

Postmortem redistribution of 12 drugs and/or metabolites in humans: Important variables that might be influencing the central blood/peripheral blood ratio.

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Introduction: Interpretation of the results of quantitative analyses in postmortem cases is challenging. Time and site dependent variations in postmortem drug concentrations occur as a result of postmortem redistribution (PMR). An often-used marker for the occurrence of PMR, is the cardiac blood concentration/peripheral blood concentration ratio (C/P ratio) of a drug. We investigated the relationship between up to 15 variables (age, attempted resuscitation, Body Mass Index (BMI), cause of death, drug concentration, grade of decomposition, history of use, hospital admission, intoxication, postmortem interval, position of the corpse at discovery, route of administration, season, sex, trauma) and the C/P ratios of 12 drugs and/or metabolites (divided into 3 separate studies), in order to provide insights that might assist in the interpretation of quantitative results in forensic casework.

Method: Toxicological results of postmortem cases investigated by the Netherlands Forensic Institute between January 1 2010 and July 31 2020 were reviewed. Cases were selected if quantification in both femoral blood and cardiac blood was performed for at least one of the 12 investigated drugs and/or metabolites. C/P ratios were determined for all 342 selected cases. In addition, for all 106 cocaine positive cases metabolite/cocaine ratios were determined. Ratios were compared between subgroups by performing either a Mann-Whitney *U* test or a Kruskal-Wallis test followed by post-hoc Mann-Whitney *U* test.

Results: The amphetamine C/P ratio was significantly lower in cases with a high amphetamine concentration in femoral blood (quartile 4) compared to cases with a low amphetamine concentration in femoral blood (quartiles 1 and 2). The MDA C/P ratio was significantly higher in cases where trauma was the cause of death compared to cases where intoxication was the cause of death and significantly lower in cases where resuscitation was attempted compared to cases where no resuscitation was attempted. The C/P ratio of ecgonine methyl ester (EME) was significantly higher in trauma cases compared to non-trauma cases. The EME/cocaine ratio was significantly higher in the BMI 18.5 – 25.0 kg/m² subgroup compared to the BMI >25 kg/m² subgroup.

Conclusion: When interpreting postmortem toxicological results, it might prove useful to take the above-mentioned variables into account.