



K55 The Persistence of 3-Methylfentanyl (3-MF) in Pennsylvania

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Learning Overview: After attending this presentation, attendees will be able to describe the resurgence of 3-MF in forensic casework between 2016 and 2019, after a nearly 30-year hiatus in Pennsylvania.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by detailing trends regarding the reappearance of 3-MF, including change in positivity over time, demographics, and quantitative data from casework, which will all highlight the unique regional reach of this compound as well as the challenges related to the toxicological confirmation of 3-MF.

In recent years, novel analogs of fentanyl primarily shipped from China have flooded the recreational drug market, but not all emerging substances are newly encountered variants. 3-MF, one of the most potent opioids detected to date, was first encountered in 1979 when it was tied to 100 overdose deaths in California; it was colloquially referred to as “China White.” Two separate incidents of Pennsylvania production were noted in the 1980s. In 1985, the Drug Enforcement Administration (DEA) arrested a chemist for producing and selling 3-MF in Delaware, and in 1988, a second chemist from western Pennsylvania was identified as the source of the drug, which was a factor in 18 fatal overdoses in Allegheny County. Following a nearly 30-year hiatus, in early 2016, 3-MF was reported in seized drug exhibits and drug-related overdose death toxicology tests results from Allegheny and Philadelphia Counties. By 2017, nine total states (Delaware, Maryland, Michigan, New Jersey, New York, Ohio, Pennsylvania, Virginia, and West Virginia) reported 3-MF seizures to NFLIS, with Ohio and Pennsylvania reporting the greatest amounts.

With the reappearance of 3-MF in drug seizures, a toxicological assay was required to confirm its presence in biological specimens. Toxicological analysis of 3-MF has presented significant challenges to toxicology laboratories, due to its potency and presence of its enantiomeric pairs, (\pm)*cis* and (\pm)*trans*-3MF. Confirmatory testing has improved over time with ultimately separation and quantitation of *cis* and *trans*-3MF becoming available late 2017 with a reporting limit of 0.05ng/mL using Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS).

Between 2016 and the first half of 2019, 206 blood samples have confirmed positive for the presence of 3-MF. In 2016, 35 cases were reported, which increased to 93 in 2017, dropping to 64 in 2018, and finally to 14 cases during the first half of 2019. These blood samples originated from eight different states (Delaware, Michigan, New Jersey, New York, Ohio, Pennsylvania, Vermont, and West Virginia), with Pennsylvania accounting for 89% of the positives. Within Pennsylvania, 25 different counties reported 3-MF in forensic casework; Montgomery County alone reported 34% of the positives. The toxicology positivity data largely correlates with the geographical distribution of the drug seizure data. Of the 200 cases reporting gender, 70% of the cases involved males while 30% involved females. Age was reported in 184 cases; the average age of an individual involved in a 3-MF case was 35±11 years old, with a reported age range of 1–62 years old.

3-MF has been confirmed in both Driving Under the Influence (DUID) and Postmortem (PM) investigation casework. It has been reported in 29 DUID cases; 10 cases reported 3-MF qualitatively or as a sum of the enantiomers, while 19 cases include isomeric quantitation. Ninety death investigation cases have reported 3-MF isomeric quantitation. A comparison of concentrations for DUID and PM casework is shown in Table 1.

Blood Cases		<i>Cis</i> -3MF (ng/mL)	<i>Trans</i> -3MF (ng/mL)
DUID	N	19	14
	Average (\pm SD)	0.35±0.24	0.15±0.066
	Range	0.080-1.1	0.05-0.29
PM	N	89	76
	Average(\pm SD)	0.87±1.1	0.36±0.40
	Range	0.060-7.2	0.051-2.2

Table 1: *Cis* and *trans*-3MF blood concentrations in DUID and PM casework

3-MF is a highly potent fentanyl analog that is analytically challenging, since it presents itself in two enantiomeric pairs. (\pm)*Cis*-3-MF is 16 times more potent than fentanyl, and is typically present in higher concentrations than the (\pm) *trans*-3MF isomer. It has reappeared in the limited geographical area of Pennsylvania and neighboring states. The limited geographical distribution raises the possibility of local production, reminiscent of the 1980s, as opposed to importation from China.

3-Methylfentanyl, NPS, Fentalog