Streamlined LC-MS/MS Workflows for Drug-Facilitated Crime Investigations

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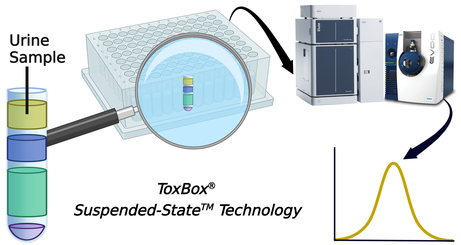
BACKGROUND AND SIGNIFICANCE

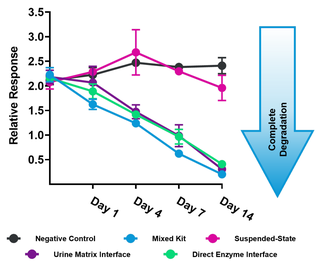
- Drug deaths & overdoses are surging in the U.S. – up 781% since 1999 (National Safety Council)
- Labs are short-staffed & training is time consuming & expensive
- New policies and standards create unsustainable administrative and technical challenges
- Analytical procedures are not streamlined and often require multiple testing platforms
- Current practices are unsustainable and public safety is impacted as backlogs continue to increase

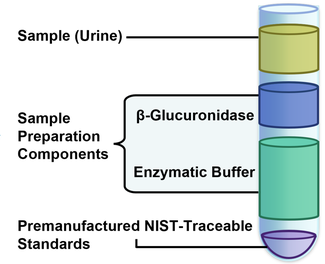
GOAL

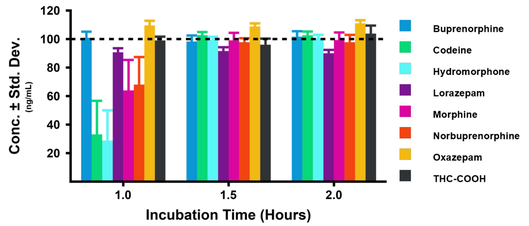
- Create and validate a first of its kind *hands-free* quantitative testing solution for liquid chromatography tandem mass spectrometry (LC-MS/MS) to meet new Academy Standards Board (ASB) standards established for drug-facilitated crime investigations
- Follow ISO17025 accreditation requirements to meet ASB Standard 036 for LC-MS/MS validations that measure accuracy, precision, uncertainty, calibration models, reportable range, sensitivity, specificity, carryover, interference, matrix effect and analyte stability



SUSPENDED-STATE TECHNOLOGY DEVELOPMENT & OPTIMIZATION

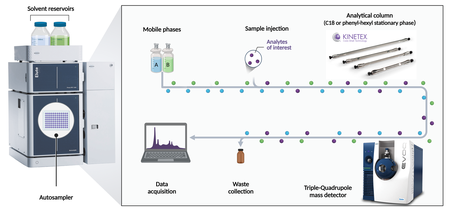




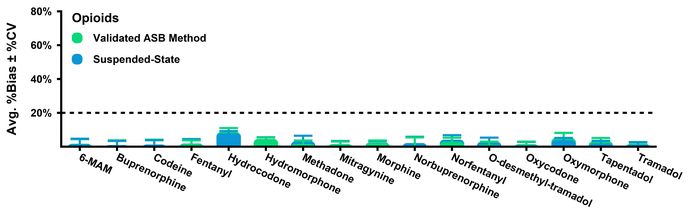


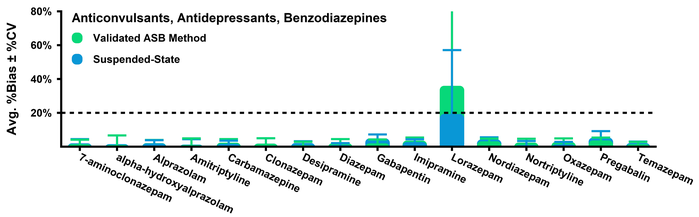
METHODS

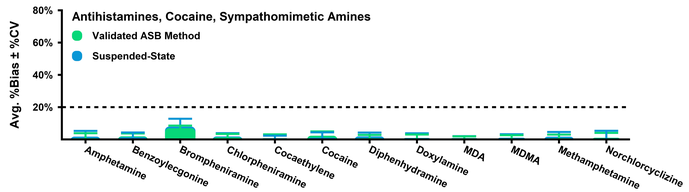
- Entry LC-MS/MS instrumentation commonly used in locally- and state-supported laboratories was optimized to evaluate urine samples processed using ToxBox® forensic test kits designed to meet ASB testing requirements for drug-facilitated crime investigations
- Urine samples were processed with β-D-glucuronidase (B-One, KURA) and extracted with a simplified liquid-liquid extraction procedure
- *Hands-free* ToxBox® kits were manufactured with newly created suspended-state™ technology to stabilize certified reference material and process controls in the presence of β-D-glucuronidase, sample matrix, and reaction buffers
- Suspended-state™ kits that incorporate method reaction components in solid-state with air gaps between phases, were removed from storage, incubated at either ambient temperature or 60°C and assayed using validated methods
- Time-dependent studies were executed to optimize the use of suspended-state™ ToxBox® kits

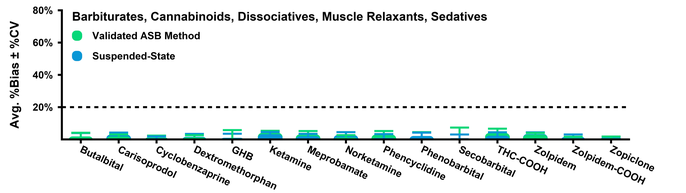


RESULTS









RESULTS & DISCUSSION

- A streamlined LC-MS/MS procedure was validated for drug-facilitated crime investigations and successfully used to test new *hands-free*, suspended-state™ testing technology designed for LC-MS/MS
- Lorazepam confirmation is challenging in the presence of the isobaric clonazepam-d4 internal standard
- Suspended-state™ technology is the first example of a *hands-free* testing application for advanced LC-MS/MS confirmation and quantitative analyses
- Suspended-state™ technology stabilized certified reference standards and process controls for long-term storage at -20°C
- Suspended-state™ technology and the streamlined LC-MS/MS method provide sustainable analytical solutions for locally- and state-funded laboratories
- The new LC-MS/MS is suitable for forensic toxicology testing

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Yes, I, or a member of my immediate family, has a financial interest to disclose. Authors are employees of PinPoint Testing or Phenomenex and their products will be mentioned