Evaluation of ARK Diagnostics Gabapentin, Lamotrigine, Levetiracetam, Topiramate and Zonisamide Immunoassays on the Beckman AU400e Chemistry Analyzer.

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Abstract
Objective: The performance of Gabapentin, Lamotrigine, Levetiracetam, Topiramate and Zonisamide immunoassays obtained from ARK Diagnostics was evaluated with an open-channel automated chemistry analyzer. Methodology: The five assays studied here (homogeneous enzyme immunoassays) were designed for the quantification of antiepileptic drugs in human serum or plasma. The assays were performed using a Beckman AU400e instrument. Assay precision, accuracy, analytical measurement range, and method comparison studies were conducted using samples prepared at known concentrations, quality control materials, and authentic patient specimens. Results were compared to previously validated immunoassays (TDx) or LC-MS/MS. Results: Assay performance was consistent with manufacture claims and clinical needs for all five assays.

Conclusions: ARK Diagnostics antiepileptic drug assays can be performed with the Beckman AU400e to support therapeutic drug monitoring needs.

Introduction
Gabapentin, Lamotrigine, Levetiracetam, Topiramate and Zonisamide are important anticonvulsant medications. Gabapentin and Topiramate have also been found to be useful in the treatment of migraine headaches and other sources of pain. Gabapentin, Lamotrigine, Levetiracetam, and Topiramate appear on most top 200 drug prescription lists. Since most people being treated for seizures are on more than one anticonvulsant it is important to be able to monitor as many drugs as possible from the same sample. ARK Diagnostics (Sunnyvale, CA) has developed a series of immunoassays targeted at the anticonvulsant class of drugs that can be used on an automated analyzer to monitor the fore mentioned drugs. Quantitative results from these assays were evaluated and compared against UltraHigh Pressure Liquid Chromatography-Tandem Mass Spectrometry for Gabapentin, Lamotrigine, and Levetiracetam with FPIA (INNOVIOUR ® Seradyn Diagnostics/Thermo Scientific, Indianapolis, IN) for topiramate and zonisamide.

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Method Comparison
The ARK Gabapentin assay was compared to the UPLC-MS/MS assay by analyzing 45 specimens. The ARK Lamotrigine assay was compared to the UPLC-MS/MS assay by analyzing 93 specimens. The ARK Levetiracetam and Zonisamide assays were compared to the FPIA assay by analyzing 21 and 22 patient specimens. Linear regression for each is found below.

Conclusions
◆ Results of the ARK assay were comparable to the UPLC-MS/MS and FPIA assays.
◆ The analytical measurement range of the ARK assays are adequate for testing but smaller than the UPLC-MS/MS
◆ Commercialization of the ARK assay may improve accessibility to anticonvulsant TDM and provides FDA approved testing.

Imprecision
Imprecision was determined by analyzing three levels of control material prepared in quintuplicate at three concentrations for eight days (n = 40 for each concentration).

Total Recovery
Recovery was evaluated by analyzing two batches of samples spiked at 3 concentrations in triplicate (n = 6 for each concentration). The percent recovery ranged from 92.0% to 105.0%.

Linearity
Linearity was evaluated by analyzing two batches of samples spiked at 6 concentrations in duplicate over the stated analytical range of the assay. Results are shown below.

Method Comparison

Carryover and Interfering Substances
Carryover was evaluated by a series of samples containing 80.0 µg/mL, followed by a sample containing 2.0 µg/mL, in five replicates. No carryover was observed. Interference studies were conducted by testing other anticonvulsant medications as well so over the counter medicines on each assay. No interferences were found.