B65 The Identification of Fine Plastic Materials by Thermal Desorption and Pyrolysis Combined With Direct Analysis in Real Time-Mass Spectrometry (TDP/DART®-MS)

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After attending this presentation, attendees will understand the value of TDP/DART®-MS for the rapid identification of minute plastic materials. This analysis method does not require any sample pre-treatment, such as solvent extraction.

This presentation will impact the forensic science community by explaining how TDP/DART®-MS can be effectively applied as an identification of minute plastic materials, such as synthetic fibers.

Drugs present in biological and autopsy specimens cannot be detected without first selecting the pretreatment and analytical conditions appropriate for the drugs. Thus, it is extremely important to investigate the analytical conditions suitable for specific compounds and samples; however, in recent years, due to the situation in which new substances appear one after another, including New Psychoactive Substances (NPS) that threaten society, it is very difficult to examine individually the analytical conditions that are appropriate for each new substance. Thus, a comprehensive analysis system for drugs that requires minimal investigation of pretreatment and analytical conditions is greatly desired. This study is investigating an analytical method for directly analyzing drugs in blood that does not require any pretreatment. In a previous study, by using TDP/DART®-MS for drugs in urine, each drug was separated and detected through thermal gradient heating for all drugs.[1] The detected ions were correctly identified according to their measured accurate mass and product ion spectra. Moreover, for the quantitative analysis, the calibration curves were prepared with urine-added drugs at concentrations ranging from 0.01μg/ml to 1μg/ml, and the curves were linear in that range; however, the detection sensitivity was not satisfactory, and this study sought higher sensitivity. In this presentation, the results of the investigation to improve the detection intensity of drugs will be described.

The samples were standard drug-mixture solutions and drug-mixtures loaded blood and urine (i.e., blank blood and urine samples with several types drug mixtures added). Mass spectra were obtained by using a quadrupole Time-Of-Flight (qTOF) MS equipped with a DART® ion source and a TDP unit. The TDP unit was mounted between the DART® ion source and the MS. Mass spectra were measured in positive-ion mode as the samples were heated from ambient temperature to 300ºC. Additionally, in order to improve the detection intensity, the solvent extraction for deproteinization treat and the analysis systems were investigated. For the investigation of solvent extraction for deproteinization treat, Ethanol (EtOH), Methanol (MeOH), and Acetonitrile (ACN) were used. For the investigation of the analysis system, the glass tee-tube (the HOOD) between an ion source and a qTOF was attached. This glass tee-tube can work to prevent the diffusion of volatilized drugs from the blood samples.

As a result of the investigation of solvent extraction for deproteinization treat, the highest sensitivity was attained using ACN. In addition, when using the HOOD, the peak areas of the extracted ion current gram of each drug were increased. It is concluded that the volatilized drugs had been ionized more efficiently by attaching the HOOD. Also, it is concluded that the sensitivity is further increased by increasing the heating rate of the samples.

Reference(s):

1. Hiroko A. et al. Forensic Drug Analysis by Thermal Desorption and Pyrolysis Combined With Direct Analysis in Real Time-Mass Spectrometry (TDP/DART®-MS). *Proceedings of the American Academy of Forensic Sciences*, 69th Annual Scientific Meeting, New Orleans, LA. 2017.

Identification of Plastics, TDP/DART®-MS, Adhesive Tape