Comparing Methods of the Analytical Analysis of Substances in Forensic Toxicology

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Introduction

The job of a forensic toxicologist is to apply methods of toxicology (specifically substance analysis) and using those methods to determine toxicity levels of different substances that could have caused harm to the human body. The substances analyzed by forensic scientists can range anywhere from drugs of abuse to new designer drugs to pharmaceuticals.

The analysis' made by these forensic scientists can be extremely crucial to criminal investigations, therefore it's important that they have the best possible methods to retrieve the most accurate results possible.

Background and Literature Review

Forensic science has become an integral part of the justice system in determining cause of death and analyzing samples from the body (White 2016). In the last decade and further, one of the popular methods of analysis of these substances found used high pressure liquid chromatography (LC) couple with mass spectrometry (MS) because of its high sensitivity and high productivity (Favretto 2013). Even though this is a great method of analysis, the matrix effect tends to be a recurring problem.

On the other hand, a new method of analysis came into play; this is known as DART-MS (direct analysis in real time mass spectrometry). This method allows for analysis of a large variety of substances (regardless of gas, solid, or liquid phase) in "real time" with little preparation of the analyte. (Pavlovich 2018). Through my research, I plan on testing these two methods against each other to determine which method gives more accurate results with the greatest amount of efficiency.

Research Question

It is important than scientists in the field of forensic toxicology use the best methods of analysis for their work, so that they achieve the most accurate results in the least amount of time possible My question is: Is DART-MS a more efficient and accurate method of analytical analysis compared to LC-MS in the field of forensic toxicology?

Method

I will be comparing two different methods of analysis of determining unknown substances. I will begin by using standard procedures of LC-MS and identify about 3 unknown substances obtained from an approved list from the chemistry department and record approximately how long it take me to identify the substance and how accurate I was compared to accepted literature values. I will then repeat these same steps with the DART-MS machine and compare the results I get from both methods.

Expected Conclusions

I am expecting the DART-MS method to be more accurate and more efficient method of analysis. Based on the research I've done, it seems to be the easiest method to work with and requires the least amount of analyte preparation, creating less room for problems with a common obstacle in substance analysis, the matrix effect.

Although if performed with accuracy, I believe the LC-MS approach will produce just as accurate data as the DART-MS, but it will take more time and effort.

Significance

This research is important because it's important for forensic scientists to get timely data, but still stay accurate for criminal cases, especially if the data needs to be taken to court to confirm cause of death for a person. This research would help further determine which method of analysis is the best option for other forensic scientists.

References

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