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.

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.

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

<table>
<thead>
<tr>
<th>UR-144 N-Pentanoic Acid Spike Concentration (ng/mL)</th>
<th>Percent of Cutoff Calibrator Concentration (10 ng/mL)</th>
<th>Number of Determinations</th>
<th>Immunoassay Results (Negative/Positive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>-50%</td>
<td>60</td>
<td>60/0</td>
</tr>
<tr>
<td>15</td>
<td>+50%</td>
<td>60</td>
<td>0/60</td>
</tr>
</tbody>
</table>

### Semi-Quantitative (ng/mL)

<table>
<thead>
<tr>
<th>UR-144 N-Pentanoic Acid Spike Concentration (ng/mL)</th>
<th>Percent of Cutoff Calibrator Concentration (10 ng/mL)</th>
<th>Within Run CV</th>
<th>Total CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>-50%</td>
<td>9.92%</td>
<td>13.96%</td>
</tr>
<tr>
<td>10</td>
<td>100%</td>
<td>6.30%</td>
<td>7.04%</td>
</tr>
<tr>
<td>15</td>
<td>+50%</td>
<td>6.08%</td>
<td>7.05%</td>
</tr>
</tbody>
</table>
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 Table

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

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

For Criminal Justice and Forensic Use Only
References


2. NFLIS 2015 annual report, pg 18.


5. CEDIA UR-144/XLR-11 Assay package insert.