

A Fatal Poisoning Involving 2-Fluorofentanyl

Mette Findal Andreasen*¹, Tore Forsingdal Hardlei¹, Ingrid Rosendal¹, Asser Hedegaard Thomsen¹, Mogens Johannsen¹ and Eva Sædder²

¹Department of Forensic Medicine, Aarhus University, Denmark.
²Department of Clinical Pharmacology, Aarhus University Hospital, Denmark.

*mfa@forens.au.dk



INTRODUCTION

A fatal intoxication involving 2-fluorofentanyl, a potent synthetic opioid analgesic, is reported. This is the first serious case associated with 2-fluorofentanyl that to our knowledge has been reported. 2-fluorofentanyl is the common name for N-(2-fluorophenyl)-N-[1-(2-phenylethyl)-4-piperidinyl]propanamide (fig. 1).



Fig. 1. 2-fluorofentanyl

It is a new illegal substance on the drug scene, as the first reports on this drug in Europe appeared in Denmark in march 2016 [EDND]. In the present case from Denmark, a 23-year-old male was found dead in his apartment on March 16th 2016, approximately 3 days after being seen alive. A small plastic bag with approx. 1 g of white powder was found in the waist of his pants. Medico-legal autopsy was performed on the deceased and peripheral whole blood, bile, liver tissue, muscle tissue and gastric content samples were submitted for toxicological examination.

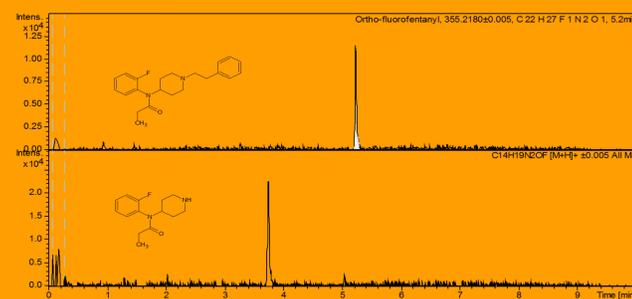


Fig. 2. **Upper chromatogram;** extracted ion chromatograms of 2-fluorofentanyl (ortho-fluorofentanyl) (C₂₂H₂₇FN₂O) from a protein precipitated blood sample acquired by UPLC-HR-TOFMS. **Lower chromatogram;** extracted ion chromatogram of a proposed metabolite of 2-fluorofentanyl ("norfluorofentanyl", C₁₄H₁₉FN₂O) from a protein precipitated blood sample acquired by UPLC-HR-TOFMS.



METHODS AND RESULTS

All samples were screened using ultra-performance liquid chromatography high-resolution time-of-flight mass spectrometry (UPLC-HR-TOFMS) and quantified with specific UPLC-MS/MS methods. Powder recovered from the scene of death was identified using gas chromatography–mass spectrometry (GC-MS), UPLC-HR-TOFMS and Nuclear Magnetic Resonance (NMR) (¹H, ¹⁹F and ¹³C).

- The powder found at the scene of death was identified to be 2-fluorofentanyl.
- The autopsy findings were consistent with acute poisoning.
- 2-fluorofentanyl was detected using UPLC-HR-TOFMS in all matrices collected from the autopsy (fig.1)
- Post-mortem femoral blood concentrations found were:

Substance	Concentration	Method used	Comments
2-fluorofentanyl	0.012 mg/kg	UPLC-MS/MS	
alcohol	0.2 ‰	HSGC-FID	likely post-mortem production
buprenorphine	0.0004 mg/kg	UPLC-MS/MS	prescribed
quetiapine	0.088 mg/kg	UPLC-MS/MS	prescribed
venlafaxine	0.089 mg/kg	UPLC-MS/MS	prescribed
o-desmethylvenlafaxine	0.31 mg/kg	UPLC-MS/MS	metabolite of prescribed drug

DISCUSSION

Initially, the drug was identified as parafluorofentanyl, as this drug is included in our routine screening libraries. However, as this drug has been banned for years in most parts of the world and because it is not possible to buy it on internet shops, we thought that the drug could be one of the isomers (ortho or meta). Our screening methods (UPLC-HR-TOFMS and GC-MS) are not able to distinguish between these isomers. However, luckily the deceased had a small plastic bag in his pants, thus NMR (¹H, ¹⁹F and ¹³C) analysis could be performed the material. These results showed that the drug was 2-fluorofentanyl (ortho-fluorofentanyl).

A metabolite probably "nor-fluorofentanyl" (C₁₄H₁₉FN₂O) was found in the blood (fig. 2). We also looked for other metabolites; "hydroxyfluorofentanyl" (C₂₂H₂₇FN₂O₂), "hydroxynorfluoro-fentanyl" (C₁₄H₁₉FN₂O₂) and "despropionylfluorofentanyl" (C₁₉H₂₃FN₂O). However, none of these was detected. The decedent had a history of drug abuse and we assume the drug was snorted as no syringe was found at the scene of death.

CONCLUSION

Based on the toxicological findings, the cause of death was determined to be a fatal overdose with 2-fluorofentanyl.

2-fluorofentanyl is a very potent and dangerous drug. The powder found at the scene of death was nearly pure, thus making it easy to cause a fatal intoxication.

To our knowledge, the present abstract reports the first quantification of 2-fluorofentanyl in biological specimens in a fatal intoxication.

