

#### Drug testing

For the detection of drugs in biological samples, an initial screening is performed to eliminate all negative results; positive results require confirmation using quantitative confirmatory methods.

#### Fentanyl compounds and derivatives

Fentanyl is a synthetic opioid used in medicine as a powerful analgesic (about 100 times the potency of morphine), but has potential for misuse, abuse and dependence.

Products containing fentanyl and its analogues appeared in the illicit drug market and there is a rapid emergence of novel fentanyl analogues. Opioids are responsible for thousands of overdose deaths worldwide. The danger of these compounds is highlighted by carfentanil, which is 10,000 times more potent than morphine.

In this context, it is relevant to maximise their detection in the screening step of the drug testing process.

### Multi-analytical screening of samples with Biochip Array Technology (BAT)

- Biochip array technology (BAT) enables the screening of multiple drugs from a single undivided sample, which consolidates the testing process and leads to laboratory efficiency.

- Multiple miniaturized immunoassays, arrayed on a biochip defining discrete test sites, are applied to dedicated biochip analysers. These systems incorporate dedicated software to process, report and archive the multiple data produced.
- BAT facilitates the drug testing process as only samples with positive results after screening require confirmation using confirmatory methods.



Biochip  $(9 \text{mm} \times 9 \text{mm})$ 

Discrete Test Regions



Evidence Fully automated, floor standing biochip analyser

# 

# MAXIMISING THE SCREENING OF ILLICIT FENTANYL COMPOUNDS AND DERIVATIVES FROM A SINGLE UNDIVIDED SAMPLE WITH BIOCHIP ARRAY TECHNOLOGY



Evidence Investigator Semi-automated benchtop biochip analyser

# Simultaneous immunoassays on biochip array (NPS II URN)

#### Test menu on the biochip array

- AH-7921
- Buprenorphine metabolite
- Designer Benzodiazepine Assays: Etizolam and clonazepam
- Designer Fentanyl Assays: Furanylfentanyl, acetylfentanyl, carfentanil, sufentanil, ocfentanyl
- Mitragynine
- MT-45
- Naloxone
- U-47700
- W-19

#### Designer Fentanyl Assays: compounds detected, inter-assay precision and recovery

Designer Fentanyl Assays: Furanylfentanyl, acetylfentanyl, carfentanil, sufentanil, ocfentanyl

### Specificity/Cross-reactivity (CR≥20%)

Furanylfentanyl Assay			
Compound (CR%)			
Ocfentanyl (100.0)	Cyclopentylfentanyl (60.5)		
Furanylfentanyl (105.5)	Para Fluoroisobutrylfentanyl (FIBF) (57.1)		
Thiofentanyl (250.4)	Benzylfentanyl (43.0)		
Methoxyacetyl Fentanyl (222.5)	Norfentanyl (37.2)		
Fentanyl (186.2)	Acrylfentanyl (36.3)		
Butrylfentanyl (150.2)	Thienylfentanyl (36.1)		
Alpha-Methylfentanyl (140.7)	lsobutyrylfentanyl (34.2)		
Furanylethylfentanyl (140.3)	Meta -Hydroxy-Acrylfentanyl (32.7)		
Parafluorofentanyl (115.9)	Norfuranylfentanyl (22.4)		
Tetrahydrofuran Fentanyl (112.2)	Valerylfentanyl (20.1)		
Ortho-Fluorofentanyl (69.4)	4-Fluoro-isobutyrylfentanyl (20.0)		

### Cut-offs (ng/mL, urine)

Furanylfentanyl	Ι
Acetylfentanyl	I
Carfentanil	0.25
Sufentanil	Ι
Ocfentanyl	2
AH-7921	I
MT-45	2
U-47700	10
W-19	2
Etizolam	2
Clonazepam	2
Mitragynine	I
Naloxone	I
Buprenorphine Metabolite	0.5

# Specificity/Cross-reactivity (CR≥20%)

Acetylfentanyl Assay		
Compound (CR%)		
Ocfentanyl (100.0)	Ortho-Fluorofentanyl (59.1)	
Furanylfentanyl (65.4)	Cyclopentylfentanyl (129.2)	
Acetylfentanyl (84.9)	Para Fluoroisobutrylfentanyl (FIBF) (132.3)	
Thiofentanyl (69.0)	Acrylfentanyl (89.8)	
Methoxyacetyl Fentanyl (163.9)	lsobutyrylfentanyl (83.5)	
Fentanyl (99.3)	Valerylfentanyl (191.1)	
Butrylfentanyl (124.8)	(±)-cis-3-methylfentanyl (27.7)	
Alpha-Methylfentanyl (31.4)	Cis-Mefentanyl (23.7)	
Furanylethylfentanyl (23.6)	Ω-Hydroxyfentanyl (84.7)	
Parafluorofentanyl (118.2)	(±)-trans-3-methylfentanyl (32.8)	
Tetrahydrofuran Fentanyl (221.8)	Para methoxy-Butyryl fentanyl (HCl) (116.9)	

4-Fluoro-isobutyrylfentanyl (80.4)

## Specificity/Cross-reactivity (CR≥20%)

### Specificity/Cross-reactivity (CR≥20%)

Oc
Cor
Oc
Methoxy
But

### Inter-assay precision and recovery (urine)

Designer Fentanyl Assays	-50% cut-off	Cut-off	+50% cut-off
Furanylfentanyl Recovery (%)	118		105
CV (%)	8.5	5.9	8.0
Acetylfentanyl Recovery (%)	119	117	
CV (%)	11.9	6.4	10.3
Carfentanil Recovery (%)	98	103	110
CV (%)	10.9	5.9	6.7
Sufentanil Recovery (%)	108		122
CV (%)	7.2	5.7	12.4
Ocfentanyl Recovery (%)	122	107	113
CV (%)	12.0	9.8	12.1

EV4271 080218pl

The Evidence Investigator biochip analyser was used.

Specificity/Cross-reactivity	(CR≥20%)
------------------------------	----------

Sufentanil Assay
Compound (CR%)
Sufentanil (100.0)
Alfentanil (92.2)
Norsufentanil (23.1)

ifentanil Acid (60.2)

entanil Assay

Ind (CR%)

entanyl Assay

ound (CR%)

cfentanyl (100.0)

yacetyl Fentanyl (54.7)

rylfentanyl (20.2)

# Conclusion

- Biochip array technology is applicable to the simultaneous screening of new psychoactive substances including fentanyl compounds from a single undivided sample.

- The result output is increased, which facilitates the drug testing process as the number of samples requiring confirmation is reduced.