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EDITORIAL

Postmortem biochemistry: Current perspectives and the road ahead

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Thanato-biochemistry or postmortem biochemistry is a comprehensive speciality study of biochemistry in which fluids and tissues retrieved from the human corpse are subjected to qualitative and quantitative estimation of desirable biochemical parameters. The field of postmortem biochemistry has started evolving in the last few decades. The conventional autopsy practice relies on the morphological findings observed during necropsy. At many occasions, the aid of pathology and forensic science laboratories is taken for histochemical examination and chemical analysis, respectively. The analysis of the biochemical parameters from the post mortem body samples can offer intensive help in assessing the derangements in the functional, biological and molecular parameters, which are not observed in the traditional method of autopsy conduction.

There are various forensically significant conditions, including myocardial ischemia, sepsis, inflammation, infection, anaphylaxis, where the biochemical analysis of specimens from the dead bodies can aid in the determination of the cause of death.[1] The presence of beta-hydroxybutyrate and acetone in the post mortem fluid samples can be a valued finding in deaths related to alcohol intoxication and diabetes.[2, 3]

Depending upon the situation, the sample requirements may include a variety of body fluids and tissues like heart-whole blood (right ventricle), peripheral whole blood, jugular vein whole blood, pericardial fluid gastric contents, urine vitreous humor, cerebrospinal fluid, synovial fluid, liver/other tissues and scene residues. Samples like heart-whole blood and jugular vein whole blood can only be subjected to qualitative toxicological analysis. The vitreous humor sample finds a special mention in the literature and is the preferred sample compared to the blood samples. The vitreous fluid is relatively less affected by the changes of decomposition. Additionally, due to the anatomical protection of eye sockets, vitreous fluid is less susceptible to the issues of microbial contamination and diffusion of analytes from the abdominal and thoracic cavities. Other than the postmortem interval estimation, the vitreous humour fluid has been utilized in postmortem diagnosis of saltwater drowning, heat shock and chronic alcohol abuse.[4] Interestingly, recently, the vitreous humor fluid has been studied to estimate postmortem interval at the crime scene.[5]

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The postmortem biomarkers may vary significantly between cases due to various factors such as pre-existent illnesses, the cause of mortality, complications, the period of survival, and cadaveric changes in the distribution and localization of analytes.[6] The issues like contamination, late recovery, and hemolysis remain to pose trouble for interpreting results. Additionally, most of the reference values of analytes are those from the live subjects and not for the hemolyzed samples retained from the dead individuals. Samples like vitreous humour, pericardial fluid, etc., are seldom available from the live subjects to determine their reference values which is a key to method validation.[7] The qualitative interpretation of endogenous biochemical substrates can become more challenging in forensic autopsies where there is the involvement of xenobiotics like sodium chloride, insulin and various poisons, which may mimic the chemical constitution of endogenous substances.[8]

The recent work on thanatobiochemistry has concentrated on various biomarkers like C reactive proteins, Ferritin, T3 (fT3), T4 (fT4), Thyroglobulin, S100 calcium-binding protein B, Neuron-Specific Enolase, GFAP, Glial fibrillary acidic protein, Human liver-type fatty acid-binding protein, and catecholamines for qualitative evaluations in deaths associated with short and long agonal periods.[9] Newer diagnostic advancements like electrochemiluminescent immunoassay, lateral flow immunoassay, inductively coupled plasma-mass spectrometry, liquid-chromatography-mass spectrometry, low/high-resolution liquid chromatography-mass spectrometryography-mass spectrometry, hollow fibre liquid-phase microextraction coupled with liquid chromatography, mass spectrometry, electrochemiluminometric assay, chemiluminescence immunoassay, CD-linked antibody immunosorbent assay, etc have introduced a new revolution in the postmortem quantitative estimation of analytes.

Since the infrastructural requirements for qualitative and quantitative analysis of postmortem samples require both machines and human resources, intradepartmental collaboration plays a vital role. The need of the hour is to do more research in postmortem biochemistry, which will help in availing credible postmortem reference values of biological samples.

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