



OPIATES IN BLOOD, PLASMA/SERUM, URINE, OR TISSUE BY LC-MS/MS OR GC-MS STYRE SCREEN[®] DBX EXTRACTION COLUMN

Part #

SSDBX033 – STYRE SCREEN[®] DBX 30 mg, 3 mL Tube

BETA-GLUC-10 – Selectrazyme[®] Beta-glucuronidase

SBSTFA-1-1 – SELECTRA-SIL[®] BSTFA w/ 1% TMCS

SPIA-0-1– SELECTRA-SIL[®] PIA (propionic anhydride)

SPYR-0-50– SELECTRA-SIL[®] Pyridine

SLDA50ID21-5UM – Selectra[®] DA HPLC Column, 50 x 2.1 mm, 5 μ m

1. PREPARE SAMPLE:

Blood: To 1 mL of 100 mM phosphate buffer (pH 6.0) add internal standards.
Add 1-2 mL of blood, plasma/ serum, or 1 g (1:4) tissue homogenate.
Mix/vortex and let stand for 5 minutes
Add 2 mL of 100 mM phosphate buffer (pH 6.0). Mix/vortex
Sample pH should be 6.0 ± 0.5 .
Centrifuge for 10 minutes at 2000 rpm and discard pellet

Urine: PREPARE SAMPLE FOR ENZYME HYDROLYSIS OF GLUCURONIDES:

To 1-2 mL of urine sample, add 1 mL of acetate buffer (pH 5.0) containing 5,000 units/mL of Selectrazyme[®] β -glucuronidase.
Optionally, add 1 mL of acetate buffer and 25-50 μ L of concentrated β -glucuronidase.
Vortex and heat for 1-2 hours at 65 °C.
Allow sample to cool
Do not adjust pH~ sample is ready to be added to the extraction column.

2. APPLY SAMPLE:

Load at 1 to 2 mL/minute.

3. WASH COLUMN:

1 x 1 mL D.I. H₂O.
1 x 1 mL 100 mM acetate buffer (pH 4.5).
1 x 1 mL CH₃OH.
Dry column (5 minutes at full vacuum or pressure).

4. ELUTE OPIATES:

2 x 0.5 mL CH₂Cl₂/ IPA/ NH₄OH (78:20:2)
Collect eluate at 1 to 2 mL/minute.
NOTE: Prepare elution solvent daily. Add IPA/ NH₄OH, mix, then add CH₂Cl₂ (pH 11-12).

5. DRY ELUATE:

Evaporate to dryness at < 40 °C.

6. RECONSTITUTE / DERIVATIZE:

- **LC-MS/MS:** Reconstitute sample in 100 μ L of mobile phase
Inject 10 μ L
- **GC-MS: Derivatize with propionic anhydride: pyridine**
Add 200 μ L of a 1:1 solution of propionic anhydride: pyridine
Make this solution fresh daily.
Mix/vortex.
React for 60 minutes at 60 °C in a heater block.
Remove from heat source to cool.
Evaporate to dryness at < 40 °C.
Reconstitute the residue with 50 μ L of Ethyl Acetate / Methanol (70:30)

Alternate Derivatization

1. DERIVATIZE with TMS

Add 50 μ L Ethyl Acetate and 50 μ L BSTFA w/ 1% TMCS

Overlay with N₂ and cap. Mix/vortex.

React 30 minutes at 70 °C. Remove from heat source to cool.

NOTE: Do not evaporate BSTFA solution

Note: Hydroxylamine can be added to sample within method if oxime derivative is preferred.

Following hydrolysis, add 200 μ L 10% Hydroxylamine solution.

Heat to 60 °C for 30 min in a heating block.

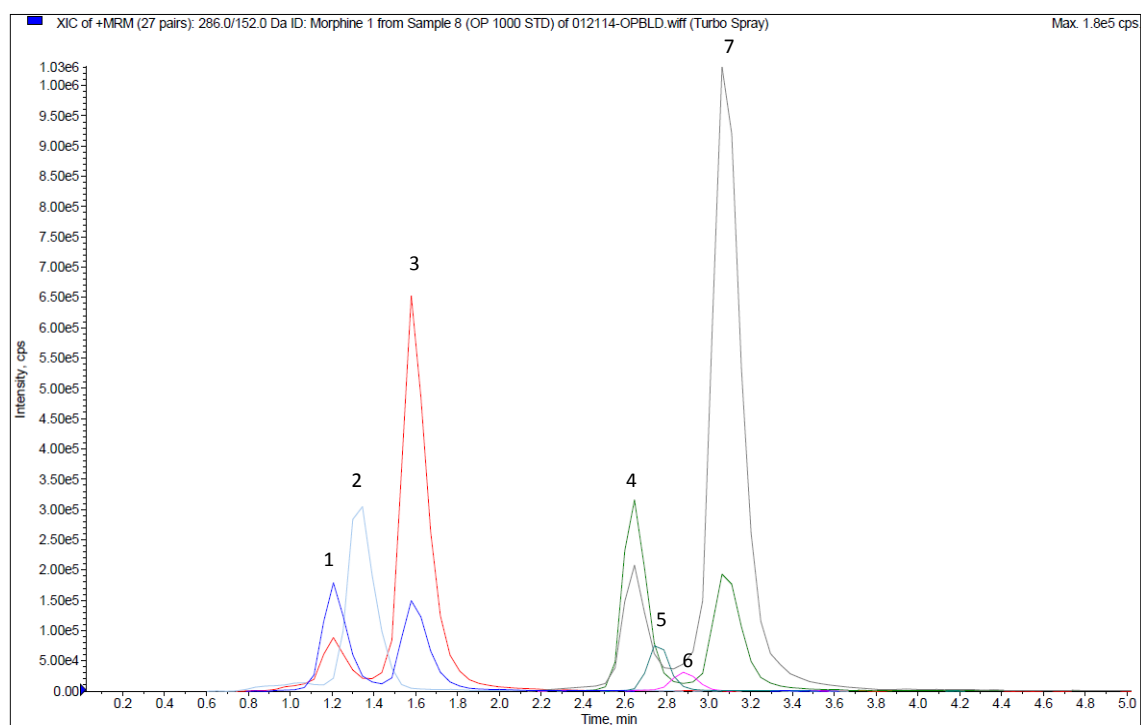
Allow sample to cool then adjust pH back to 5 with 1.0 M NaOH.

Centrifuge for 10 minutes at 2000 rpm and discard pellet

Sample is now ready to be added to the extraction column

INSTRUMENT CONDITIONS (LC-MS/MS):

CHROMATOGRAM



Analyte	MRM Transitions		Relative Retention Time (min)
	Q1	Q3	
1. Morphine	286.0	152.0	1.21
2. Oxymorphone	302.0	227.0	1.30
3. Hydromorphone	286.0	185.0	1.60
4. Codeine	300.0	152.0	2.65
5. 6-MAM	328.0	165.1	2.75
6. Oxycodone	316.0	240.0	2.85
7. Hydrocodone	300.0	199.0	3.10

PARAMETERS

Mobile Phase A: 0.1% Formic Acid in D.I. H₂O

Mobile Phase B: 0.1% Formic Acid in Methanol

Flow Rate: 0.6 mL/minute

Polarity: Positive

Injection Volume: 10 µL

LC Column: Selectra[®] DA HPLC Column 50 x 2.1 mm 5 µm

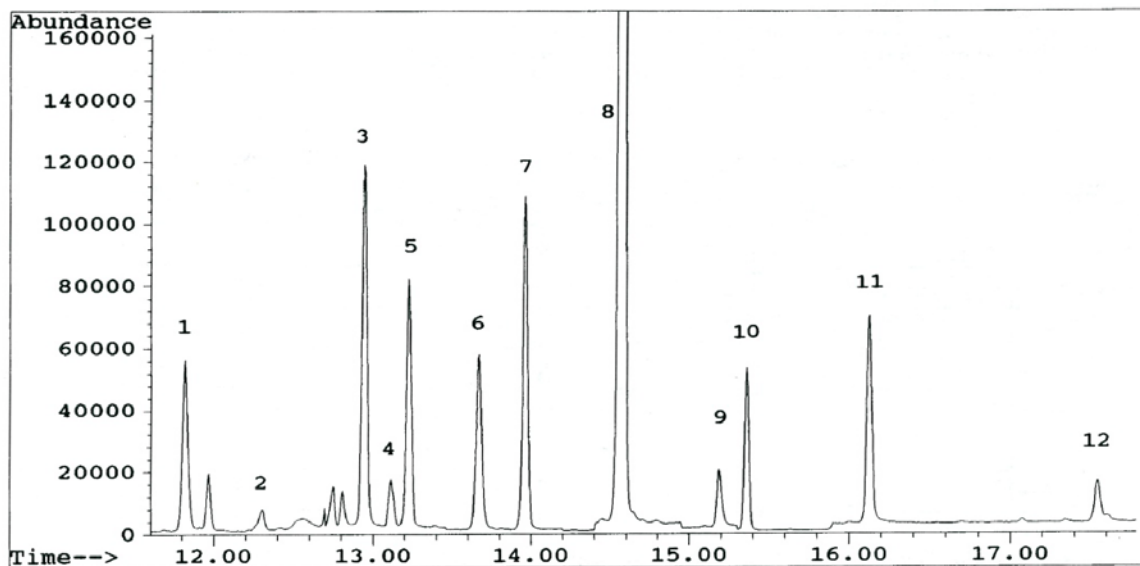
Instrument: API 3200 Qtrap MS/MS with Shimadzu Prominence UFLC

Gradient:

Time	%A	%B
0.00	85	15
7.00	40	60
7.01	20	80
8.00	85	15
9.00	STOP	

INSTRUMENT CONDITIONS (GC-MS):

CHROMATOGRAM



PROPYL DERIVATIVES

Analyte	Quantify Ion	Qualifier Ion 1	Qualifier Ion
1. Hydrocodone	299.0	242.0	214.0
2. Thebaine	311.2	296.2	312.2
3. Codeine	355.0	282.0	229.0
4. Oxycodone	371.0	314.0	298.0
5. Heroin	327.2	369.2	268.2
6. Hydromorphone	285.0	341.0	228.0
7. 6-Mam	327.2	268.0	383.2
8. Morphine	341.0	268.0	397.0
Morphine-D ₃	344.3	271.3	400.3
9. Oxymorphone	357.0	300.0	413.0
10. Naloxone	327.1	383.2	328.2
11. Nalorphine	367.2	350.2	294.2
12. Norcodeine	223.1	224.1	236.1

BSTFA-OXIME DERIVATIVES

Analyte	Quantify Ion	Qualifier Ion 1	Qualifier Ion 2
Morphine TMS	429.0	414.0	401.0
Morphine-D ₃ TMS	432.0	417.0	404.0
Morphine-D ₆ TMS	435.0	420.0	404.0
Normorphine TMS	487.0	472.0	414.0
Diacetylmorphine	369.0	327.0	268.0
Oxymorphone Oxime TMS	532.0	517.0	287.0
Oxymorphone Oxime-D ₃ TMS	535.0	520.0	290.0
Hydromorphone Oxime TMS	444.0	429.0	355.0
Hydromorphone Oxime-D ₃ TMS	447.0	432.0	358.0
Codeine TMS	371.0	356.0	343.0
Codeine-D ₃ TMS	374.0	359.0	346.0
Codeine-D ₆ TMS	377.0	349.0	316.0
Dihydrocodeine TMS	373.0	315.0	358.0
Norcodeine TMS	429.0	414.0	356.0
6-MAM TMS	399.0	400.0	340.0
Oxycodone Oxime TMS	474.0	459.0	417.0
Oxycodone Oxime-D ₃ TMS	477.0	462.0	420.0
Oxycodone Oxime-D ₆ TMS	480.0	465.0	420.0
Hydrocodone Oxime TMS	386.0	297.0	371.0
Hydrocodone Oxime-D ₃ TMS	389.0	300.0	374.0
Hydrocodone Oxime-D ₆ TMS	392.0	303.0	377.0

Meperidine-D₄	251.0	222.0	250.0
Meperidine	247.0	218.0	246.0
Normeperidine-D₄ TMS	308.0	280.0	309.0
Normeperidine TMS	305.0	276.0	304.0
Tramadol TMS	335.0	245.0	290.0
O-Desmethyltramadol TMS	393.0	378.0	303.0
N-Desmethyltramadol TMS	393.0	378.0	116.0
Pentazocine TMS	357.0	342.0	289.0

PARAMETERS

GC/MS: Hewlett Packard 5971A/ 5890 GCMS System with 7673 ALS

GC capillary column: Rtx-5 30 m x 0.25 mm, 0.25 µm

Injector: 2 µL Splitless, 250 °C

Oven temperature program: 100 °C (1 minute) to 250 °C (25 °C/minute): hold (2 minutes) to 290 °C (10°C/minute): hold (0.5 minutes) to 325°C (25°C/minute): hold (3.1 minutes).

Carrier gas: Helium (1.2mL/minute)

MSD condition: Aux temperature: 280 °C, MS Source: 350 °C, MS Quad: 150 °C

References: Hackett,J.; Telepchak, M.J.; Coyer, M.J. Automation of solid-phase extraction for urinary opiate analysis. American Laboratory. 2008.