QUANTITATIVE DETECTION OF HEPATITIS B VIRUS USING AN INTEGRATED MOLECULAR DIAGNOSTIC SYSTEM
C. Couture, E. Craig, ME. Carey, HL. Lee, J. Zhu, K. Rutila, M. Mastronardi, B. Wu, S. Brahmasandra, NeuMoDx Molecular Inc., Ann Arbor, MI

BACKGROUND
Quantitative detection of hepatitis B virus (HBV) DNA titers or infected patients is essential to monitor disease progression and efficacy of antiviral therapies, as well as to detect drug-resistant mutants and identify resistant upon discontinuation of antiviral therapy. The NeuMoDx HBV Test is a fully automated, in-vitro diagnostic test offered on the NeuMoDx 2000 Molecular System which combines universal nucleic acid amplification with sensitive real-time PCR detection of HBV particles. Upon loading the samples, the System automatically extracts, denatures, and purifies DNA using proprietary reagents and nucleic acid capture. The System then automatically uses the DNA to create a standard curve and interprets the result in real time. The assay features excellent linearity and accuracy of results. The objective of this study was to test and report on the performance of the NeuMoDx HBV Test against the benchmark.

METHODS
Analytical studies were performed to determine sensitivity, limits of quantitation, linearity, efficacy of cross-reacting or interfering agents, within-laboratory, and inter-laboratory reproducibility of the NeuMoDx HBV Test. Analytical sensitivity was determined using WHO International Standard for HBV. The Limit of Detection (LOD) and Lower Limit of Quantitation (LLQ) along with linearity parameters were also assessed across the different HBV genotypes. Each sample was run in triplicate. 10 replicate samples with 3 different genotypes and 3 different environmental conditions were used to determine results. Cross-reactivity was determined across a family of agents. An in-house method comparison study was also performed to assess quantitative concordance with reference tests.

RESULTS
The NeuMoDx HBV Test demonstrated a LOD of 5-2.5 IU/mL and a LLQ of 7.3-0.4 IU/mL across all relevant genotypes. The test demonstrated excellent linearity across an 8 Log Dynamic range (2.5-10^8 IU/mL) along with an accuracy of 95-100% (6.2-8.0 IU/mL) across the entire range. The assay was determined to be linear (R^2 > 0.99) across the entire 8 Log range. The average concordance with reference test was excellent. Within-Lab Precision was assessed over 12 days on three Systems and lot to lot reproducibility was determined across three lots of reagents. An in-house method comparison study was also performed to assess quantitative concordance with reference tests.

FEATURES
- Integrated Operation: Integrates all steps of molecular diagnostics, including two clinical specimens to provide real-time PCR results in a fully automated process
- True Random Access: Unlimited ability to mix specimens types and tests
- High Throughput: 400 DNA tests in an 8-hour shift
- Fast Time to First Results: Up to 288 samples
- Large Walk-Away Window: 24 hours
- Continuous Loading: Specimens and Reagents can be loaded/unloaded at any time
- Seamless On-Demand Operation: Automated inventory management of consumables and reagents
- Long-Term Shelf Life: On-board room temperature stability
- Real-Time PCR: Fluorescence detection offers real-time PCR multiplexing ability

CONCLUSION
The NeuMoDx HBV Test offers a rapid, real-time throughput technology in an on-demand, sample-to-result testing format. These features coupled with excellent sensitivity and accuracy performance metrics make the NeuMoDx HBV Test an outstanding solution for rapid and reliable monitoring required for effective patient management of blood borne virus infections.

ACKNOWLEDGMENTS
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