

The role of analytical chemistry in forensic sciences

Editorial

The word forensic comes from the Latin word *forensis*: public, to the forum or public discussion. A relevant, modern definition of forensic is: *relating to, used in, or suitable to a court of law* (Merriam Webster Dictionary, www.merriam-webster.com). Any science used for the purposes of the law is a forensic science. The forensic sciences are used around the world to resolve civil disputes, to justly enforce criminal laws and government regulations. Forensic scientists may be involved anytime an objective, scientific analysis is needed to find the truth and to seek justice in a legal proceeding. Early on, forensic science became identified with law enforcement and the prosecution of criminal cases - an image enhanced by books, television, and movies. This is misleading because forensic science is objective, unbiased, and applies equally to either side of any criminal, civil, or other legal matter. Forensic investigations involve the discovery and characterization of evidence that can be used to reconstruct a chronology of events associated with the commission of a crime or other matters being adjudicated. As they become available, increasingly sophisticated analytical tools and methods are being employed to detect and discriminate evidence.

Multiply hyphenated techniques, such as gas chromatography/mass spectrometry with retention time locking (GC/MS/RTL), liquid chromatography/time-of-flight mass spectrometry (LC/MS/TOF), micro fluidic-based capillary electrophoretic analysis of mitochondrial DNA (mtDNA), and laser ablation inductively coupled plasma mass spectrometry (LA/ICP/MS), are able to uncover forensically germane information by providing unprecedented levels of analytical selectivity and sensitivity, extracting genetic signatures from previously overlooked biological sources, and sequentially micro deconstructing samples so as to map the spatial variation and concentration of elemental constituents. These new ranges of information and rich data sets can contribute facts crucial to the reconstruction of events and thereby increase the probability of an accurate finding in the matters under investigation. The term forensic science is associated with the application of analytical tools and techniques in the discovery of evidence deemed relevant in the investigation of a crime or in some other legal proceeding. Sources of evidence may be biological samples from persons living or dead, physical objects and their disposition, deposited trace materials, alteration or disruption of a setting, as well as circumstantial references connecting these data. The evolving power and sophistication of analytical instrumentation has made it possible to perform forensic investigations at ever smaller size scales with greater sensitivity and finer ranges of differentiation.

As a result, it is now possible to routinely uncover evidence formerly indiscernible or inaccessible. Analytical chemistry is the science that addresses methods used to determine the quantitative or qualitative composition of unknown samples. Although frequently neglected, the nature of the sample and the use of the analytical chemical information play important roles in selecting and executing the appropriate chemical analysis technique. Forensic chemistry is a

Volume 4 Issue 5 - 2017

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Received: April 11, 2017 | **Published:** May 08, 2017

timely subject that serves as a palette from which we can stimulate the interests and abilities of our students. One of the most important aspects of criminal justice is forensic science, or the practice of scientifically examining physical evidence collected from the scene of a crime or a person of interest in a crime. Many people consider forensic science the application of science to law enforcement. Two of the most common crimes that are determined in the forensic science lab are drug-related crimes and sex crimes. It is in the crime lab that the chemical makeup of an unidentified substance recovered from a suspect is determined to be cocaine, marijuana or a controlled substance. This is used as evidence in court to prove that a person was in possession of illegal drugs.

Forensic toxicology can determine if a person was drunk behind the wheel of a car after a fatal accident, or if someone was poisoned to death. DNA evidence recovered from a victim's body can help determine who was responsible for a physical or sexual assault. This evidence is commonly used in court to put sex offenders and child molesters behind bars, and to set innocent people free. The role of analytical science in forensic investigations is becoming increasingly important due to the major developments in analytical chemistry and advances in molecular biology. Forensic Science involves the analysis of biological chemical or physical samples collected as evidence during a criminal investigation. The key problem solving and analytical skills developed in forensic & analytical science are widely sought after in many other industrial sectors including the oil, gas, pharmaceutical and food industries. The skills of the forensic scientist provide crucial scientific evidence which may link a suspect with the scene of the crime, the victim or the weapon.

Acknowledgments

None.

Conflicts of interest

The author declares there are no conflicts of interest.