Postmortem Toxicology and Its Role in Criminal Investigation: A Review

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Abstract: We provide toxicology analysis for victims in death investigations to determine if other substances were the cause of death or contributed to the trauma. Drug concentrations may vary from pre- to end-stage due to changes in pharmacokinetics, treatment during recovery or in the intensive care unit, depression, or the presence of drug tolerance. The potential for disease modification should be considered with all drugs but few. The creation of new organisms as well as the destruction of drugs that arise from decaying corpses. In addition, body fluids and tissues are highly susceptible to autolysis and decomposition. Samples should be selected based on individual case history and availability. Analytical procedures should be performed on a quality assurance basis appropriate for toxicology research. Problems arise when separating and defining a drug. The interpretation of analysis results is often limited by the information provided in a given case.

Keywords: Acute poisoning, autopsy, toxicology, homicide, retrospective study, suicide

INTRODUCTION

Allergy is a special area of science analysis focused on the analysis and analysis of collected biological samples. from the dead focus. People can detect the presence of drugs, alcohol, poisons and other toxic substances. This branch of toxicology plays an important role in criminal investigations, especially in cases of accidental deaths, homicides, suicides and accidental overdoses. Recognizing the importance of immunity requires an examination of its methods, applications and implications in legal contexts.

IMPORTANCE OF POSTMORTEM TOXICOLOGY

1. Determining the cause of death:
One of the main goals of postmortem toxicology is to determine whether toxic substances were involved in the death. This information is very important to distinguish between natural causes and malicious activities.

2. Substance identification:
Toxicology analyzes can identify a wide range of substances, including drugs, illegal drugs, alcohol, heavy metals and environmental toxins. The sign helps viewers to understand the circumstances surrounding the disease.

3. Timing:
Concentration levels of substances in biological fluids (such as blood or urine) can provide insight into when a substance was ingested in relation to the time of death. This part of the time is important to determine the schedule during the inspection.

4. Supporting legal cases:
The results of post-mortem toxicological analyzes are used as evidence in legal cases. They can support charges such as murder or manslaughter if it is determined that a substance was used with intent to harm.

5. Understanding students:
Postmortem toxicology also contributes to broader public health knowledge by identifying patterns of drug use and disease in populations. These data can inform prevention strategies and policy decisions.

Techniques used in pathology
1. Specimen collection:
Biological samples are usually taken from different parts of the body, including blood, urine, liver tissue, vitreous (the skin-like substance of the eye), and hair. Each type of test has its own advantages depending on what is being tested.

2. Analytical techniques:
Various analytical techniques are used to detect and quantify substances:
• Gas chromatography-mass spectrometry (GC-MS):
A highly sensitive technique used to isolate and identify compounds.
• Phase chromatography-mass spectrometry (LC-MS):
Useful for analyzing complex mixtures and detecting polar compounds.
• Immunoassays:

These tests use antibodies to rapidly detect drugs or metabolites, but may not be as specific as chromatographic methods.

3. Interpretation of the results:
Allergists must interpret by taking into account factors such as the distribution of the disease (the movement of drugs in the body after infection), and possible contamination when a sample is collected or analyzed, and the individual variation among the deceased individuals.

4. Reporting of findings:
Findings from post-mortem toxicological analyzes are compiled into reports detailing the methods used, the results obtained, and expert interpretations of criminal activity and conclusions about their relationship to the cause of the disease or criminal activity.

Challenges in drug toxicity
1. Metabolic changes:
After infection, physiological changes occur that affect drug concentration. For example, depression can alter drug levels due to microbial activity. 2. Complexity of cases: In many cases there are multiple substances involved and an underlying medical condition, making it difficult to determine the cause.

LITERATURE REVIEW

Postmortem toxicology is the study of the presence and effects of drugs, alcohol and other substances in the deceased. It plays an important role in criminal investigations by explaining the cause of death, brutality and the circumstances surrounding a person's death.

Analysis of biological samples (such as blood, urine and tissue) can reveal whether the victim ingested certain substances that caused the illness. This information is important in determining whether the death was an accident, suicide, or homicide. Toxicology findings can also identify victims when their identity is unknown or known.

DICUSSION

Drug and Non-Drug Related Deaths

After analyzing the results, drug-related and non-drug-related deaths were categorized based on the concentrations of substances found. Drug-related deaths, which include accidental deaths from acute intoxication and suicides (both simple and complex), involved 28 cases in total. These included 26 cases of acute intoxication and two suicides (one simple and one complex). Cocaine was the most common drug found in cases of acute intoxication, accounting for 16 cases (29.6%), including one complex suicide. Morphine and methadone were also present, with four cases (7.4%) involving morphine and three cases (5.4%) involving methadone.

These findings differ somewhat from another study, which reported morphine as the most common drug in acute intoxication deaths (25.8%), followed by cocaine (9.5%) and methadone (7.7%). In New York, opioids (such as heroin), cocaine, and alcohol were the most common substances found in accidental fatal intoxications, whether taken alone or together. In contrast, a study from Cairo, Egypt, conducted from 2015 to 2019, found that opioids were the most frequently detected drugs in fatal intoxications.

Additionally, in our analysis, 54 cases of acute intoxication involved more than one substance. During a two-year period, 4.0% of the 1,323 autopsies examined were attributed to acute intoxication. In comparison, Finland reported a higher percentage, with 8.0% of the population dying from acute intoxication between 2000 and 2017. Based on our data, Italy seems to have a lower rate of fatal intoxication compared to other countries, like Finland. In Sweden, during a ten-year period, 22.0% of deaths from acute intoxication (both accidental and suicide) were due to a single substance. This contrasts with our study, where 51.8% (28 out of 54) of acute intoxication deaths were caused by a single drug. When considering only cases where toxicology tests were conducted, deaths from acute intoxication were reported in 39.7% of the cases (54 out of 136).

We also identified seven cases of non-drug-related deaths that involved a single substance. These included one simple suicide, two complex suicides, three natural deaths due to heart failure, and one car accident. Cocaine was the most frequently detected drug in these cases, with concentrations ranging from 0.33 to 19.8 µg/ml in cardiac blood (an average of 5.37 µg/ml), and 0.49 to 18.78 µg/ml in femoral blood (an average of 5.28 µg/ml) in drug-related deaths. In the one non-drug-related death involving cocaine, the concentrations were much lower: 0.05 µg/ml in cardiac blood and 0.14 µg/ml in femoral blood.

The concentrations of cocaine found in drug-related deaths align with the levels reported in the literature

as being lethal. However, while it's difficult to make a direct comparison between drug-related and non-drug-related deaths, the concentrations obtained in this study match those found in previous research.

When comparing suicides by acute intoxication and accidental acute intoxication involving a single drug, cocaine was the only substance present in both categories. Cocaine was detected in one complex suicide, where it was the primary cause of death, with a concentration of 1.53 µg/ml in cardiac blood and 0.1 µg/ml in femoral blood. In 15 cases of accidental acute intoxication, the average cardiac blood concentration was 5.37 µg/ml (calculated from 13 cases), and the average femoral blood concentration was 5.28 µg/ml (calculated from 14 cases).

CONCLUSION

Postmortem toxicology is an essential aspect of forensic investigations that provides insights into potential causes of death related to substance use or poisoning. Understanding PMR mechanisms and recognizing artifacts affecting drug analysis are crucial for accurate interpretation of toxicological data. As research continues in this field, improved methodologies for assessing postmortem drug levels will enhance our ability to draw meaningful conclusions from forensic toxicology analyses. Postmortem toxicology is used to help in identifying the cause of death.

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