Australian Government
Department of Industry, Science and Resources

National Measurement Institute

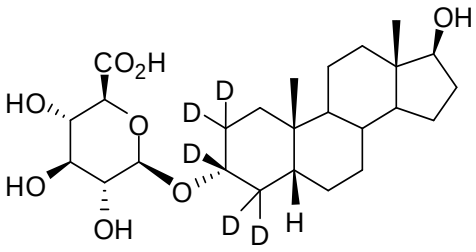
DEUTERATED INTERNAL STANDARD PRODUCT INFORMATION SHEET

NMIA S012: d_5-5β-Androstane-3α,17β-diol-3-*O*-β-glucuronic acid

Report ID: S012.2021.02

Chemical Formula: $C_{25}H_{35}D_5O_8$

Molecular Weight: 473.6 g/mol



Property value

Batch No.	CAS No.	Purity estimate (by HPLC-ELSD)
11-S-09	Not available	99.7 ± 0.3%

Synonyms: d_5-(3α,5β,17β)-17-Hydroxyandrostan-3-yl β-*D*-glucopyranosiduronic acid
d_5-17β-Hydroxy-5β-androstan-3α-yl β-*D*-glucopyranosiduronic acid

Expiration of certification: The property values are valid till 11 June 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 sample bottles that have been opened. In such cases it is recommended that the end-user conduct their own in-house stability trials.

Description: White powder 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: The isotopic purity of this material is an estimate only. This material should be considered for use as an internal standard only.

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 4 ºC in a closed container in a dry, dark area.

Stability: 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 ELS detection 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.
16 November 2022

This report supersedes any issued prior to 16 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:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. The purity value was obtained by mass balance from a combination of traditional analytical techniques, including GC-FID, thermogravimetric analysis, 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 elemental microanalysis.

The main component of this material is d_5-5β-androstane-3α,17β-diol-3-*O*-β-glucuronic acid. d_4- d_3-, d_2-, d_1- and d_0- Androstane-3α,17β-diol-3-*O*-β-glucuronic acid are also present. The stated chemical purity of the analyte represents the combined mass fractions of deuterated (d_5, d_4, d_3, d_2 and d_1) and d_0- androstane-3α,17β-diol-3-*O*-β-glucuronic acid in the material.

The isotopic purity of this material is an estimate only. This material should be considered for use as an internal standard only.

Isotopic Purity: $d_5 \approx 93\%$ [= $d_4/(d_4 + d_3 + d_2 + d_1 + d_0) \times 100$]

$d_0 < 0.2\%$ [= $d_0/(d_4 + d_3 + d_2 + d_1 + d_0) \times 100$]

HPLC:	Instrument:	Waters alliance 2695 or Waters Model 1525 Binary pump, 717 plus autosampler
	Column:	Alltima C-18, 5 μm (4.6 mm x 150 mm) (2013) X-Bridge C-18, 5 μm (4.6 mm x 150 mm) (2018 and 2021)
	Column oven:	40 °C
	Mobile Phase:	Methanol/MilliQ water (65:35) 0.5% Formic acid was present in the aqueous phase. (2013) Methanol/MilliQ water (61:39) 0.5% or 0.1% Formic acid was present in the aqueous phase. (2018 and 2021)
	Flow rate:	1 mL/min
	Detector:	Waters ELSD 2424
	Relative peak area of the main component:	
	Initial analysis:	Mean = 99.4%, s = 0.01% (10 sub samples in duplicate, January 2013)
	Re-analysis:	Mean = 99.5%, s = 0.16% (7 sub samples in duplicate, June 2018)
	Re-analysis:	Mean = 99.9%, s = 0.01% (5 sub samples in duplicate, June 2021)
Thermogravimetric analysis:		Volatile content 3.4% and non volatile residue 1.5% mass fraction (February 2013).
Karl Fischer analysis:		Moisture content 4.0% mass fraction (February 2013) Moisture content 4.7% mass fraction (June 2018)

Spectroscopic and other characterisation data

LC-MS:	Instrument:	Waters 2695 (HPLC)/Micromass Quatro
	Column:	X-Bridge C-18, 100 mm × 2.1 mm I.D. × 3.5 μm
	Column temp:	30 °C
	Solvent system:	2% Formic acid in MilliQ water [10%], Methanol [60% v/v], MilliQ water [30% v/v]
	Flow rate:	1 mL/min
	Sample prep:	50 μg/g in MeOH/MilliQ water (25:75)
	Injection volume:	30 μL
	Ionisation mode:	Electrospray negative ion
	Capillary voltage:	3.0 kV Cone voltage: 35 V
	Source temp:	130 °C Desolvation gas temperature: 350 °C
	Cone gas flow rate:	27 L/hr Desolvation gas flow rate: 762 L/hr
	The retention time of d_5-5β-androstan-3α, 17β-diol-3-O-β-glucuronic acid is reported along with the major peak in the mass spectrum. The latter is reported as a mass/charge ratio.	
	9.75 min:	472.4 ($M\text{-}H^+$) *m/z*
GC-MS:	Instrument:	Agilent 6890/5973
	Column:	HP Ultra 1, 17 m × 0.22 mm I.D. × 0.11 μm
	Program:	180 °C, 3 °C/min to 240 °C, 10 °C/min to 265 °C, 30 °C /min to 310 °C
	Injector:	260 ºC
	Transfer line temp:	300 ºC
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	14/1
	The free steroid was liberated upon treatment with β-glucuronidase enzyme (E. Coli K12) and derivatised with MSTFA. The retention time of the *bis*-TMS derivative of d_5-5β-androstan-3α, 17β-diol 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.	
	Bis-TMS (9.8 min):	441 (M^+, 1), 426 (3), 351 (10), 261 (43), 246 (41), 235 (7), 220 (24), 199 (16), 175 (4), 160 (8), 147 (8), 129 (56), 116 (13), 107 (12), 101 (11), 93 (16), 81 (16), 73 (100) *m/z*
TLC:	Conditions:	Kieselgel 60F_{254}. Chloroform/methanol (2/1) Single spot observed, R_f = 0.86. Visualisation with vanillin
IR:	Instrument:	Biorad FTS3000MX FT-IR
	Range:	4000-400 cm^{-1}, KBr powder
	Peaks:	3551, 3441, 3342, 2980, 2932, 2922, 2897, 2864, 2203, 2122, 1722, 1448, 1375, 1336, 1254, 1215, 1168, 1123, 1062, 1050, 1017, 996, 944, 925, 695 cm^{-1}
^{1}H NMR:	Instrument:	Bruker Avance III-400
	Field strength:	400 MHz
	Solvent:	CD_3OD (3.31 ppm)
	Spectral data:	δ 0.72 (3H, s), 0.96 (3H, s), 0.94-1.18 (4H, m), 1.19-1.32 (3H, m), 1.37-1.52 (6H, m), 1.59 (1H, m), 1.81-2.02 (4H, m), 3.19 (1H, dd, *J* = 7.9, 9.2 Hz), 3.38 (1H, t, *J* = 9.0 Hz), 3.52 (1H, t, *J* = 9.6 Hz), 3.57 (1H, t, *J* = 8.7 Hz) 3.78 (1H, d, *J* = 9.7 Hz), 4.45 (1H, d, *J* = 7.8 Hz) ppm
^{13}C NMR:	Instrument:	Bruker Avance III-400
	Field strength:	101 MHz
	Solvent:	CD_3OD (49.0 ppm)
	Spectral data:	δ 11.7, 21.5, 23.9, 24.3, 27.2, 28.1, 30.7, 35.8, 36.2, 37.3, 38.2, 42.1, 43.4, 44.2, 52.4, 73.2, 74.8, 76.6, 77.5, 82.6, 102.5, 172.6 ppm
Melting point:		208-210 °C decomposition
Microanalysis:	Found:	C = 59.6%; H = 8.6% (February, 2013)
	Calculated:	C = 63.4%; H = 8.6% (Calculated for $C_{25}H_{35}D_5O_8$)