

Maximize Detection of Synthetic Cannabinoids

CEDIA UR-144/XLR-11 Assay

Cross-reacts With More Than 15 Metabolites and Derivatives

Synthetic cannabinoids are a class of synthetic compounds chemically similar to THC, the psychoactive ingredient in marijuana. They act upon the cannabinoid receptors in the body, mimicking to varying degrees the main active chemical found in marijuana. They can have higher potency and higher health risks to users than plant derived THC. The effects are similar to using botanical marijuana and include symptoms such as impaired coordination, increased appetite, nausea/vomiting, and acute psychosis to name a few. Additional effects from synthetic cannabinoid use include agitation, violent behavior, suicidal thoughts, cognitive impairment, seizures, muscle spasms, low potassium, kidney damage, coma, and even death.¹

Poison centers across the United States experienced a significant increase in calls related to synthetic cannabinoids, tripling in number between 2014 and 2015 from 1,085 to 3,572 calls.²

These chemicals are sprayed or soaked on to a mixture of shredded plant material and marketed mostly over the internet or in head shops as incense under the common brand names of “Spice,” “K2” or “Kronic”. Although the packages are labeled “not for human consumption”, and are marketed as legal and safe, they look like plant material, leaving people to believe that it is a safe alternative to marijuana.¹

UR-144 and XLR-11 (a fluorinated form of UR-144, also known as 5-F-UR-144), are among the commonly used



synthetic cannabinoid drugs, accounting for more than one-fifth of all types of synthetic cannabinoids reported in the United States.² Due to its prevalence and potential for adverse health effects, the Drug Enforcement Administration (DEA) has placed both UR-144 and XLR-11 as schedule I drugs under the Controlled Substance Act.³

Benefits of Using the Thermo Scientific™ CEDIA® UR-144/XLR-11 Assay

- Specifically detects UR-144 and XLR-11 (5-F-UR144), Schedule I drugs by DEA
- Cross reacts with more than 15 major metabolites of UR-144 and XLR-11 and derivatives
- Good correlation to LC-MS/MS (96%)
- Applications available on a wide range of clinical analyzers
- Qualitative and semi-quantitative detection

Maximize Detection

Thermo Fisher Scientific offers an immunoassay that allows you to quickly screen human urine for both UR-144 and XLR-11, all in one test. This assay cross-reacts with more than 15 metabolites of UR-144, XLR-11, and other derivatives, maximizing detection for these compounds.

Monitor for Borderline Samples

Semi-quantitative (SQ) Detection (ng/mL)

The semi-quantitative option in this immunoassay lets you determine if borderline samples, which screen just below the cutoff, contain detectable levels of synthetic cannabinoids.

Detect Compounds with Low Cross-Reactivity

The Cumulative Response

Structurally similar compounds may not be detected by themselves due to their low cross-reactivity (% cross-reactivity). However, they may still give a positive result when multiple drugs are present simultaneously in the urine specimen; this is due to cumulative cross-reactivity to the antibody in the assay.⁴

Accuracy

A total of 84 urine samples were analyzed by the CEDIA UR-144/XLR-11 Assay in qualitative and semi-quantitative modes and the results were compared to LC-MS/MS. At 10 ng/mL cutoff, the UR-144/XLR-11 assay tested 31 of the 34 positive urine samples confirmed by LC-MS/MS as positive, and all 50 of the confirmed negative samples as negative. Our results indicate that the UR-144/XLR-11 assay has good agreement (96.4%) with LC-MS/MS.

		LC-MS/MS	
		+	-
CEDIA UR-144/XLR-11 Assay (cutoff 10 ng/mL)	+	31	0
	-	3*	50

* Samples were detected between 7 and 9 ng/mL.

Precision

Samples were prepared by spiking UR-144 N-pentanoic acid into drug free urine at 5 ng/mL, 10 ng/mL (cutoff), and 15 ng/mL, and tested in both qualitative and semi-quantitative modes using a modified Clinical Laboratory and Standards Institute (CLSI) protocol. Results presented below were generated by testing the samples in replicates of 6, twice per day for 5 days (total n=60). Our results indicate that the UR-144/XLR-11 assay has excellent precision.

Qualitative Study Analysis

UR-144 N-Pentanoic Acid Spike Concentration (ng/mL)	Percent of Cutoff Calibrator Concentration (10 ng/mL)	Total Precision (n=60)	
		Number of Determinations	Immunoassay Results (Negative/Positive)
5	-50%	60	60/0
15	+50%	60	0/60

Semi-Quantitative (ng/mL)

UR-144 N-Pentanoic Acid Spike Concentration (ng/mL)	Percent of Cutoff Calibrator Concentration (10 ng/mL)	Precision (n=60)	
		Within Run CV	Total CV
5	-50%	9.92%	13.96%
10	100%	6.30%	7.04%
15	+50%	6.08%	7.05%

Specificity

The cross-reactivity of UR-144/XLR-11, their metabolites, and other synthetic cannabinoids was evaluated by adding known amounts of each metabolite in drug free urine. The following compounds tested positive at the cutoff concentration of 10 ng/mL for the indicated concentrations below; the assay cross-reacts with more than 15 metabolites of UR-144 and XLR-11 derivatives. For a complete list of cross-reactants, please refer to the package insert.

Significant Cross Reactants Table⁵

UR-144 Derivatives and Metabolites	Tested Concentration (ng/mL) ‡	SQ Concentration (ng/mL) §	% Cross-Reactivity
UR-144 N-(5-hydroxypentyl) β-D- glucuronide	5	12	240%
UR-144 N-(5-hydroxypentyl)	5	11	220%
UR-144 N-pentanoic acid	10	12	120%
XLR-11	15	15	100%
XLR11 N-(4-pentenyl) analog	15	14	93%
UR-144 N-(4-hydroxypentyl)	15	11	73%
UR-144	20	11	55%
XLR-11 N-(2-fluoropentyl) isomer	15	11	55%
XLR-12	25	11	44%
UR-144 N-(2-hydroxypentyl)	35	11	31%
UR-144 N-(5-chloropentyl) analog	50	14	28%
UR-144 N-(5-bromopentyl) analog	100	17	17%
A-834,735	100	12	12%
UR-144 N-heptyl analog	100	12	12%
A-836,339	100	12	12%

Ordering

Part Number	Description	Size
Reagents		
10022949	CEDIA UR-144/XLR-11 Assay	3 x 17 mL
10022955	CEDIA UR-144/XLR-11 Assay	65 mL
Calibrators		
10022753	CEDIA Negative Calibrator II	1 x 7.5 mL
10022754	CEDIA UR-144 10 ng/mL Calibrator	1 x 5 mL
10022755	CEDIA UR-144 20 ng/mL Calibrator	1 x 5 mL
10022756	CEDIA UR-144 40 ng/mL Calibrator	1 x 5 mL
10022759	CEDIA UR-144 60 ng/mL Calibrator	1 x 5 mL
Controls		
10022760	CEDIA UR-144 Control Set Low (5 ng/mL), High (15 ng/mL)	2 x 5 mL each

For Criminal Justice and Forensic Use Only

References

1. NIDA, SAMHSA-ATTC Blending Initiative, www.naatc.org (accessed February 27, 2017).
2. NFLIS 2015 annual report, pg 18.
3. U.S Department of Justice, Drug Enforcement Administration, UR-144 (TCMP-018;KM-X1) and XLR11 (5-F-UR-144), May 2013, https://www.deadiversion.usdoj.gov/drug_chem_info/spice/spice_ur144_xlr11.pdf (accessed February 28, 2017).
4. Barnes, A.J., Young, S., Spinelli, E., Martin, T.M., Klette, K.L., Huestis, M.A. Evaluation of a homogeneous enzyme immunoassay for the detection of synthetic cannabinoids in urine. *Forensic Sci Int.* 2014 August; 241; 27-34.
5. CEDIA UR-144/XLR-11 Assay package insert.

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PS-10021652-0MTL CEDIA UR-144/XLR-11 Assay Spec Sheet 2017 11

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