



**CONTEMPORARY METHODS FOR ESTABLISHING THE CAUSE OF DEATH IN
FORENSIC MEDICINE**

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Abstract: Forensic medicine represents a vital applied medical discipline that provides scientifically justified conclusions for judicial and investigative practice. This article presents an original analytical overview of classical and innovative methods used in determining the cause of death. Emphasis is placed on the integrated use of forensic autopsy, toxicological screening, histopathological examination, and molecular-genetic techniques. The diagnostic value, practical relevance, and limitations of each method are discussed, demonstrating the necessity of a comprehensive forensic approach.

Keywords: forensic medicine, cause of death determination, forensic autopsy, toxicological analysis, histopathology, DNA profiling

Introduction

The determination of the cause of death is one of the central tasks of forensic medicine and has direct legal significance. Unlike clinical medicine, forensic practice often deals with incomplete information, atypical presentations, and externally influenced death mechanisms. Therefore, forensic experts must rely on objective morphological, laboratory, and instrumental findings. Continuous development of diagnostic technologies has significantly expanded the possibilities of forensic investigations, improving both accuracy and evidentiary value.

Core Sections

1. Role of Forensic Autopsy in Death Investigation

The forensic autopsy remains the cornerstone of postmortem examination. It enables systematic assessment of external signs, internal organ pathology, and injury patterns. Through detailed macroscopic analysis, experts can identify lethal trauma, natural disease processes, or combined mechanisms of death. Importantly, autopsy findings often guide the selection of additional laboratory and instrumental examinations, making it a pivotal stage of forensic analysis.

2. Importance of Toxicological Analysis

Toxicological investigations are essential in cases where chemical substances, medications, or alcohol may have contributed to death. Advanced analytical methods allow detection of substances even in minimal concentrations, including metabolites. Interpretation of toxicological results requires correlation with autopsy findings and case circumstances, as the presence of a substance alone does not necessarily indicate causality.

3. Histopathological Examination



Histopathology provides microscopic confirmation of pathological processes and injury vitality. This method is particularly valuable for diagnosing early myocardial infarction, inflammatory reactions, hypoxia-related tissue damage, and subtle traumatic changes. Histological evidence strengthens forensic conclusions by revealing processes that may not be macroscopically apparent.

4. Application of Molecular and Genetic Techniques

Molecular-genetic methods have significantly expanded forensic capabilities. DNA profiling is routinely applied for personal identification and biological trace analysis. In selected cases, genetic testing may also contribute to identifying inherited cardiac or metabolic disorders associated with sudden unexplained death, thereby refining the determination of death causation.

Discussion

No single forensic method can independently provide a definitive conclusion regarding the cause of death. Reliable forensic diagnosis is achieved only through the integration of morphological findings, laboratory data, and investigative information. A multidisciplinary approach minimizes diagnostic errors and enhances the scientific validity of expert opinions presented in court.

Conclusion

Modern forensic medicine relies on a holistic diagnostic strategy that combines autopsy findings with toxicological, histological, and molecular analyses. Such an approach ensures objective determination of the cause of death and supports the legal system with well-founded medical expertise. Ongoing methodological advancements will continue to improve the precision and reliability of forensic investigations.

References

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