Comparison of Fisher Tissuemiser® and Bullet Blender™ in Homogenizing Meconium for Drug Testing

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Introduction
Meconium, the first stool of a newborn, has been used to detect in utero drug exposure since the 1980’s (1,2). Meconium begins accumulating in the digestive tract of a developing fetus from about 16 weeks of gestation and continues to collect until birth, thus potentially reflecting drug use by the mother over the last trimester of pregnancy (3,4).

The heterogeneity and complexity of the meconium matrix requires homogenization in order to produce a workable specimen for further solid phase extraction and analysis. In our laboratory we have used the Fisher Tissuemiser homogenizer (Thermo Fisher Scientific, Waltham, MA), but this method was time consuming, labor intensive, and presented the opportunity for carryover and repetitive motion injuries. To overcome these issues, we evaluated the Bullet Blender (Next Advance, Averill Park, NY), a vortex/homogenizer that can process up to 24 samples simultaneously. Results for seven drug classes produced with extracts prepared by the two homogenization methods are shown.

Methods

- Fifty-six de-identified patient specimens were homogenized with the Bullet Blender in duplicate.
- Opioids were part of complete method validation and were not run in duplicate.
- Samples were extracted and analyzed using previously validated GC-MS or LC-MS/MS methods.
- Drug analyte concentrations were used to compare equivalence in recovery of analytes between the two homogenization methods and to evaluate reproducibility.

Fisher Tissuemiser

- To a 5 ml polypropylene tube, accurately weigh 1.0 g of meconium.
- Add 2.9 mL of methanol.
- Place the shaft of the Fisher Tissuemiser in the tube and operate for approximately one minute.
- Clean the Fisher Tissuemiser through a series of water and methanol washes and wipe dry to prevent carryover.
- Repeat for all samples.

Bullet Blender

- To a 5 ml polypropylene tube, accurately weigh 1.0 g of meconium.
- Add approximately 1.5 g of 0.9 - 2.0 mm blend stainless steel beads.
- Centrifuge all specimens briefly to force the meconium and stainless steel beads to the bottom.
- Add 2.9 mL of methanol.
- Cap tubes securely and place in Bullet Blender at setting 7 for approximately 5 minutes.
- Verify that all specimens have a uniform appearance. As necessary, place back in the Bullet Blender for another 5 minutes.

Results

- Good correlation and reproducibility were observed between results generated using the two sample preparation methods.
- Differences are most likely attributed to heterogeneity and complexity of the meconium matrix.
- Several samples homogenized with the Bullet Blender demonstrated increased recovery.
- Technologists preferred the Bullet Blender for ergonomics and efficiency.
- The Tissuemiser required approximately one minute of a technologist’s time to adequately homogenize each sample.
- The Bullet Blender homogenized up to 24 samples in 5-8 minutes.

Conclusions

- Both methods homogenized samples completely for use in preparation of meconium for drug testing.
- The Bullet Blender has several advantages. Less labor intensive;
- Less time consuming (especially with larger runs);
- Eliminates the possibility of homogenizer carryover and repetitive motion injuries.

Acknowledgements

Funding, supplies, instrumentation, and physical facilities that were used to conduct this research were provided by the ARUP Institute for Clinical and Experimental Pathology and ARUP Laboratories, Inc. We also thank Next Advance for providing materials and instrumentation to conduct this validation.

References