K24 2017 Novel Illicit Opioids: Trends and Toxicological Insights

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After attending this presentation, attendees will be able to describe the changes in novel illicit opioid positivity in forensic casework over a 6- to 12-month time period in 2017.

This presentation will impact the forensic science community by detailing trends in the use of novel illicit opioids in 2017, including change in positivity over time, user demographics, and quantitative data from casework, all of which underscore the need for comprehensive toxicological testing with a dynamic scope for novel opioids and vigilance by investigators, forensic scientists, and legislators.

Novel illicit opioids are a major component of the opioid epidemic that has become a major public health crisis. Increased misuse and diversion of pharmaceutical fentanyl in the early 2000s has given way to exponential growth since 2013 with the appearance of illicitly synthesized fentanyl and the introduction of additional novel illicit opioids, such as U-47700, furanyl fentanyl, and carfentanil, which have subsequently been identified in toxicological casework. Toxicological identification involved either Liquid Chromatography/Time Of Flight (LC/TOF) or fentanyl-based immunoassay screening and targeted confirmations using Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) or a Gas Chromatography/Mass Spectrometry (GC/MS) database match.

Positivity data was obtained from toxicology casework (death investigation, impaired driving, and hospital admissions) in which the commonly encountered novel opioids furanyl fentanyl, U-47700, carfentanil, butyryl fentanyl, para-Fluoroisobutyryl Fentanyl (FIBF), and acryl fentanyl were detected in blood samples (Table 1). Percent positivity indicates the proportion, relative to the totals for these drugs encountered by month.

	January		**February**		**March**		**April**		**May**		**June**		**TOTAL**
	N	%Pos	N	%Pos	N	%Pos	N	%Pos	N	%Pos	N	%Pos	
Furanyl Fentanyl	122	41.4	178	49.3	164	39.0	114	39.6	120	33.7	90	28.1	**788**
U-47700	34	11.5	31	8.6	53	12.6	47	16.3	68	19.1	45	14.1	**278**
Carfentanil	79	26.8	51	14.1	31	7.4	46	16.0	51	14.3	73	22.8	**331**
Butyryl Fentanyl*	6	2.0	17	4.7	45	10.7	18	6.3	23	6.5	7	2.2	**116**
FIBF*	34	11.5	28	7.8	55	13.1	29	10.1	63	17.7	80	25.0	**289**
Acryl Fentanyl	20	6.8	56	15.5	72	17.1	34	11.8	31	8.7	25	7.8	**238**
TOTAL	**295**		**361**		**420**		**288**		**356**		**320**		**2040**

Table 1: *Change in positivity from January 2017 to June 2017.*

**%Pos = %Positivity for month specified. *Butyryl Fentanyl and FIBF are not differentiated from their isomers isobutyryl fentanyl and para-fluorobutyryl fentanyl, respectively.*

During the same time period, a total of 5,589 fentanyl cases were encountered, in addition to 2,458 cases containing the heroin metabolite 6-monoactylmorphine. Carfentanil, furanyl fentanyl, and U-47700 became popular in 2016 and maintained popularity in 2017. Positivity of furanyl fentanyl has been declining as positivity for acryl fentanyl and FIBF have been increasing from 6.8% to 7.8%, and 11.5% to 25%, respectively, in casework between January and June. Several other fentanyl variants are also being detected in toxicology casework to a lesser extent. 3-methyl fentanyl has continued to be seen (70+ detections total) in 2017, after re-appearing in 2016 following a roughly 30-year hiatus. There have also been sporadic detections of valeryl fentanyl (*n*=1), 4-methoxybutyryl fentanyl (*n*=1), and fluoro fentanyl analogs (*n*=20). An additional "U" series compound, U-49900, has been confirmed in two postmortem cases and both cases were also positive for Tetrahydrofuran Fentanyl (THF-F), a new fentanyl derivative first seen in 2017. Additionally, methoxyacetyl fentanyl (*n*=7) and cyclopropyl fentanyl (*n*=1) are being detected with increasing frequency as of July 2017.

These new substances challenge the forensic toxicology and chemistry communities because they pose all the same risks of routine opioids while going undetected. The data also illustrates the short cycle time of many of these drugs as they can come and go before a toxicology laboratory can develop and validate a method for their detection. In addition, the potency of these derivatives and correspondingly low concentrations in biological fluids challenge the capabilities of routine analytical methodology, forcing laboratories to seek new technologies to keep abreast of the trends.

Novel illicit opioids have been confirmed by the reporting laboratory in 42 states and Canada. Although certain states, especially the Northeast United States, have greater prevalence for certain compounds, they are not isolated to one part of the country. The forensic science community in general needs to be aware of the impact of novel illicit opioids.

Opioids, Novel Psychoactive Substances, Methoxyacetyl Fentanyl