partially related areas include “Comprehensive, systematic, well-controlled studies that provide both foundational knowledge and practical data about “touch evidence” DNA transfer (e.g., primary, secondary) and persistence in the real world, as well as best practices for interpretation”; “Improved DNA collection devices or methods for recovery and release of DNA”

5. In what ways would the research results improve current laboratory capabilities?

Most collection and extraction techniques are designed around intact cellular DNA. This area of research would explore improvements in methods for the collection, purification and storage of extra-cellular DNA. A way to distinguish between cellular and extra-cellular DNA would be informative when dealing with activity level propositions, often the source of disagreement in so-called “touch” DNA cases.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

This would allow for more focused guidance documents for evaluating DNA evidence when the dispute is about the activities that caused DNA to move from A to B.

7. In what ways would the research results improve services to the criminal justice system?

Most DNA trials move towards the activity level of the hierarchy of propositions. A better understanding of cellular DNA vs. extra-cellular DNA may be helpful in Bayesian Networks for evaluating DNA evidence given questions of activity.

8. Status assessment (I, II, III, or IV):

II

| | Major gap in current knowledge | Minor gap in current knowledge |
|---|--------------------------------|--------------------------------|
| No or limited current research is being conducted | I | III |
| Existing current research is being conducted | II | IV |

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.