K21 Fatal Cases of Aconitum Alkaloids Poisoning in Korea

Sujin Jeong, MS, 139 Jiyang-ro Yangcheon-gu, Seoul, Korea 158-707, KOREA; Seungkyung Baeck, PhD*, 139 Jiyang-ro Yangcheon-gu, Seoul, Korea 158-707, KOREA; Sangki Lee, PhD*, 139 Jiyang-ro Yangchun-gu, Seoul, Korea , KOREA; Hee-Sun Chung, PhD*, 1402-703 Mokdong Apt, Shunjung-dong, Yangchon-ku, Seoul, Seoul 158-774, KOREA*

After attending this presentation, attendees will gain knowledge regarding concentration levels in fatal cases of aconite poisoning and detection methods.

This presentation will impact the forensic science community by showing how this method was successfully applied to detect aconitines in various specimens of related aconitum alkaloids poisoning cases.

Aconitum alkaloids have been occasionally used in Korean herbal medicine because of pharmacological effects such as analgesic, anti-epileptic, and anti-inflammatory, but they can lead to sudden death by their cardiotoxins and neurotoxins. In traditional medicine, aconite roots are used only after processing to reduce the toxic alkaloid content. Soaking and boiling during processing will hydrolyze aconite alkaloids into less toxic and non-toxic derivatives; however, the use of a larger-than-recommended dose and inadequate processing increases the risk of poisoning. Every year, several causes of death were contributed to aconite toxicity. The high levels of toxicity of aconite are considered to be derived from aconitine, mesaconitine, and hypaconitine. The lethal dose of aconitine in human adults is estimated to be only 1mg – 4mg.

There have been reported cases of homicide, suicide, and accidental ingestion. Severe aconite poisoning can occur after accidental ingestion of wild plants or consumption of herbal decoction-made aconite roots. Some fatal cases were caused by unrefined herbal medicine prepared from aconite. Aconitum alkaloids have been indentified in various samples such as traditional prescribed herbal medicine, aconite infusion water, aconite liquor, wild greens mixed aconite, and their biological specimens from five cases related to aconite poisoning this year.

A rapid, specific, and sensitive Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) method was developed for simultaneous identification of aconitine, mesaconitine, and hypaconitine. The determination of aconitum alkaloids in specimens was performed by LC/MS/MS after liquid-liquid extraction using trimipramine-d3 as an internal standard. Samples of each, 1mL or 1g, were extracted with 5mL of ethyl acetate in alkali of NH_4OH. The organic layer was dried with a stream of nitrogen at 45°C. The residues were reconstituted with methanol and injected into LC/MS/MS. The separation was applied on Agilent XDB C18 column (1.8 micron, 4.6×50 mm). The injection volume was 5µL and the retention time was less than 8 minutes. A gradient elution of acetonitrile and water of 0.1M ammonium formate and 0.1% formic acid were used as mobile phase. Flow rate was 0.4mL/min. LC/MS/MS system (ABSciex, ABI 3200QTrap) coupled with an Electrospray Ionization (ESI) source was performed in multiple reaction monitoring(MRM) mode. The transitions of the Aconitum alkaloids executed as follows: m/z 646.3→586.0 for aconitine, m/z 632.3→572.4 for mesaconitine, m/z 616.3→556.3 for hypaconitine, and m/z 298.3→103.0 for trimipramine-d3 as internal standard. This method was successfully applied to detect aconitines in specimens. The validation results of selectivity, matrix effect, recovery, linearity, intra- and inter-assay precision, and accuracy were satisfactory.

It is well known that aconite poisoning can cause various symptoms, including arrhythmia and death, but specific autopsy findings are not configurative. There is a potential risk to overlook the death by aconite ingestion without advance information. When given more information about the scene, this method is useful to investigate aconite poisoning. At the same time, the public should be warned of the danger of eating wild plants and be educated on the potential hazards from self treatment with aconite root. In addition, it is necessary to have institutional restrictions on aconite medicine.

Aconitine, Fatality, LC/MS/MS

 ** Presenting Author*