



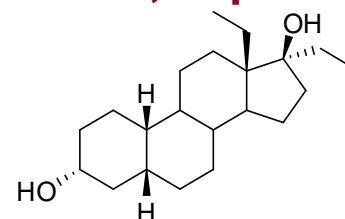
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D818b: (\pm)-18a-Homo-17 α -ethyl-5 β -estrane-3 α , 17 β -diol

Report ID: D818b.2021.02 (Ampouled 161208a)

Chemical Formula: C₂₁H₃₆O₂

Molecular Weight: 320.5 g/mol



Relative stereochemistry

Certified value

Batch No.	CAS No.	Mass per ampoule
16-S-08	24366-75-4	982 ± 19 µg

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

Synonyms: (\pm)-18a-Homo-19-nor-17 α -pregnane-3 α , 17 β -diol
(\pm)-13 β , 17 α -Diethyl-5 β -gonane-3 α , 17 β -diol
(\pm)-(3 α ,5 β ,17 α)-13-Ethyl-18,19-dinorpregnane-3,17-diol.

Expiration of certification: The property values are valid till 6 October 2026, 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 ampoules that have been opened. In such cases it is recommended that the end-user conduct their own in-house stability trials.

Description: The compound is supplied as a dried aliquot in a sealed ampoule under an atmosphere of argon. The CRM is intended for a single use to prepare a standard solution containing D818b. This material was prepared by synthesis, and certified for identity and purity by NMIA.

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

Instructions for use: Open the ampoule and carefully rinse the interior at least three times with a suitable organic solvent (e.g. chloroform). This will transfer 982 ± 19 µg of anhydrous (\pm)-18a-Homo-17 α -ethyl-5 β -estrane-3 α , 17 β -diol. The mass of analyte in each ampoule is calculated from the assigned purity of the bulk and the concentration of bulk material in a stock solution used to prepare the ampoules.

Recommended storage: When not in use, this material should be stored at or below 4 °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%.

Stability: This material has demonstrated stability over a minimum period of three 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 GC-FID on seven randomly selected ampoules 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 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

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Dr Stephen R. Davies,
Team Leader,
Chemical Reference Materials, NMI.
14 November 2022

This report supersedes any issued prior to 14 November 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:

GC-FID: Instrument: Agilent 7890A/8890
Column: HP-1MS/HP-5, 30 m × 0.32 mm I.D. × 0.25 μm
Program: 180 °C (1 min), 15 °C/min to 250 °C (5 min), 30 °C/min to 300 °C (3 min)
Injector: 250 °C
Detector Temp: 320 °C
Carrier: Helium
Split ratio: 20/1
Relative mass fraction of the main component:
Initial analysis: Mean = 98.4%, s = 0.01% (7 ampoules in duplicate, December 2016)
Re- analysis: Mean = 98.4%, s = 0.01% (5 ampoules in duplicate, November 2017)
Re- analysis: Mean = 98.5%, s = 0.00% (5 ampoules in duplicate, November 2018)
Re- analysis: Mean = 98.4%, s = 0.03% (5 ampoules in duplicate, October 2021)

The following analytical data was obtained on the bulk material subsequently used in the preparation of the ampoules.

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 GC-FID, thermogravimetric analysis, Karl Fischer analysis and ¹H NMR spectroscopy. The purity value is calculated as per Equation 1.

$$\text{Purity} = (100 \% - I_{\text{ORG}}) \times (100 \% - I_{\text{VOL}} - I_{\text{NVR}}) \quad \text{Equation 1}$$

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

Supporting evidence is provided by elemental microanalysis.

GC-FID: Instrument: Agilent 7890A
Column: HP-1MS, 30 m × 0.32 mm I.D. × 0.25 μm
Program: 180 °C (1 min), 15 °C/min to 250 °C (5 min), 30 °C/min to 300 °C (3 min)
Injector: 250 °C
Detector Temp: 320 °C
Carrier: Helium
Split ratio: 20/1
Relative mass fraction of the main component:
Initial analysis: Mean = 98.4%, s = 0.02% (10 sub samples in duplicate, September 2016)
Karl Fischer analysis: Moisture content 0.3% mass fraction (September 2016)
Thermogravimetric analysis: Volatile content < 0.1% and non volatile residue < 0.2% mass fraction (June 2016)

Spectroscopic and other characterisation data

GC-MS:	Parent compound:	
	Instrument:	Agilent 6890/5973
	Column:	HP-1MS, 30 m x 0.25 mm I.D. x 0.25 µm
	Program:	180 °C (1 min), 15 °C/min to 250 °C (5 min), 30 °C/min to 300 °C (3 min)
	Injector:	250 °C
	Transfer line temp:	280 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/1
	<i>Bis</i> -TMS derivative:	
	Instrument:	Agilent 6890/5973
	Column:	HP-1MS, 30 m x 0.25 mm I.D. x 0.25 µm
	Program:	180 °C (1 min), 15 °C/min to 250 °C (5 min), 30 °C/min to 300 °C (3 min)
	Injector:	250 °C
	Transfer line temp:	280 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/1
	The retention times of the parent compound and <i>bis</i> -TMS derivative are 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.	
	Parent (11.3 min):	320 (M ⁺ , 2), 302 (17), 291 (21), 273 (82), 255 (100), 231 (35), 230 (35), 217 (29), 215 (29), 201 (30), 187 (14), 173 (13), 161 (20), 159 (21), 147 (29), 121 (40), 107 (34), 91 (43), 79 (37), 67 (34), 57 (34) <i>m/z</i>
	<i>Bis</i> -TMS (12.6 min):	435 (M ⁺ , 22), 345 (22), 255 (36), 157 (100), 144 (59), 75 (38), 73 (37) <i>m/z</i>
HS-GC-MS:	Instrument:	Agilent 6890/5973/G1888
	Column:	DB-624, 30 m x 0.25 mm I.D. x 1.4 µm
	Program:	50 °C (5 min), 7 °C/min to 120 °C, 15 °C/min to 220 °C (8.3 min)
	Injector:	150 °C
	Transfer line temp:	280 °C
	Carrier:	Helium, 1.2 mL/min
	Split ratio:	50/1
	Solvents detected:	Ethyl acetate, hexane
TLC:	Conditions:	Kieselgel 60F ₂₅₄ . Chloroform/ethyl acetate (4/1) Single spot observed, R _f = 0.4. Visualisation with UV at 254 nm
IR:	Instrument:	Biorad FTS3000MX
	Range:	4000-400 cm ⁻¹ , KBr powder
	Peaks:	3370, 2929, 2871, 1454, 1374, 1150, 1031, 870 cm ⁻¹
¹ H NMR:	Instrument:	Bruker Avance III 500
	Field strength:	500 MHz
	Solvent:	CDCl ₃ (7.26 ppm)
	Spectral data:	δ 0.85 (1H, m), 0.96 (3H, t, <i>J</i> = 7.3 Hz), 0.97 (3H, t, <i>J</i> = 7.3 Hz), 1.03 (1H, m), 1.10-1.30 (8H, m), 1.32-1.72 (15H, m), 1.74-1.84 (2H, m), 1.87-1.97 (2H, m), 3.63 (1H, m) ppm Ethyl acetate estimated at 0.6% mass fraction by ¹ H NMR
¹³ C NMR:	Instrument:	Bruker Avance III 500
	Field strength:	126 MHz
	Solvent:	CDCl ₃ (77.2 ppm)
	Spectral data:	δ 7.8, 10.1, 20.4, 23.2, 25.7, 26.2, 26.3, 28.0, 29.89, 29.92, 31.7, 34.5, 35.9, 36.6, 38.4, 40.0, 42.7, 48.1, 51.6, 71.9, 85.7 ppm
Melting point:		188 °C
Microanalysis:	Found:	C = 78.5%; H = 11.5% (September 2016)
	Calculated:	C = 78.7%; H = 11.3% (Calculated for C ₂₁ H ₃₆ O ₂)