Trends in Fentanyl Analysis in Workplace Urine Drug Testing at CRL

INTRODUCTION

Fentanyl began its dramatic impact on the opioid epidemic around 2013, and since 2021 has turned this public health emergency into a polysubstance overdose crisis. Combined with other drugs, fentanyl boosts potency and causes fatalities at lower than expected doses. The United States Center for Disease Control (CDC) and Drug Enforcement Administration (DEA) have reported that fentanyl has contributed to an estimated 70% of more than 300,000 overdose deaths in the US over the last three years. CRL began providing urine fentanyl analysis to clients in 2006, but increasing fentanyl abuse has caused more employers to add fentanyl to their standard workplace testing panels.

OBJECTIVE

Explore trends in fentanyl analysis in workplace urine drug testing through examining positivity rates, reasons for test, and concurrence of fentanyl positive results with other drugs of abuse.

METHODS

CRL tests for fentanyl and its metabolite norfentanyl in urine through enzyme immunoassay (EIA) screening with confirmation of all presumptive positives by HPLC-MS/MS. Cutoff concentrations for both screening and confirmation are variable by client, with screening cutoffs most commonly at 1.0 ng/mL, followed by 0.5 ng/mL, and confirmation cutoffs most commonly 0.5 ng/mL, followed by 1.0 ng/mL. For this study, demographic information and reported results for workplace urine drug testing samples analyzed at CRL from January 2022 to January 2024 were reviewed; specimens tested through professional monitoring programs, parole and probation groups, and rehabilitation services were omitted. Either fentanyl or norfentanyl concentrations greater than the cutoff were considered a positive reported result.

RESULTS / DISCUSSION

Figure A: Urine Fentanyl and Norfentanyl Confirmation Status (n=4779)

Fentanyl/Norfentanyl Positive: 1978, 41%

> Fentanyl Positive, **Norfentanyl Negative:** 1586, 33%

For almost 5,000 workplace urine drug testing specimens screening positive by immunoassay, the overall confirmation rate was 87%. Reported positives were comprised of 41% of samples testing greater than cutoff for both fentanyl and norfentanyl, 33% testing positive for fentanyl and less than cutoff for norfentanyl, and 13% testing below cutoff for fentanyl but positive for norfentanyl. See Figure A.

Norfentanyl Positive,

Fentanyl Negative:

595, 12%



Median positive values for fentanyl and norfentanyl were 12.6 ng/mL and 40.0 ng/mL, respectively. Mean positive results were 257.5 ng/mL for fentanyl and 1025.4 ng/mL for norfentanyl. Maximum concentrations were 36,199 ng/mL for fentanyl and 52,595 ng/mL for norfentanyl. See Figure B.

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Table 1: Number of Single and Polydrug Positives by Collection Reason									
		FOLLOW-UP	NOT SPECIFIED	OTHER	POST ACCIDENT	PRE-EMPLOYMENT	RANDOM	REASONABLE CAUSE	RETURN TO DUTY
	5+	16	11	11	1	1	100	15	0
	4	13	22	24	1	3	123	19	0
	3	23	54	79	4	13	300	48	0
	2	47	71	102	5	34	444	86	4
	1	37	69	170	8	54	598	81	3
	0	51	71	240	22	123	828	115	10



CONCLUSION

The typical detection window for fentanyl and norfentanyl in urine is 2-4 days, but can extend past 7 days depending on dosage, frequency of use, and testing methodology. The high confirmation rate for fentanyl in workplace urine drug testing at CRL indicates the importance of this testing for workplace safety; with the majority of workplace urine drug tests being conducted as pre-employment screens, the number of fentanyl positives generated from random drug tests was alarming. Trends in concurrent drug use with fentanyl were supported by the numbers of polydrug positives observed, especially the combinations with stimulants like amphetamine and methamphetamine. Fentanyl-opiate combination positives were lower than expected, considering the prevalence of fentanyl-adulterated heroin and counterfeit prescription opioid pills. This study indicates that workplace urine fentanyl testing results reflect current patterns of concern in the opioid epidemic. CRL offers 1600 testing panels that include fentanyl, providing various cutoffs and accompanying analytes. With no foreseeable decline in fentanyl distribution and abuse, it is essential for employers to recognize the importance of fentanyl testing to workplace safety.

REFERENCES

U.S. Department of Justice, Drug Enforcement Administration. Drug Enforcement Administration National Drug Threat Assessment 2024. Feb/May 2024. DEA-DCT-DIR-010-24. https://www.dea.gov/sites/default/files/2024-07/2024%20NDTA-updated%207.5.2024.pd Spencer M.R., Miniño A.M., Warner M. Drug overdose deaths in the United States, 2001–2021. NCHS Data Brief, no 457. Hyattsville, MD: National Center for Health Statistics. 2022. DOI: https://dx.doi.org/ 10.15620/cdc:122556. Spencer M.R, Warner M., Cisewski J.A., Miniño A., Dodds D., Perera J., Ahmad F.B. Estimates of drug overdose deaths involving fentanyl, methamphetamine, cocaine, heroin, and oxycodone: United States, 2021. Vital Statistics Rapid Release; no 27. Hyattsville, MD: National Center for Health Statistics. May 2023. DOI: https://dx.doi.org/ 10.15620/cdc:125504 OuickStats: Age-Adjusted Drug Overdose Death Rates, by State — United States, 2022, MMWR Morb Mortal Wkly Rep 2024; 73;708, DOI: http://dx.doi.org/10.15585/mmwr.mm7332 National Center for Health Statistics. CDC WONDER. Provisional mortality data. 2022 Ahmad FB, Cisewski JA, Rossen LM, Sutton P. Provisional drug overdose death counts. National Center for Health Statistics. 2023. Available at https://www.cdc.gov/nchs/nvss/ vsrr/drug-overdose-data.htm Friedman, J., Bourgois, P., Godvin, M., Chavez, A., Pacheco, L., Segovia, L.A., Beletsky, L., Arredondo, J. The introduction of fentanyl on the US-Mexico border: An ethnographic account triangulated with drug checking data from Tijuana. International Journal of Drug Policy, Volume 104, 2022, 103678, ISSN 0955-3959, https://doi.org/10.1016/j.drugpo.2022.103678 Shover, C.L., Falasinnu, T.O., Dwver, C.L., Benitez Santos, N., Cunningham, N.J., Freedman, R.B., Vest, N.A., Humphrevs, K. Steep increases in fentanyl-related mortality west of the Mississippi River: Recent evidence from county and state surveillance. Drug and Alcohol Dependence Vol 216, 2020, 108314, ISSN 0376-8716, https://doi.org/10.1016/j.drugalcdep.2020.108314. hover, C.L., Friedman, J.R., Ruby Romero, R., Jimenez, S., Beltran, J., Garcia, C., Goodman-Meza, D. Leveraging pooled medical examiner records to surveil complex and emerging patterns of polysubstance use in the United States. International Journal of Drug Policy, 2024, 104397, ISSN 0955-3959, https://doi.org/10.1016/j.drugpo.2024.104397 Huhn, A.S., Hobelmann, J.G., Oyler, G.A., Strain, E.C. Protracted renal clearance of fentanyl in persons with opioid use disorder. Drug and alcohol dependence, Vol 214, September 2020, 108147, https://doi.org/10.1016/i.drugalcdep.2020.108147 Kiefer, M.K., Cowen, J., Hinely, K.A., Rood, K.M. Prolonged detection of urine norfentanyl in individuals enrolled in a medication for opioid use disorder in pregnancy and postpartum program: a case series. AJOG Global Reports, Vol 4, Issue 2, 2024, 100313, ISSN 2666-5778 nttps://doi.org/10.1016/i.xagr.2024.10031 S. Chapter One - Advances in fentanyl testing, Ed(s): Makowski, G.S. Advances in Clinical Chemistry, Elsevier, Vol 116, 2023, Pages 1-30, ISSN 0065-2423, ISBN 9780443192920, https://doi.org/10.1016/bs.acc.2023.05.004 Stanley, T.H. The History and Development of the Fentanyl Series. Journal of Pain and Symptom Management Vol 7 No. 3 (Suppl.) April 1992, Pages S3-S7, ISSN 0885-3924, https://doi.org/10.1016/0885-3924 (92)90047-I Fentanyl and analogues. LverTox. 16 Oct 2017. Archived from original 7 Jan 2017. Ret 14 Dec 2017 https://web.archive.org/web/20170107002718/https://livertox.nlm.nih.gov/FentanylAndAnalogues.htm Overdose deaths from fentanyl laced stimulants have risen 50-fold since 2010. https://www.uclahealth.org/news/overdose-deaths-fentanyl-laced-stimulants-have-risen-50-fold riedman J., Shover C.L. Charting the fourth wave: Geographic, temporal, race/ethnicity and demographic trends in polysubstance fentanyl overdose deaths in the United States, 2010–2021. Addiction. 2023; 118(12): 2477–2485. https://doi.org/10.1111/add.16318 Substance Abuse and Mental Health Services Administration. SAMHSA Overdose Prevention and Response Toolkit. Publication No. PEP23-03-00-001. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2023. overdose-prevention-response-kit-pep23-03-00-001.pd Maucione, S., WYPR, KFF Health News. Fentanyl mixed with cocaine or meth is driving the '4th wave' of the overdose crisis. (2023). https://www.npr.org/sections/health-shots/2023/09/14/1199396794/fentanyl-mixed-with-cocaine-or-meth-is-driving-the-4th-wave-of-the-overdose-crisis. Arditi, L. Stimulant users caught up in fatal 'fourth wave' of opioid epidemic. (2024). https://www.npr.org/sections/shots-health-news/2024/07/09/nx-s1-5015243/stimulant-users-meth-cocaine-coke-in-overdose-fourth-wave-opioid-epidemic Payer, D.E., Young, M.M., Maloney-Hall, B., Mill, C., Leclerc, P., Buxton, J., the Canadian Community Epidemiology Network on Drug Use, & the National Drug Checking Working Group. (2020). Adulterants, contaminants and co-occurring substances in drugs on the illegal market Canada: An analysis of data from drug seizures, drug checking and urine toxicology. Ottawa, Ont.: Canadian Centre on Substance Use and Addiction. https://www.ccsa.ca/sites/default/files/2020-04/CCSA-CCENDU-Adulterants-Co-occurring-Substances-in-Drugs-Canada Report-2020-en.pdf Spencer M.R., Miniño A.M., Garnett M.F. Co-involvement of opioids in drug overdose deaths involving cocaine and psychostimulants, 2011–2021, NCHS Data Brief, no 474, Hyattsville, MD: National Center for Health Statistics, 2023. https://www.cdc.gov/nchs/products/databriefs/db474.htm Bazazi, A.R., Low, P., Gomez, B.O. et al. Overdose from Unintentional Fentanyl Use when Intending to Use a Non-opioid Substance: An Analysis of Medically Attended Op

American Medical Association. AMA Overdose Epidemic Report 2023. https://www.ama-assn.org/system/files/ama-overdose-epidemic-report.pdf

Ciccarone D. The rise of illicit fentanyls, stimulants and the fourth wave of the opioid overdose crisis. Current opinion in psychiatry, Vol 34(4), 2021, 344–350. https://doi.org/10.1097/YCO.0000000

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