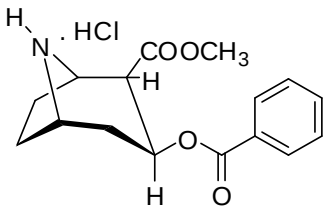
Australian Government
Department of Industry, Science and Resources

National Measurement Institute

NATA
WORLD RECOGNISED ACCREDITATION

CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D856b: Norcocaine hydrochloride



Report ID: D856b.2025.01

Chemical Formula: $C_{16}H_{19}NO_4$.HCl

Molecular Weight: 325.8 g/mol (HCl salt), 289.3 g/mol (base)

Property value

Batch No.	CAS No.	Purity estimate
15-D-23	61585-22-6 (HCl) 18717-72-1 (base)	90.9 ± 0.8%

IUPAC name: Methyl (1R,2R,3S,5S)-3-(benzoyloxy)-8-azabicyclo[3.2.1]octane-2-carboxylate hydrochloride

Expiration of certification: The property values are valid till 06 May 2030, five years from the date of re-certification provided the **unopened** material is handled and stored in accordance with the recommendations below. The material as issued in the unopened container and stored as recommended below should be suitable for use beyond this date, subject to confirmation of batch stability from the issuing body. The expiry date/shelf life does not apply to sample bottles that have been opened. In such cases it is recommended that the end-user conduct their own in-house stability trials.

Description: Off-white powder prepared by synthesis and certified for identity and purity by NMI Australia. Packaged in amber glass bottles with a septum and crimped aluminium cap or screw top cap.

Intended use: This certified reference material is suitable for use as a primary calibrator.

Instructions for use: Equilibrate the bottled material to room temperature before opening.

Recommended storage: When not in use this material should be stored at or below 25 ºC in a closed container in a dry, dark area.

Stability: This material has demonstrated stability over a minimum period of five years. The long-term stability of the compound in solution has not been examined.

Homogeneity assessment: The homogeneity of the material was assessed using purity assay by GC-FID on ten randomly selected 1-2 mg sub samples of the material. The material was judged to be sufficiently homogeneous at this level of sampling as the variation in analysis results between samples was not significantly different at a 95% confidence level from that observed on repeat analysis of the same sample.

Safety: Treat as a hazardous substance. Use appropriate work practices when handling to avoid skin or eye contact, ingestion or inhalation of dust. Refer to the provided safety data sheet.

S. R. Davies

Dr Stephen R. Davies,
Team Leader,
Chemical Reference Materials, NMI.
23 May 2025

This report supersedes any issued prior to 23 May 2025.

NATA Accreditation No. 198 / Corporate Site No. 14214.

Characterisation Report:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. Impurities of related structure were assessed by GC-FID. The purity estimate was obtained by mass balance using a combination of traditional analytical techniques, including GC-FID, Karl Fischer analysis, and ^{1}H NMR spectroscopy. The purity value is calculated as per Equation 1.

Purity = (100 % - I_{ORG}) x (100 % - I_{VOL} – I_{NVR}) Equation 1

I_{ORG} = Organic impurities of related structure, I_{VOL} = volatile impurities, I_{NVR} = non-volatile residue.

Supporting evidence is provided by thermogravimetric analysis, and elemental microanalysis.

GC-FID:	Instrument:	Varian CP-3800
	Column:	HP-1, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	150 °C (1 min), 10 °C/min to 250 °C, 30 °C/min to 280 °C (10 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative peak area of the main component as the *N*-acetyl derivative:	
	Initial analysis:	Mean = 99.3%, s = 0.03% (7 sub samples in duplicate, January 2016)
	Re-analysis:	Mean = 98.8%, s = 0.06% (5 sub samples in duplicate, January 2017)
	Re-analysis:	Mean = 99.0%, s = 0.14% (5 sub samples in duplicate, March 2018)
	Re-analysis:	Mean = 99.1%, s = 0.06% (5 sub samples in duplicate, January 2021)
	Re-analysis:	Mean = 99.2%, s = 0.03% (5 sub samples in duplicate, May 2025)
Karl Fischer analysis:		Moisture content 8.4% mass fraction (November 2015) Moisture content 8.2% mass fraction (November 2016, January 2018, January 2021 and May 2025)
Thermogravimetric analysis:		Volatile content 8.5% and non-volatile residue < 0.2% mass fraction (November 2015)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	Agilent 6890/5973
	Column:	HP-1MS, 30 m x 0.25 mm I.D. x 0.25 μm
	Program:	60 °C (1 min), 10 °C/min to 300 °C (3 min)
	Injector:	250 °C
	Transfer line temp:	280 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/
	The retention time of the free base is reported along with the major peaks in the mass spectra. The latter are reported as mass/charge ratios and (in brackets) as a percentage relative to the base peak.	
	Free base (19.2 min):	289 (M^+, 14), 168 (100), 136 (45), 108 (34), 105 (31), 82 (16), 80 (23), 77 (30), 68 (45) *m/z*
TLC:	Conditions:	Kieselgel 60F_{254}. Methanol/conc NH_3 (200:3). Single spot observed, R_f = 0.5. Visualization with UV light (254 nm)
IR:	Instrument:	BioRad FTS3000MX FT-IR
	Range:	4000-400 cm^{-1}, KBr powder
	Peaks:	3597, 3408, 3152, 2951, 2772, 2744, 2527, 1721, 1440, 1350, 1275, 717 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance III-500
	Field strength:	500 MHz
	Solvent:	D_2O (4.79 ppm)
	Spectral data:	δ 2.15-2.35 (6H, m), 3.59 (1H, dd, *J* =2.5, 7.2 Hz), 3.62 (3H, s), 4.28 (1H, m), 4.36 (1H, dd, *J* =1.8, 5.1 Hz), 5.56 (1H, sextet, *J* =7.5 Hz), 7.53 (2H, ddd, *J* = 1.8, 7.5 Hz), 7.69 (1H, ddd, *J* = 1.2, 2.5, 7.5 Hz), 7.95 (2H, dd, *J* =1.3, 8.5 Hz)
		Diethyl ether (0.01%) estimated mass fraction was observed in the ^{1}H NMR
^{13}C NMR:	Instrument:	Bruker Avance III-500
	Field strength:	126 MHz
	Solvent:	D_2O
	Spectral data:	δ 24.4, 25.1, 31.1, 44.9, 53.0, 54.3, 55.3, 65.0, 128.4, 128.8, 129.4, 134.3, 167.1, 173.0 ppm
Melting point:		96-99 °C
Microanalysis:	Found:	C = 54.6%; H = 6.5%; N = 4.0%; Cl% = 9.8% (November, 2015)
	Calculated:	C = 54.3%; H = 6.6%; N = 4.0%; Cl% = 10.0% (Calculated for $C_{13}H_{17}NO_2$.HCl + 8.0% mass fraction H_2O)