



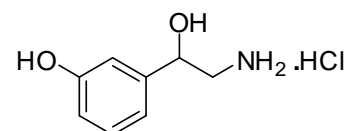
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA M937b: Norphenylephrine hydrochloride

Report ID: M937b.2019.03

Chemical Formula: $C_8H_{12}ClNO_2 \cdot HCl$

Molecular Weight: 189.6 g/mol (HCl), 153.2 g/mol (base)



Certified value

Batch No.	CAS No.	Purity (mass fraction)
09-D-15	4779-94-6 (HCl) 536-21-0 (base)	99.7 ± 0.7%

The uncertainty has been calculated according to ISO Guide 35 and is stated at the 95% confidence limit ($k = 2$).

IUPAC name: 3-(2-Amino-1-hydroxyethyl)phenol hydrochloride (1:1)

Expiration of certification: The property values are valid till 5 November 2024, i.e. 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 solid prepared by synthesis, and certified for identity and purity by NMIA. 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 °C in a closed container in a dry, dark area.

Metrological traceability: The certified purity value is traceable to the SI unit for mass (kg) through Australian national standards via balance calibration. In the mass balance approach all impurities are quantified as a mass fraction and subtracted from 100%. Quantitative NMR provides an independent direct measure of the mass fraction of the analyte of interest, calibrated with an internal standard certified for purity (mass fraction).

Stability: This material has demonstrated stability over a minimum period of five years. The measurement uncertainty at the 95% confidence interval includes a stability component which has been estimated from annual stability trials. 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 HPLC with UV detection on seven 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.
12 October 2022

This report supersedes any issued prior to 12 October 2022.

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

Legal notice: Terms and Conditions associated with the provision of this reference material can be found on the NMIA website.

Characterisation Report:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. The certified purity value was obtained by mass balance from a combination of traditional analytical techniques, including HPLC with UV/ELS detection, thermogravimetric analysis, Karl Fischer analysis and ¹H NMR spectroscopy. The purity value is calculated as per Equation 1.

$$\text{Purity} = (100\% - I_{\text{ORG}}) \times (100\% - I_{\text{VOL}} - I_{\text{NVR}})$$

Equation 1

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

Supporting evidence is provided by Quantitative NMR and elemental microanalysis.

HPLC: Instrument: Waters Model 1525 Binary pump, 717 plus Autosampler or 2695 Separations module
 Column: Alltima C-18, 5 μm (4.6 mm I.D \times 150 mm)
 Mobile Phase: Acetonitrile/20mM $\text{NH}_4\text{OAc}/\text{NH}_4\text{OH}$ pH 9 buffer, 90/10
 Flow Rate: 0.8 mL/min
 Detector: PDA max plot

Relative mass fraction of the main component:

Initial analysis: Mean = 99.99%, s = 0.02% (7 sub samples in duplicate, September 2009)

Re-analysis: Mean = 100.0%, s = 0.0% (5 sub samples in duplicate, November 2011)

Re-analysis: Mean = 99.97%, s = 0.0% (5 sub samples in duplicate, October 2014)

Re-analysis: Mean = 99.96%, s = 0.0% (5 sub samples in duplicate, November 2019)

QNMR: Instrument: Bruker Avance III-400
 Field strength: 400 MHz
 Solvent: D_2O (4.79 ppm)
 Internal standard: Sodium acetate (60.1% mass fraction)
 Initial analysis: Mean (3.2 ppm) = 100.4%, s = 0.2% (5 sub samples, October 2009)

Karl Fischer analysis: Moisture content < 0.2 % mass fraction (May 2009, September 2010, October 2011, August 2014 and July 2019)

Thermogravimetric analysis: Initial volatile content < 0.2 % mass fraction (April 2009)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	Agilent 6890
	Column:	VF-1ms, 14.9 m x 0.25 mm I.D. x 0.25 µm
	Program:	60 °C (1min), 10 °C/min to 200 °C (2 min), 40 °C/min to 300 °C (3 min)
	Injector:	250°C
	Split ratio:	20/1
	Transfer line temp:	300 °C
	Carrier:	Helium, 1.0 mL/min
	Scan range:	50-550 <i>m/z</i>
	The retention time of the free base is reported along with the major peaks in the mass spectrum. The latter are reported as mass/charge ratios and (in brackets) as a percentage relative to the base peak.	
	Parent (10.2 min):	153 (M+, 5), 124 (100), 95 (52), 77 (55), 65 (20), 51 (10) <i>m/z</i>
TLC:	Conditions:	Kieselgel 60F ₂₅₄ . MeOH/NH ₃ (9:1) Single spot observed, R _f = 0.58. Visualisation with UV at 254 nm
IR:	Instrument:	Biorad FTS300MX FT-IR
	Range:	4000-400cm ⁻¹ , KBr powder
	Peaks:	3430, 3134, 3027, 2941, 2593, 1593, 1493, 1386, 1365, 1275, 1235, 1136, 1102, 1054, 1015, 941, 878, 802, 771, 706, 638 cm ⁻¹
¹ H NMR:	Instrument:	Bruker Avance III-400
	Field strength:	400 MHz
	Solvent:	DMSO- <i>d</i> ₆ (2.54 ppm)
	Spectral data:	δ 2.76 (1H, dd, <i>J</i> = 9.9, 12.7 Hz), 2.94 (1H, dd, <i>J</i> = 3.0, 12.7 Hz), 4.75 (1H, d, <i>J</i> = 8.5 Hz), 6.01 (1H, br s), 6.70 (1H, ddd, <i>J</i> = 2.4, 2.4, 8.0 Hz), 6.76 (1H, d, <i>J</i> = 7.6 Hz), 6.81 (1H, s), 7.13 (1H, t, <i>J</i> = 7.8 Hz), 8.17 (3H, br s), 9.55 (1H, br s) ppm Ethanol was observed in the ¹ H NMR at 0.04% mass fraction.
¹³ C NMR:	Instrument:	Bruker Avance III-400
	Field strength:	100 MHz
	Solvent:	DMSO- <i>d</i> ₆ (40.45 ppm)
	Spectral data:	δ 45.9, 69.1, 112.8, 114.6, 116.3, 129.3, 143.4, 157.5 ppm
Melting point:	156-158 °C	
Microanalysis:	Found:	C = 51.0%; H = 6.5%; N = 7.4% (April 2009)
	Calculated:	C = 50.7%; H = 6.4%; N = 7.4% (Calculated for C ₈ H ₁₂ ClNO ₂)