K67 Circumstances, Postmortem Findings, and Toxicology in a Series of Methoxyacetylfentanyl-Related Deaths

Robert Kronstrand, PhD, National Board of Forensic Medicine, Linkoping, Ostergotland SE 587 58, SWEDEN; Svante Vikingsson, PhD, National Board of Forensic Medicine, Linkoping 58758, SWEDEN*

Learning Overview: The goal of this presentation is to increase the knowledge of the toxicology of Methoxyacetylfentanyl (MAF) by providing quantitative data in postmortem cases and discuss cases of fatal intoxications.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing the awareness of new non-routine drugs, the toxicology of MAF, and provide an insight into the postmortem findings.

MAF is a fentanyl analog, with replacement of the propionamide group by a 2-methoxyacetamide group. MAF is also closely structurally related to ocfentanil (having an additional fluorine in the 2-position on the aniline ring structure). In Europe, MAF became available in late 2016. The first death in Sweden occurred on December 3, 2016. MAF was scheduled as a hazardous product prohibited for sale in Sweden on January 25, 2017, and later that year, on October 19, scheduled as a narcotic drug. This study reports the circumstances, postmortem findings, and toxicological findings in 11 deaths related to the intake of MAF.

Quantification of MAF in femoral blood was performed on an LC-30AD liquid chromatography system equipped with a Triple Quad 4500 mass spectrometer. Mobile phases A (0.05% formic acid in 10mM ammonium formate) and B (0.05% formic acid in methanol) were used at a flow rate of 0.8mL/min; the linear gradient was from 2% B to 100% B in 3.0min. An Acquity® BEH Phenyl column (60°C) was used. Electrospray in positive mode was used for ionization. Data acquisition with two transitions for MAF with *m/z* 353.20/188.10 as quantifier and *m/z* 353.20/105.10 as qualifier was used with D5-fentanyl as the internal standard (m/z 342.0/188.0). A 0.5g aliquot of blood was fortified with internal standard and precipitated with 0.75mL of acetonitrile:ethanol (90:10) with the addition of 0.075% formic acid.

The 11 decedents were aged 27 to 41 years (mean 32.5), with one female and ten males. The manner of death was accidental in seven cases, natural disease in one case, and undetermined in three cases. The cause of death was intoxication by MAF alone (*N*=7) or in combination with other drugs in all but one case, where death was attributed to acute complications of an underlying heart disease but with possible contribution from MAF. Significant postmortem findings that pointed toward opiate toxicity were lung congestion and lung and brain edema with a mean combined lung weight of 1,469 grams. Three subjects also presented with froth in the airways. There were few other significant findings, but pneumonia, hepatitis, and atherosclerosis of varying degrees were pathologies found. At least eight of the decedents had a history of drug abuse, and all but two were found dead indoors. One subject was found alive but in respiratory and cardiac arrest. At the hospital, the patient presented with RLS8 and an MAF concentration of 41ng/g. During hospitalization, the patient never regained consciousness and also developed acute kidney injury. The MAF concentrations in femoral blood ranged between 18–140ng/g with a mean of 47ng/g and a median of 34ng/g. In the literature, there are ten cases reported from the United States and three cases from Denmark where MAF was quantified in femoral blood. Concentrations were 22, 23, and 56 (ng/g) in the Danish cases and ranged between 0.21–39.9 (ng/mL) in those reported from the United States (mean 17.7ng/mL). Polydrug use was confirmed from toxicological analyses in all cases, but no other non-prescription opioids were present. Benzodiazepines (alprazolam, clonazepam, and diazepam) as well as the non-prescription norfludiazepam and etizolam were present, together with numerous other prescription drugs and the scheduled drugs amphetamine and tetrahydrocannabinol. At least three different routes of administration were suggested from the death scene findings: injection, oral administration of tablets, and snorting. The deaths occurred between December 2016 and May 2018, both prior to and after scheduling of MAF in Sweden.

The concentrations of MAF were in the upper concentration range compared to those previously reported in femoral blood and contribute to previous knowledge of fatal concentrations. Polydrug use was common but not necessarily an acute contributing factor. Since most deaths were accidental and unwitnessed, a possible risk factor is the use of MAF alone. The scheduling of MAF did not preclude its use.

Methoxyacetylfentanyl (MAF), New Psychoactive Drugs, Fatal Intoxication