Introduction

The use of Novel Psychoactive Substances (NPS) is cause of health concern. Manufactured as synthetic alternatives to traditional drugs, NPS often exhibit similar effects but with heightened potency and legally evasive potential. The increasing number of these drugs represents a challenge in clinical test settings trying to maximise the detection of a large number of these compounds in a sample. Biochip array technology allows the multi-analytical screening of NPS and related analytes from a single sample. By employing simultaneous immunoassays, this technology increases the detection capacity, which is important when facing this opioid epidemic. Rapid development of such assays is also necessary to ensure relevance in a market which is constantly changing.

The objective of this study was to evaluate a biochip array, which enables the simultaneous detection of fentanyl and opioid novel psychoactive substances from a single urine sample.

Methodology

Competitive chemiluminescent immunoassays defining discrete test regions on a biochip and applicable to the Evidence series analysers, were employed.

Results

Results presented were obtained with the Evidence Investigator analyser.

Cut-offs and Limits of Detection (LOD) in urine

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cut-offs (ng/mL)</th>
<th>LOD (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furanylfentanyl</td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td>Acetylcytantenyl</td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td>Carfentanil</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sufentanil</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ocfentanil</td>
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<td>1</td>
</tr>
<tr>
<td>MT-45</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>U-47700</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Etizolam</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Clonazepam</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Mirtazapine</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Naloxone</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Buprenorphine Metabolite</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compound</th>
<th>Cut-offs (ng/mL)</th>
<th>LOD (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH-7921</td>
<td>0.02</td>
<td>0.04</td>
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<tr>
<td>Buprenorphine</td>
<td>0.03</td>
<td>0.12</td>
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<tr>
<td>Clonazepam</td>
<td>0.01</td>
<td>0.11</td>
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<tr>
<td>Etizolam</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Furanylfentanyl</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Acetylcytantenyl</td>
<td>0.02</td>
<td>0.17</td>
</tr>
<tr>
<td>Carfentanil</td>
<td>0.03</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Conclusion

This biochip array, by simultaneously detecting multiple NPS and related analytes from a single urine sample, is relevant for the current NPS market, doubling as both a screening method and indication of treatment. It is an anticipated answer for many laboratories facing the crisis of unknown drug combinations and concentration.