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Research Article **Published Date:- 2025-07-14**

Impact of Rainy Environments on Nitrate Ion Detection in Post-blast Soil Analysis: A Forensic Study

The forensic identification of nitrate ions in post-blast pit soil samples is crucial for investigating nitrate-based explosive incidents owing to environmental factors such as rainfall and monsoon conditions, which can significantly alter the concentration and distribution of nitrate residues at blast sites, as nitrate ions are completely soluble in water. This study investigated the influence of rainfall on the retention and detectability of nitrate ions in pit soil collected from spiked simulated explosive samples, replicating the topographical conditions of hilly regions frequently impacted by insurgent and terrorist activities. Ion Chromatography (IC), a highly sensitive and selective analytical technique, was employed to quantify nitrate ion concentrations within the soil matrix. This study aimed to elucidate the mobility, leaching behavior, and retention of nitrate ions in soils affected by blast under natural drizzling rainfall conditions.

Case Report **Published Date:- 2025-07-04**

Acute Gas Toxicity at Work: A Tale of Two Cases with Review of Literature

Hydrogen sulphide [H2S] is created when sewage material breaks down. The well-known "rotten egg" odour is linked to H2S at low quantities. It is a colourless and odourless gas that, at greater quantities, can cause cerebral and respiratory depression, fast unconsciousness, and impending death. As a sad occupational accident, worker deaths in septic tanks or sewage systems are not unusual in medico-legal practice.
Death is attributed to poisoning with hazardous gases, particularly hydrogen sulphide, but the depletion of oxygen in the air due to an excess of carbon dioxide is not mentioned. Colleague fatalities are frequently linked to deaths in similar situations. Two tragic accidents that resulted in victim deaths are detailed in this paper. Here, the morphological findings—pulmonary diseases, submucosal/sub-serosal congested haemorrhage, and discolouration from postmortem staining—were discovered in both cases.
A detailed scene investigation about the potential for life-threatening H2S poisoning for the assistants, the characteristic rotten egg smell that may be detected on the corpses, and the previously described morphological results should be the foundation for any suspicion of a deadly H2S poisoning. A qualitative and, if feasible, quantitative study of H2S should be performed to confirm the diagnosis.

Review Article **Published Date:- 2025-07-04**

Challenges in Y-DNA Recovery from Fabric: Effects of Environmental Degradation and Implications for Forensic Casework

Y-chromosomal DNA (Y-DNA) testing plays a critical role in forensic investigations involving male suspects, especially when traditional autosomal DNA evidence is insufficient or degraded. This review explores how different environmental factors—such as heat, moisture, Ultraviolet (UV) exposure, and microbial activity—impact the ability to recover Y-DNA from fabrics commonly found at crime scenes, including cotton, polyester, and denim. The study found that longer exposure to harsh environments, especially humidity and UV radiation, led to a sharp drop in the amount and quality of recoverable Y-DNA. The type of fabric also influenced results, with cotton generally retaining more DNA than synthetic materials like polyester. These findings reinforce the need for quick evidence collection and proper storage to preserve the integrity of Y-DNA. Several real-world cases are highlighted where Y-DNA analysis provided clear forensic outcomes, especially when autosomal DNA failed due to issues like allelic dropout—where one or more genetic markers fail to appear during testing—or secondary transfer, which occurs when DNA is unintentionally passed from one surface or person to another. In such cases, Y-DNA profiling was crucial in narrowing down or identifying male suspects, particularly when other forms of DNA were inconclusive. This review underscores the unique value of Y-DNA analysis in situations involving degraded or limited biological material and calls for the development of better recovery techniques to improve success in challenging forensic contexts.

Research Article **Published Date:- 2025-07-03**

Developing an Explainable AI System for Digital Forensics: Enhancing Trust and Transparency in Flagging Events for Legal Evidence

Advanced forensic approaches are necessary to handle digital crimes, as they must provide transparent methods that foster trust and enable interpretable evidence in judicial investigations. The current black-box machine learning models deployed in traditional digital forensics tools accomplish their tasks effectively yet fail to meet legal standards for admission in court because they lack proper explainability.

This study creates an Explainable Artificial Intelligence (XAI) system for digital forensics to improve flagging events as legal evidence by establishing high levels of trust and transparency. A digital evidence system employs interpretable machine learning models together with investigative analysis techniques for the detection and classification of computer-based irregularities, which generate clear explanations of the observed anomalies.

The system employs three techniques, including SHAP (Shapley Additive Explanations) alongside LIME (Local Interpretable Model-agnostic Explanations) and counterfactual reasoning to deliver understandable explanations about forensic findings, thus enhancing investigation clarity for law enforcement agents and attorneys as well as stakeholder professionals.

The system performs successfully on actual digital forensic datasets, thus boosting investigation speed while minimizing false alerts and improving forensic decision explanations. The system must demonstrate GDPR and digital evidence admission framework compliance to maintain legal and ethical correctness for usage in court procedures.

Forensic digital investigations need explainable Artificial Intelligence as an essential integration for creating reliable and legally sound practices.