Liquid Chromatography-Tandem Mass Spectrometry for Measurement of Serum Lacosamide and Desmethyl Lacosamide

Background Information

Lacosamide (LCM) is an antiepileptic drug (AED) approved by the Food and Drug Administration for the adjunctive treatment of partial onset seizures. LCM has a novel mode of action by selectively enhancing the slow deactivation of sodium gated channels.[1] This differs from most AEDs that enhance the fast deactivation of sodium gated channels.[2] LCM plasma concentrations peak within 1-4 hours when taken orally, and has a half-life of 13 hours.[3,4] The major human metabolite is O-desmethyl lacosamide (ODL).

Ultraviolet (UV) spectroscopy, high-performance liquid chromatography (HPLC)-UV, high-performance thin layer chromatography and liquid chromatography-tandem mass spectrometry (LC-MS/MS) have all been used for the measurement of LCM.[4] Although HPLC-UV is one of the most commonly used techniques for the measurement of AEDs, it suffers from analytical interference and long run times. New methods have recently been reported using LC-MS/MS, which offers better specificity, shorter run times and simple sample preparation.

Clinical Indications

Therapeutic drug monitoring (TDM) of this drug is used to optimize seizure control while limiting adverse effects, establishing an individualized therapeutic range, and to assess compliance to therapy.

Interpretation[5]

Lacosamide: Expected random concentration for patients receiving 200-400 mg/day is 2.2-19.8 μg/mL.

O-desmethyl lacosamide: Expected random concentration for patients receiving 200-400 mg/day is up to 2.5 μg/mL.

Limitations of the Assay[5]

Assay is linear from 0.4-47.5 μg/mL and 0.3-48.2 μg/mL for lacosamide and o-desmethyl lacosamide, respectively.

Minimum sample size of 0.5 mL is required.

This is a laboratory-validated assay that uses analyte specific reagents (ASR), which will be indicated.

Methodology[5]

This assay measures lacosamide and o-desmethyl lacosamide.

- Lacosamide and o-desmethyl lacosamide are extracted by protein precipitation and analyzed by LC-MS/MS.
- Blood should be collected in a serum, no additive (Red), vacutainer. Do not use serum separator tubes.
- Serum should be removed from the cells and stored at 4°C prior to testing.

References

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2. Chung S, Ben-Menachem E, Sperling MR *et al*. Examining the clinical utility of lacosamide: pooled analyses of three phase II/III clinical trials. *CNS drugs*. 2010;24(12):1041-1054.
3. Halasz P, Kalviainen R, Mazurkiewicz-Beldzinska M *et al*. Adjunctive lacosamide for partial-onset seizures: Efficacy and safety results from a randomized controlled trial. *Epilepsia*. 2009;50(3):443-453.

4. Valarmathi R, Banu SF, Akilandeswari S, Senthamarai R, Dhivya C. A Review on New Antiepileptic Drug–Lacosamide and its Analytical Methods. *CHEMISTRY*, 4, 5.

5. Drew Payto, Nancy Foldvary-Schaefer, Norman So, Monica Bruton, Sihe Wang. A Sensitive and Rapid Method for Quantification of Lacosamide and Desmethyl Lacosamide by Liquid Chromatography-Tandem Mass Spectrometry. *Bioanalysis*. In press.

Related Tests

- Levetiracetam
- Gabapentin
- Lamotrigine
- Zonisamide
- Topiramate
- Rufinamide

Test Overview

Test Name	Lacosamide
Ordering Mnemonic	LACOS
Lacosamide Expected Concentration	Expected random concentration for patients receiving 200-400 mg/day is 2.2-19.8 μg/mL.
O-desmethyl lacosamide Expected Concentration	Expected random concentration for patients receiving 200-400 mg/day is up to 2.5 μg/mL.
Patient Preparation	N/A
Specimen Requirements	0.5 mL Serum (No additive)
Disclaimers or Notations	Not FDA-approved
Billing Code	88181
CPT Code	82542

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