Description for the general public

The purpose of the project is to study behavior of various psychoactive drugs in human bone marrow. This alternative material, despite its advantage of being one of the best protected from putrefaction part of human body, is still not regarded as a reliable source of toxicological data. This is due to not satisfactory amount of studies of drugs in marrow.

Basing on properties of psychoactive drugs, such as hydrophobicity, it is sometimes possible to derive some basic assumptions regarding their behavior in marrow. Despite that, it is still impossible to predict with good accuracy, which drugs will be incorporated in bone marrow or if their concentrations in marrow and blood will be correlated. This is related to the lack of understanding of the mechanisms of xenobiotics' incorporation, distribution and transformation in the bone marrow. During the course of the project, many cases will be examined. This will enable to derive conclusions regarding behavior of psychoactive drugs in marrow.

The project will be divided into several parts. The first one is analysis of drugs' distribution in human bone marrow. For this part of the study, marrow collected from different bones, namely right and left femur, sternum and rib, will be examined separately and the xenobiotics' concentrations for each type of bone marrow will be compared. This part is particularly important, because to this day there are no widely approved recommendations for bone marrow analysis. The results will enable investigation of differences between various bones and choosing the best one for toxicological analysis. This study will be also helpful for elucidating drugs' behavior in marrow.

The second part is assessment of correlations between xenobiotics' concentrations in blood and all studied marrow types and between vitreous humor and all studied marrow types. Such a correlation would make it possible to obtain drugs concentrations in blood in cases when this material will be unavailable, e.g. in cases of exhumation or catastrophes.

The next part is examination of xenobiotics' stability in bone marrow samples during storage at -20°C. For this part, all types of marrow will be stored for a week, a month and a year. The xenobiotics' concentrations after these periods will be compared with the results obtained after receiving the samples.

The last goal is prediction of possible metabolites of considered drugs, that might be present in post mortem material. For this purpose, a proper software, able to simulate different metabolic processes, will be used.

For drugs isolation and quantification, modern techniques will be used. For sample preparation, solid phase microextraction (SPME) and microwave-assisted extraction (MAE) will be applied, while for sample analysis two different techniques: capillary electrophoresis coupled with mass spectrometry (mSPME-CE-MS) and liquid chromatography coupled with tandem mass spectrometry (MAE-LC-MS/MS) will be used.

The project will encourage other groups to examine this biological material as a potential alternative matrix for toxicological analysis. The studies will elucidate, for which drugs marrow is a good depot and when it would be possible to drive conclusions about blood concentrations of a given drug, when only bones are obtainable for the analysis.

The project will be a good starting point for further research. Its results might make it possible to predict behavior of yet unexamined in marrow xenobiotics, basing on the results obtained for other, similar substances.