



H180 Electrolytes, Glucose, and Lactate in Postmortem Blood (BL), Vitreous Humor (VH), and Synovial Fluid (SF): A Comprehensive Study

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Learning Overview: After attending this presentation, attendees will better understand the comparative and correlation study of sodium, potassium, chloride, magnesium, glucose, and lactate levels in postmortem BL, VH, and SF of the same subject as well as the correlation study between the constituent concentrations in the fluids and various factors, including gender, age, body height, body weight, body mass index, and Postmortem Interval (PMI), the essential basic knowledge that can fill the current gap in intelligence about using the biochemical substance levels in the fluids to solve any forensic issues in daily practice or further research.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by serving as essential knowledge of postmortem investigation of sodium, potassium, chloride, magnesium, glucose, and lactate levels in BL, VH, and SF for forensic applications that have been challenging the forensic community worldwide.

In forensics, sodium, potassium, chloride, magnesium, glucose, and lactate levels in certain human body fluids have been demonstrated to change over time since death. However, there is still controversy regarding their changes in the fluids, and no studies have explored their levels in postmortem BL, VH, and SF simultaneously. Thus, such changes were investigated in the fluids of 52 forensic autopsy cases with an intact body, no metabolic disorders, and no functional or structural abnormality of the eyes or knees, who were autopsied within 15 hours after death. This study also compared and correlated the values from the fluids and determined the effects of gender, age, body height, body weight, Body Mass Index (BMI), and PMI on the parameter concentrations.

Study results showed that BL potassium, magnesium, glucose, and lactate values were significantly higher than the VH and SF values. The opposite pattern was seen for VH sodium levels and VH and SF chloride levels ($p < 0.001$), where SF sodium values were equivalent to the BL values. VH and SF sodium, potassium, chloride, and lactate values had significant relationships with the BL values ($p < 0.05$), but not for magnesium and glucose values. BL potassium and magnesium levels were significantly higher in men than in women, but the opposite pattern was seen with BL chloride levels ($p < 0.05$). Only SF magnesium levels had a negative correlation with the body height of the decedents ($p < 0.05$). This study also found positive linear correlations between BL, VH, and SF potassium concentrations and the PMI as well as between VH and SF lactate concentrations and the PMI, but negative correlations with the PMI for BL sodium, BL chloride, and VH glucose concentrations ($p < 0.05$). Among these relationships, VH potassium has the strongest correlation with PMI ($r = 0.67$, $R^2 = 0.45$), followed by BL potassium ($r = 0.56$, $R^2 = 0.32$) and SF potassium ($r = 0.49$, $R^2 = 0.24$) with respective high prediction index. The parameters that change over the PMI are unreliable indicators of antemortem levels unless the samples are obtained very shortly after death. In addition, the low rates of change of certain parameters with low predictability of PMI make them of very limited use in estimating the PMI. Other parameters served better as biomarkers of underlying conditions or causes of death. The variable effects of the state of the decedents, such as gender and body height, should also be taken into account whenever considering the use of certain biochemical substances for application to specific issues in forensic practice.

Postmortem Biochemistry, Postmortem Chemistry, Thanatochemistry