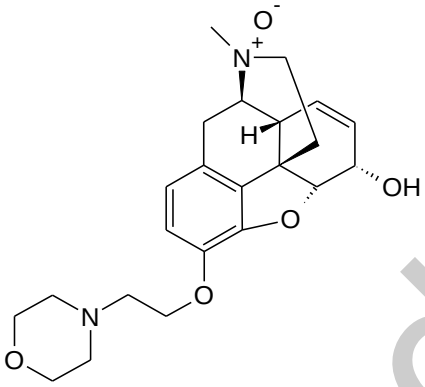
Our Formula. Your Success.

Reference Material Product Information Sheet

Epichem's Quality System conforms to ISO9001:2015 as certified by ECAAS Pty Ltd - Certification number 616061.



Name	pholcodine *N*-oxide
BP Name	Pholcodine Impurity C
Synonym(s)	(17*RS*)-7,8-didehydro-4,5α-epoxy-17-methyl-3-(2-(morpholin-4-yl)ethoxy)morphinan-6α-ol 17-oxide
Epichem Item #	EPL-AA192 Batch 1
CAS #	433308-89-5
Molecular Formula	$C_{23}H_{30}N_2O_5$
Molecular Weight	414.51 g/mol
Appearance	Off-white powder
Combustion Analysis	Required (%): C:66.6 H:7.3; N:6.8. Found (%): C:60.5; H:7.7; N:6.2
Purity*	96.9%
Date of Manufacture	19 April 2016
Storage Requirements	Very hygroscopic. Protect from heat, light and moisture. Store sample in dry, inert atmosphere.
Special Precautions	**This compound is for laboratory use only. Its toxicological properties may not have been fully established. It should be handled only by suitably qualified personnel.**
Intended Use	This compound is suitable for the identification of impurities and degradants in pharmaceutical materials. The purity assay is considered as relative contribution.
Date of Shipment	TBA
	This certificate is valid for one year from the date of shipment provided the substance is unopened and stored under the recommended conditions.
Retest Date	TBA (Proper Storage and Handling Required)

** NATA accreditation does not cover the performance of this service*

Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

I. Identity

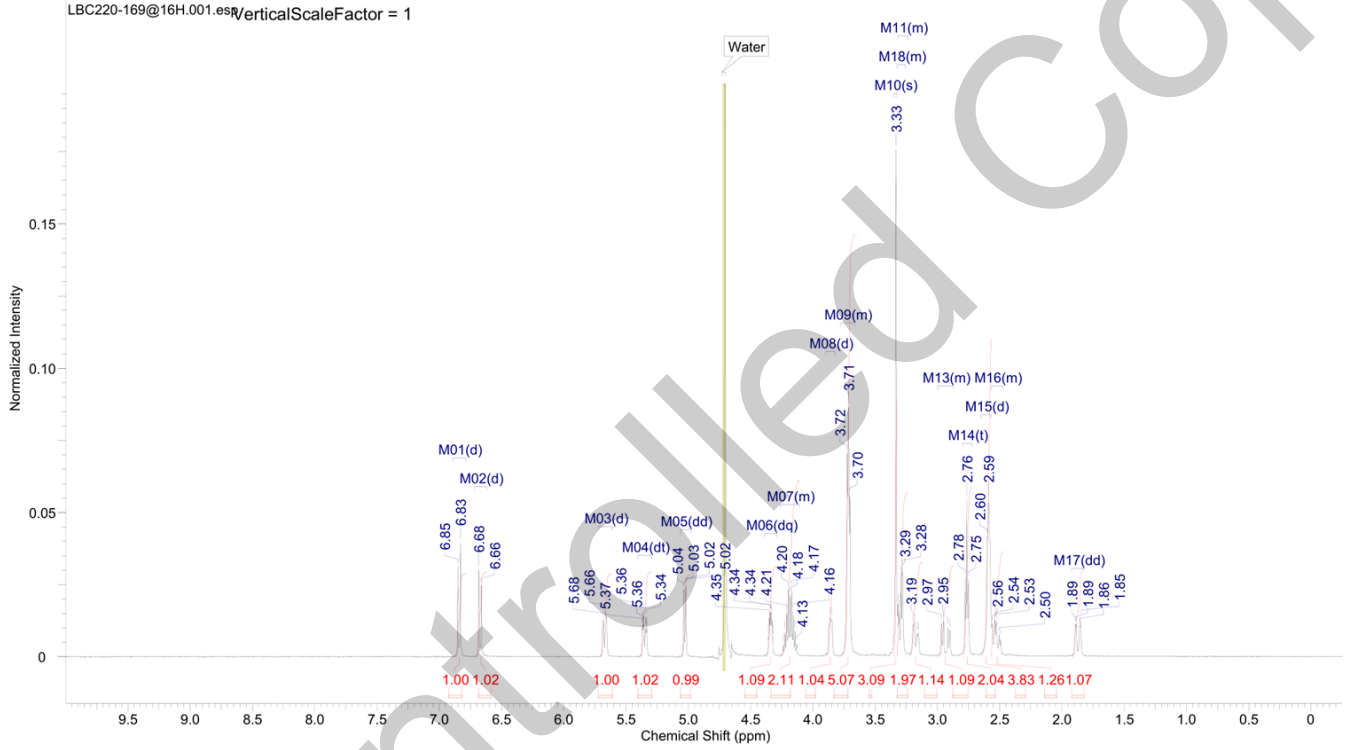
The identity of this product was established using the following analyses:

Ia. [1]HNMR Spectrum

Conditions: 400 MHz, D_2O

[1]HNMR spectrum consistent with chemical structure.

Acquisition Time (sec)	3.7547	***Comment***	LBC220-169@16H 1H D2O {E:\dataexternal\epichem} cygoh 10				
Date	23 Mar 2016 08:40:32			***Date Stamp***	23 Mar 2016 08:40:32		
File Name	\\NAPHTHALENE\Company\NMR files\LBC220-169@16H\1\fid					***Frequency (MHz)***	400.13
Nucleus	1H	***Number of Transients***	8	***Origin***	spect	***Original Points Count***	24038
Owner	nmr	***Points Count***	32768	***Pulse Sequence***	zg	***Receiver Gain***	161.00
SW(cyclical) (Hz)	6402.05	***Solvent***	DEUTERIUM OXIDE			***Spectrum Offset (Hz)***	2800.9097
Spectrum Type	STANDARD	***Sweep Width (Hz)***	6401.85	***Temperature (degree C)***	26.836		



Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

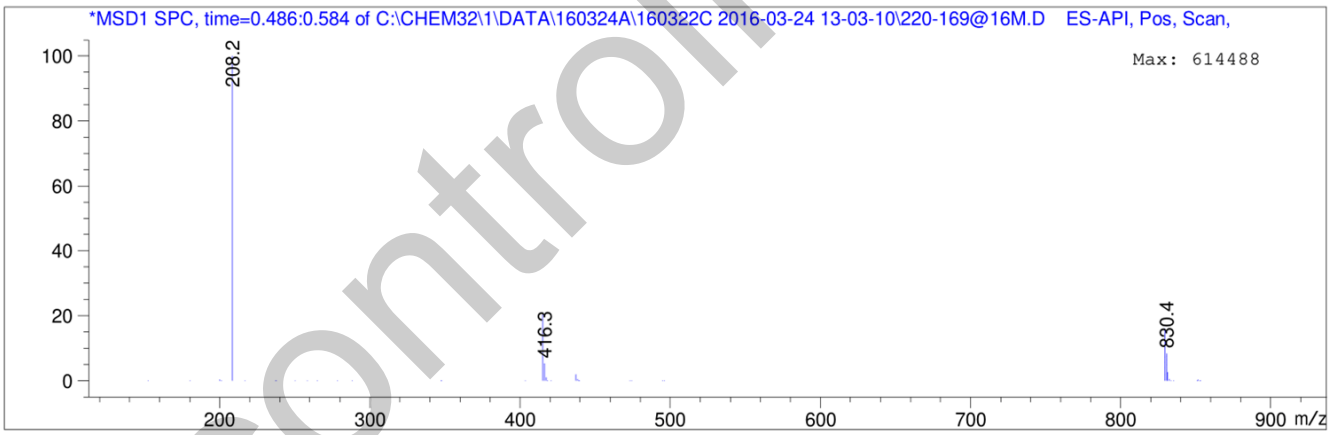
Ib. Mass Spectrum

The mass spectrum of this material was analysed by Liquid Chromatography Mass Spectroscopy (LCMS) using in-house EM005.WI08.

Method: 5% to 100% ACN in water gradient (+0.1% formic acid)

Poroshell 120 EC-C18, 4.6 x 50 mm, 2.7 micron

Retention Time (MS)	MS Area	Mol. Weight or Ion
0.523	8600997	829.40 I
		415.20 I
		208.20 I
0.739	521404	429.15 I
		215.20 I
		208.20 I
0.919	371957	415.30 I
		208.30 I
1.113	35178	431.20 I
		216.20 I
		192.90 I
1.562	235654	415.25 I
		208.20 I



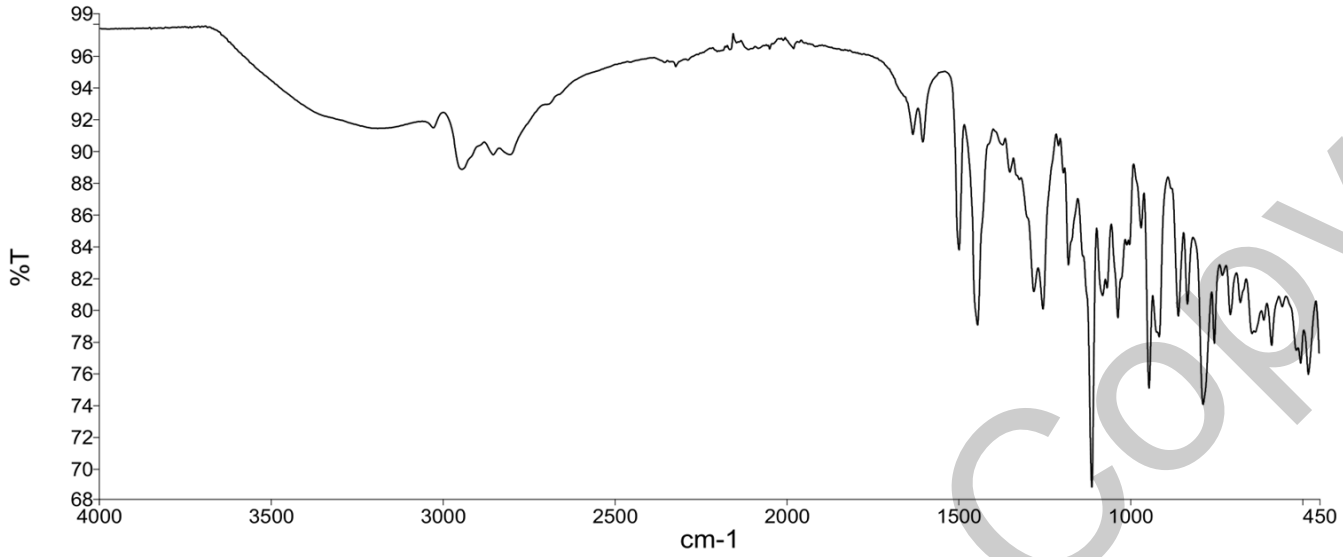
Theoretical value: 415.3 $[M+H]^+$.

The signal of the Mass Spectrum is consistent with the theoretical value and its interpretation is consistent with the structural formula.

Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

Ic. IR Spectrum

The infra-red spectrum of this material was analysed by Fourier-Transform Infra-red Spectroscopy (FTIR) using in-house EM005.WI09.



The interpretation of the signals of the Fourier Transform Infra-red Spectrum is consistent with the structural formula.

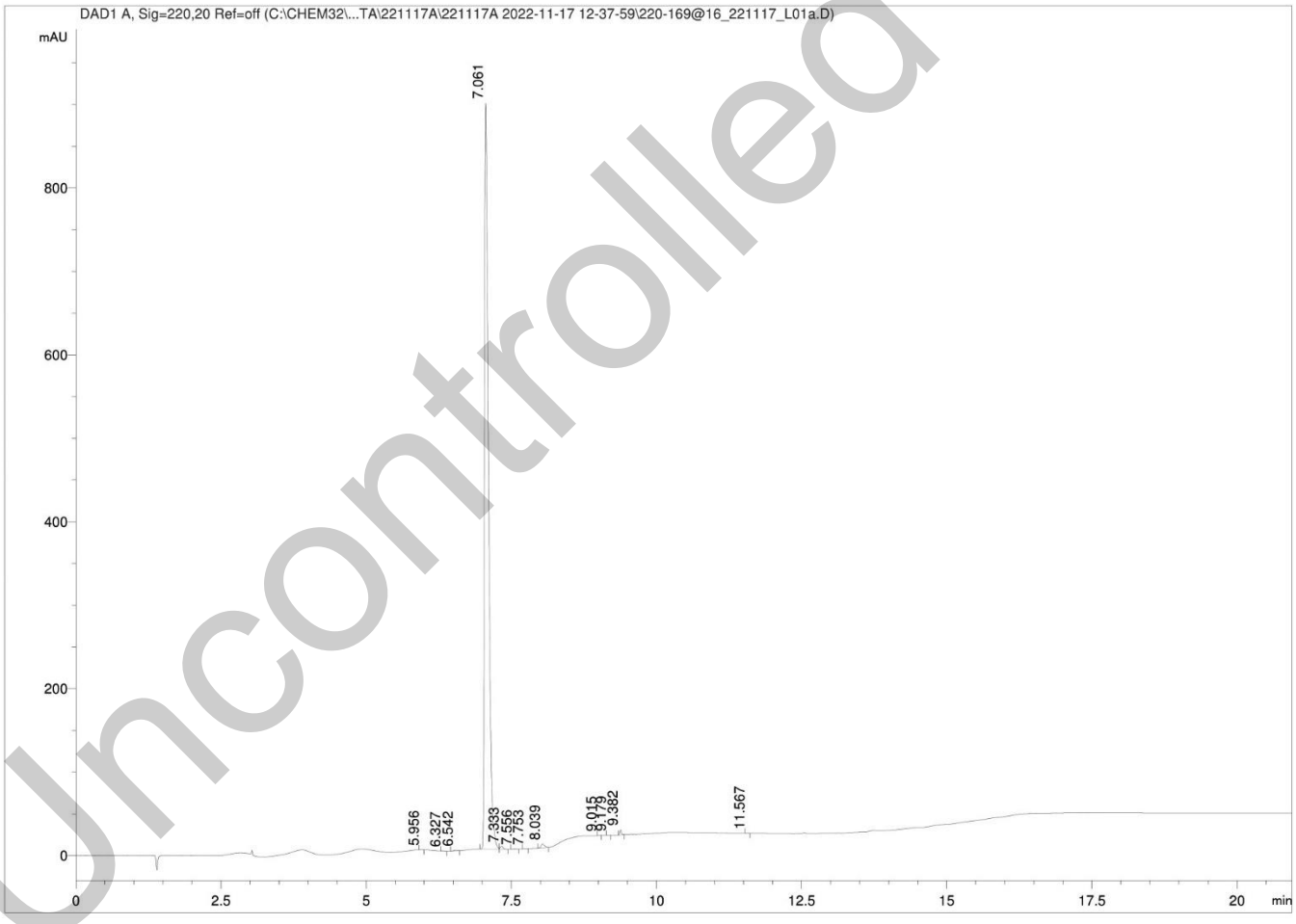
Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

II. Purity

The purity of this material was analysed by high performance liquid chromatography (HPLC) using in-house EM005.WI07.

HPLC Conditions:

Column	Conditions				Detector	Injector
Fortis H2o 4.6 x 100mm 3 micron	25ºC				DAD 220nm	Auto 2.0 µL 1.0 mg/mL in 100% water (NO MODIFIERS)
	Time (min)	% Line A (Water + 0.1% (v/v) TFA)	% Line B (Acetonitrile + 0.1% (v/v) TFA)	Flow rate (mL/min)		
	0.00	99.5	0.5	1.0		
	6.00	87.5	12.5	1.0		
	14.25	5	95	1.0		
	19.25	5	95	1.0		
	20.25	99.5	0.5	1.0		
	26.25	99.5	0.5	1.0		



Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

Area Percent Report – Sorted by Signal

Peak Number	Retention Time (rounded)	Area	Area % (rounded)
1	5.96	0.73	0.02
2	6.33	0.45	0.01
3	6.54	2.57	0.06
4	7.06	4186.83	98.84
5	7.33	12.02	0.28
6	7.56	1.05	0.02
7	7.75	0.40	0.01
8	8.04	19.29	0.46
9	9.02	0.47	0.01
10	9.18	0.34	0.01
11	9.38	11.70	0.28
12	11.57	0.29	0.01
Totals			100 (rounded)

For the calculation the system peaks were ignored. The content of the analyte was determined as a ratio of the peak area of the analyte and the cumulative areas of the purities, added up to 100%.

Results:

Average 98.8% (average of 10 duplicate analyses)

Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902

III. Water Content

Method: Karl-Fischer titration using in-house EM005.WI04.

Results:

Average 1.9%

IV. Ash Content

Method: BP2016 Ash (Appendix XI J)

Result:

Contains <0.1% ash.

V. Residual Solvents

Method: ^{1}HNMR

Result:

No significant impurities detected by ^{1}H NMR analysis.

VI. Final Result

Chromatographic purity (HPLC)	98.8%
Water content	1.9%
Ash content	<0.1%
Residual solvents	<0.1%
Purity*	96.9%

This purity is assessed to be 96.9%.

Product Reviewed By:

Jacob Heppell, PhD
Chemist

Product Released By:

Carol Worth, PhD
Quality Manager

Release Date: 22 November 2022

**NATA accreditation does not cover the performance of this service.*

The calculation of the purity follows the formula:

$$\text{Purity}(\%) = \frac{((\text{Chromatographicpurity[HPLC]})x(100 - (\text{watercontent} + \text{ashcontent} + \text{volatilecontents})))}{100}$$

Epichem Pty Ltd, Suite 5, 3 Brodie-Hall Drive, Bentley WA 6102, Australia
Tel + 61 (0)8 6167 5200 Fax + 61 (0)8 6167 5201 www.epichem.com.au ABN 80 106 769 902