[ID-P#154] Detergent poisoning: Detection of surfactants in biological samples via liquid chromatography time-of-flight mass spectrometry

Yuji Fujita[ab], Kiyotaka Usui[c], Yasuhisa Fujino[a], Tomohiko Mase[a]

[a]Department of Critical Care and Disaster Medicine, Iwate Medical University School of Medicine, [b]Poisoning and Drug Laboratory Division, Critical Care and Emergency Center, Iwate Medical University Hospital, [c]Division of Forensic Medicine, Tohoku University Graduate School of Medicine

Background: Surfactants have unique structures containing both hydrophilic and hydrophobic moieties. Surfactants are widely used in various products such as laundry detergents, pesticides, foods, pharmaceuticals, and cosmetics because of their properties. Surfactant poisoning has been reported in many clinical cases; however, analysis of surfactants in biological samples is often ignored. In this study, we performed the toxicological analysis of a patient who ingested a laundry detergent, identified the toxic agent of the surfactant, and estimated the metabolites of the surfactant.

Method: Surfactant analysis was performed through liquid chromatography time-of-flight mass spectrometry. The mass spectrometer was operated in positive and negative electrospray ionization modes. The analysis samples were a laundry detergent product ingested by the patient, gastric content, serum, and urine.

Results: The laundry detergent product and gastric contents mainly contained nonionic surfactant polyoxyalkylene alkyl ether (POEPOPAE, alkyl: C12, polyoxyethylene (EO): 12-25, polyoxypropylene (PO): 2-6). Additionally, nonionic surfactant polyoxyethylene alkyl ether (POEAE, alkyl: C12, EO: 1-14) was detected. The serum sample contained POEPOPAE (alkyl: C12, EO: 10-25, PO:1-4), POEAE
(alkyl: C12, EO: 8-25), and anion surfactant polyoxyethylene alkyl ether carboxylate (POEAEC, alkyl: C12, EO: 5-23). The urine sample contained POEPOPAE (alkyl: C12, EO: 16-25, PO: 1-2), POEAE (alkyl: C12, EO: 17-26), and POEAEC (alkyl: C12, EO:
13-23). For POEPOPAE and POEAE, the addition polymerization of EO and PO in the serum and urine was different from that in the product and gastric content samples. POEAEC was not detected in the product or gastric contents. The surfactants detected in the serum and urine appeared to be POEPOPAE metabolites.

Conclusions: The analytical data on surfactant poisoning may provide useful information for the toxicological assessment of surfactants for clinical purposes.