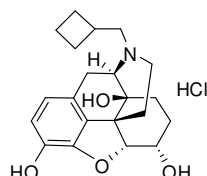


Certificate of Analysis

Axon Catalogue ID: 1577 **Batch Number:** 1
Product Name: Nalbuphine hydrochloride
Alternative Name(s): Nubain
IUPAC Name: (-)-17-(Cyclobutylmethyl)- 4,5 α -epoxymorphinan-3,6 α ,14-triol hydrochloride

Structure:



Amount:

CAS number(s): 20594-83-6 (parent), 23277-43-2 (HCl (1:1))
Molecular Formula: C₂₁H₂₇NO₄.HCl **Molecular Weight:** 393.90
Batch Molecular Formula: C₂₁H₂₇NO₄.HCl.1H₂O **Batch Molecular Weight:** 411.92
Appearance: White solid **Observed mp:** 252 °C (decomp)
TLC (R_f): 0.7 DCM/MeOH (9:1)
Chemical Purity: 99.0%
Optical Purity (ee): N.A.
¹H-NMR (300 MHz): Analytical data confirm chemical structure
Mass Spec: Analytical data confirm chemical structure
Microanalysis: Calculated: C 61.23, H 7.34, N 3.40; Found: C 60.80, H 7.45, N 3.40
Storage Conditions: Desiccate at +4 °C

Solubility Data:	Solvent	Solubility (mg/ml)	Solubility (mM)	Remarks
	Water	23.3	56.6	
	0.1N NaOH (aq)			Not Tested
	0.1N HCl (aq)			Not Tested
	DMSO			Not Tested
	EtOH			Not Tested

Remarks:

QC Date: 07-05-2020

The purity of Axon Ligands is confirmed by HPLC, MS, NMR and/or microanalysis. Analytical data are available upon request. Request can be submitted by e-mail to info@axonmedchem.com indicating Catalogue ID and Batch number.

Caution: Not fully tested. For research purposes only