BDG SYNTHESIS

Certificate of Analysis

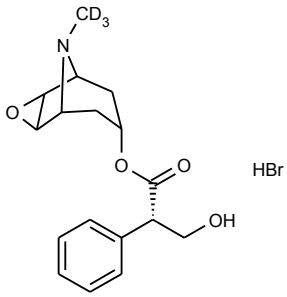
BDG Synthesis certifies that this reference material meets or exceeds the specifications stated herein.

Neil Beare, PhD, Director
20 June 2017

Name: **Scopolamine-d_3 HBr**

CAS Number: 114-49-8 (unlabelled trihydrate)

Structure:



Molecular Weight: $C_{17}H_{18}D_3NO_4 \cdot HBr = 387.28$

Lot Number: BDG 15317

Appearance: White, crystalline solid

Corrected Purity: 99.6 % (HPLC) - 3.2 % (methanol) - 4.4 % (water) = 92.0 %

Isotopic Purity: Under 0.5 % d_0

Re-test Date: 20 June 2022

Storage and Handling:

Temperature:	refrigerate for prolonged storage; may be handled and shipped at ambient temperature.
Humidity:	not believed to be hygroscopic; may be handled in normal laboratory atmosphere.
Light:	protect from strong sunlight.
Caution:	only experienced laboratory personnel should handle the material.

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Identity and Purity

Proton NMR Spectrum

Identity: the signals are consistent with the proposed structure and in accord with literature where available.
Isotopic Labelling: signals at the site of deuteration are absent, compared with the spectrum of unlabelled material, indicating clean deuteration.
Residual Solvents: a small amount of methanol (3.2 % *w/w*) is observed.
Impurities: no significant impurities are evident in the spectrum.

Carbon-13 NMR Spectrum

Identity: the signals are consistent with the proposed structure and in accord with literature where available.
Isotopic Labelling: the signal for the N-methyl carbon is masked by a methylene carbon and therefore cannot be used to ascertain the extent of deuterium incorporation.

High-resolution Mass Spectrum (ESI+)

Found *m/z* 307.1732. $C_{17}H_{19}D_3NO_4$ $[M+H]^+$ requires *m/z* 307.1732. The deviation of 0.0 ppm is within normally accepted limits for the establishment of identity by HRMS. No signal for d_0 material was seen (detection limit about 0.5 %).

HPLC

A sharp, symmetrical peak is observed (99.6 %). Note: in the absence of reference materials for preparing calibration curves, it is assumed that all peaks have the same detector response. Where possible, the conditions of analysis follow a pharmacopeial or literature method, or have been adapted from same.

Elemental Analysis

	Found:	C 50.46, H 5.37, D 1.54, N 3.36 %
$C_{17}H_{18}D_3NO_4 \cdot HBr \cdot 1.0H_2O$	Requires:	C 50.38, H 5.22, D 1.49, N 3.46 %, H_2O 4.44 %
$C_{17}H_{18}D_3NO_4 \cdot HBr$	Requires:	C 52.72, H 4.94, D 1.56, N 3.62 %

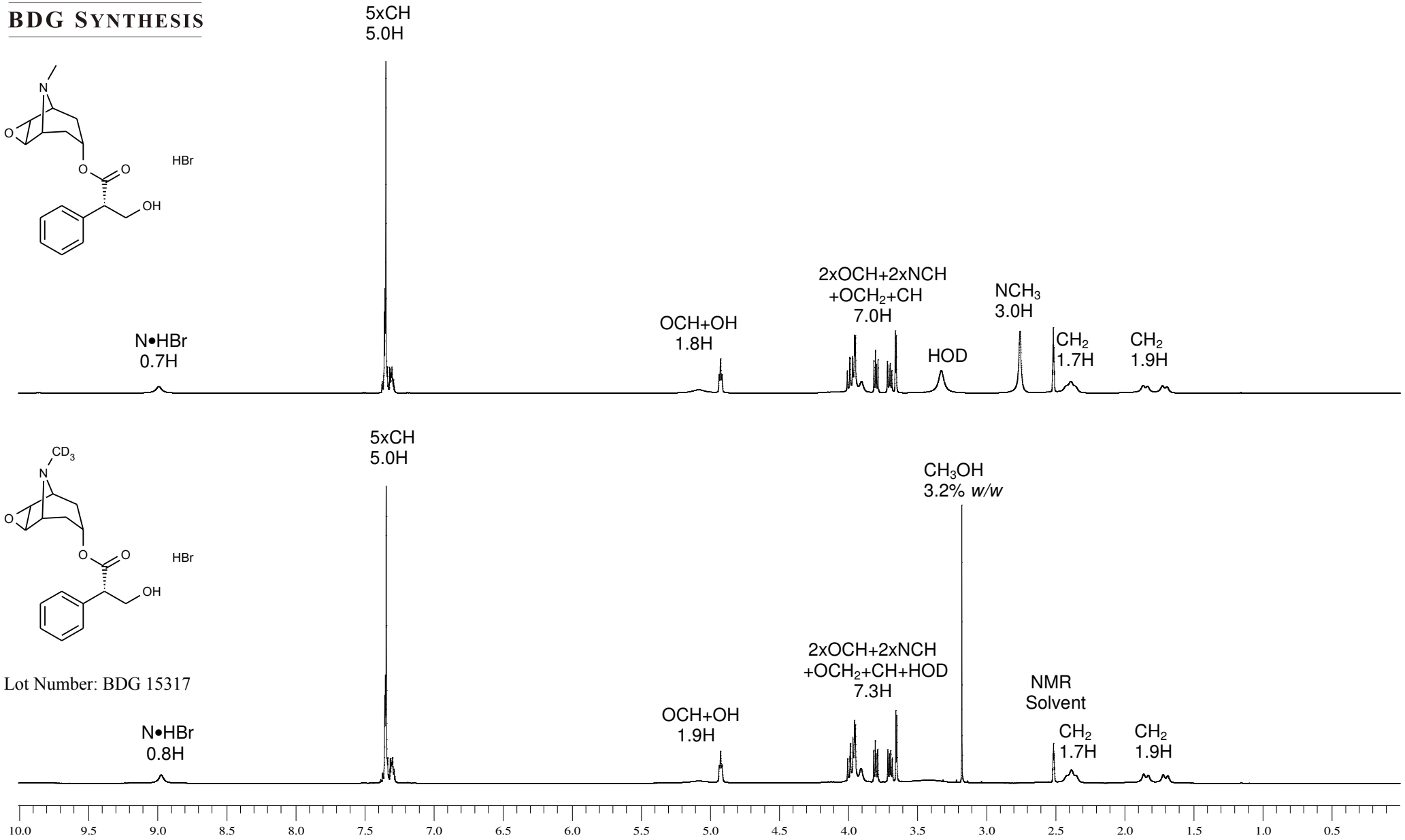
The elemental analyses fall somewhat outside those expected for anhydrous material; the presence of water is reasonably expected from the method of purification and/or the type of material, and the “best-fit” hydrated molecular formula is given. In the absence of a Karl-Fischer water analysis, we recommend that the “best-fit” water content be used when determining corrected purity.

The available quantity of custom-synthesised material is always small, and this limits the extent and type of analytical data which can be obtained. This Certificate is presented in descriptive format for use by analytical chemists who are trained in the use of custom-synthesised materials. Custom materials often contain higher levels of residual solvents and/or water, and we urge you to use the corrected purity where needed rather than the raw HPLC purity. This compound is intended for use as an analytical reference material and it is not for human administration. Structures are shown with relative stereochemistry unless otherwise specified.

The re-test date is assigned from experience gained with the material in the laboratory and/or on storage. It is not possible to perform formal storage studies because of the small amount of material available.

BDG SYNTHESIS

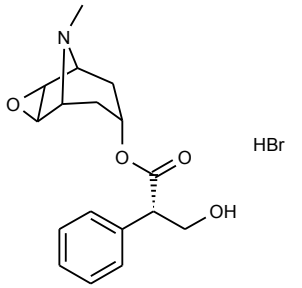
Proton NMR Spectrum of Scopolamine HBr (top) and Scopolamine-d_3 HBr (bottom) in DMSO-d_6

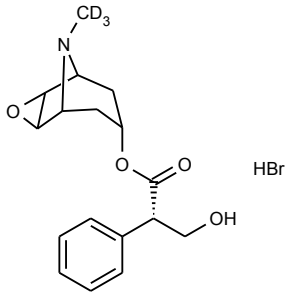


Lot Number: BDG 15317

BDG SYNTHESIS

Carbon-13 NMR Spectrum of Scopolamine HBr (top) and Scopolamine-d_3 HBr (bottom) in DMSO-d_6





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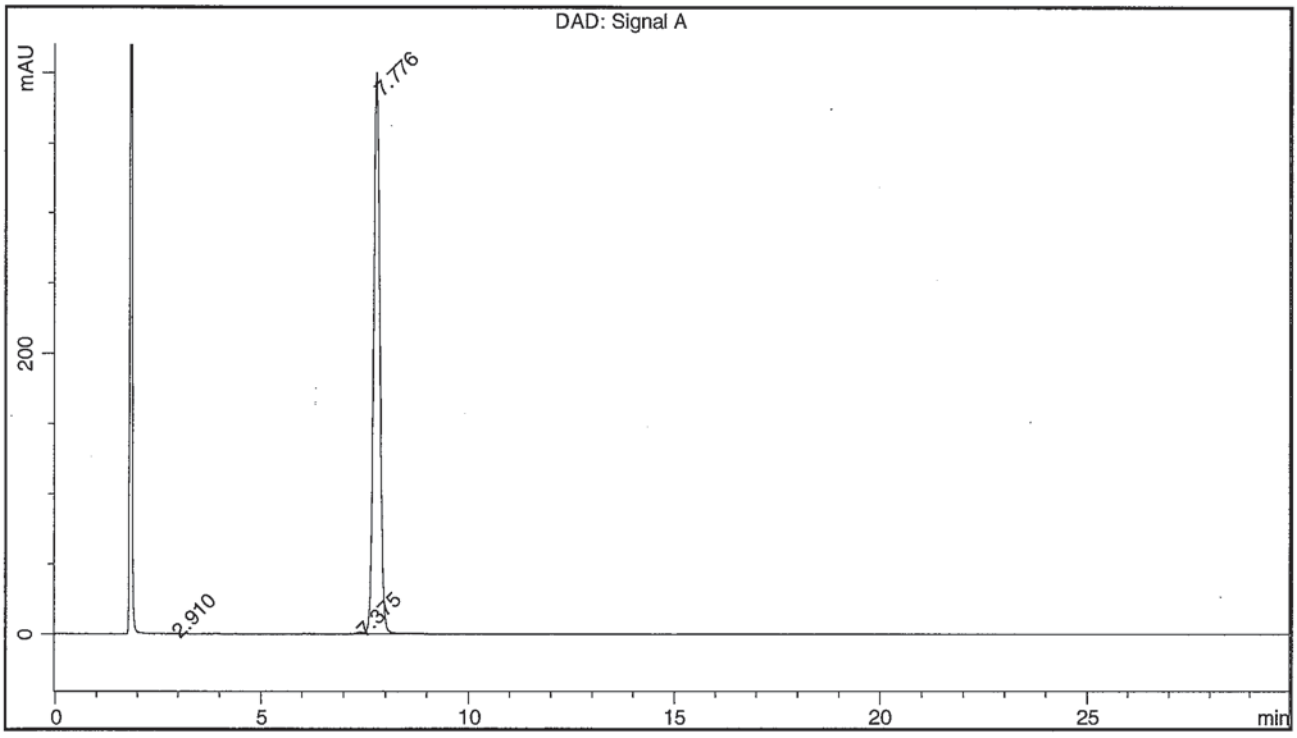
BDG - Analysis of Scopolamine-d3 HBr

Column : Phenomenex Luna C8(2) 5um 250 x 4.6 mm
Guard : Phenomenex Security Guard C8 RP 4 x 3 mm
Mobile Phase : 55:45 8.7 mM Sodium Dodecylsulphate pH=2.5 (H3PO4) : Acetonitrile
Flow Rate : 1.0 mL/min
Sample Solvent : Mobile Phase
Column Temperature : 20 C
Injection Volume : 10 uL
Detection : UV 210 nm

Sample Name	BDG 15317	**Instrument**	AnalyticalLC01
Acquisition	20/06/2017, 18:39:19	**Method (rev.)**	LC10344a (9)
Sequence	BDG_20Jun2017a - Reprocessed	**Vial Position**	1
Operator	solvation010\cerityadmin	**Injection**	2 of 2



Area Percent Report

Peak#	RT	Peak Height	Peak Area	Width	Area %
1	2.91 min	0.4914	3.9708	0.1063 min	0.094 %
2	7.37 min	1.3011	12.7651	0.1385 min	0.303 %
3	7.78 min	400.7050	4193.2292	0.1601 min	99.602 %