Fentanyl Analog ELISA Kits for Forensic Drug Detection

Fentanyl Background

Fentanyl and its analogs are some of the most potent synthetic opioids currently in existence. To put this into context, fentanyl is about 100 times stronger than morphine and about 50 times the potency of pure heroin. Sufentanil is commonly used in epidural medication that is approximately 10 times stronger than fentanyl. Even more powerful is carfentanil, which at 100 times the strength of fentanyl. Carfentanil is used by used by veterinarians as an elephant sedative. Due to the sheer strength of these opioids, there has been a growing epidemic across the U.S. with their abuse and overdose-related deaths, especially when fentanyl and its analogs are combined with heroin and ingested unknowingly.

NEOGEN® offers several kits that target fentanyl and its analogs — some feature broad cross-reactivity while others are highly specific. Reviewing the sensitivity and specificity information for each kit is the best way to determine which kit is most appropriate for your screening requirements.

Fentanyl
#131519 (96-well)/#131515 (480-well)

Compound	I-50 (ng/mL)	% Cross-reactivity
Acrylfentanyl	0.15	215
Valerylfentanyl	0.16	208
Methoxyacetylfentanyl	0.18	184
Furanylfentanyl	0.19	180
p-Fluorofentanyl	0.24	136
Ocfentanil	0.29	112
Fentanyl	0.33	100
Butyrfentanyl	0.35	96
4-Fluorobutyrfentanyl	0.44	76
Cyclopropylfentanyl	0.49	68
Thiofentanyl	0.50	67
Isobutyrfentanyl	0.50	66
Fluoroisobutyrfentanyl	0.56	59
p-Chlorisobutyrylfentanyl	0.63	53
3-Methylfentanyl	0.66	50
Cyclopentylfentanyl	0.72	45
Furanylethylfentanyl	0.73	45
Acetylfentanyl	0.78	42
Tetrahydrofuranyl fentanyl	0.97	34
α-Methylfentanyl	3.0	11
Carfentanil	5.5	6
ß-Methylfentanyl	7.9	4.2
α-methylthiofentanyl	8.5	3.9
ß-hydroxyfentanyl	10.2	3.2
ß-hydroxythiofentanyl	16.5	2.0

Fentanil Group
#100519 (96-well)/#100515 (480-well)

Compound	I-50 (ng/mL)	% Cross-reactivity
Sufentanil	0.26	270
Norsufentanil	0.60	119
Alfentanil	0.69	100
Carfentanil	0.78	88
α-Methylthiofentanyl	0.83	83
Remifentanil	0.91	76
Fentanyl	34.5	2
Acrylfentanyl	38.1	1.8
Thiofentanyl	62.73	1.1
α-Methylfentanyl	89.61	0.77
Acetylfentanyl	92.27	0.75
Cyclopropylfentanyl	131.39	0.53
ß-Hydroxyfentanyl	169.60	0.41
ß-Methylfentanyl	196.15	0.35
ß-Hydroxythiofentanyl	236.22	0.29
Butyrylfentanyl	259.49	0.27
p-Fluorofentanyl	363.21	0.19
Benzylfentanyl	385.04	0.18

Note: Italicized drugs are the target for each kit.

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Sufentanil #104919 (96-well)/#104915 (480-well)

Compound	I-50 (ng/mL)	% Cross-reactivity
Sufentanil	0.09	100
Acetylfentanyl	0.09	100
ß-Hydroxythiofentanyl	0.17	53.6
Carfentanil	0.70	12.7
Butyrfentanyl	0.72	12.4
Acrylfentanyl	0.87	10.4
Tetrahydrofuranyl fentanyl	0.99	9.1
Methoxyacetylfentanyl	1.21	7.4
Thiofentanyl	1.41	6.4
Ocfentanil	1.48	6.1
Valerylfentanyl	1.72	5.2
Furanylfentanyl	2.43	3.7
Cyclopropylfentanyl	2.48	3.6
Isobutyrfentanyl	2.68	3.4
Cyclopentylfentanyl	3.04	3.0
Fentanyl	3.0	3.0
Furanylethylfentanyl	3.42	2.6
4-Fluorobutyrfentanyl	4.4	2.1
p-Fluorofentanyl	10.0	0.90

Our alfentanil, carfentanil, and lofentanil kits offer more sensitivity and are highly specific to their respective target drugs.

Carfentanil #103919 (96-well)/#103915 (480-well)

Compound	I-50 (ng/mL)	% Cross-reactivity
Carfentanil	0.1	100
Remifentanil	3.7	2.7
Sufentanil	20	0.50
Alfentanil	50	0.2
ß-Methylfentanyl	164	0.06
Fentanyl	166	0.06
Norsufentanil	<200	<0.05
Lofentanil	250	0.04
Cyclopropylfentanyl	410	0.02
Furanylethylfentanyl	479	0.02
Acrylfentanyl	523	0.02
α-Methylthiofentanyl	593	0.02
Acetylfentanyl	606	0.02
Furanylfentanyl	608	0.02
Methoxyacetylfentanyl	721	0.01
p-Chlorisobutyrylfentanyl	725	0.01
Butryfentanyl	740	0.01

Lofentanil #102419 (96-well)/#102415 (480-well)

Compound	I-50 (ng/mL)	% Cross-reactivity
Lofentanil	0.25	100
Carfentanil	6.25	4.0
Sufentanil	20.8	1.2
Alfentanil	312.5	0.08
Thienylfentanyl	416.6	0.06
Fentanyl	500	0.05
3-Methylfentanyl	500	0.05
Norsufentanil	625	0.04
p-Fluorofentanyl	833	0.03
α-Methylfentanyl	833	0.03

Alfentanil #103619 (96-well)/#103615 (480-well)

Compound	I-50 (ng/mL)	% Cross-reactivity
Alfentanil	0.11	100

Note: Italicized drugs are the target for each kit.

Sensitivity and Specificity

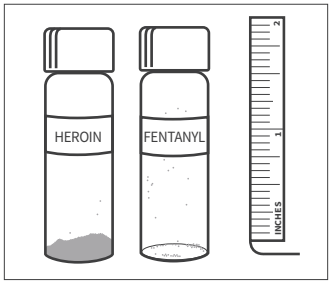
Kit sensitivity is defined by the I-50 of the target drug, representing the drug concentration that develops 50% less color activity than the negative control. This information is also listed for each drug that cross-reacts with the kit, outlining specificity.

Calculating Relative Cross-reactivity

Comparing the I-50 of the kit target with other reacting drugs allows you to see what concentration of each cross-reactant will flag, with respect to the selected cutoff concentration.

For example, if a laboratory is using the fentanyl kit with a cutoff concentration of 5 ng/mL, we would expect samples containing only acetylfentanyl to also flag positive when the concentration is approximately 11.8 ng/mL or greater. This is because the I-50 of fentanyl is 0.33 ng/mL and equivalent color development will be observed with 0.78 ng/mL of acetylfentanyl.

Lethal dose of heroin vs. lethal dose of fentanyl



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