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Editorial

Separation Science Tools Serve Forensic Science and Toxicology

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1. Introduction

The pathway to developing routine tools to investigate evidence in forensic laboratories is a challenging and lengthy process. When putting the implications of legal investigations in perspective, one can easily understand why forensic methods undergo such a high level of scrutiny. The results presented in courtroom testimony are a major component of judge and jury decision-making processes, and as such, it is essential that the information communicated be of the highest quality, reliability, and utility. There are a number of processes in place in forensic laboratories to ensure this standard is reached, including laboratory accreditation, scientist training, and certification, method optimization and validation, proficiency testing, quality management systems, incident reporting, communication training, reporting guidelines, and more.

As such, one might argue that method development is quite unique in the lens of the forensic sciences. This section has been launched in recognition that separation science serving the legal system requires rigorous and dedicated efforts to sufficiently prepare new research for routine use. It is our hope that both forensic and toxicological analyses related to legal investigations will be served by contributions to this section, with a focus on use-inspired applications. This requires not only cutting-edge and sound scientific studies to be published, but also evaluation based on the broader impact of the work and its practical implementation within the forensic science landscape.

2. Section Description

The Section "Forensics/Toxins" offers scholars a specific forum for the rapid publication of manuscripts on forensic and toxicological analysis, with special emphasis on new challenges and trends. Currently, techniques such as gas chromatography, liquid chromatography, and capillary electrophoresis are essential to characterize, classify, and quantitate a wide range of analytes in forensic casework and toxicology. Chromatographic methods are also often employed for sample preparation and screening purposes. This section will welcome all original research and reviews that emphasize the importance of chromatographic method development, quality assurance, quality control, validation, and standardization as they relate to forensic and toxicological analyses.

This section is also interested in specific hot topics in the field of forensic and toxicological analysis, including but not limited to:

- emerging separation techniques that improve on conventional analyses
- characterization of novel and emerging analytes
- data processing workflows that improve throughput
- chemometric strategies of chromatographic data
- statistical methods for interpretation or decision-making from data

We are also particularly interested in studies that provide data or commentary on the incorporation of separation techniques in courtroom testimony.

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3. Section Content

To date, this section has collated a number of initial articles which review forensic and toxicological analyses. Within the topic of toxins, some articles have focused on method development and validation for substances that are dangerous to both animals and humans if detected in food and feed. One study focused on the characterization of aflatoxins from *Aspergillus flavus* in sweet corn using high-performance liquid chromatography with fluorescence detection and a post-column photochemical reaction [1]. Another study focused on validating a liquid chromatography—quadrupole time-of-flight mass spectrometry (LC-QTOFMS) method with a simplified extraction for the analysis of 11 polar pesticides in foods of animal origin; this method built upon methods that must currently monitor only a subset of these compounds according to national monitoring regulatory programs [2]. These studies highlight the need for continuing work in developing robust, convenient, and simpler methods for monitoring a range of toxins that can have human health implications.

Within the topic of forensic sciences, so far articles have focused largely on forensic toxicology analyses from biological matrices. One study investigated an accessible, low-cost analysis that minimized solvent usage for the detection of lidocaine in postmortem blood using liquid-liquid extraction (LLE) with gas chromatography—mass spectrometry (GC-MS) [3]. Reducing solvents and exposure to toxic chemicals in sample preparation appears to be a common and emerging theme in forensic toxicology research. For example, Wang et al. published a method to use magnetic nanoparticle solid phase extraction (SPE) and GC-MS to detect 16 synthetic cathinones in human urine that would assist in reducing exposure to chemicals in the sample preparation procedures [4]. The theme of increasing analyte monitoring beyond traditional screening protocols also appears to exist across current Forensics/Toxins topics. For example, Vaiano et al. developed a multi-analyte screening method using LC-MS/MS to investigate 163 total analytes including 120 new psychoactive substances (NPS) with 43 other drugs of interest [5]. Finally, the section accepted its first case report submission which documented a complex drowning case involving a bisoprolol intoxication finding [6]. These studies pave the way for emerging papers that use separation science to solve challenging problems and cases in forensic science. Though case reports are not very common in some other areas of separation science publishing, we expect that case reports on the use of separation techniques in forensic cases will provide authors with an avenue to publish valuable case findings that can further the field of forensic analysis.

Several Special Issues are also currently under development to begin highlighting these important topics and to further define the scope of this section. These various Special Issues focus on topics such as chromatography and mass spectrometry approaches for forensic analysis in criminalistics, including but not limited to drug analysis and toxicology. Through the announcement of this section and these upcoming Special Issues, we hope to expand the topics submitted to the Forensics/Toxins section to focus not only on drug and toxin analysis, but other fields of forensic science relying on separation techniques to understand physical evidence and complex cases.

4. Conclusions

Through its official launch, we hope to broaden the submissions of this section to represent the wide range of forensic and toxicological analyses that contribute to legal investigations. If you believe your work can positively contribute to the areas described above, we encourage you to submit your article to the section and/or one of the Special Issues, or perhaps to propose new topics for Special Issues. Your contributions will help to shape the content of this section and subsequently impact the awareness of the importance of quality separation science within investigations. Ultimately, the works contributed to this section will have an overarching goal of using separation science as a tool to serve justice within our society.

Conflicts of Interest: The author declares no conflict of interest.

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