OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need:	Alternative Matrices
Keywords:	Emerging, Novel, Drugs

R&D Need Rank: Low, Medium, High	Medium	**SAC Approved Date:**	6/4/2025

Submitting subcommittee(s): Forensic Toxicology

Research Need Summary:

The purpose of these research needs is to build a stronger scientific foundation for forensic science standards. The information provided herein will help to evaluate and strengthen existing standards, and/or fill any standards related gaps. In the space below, please provide a brief narrative of the need to be addressed. This should include:

- The identity of any specific standards that would be affected/improved/evaluated
- A discussion on gaps that exist within the standards or standards related gaps that need to be filled
- How this work would fill those gaps
- An overview of any current or past research efforts that may be relevant to this effort
- A discussion regarding how this research might improve current laboratory capabilities and/or forensic services within the criminal justice system
- Any relevant references

Alternative matrices such as oral fluid, hair, neonatal specimens, and breath are increasingly being used for toxicological testing of drugs, and results are receiving scrutiny in court and other arenas. Increased understanding of both analytical and interpretive aspects are needed.

Multiple:

Palmer, K.L. and Krasowski, M.D. (2019) Alternate Matrices: Meconium, Cord Tissue, Hair, and Oral Fluid. Methods in Molecular Biology (Clifton, N.J.), 1872, 191–197.

Neonatal:

Concheiro, M. and Huestis, M.A. (2018) Drug exposure during pregnancy: analytical methods and toxicological findings. Bioanalysis, 10, 587–606.

Wabuyele, S.L., Colby, J.M. and McMillin, G.A. (2018) Detection of Drug-Exposed Newborns. Therapeutic Drug Monitoring, 40, 166–185.

Di Trana, A., La Maida, N., Tittarelli, R., Huestis, M.A., Pichini, S., Busardò, F.P., et al. (2019) Monitoring Prenatal Exposure to Buprenorphine and Methadone. Therapeutic Drug Monitoring, August 14, 2019: 10.1097/FTD.0000000000000693.

Paniagua-González, L., Jiménez-Morigosa, C., Lendoiro, E., Concheiro, M., Cruz, A., López-Rivadulla, M., et al. (2018) Development and validation of a liquid chromatography-tandem mass spectrometry method for the determination of nicotine and its metabolites in placenta and umbilical cord. Drug Testing and Analysis, March 10, 2018: 10.1002/dta.2381.

Oral Fluid:

Desrosiers, N.A. and Huestis, M.A. (2019) Oral Fluid Drug Testing: Analytical Approaches, Issues and Interpretation of Results. Journal of Analytical Toxicology, 43, 415–443.

Veitenheimer, A.M. and Wagner, J.R. (2017) Evaluation of Oral Fluid as a Specimen for DUID. Journal of Analytical Toxicology, 41, 517–522.

Busardò, F.P., Pichini, S., Pellegrini, M., Montana, A., Lo Faro, A.F., Zaami, S., et al. (2018) Correlation between Blood and Oral Fluid Psychoactive Drug Concentrations and Cognitive Impairment in Driving under the Influence of Drugs. Current Neuropharmacology, 16, 84–96.
Lee, D. and Huestis, M.A. (2014) Current knowledge on cannabinoids in oral fluid. Drug Testing and Analysis, 6, 88–111.

Breath:

Hubbard, J.A., Smith, B.E., Sobolesky, P.M., Kim, S., Hoffman, M.A., Stone, J., et al. (2019) Validation of a liquid chromatography tandem mass spectrometry (LC-MS/MS) method to detect cannabinoids in whole blood and breath. Clinical Chemistry and Laboratory Medicine, September 17, 2019: 10.1515/cclm-2019-0600.
Trefz, P., Kamysek, S., Fuchs, P., Sukul, P., Schubert, J.K. and Miekisch, W. (2017) Drug detection in breath: non-invasive assessment of illicit or pharmaceutical drugs. Journal of Breath Research, 11, 024001.
Beck, O., Ullah, S. and Kronstrand, R. (2019) First evaluation of the possibility of testing for drugged driving using exhaled breath sampling. Traffic Injury Prevention, 20, 238–243.
Beck, O. (2014) Exhaled breath for drugs of abuse testing - evaluation in criminal justice settings. Science & Justice: Journal of the Forensic Science Society, 54, 57–60.

Hair:

Kintz, P. (2017) Hair Analysis in Forensic Toxicology: An Updated Review with a Special Focus on Pitfalls. Current Pharmaceutical Design, 23, 5480–5486.
Mantinieks, D., Wright, P., Di Rago, M. and Gerostamoulos, D. (2019) A systematic investigation of forensic hair decontamination procedures and their limitations. Drug Testing and Analysis, 11, 1542–1555.
Ferreira, C., Paulino, C. and Quintas, A. (2019) Extraction Procedures for Hair Forensic Toxicological Analysis: A Mini-Review. Chemical Research in Toxicology, 32, 2367–2381.
Khajuria, H., Nayak, B.P. and Badiye, A. (2018) Toxicological hair analysis: Pre-analytical, analytical and interpretive aspects. Medicine, Science, and the Law, 58, 137–146

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