OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Laboratory Automation

Keyword(s): Laboratory Automation, Robotics, Sample Preparation

Submitting subcommittee(s): Toxicology **Date Approved:** 5/22/20

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

Background Information:

1. Description of research need:

As toxicology laboratories continue to battle increasing and more complex caseloads, we are challenged with maintaining efficiency without access to increased resources. Laboratory automation is readily used in high throughput laboratories analyzing simple specimens (antemortem blood, urine). Automation is less widely adopted in lower volume laboratories and those labs performing analysis of complex matrices (postmortem blood, tissues). Automation should be explored to assess if analytical sensitivity and reproducibility are impacted. Evaluation of automation should also be explored for a multitude of sample preparation stages in a working laboratory.

2. Key bibliographic references relating to this research need:

Stimpfl, T. and Vycudilik, W. (2004) Automatic screening in postmortem toxicology. *Forensic Science International*, **142**, 115–125.

Andersen, D., Rasmussen, B. and Linnet, K. (2012) Validation of a fully automated robotic setup for preparation of whole blood samples for LC-MS toxicology analysis. *Journal of Analytical Toxicology*, **36**, 280–287.

Alexovič, M., Dotsikas, Y., Bober, P. and Sabo, J. (2018) Achievements in robotic automation of solvent extraction and related approaches for bioanalysis of pharmaceuticals. *Journal of Chromatography. B, Analytical Technologies in the Biomedical and Life Sciences*, **1092**, 402–421.

Jiang, H., Cao, H., Zhang, Y. and Fast, D.M. (2012) Systematic evaluation of supported liquid extraction in reducing matrix effect and improving extraction efficiency in LC-MS/MS based bioanalysis for 10 model pharmaceutical compounds. *Journal of Chromatography. B, Analytical Technologies in the Biomedical and Life Sciences*, **891–892**, 71–80.

Ma, J., Shi, J., Le, H., Cho, R., Huang, J.C., Miao, S., et al. (2008) A fully automated plasma protein precipitation sample preparation method for LC-MS/MS bioanalysis. *Journal of Chromatography. B, Analytical Technologies in the Biomedical and Life Sciences*, **862**, 219–226.

Kristoffersen, L., Langødegård, M., Gaare, K.I., Amundsen, I., Terland, M.N. and Strand, D.H. (2018) Determination of 12 commonly found compounds in DUID cases in whole blood using fully

automated supported liquid extraction and UHPLC-MS/MS. *Journal of Chromatography. B, Analytical Technologies in the Biomedical and Life Sciences*, **1093–1094**, 8–23.

Deslandes, G., Grégoire, M., Renaud, C., Monteil-Ganière, C., Azoulay, C., Pineau, A., et al. (2016) Comparison Between an Automated and Manual Extraction for the Determination of Immunosuppressive Drugs Whole Blood Concentrations by Liquid Chromatography Tandem Mass Spectrometry. *Journal of Clinical Laboratory Analysis*, **30**, 924–929.

3a. In what ways would the research results improve current laboratory capabilities?

Automated sample preparation may improve efficiency with regards to time,cost, and number of personnel.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

Automation could improve overall work quality for toxicology cases. Dissemination of automation workflows to the field would benefit agencies that are interested.

3c. In what ways would the research results improve services to the criminal justice system?

Automation can offer improved turnaround time for analysis and reporting.

4. 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.

Approvals:

Subcommittee Approval date: 04/30/2020

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SAC

1. Does the SAC agree with the research need? Yes [X] No [ ]
2. Does the SAC agree with the status assessment? Yes [X] No [ ]

If no, what is the status assessment of the SAC: [ ]

Approval date: 5/22/20

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)