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Assessing the Analytical Performance of the Anti-Müllerian Hormone Assay on the Atellica CI Analyzer

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Background

In reproductive medicine, ovarian reserve (OR) is a critical measure that indicates the quantity of a woman's remaining eggs (oocytes) in relation to her age. This measure is essential for predicting reproductive potential and guiding fertility treatments. Anti-Müllerian Hormone (AMH) serves as a reliable and non-invasive biomarker that is closely associated with the number of antral follicles, which are small fluid-filled structures containing immature eggs within the ovaries. Evaluating OR typically involves counting antral follicles via transvaginal ultrasound and measuring serum AMH levels.[1]

The Atellica IM Anti-Müllerian Hormone (AMH) assay was previously developed and commercialized for use on the Atellica IM Analyzer.[2] This assay allows the serological determination of AMH. Results are reported quantitatively using primary reporting units in ng/mL converted in pmol/L units by applying the conversion formula of 1 ng/ml = 7.14 pmol/L.

For over three years, the Atellica CI Analyzer (Figure 1) has been part of the Atellica Solution portfolio, offering a reduced footprint of 1.9 square meters. It is an integrated clinical chemistry and immunoassay analyzer designed for low- to mid-volume laboratories and features the same reagents,*consumables,* and sophisticated user interface as the Atellica IM Analyzer.[3]

To evaluate the analytical performance of the Atellica IM assays using this recent analyzer, precision, method comparison (MC), limit of blank, detection, quantitation (LoB, LoD, LoQ), and linearity studies were assessed as performance indicators for the Atellica IM AMH assay on the Atellica CI Analyzer.

Figure 1. The Atellica CI Analyzer

Material and Methods

Precision (CLSI EP05-A3)

Repeatability and Within-Laboratory Precision

- Sample types: contrived samples consisting of pooled human female serum samples either undiluted or diluted with AMH-negative human female serum pool or spiked with purified bovine AMH antigen, and quality control (QC) samples.
- One aliquot/sample; tested in duplicate; two runs/day >2 hours apart for 20 days.
- One reagent lot; two analyzers; total n = 80 replicates for each system/lot combination.
- One representative system/lot combination result across all lot and system combinations tested is shown (Table 1).
- Each testing day, single freeze-thaw aliquots were used for each run. Calibrators and QC materials were handled according to the manufacturer's instructions; two calibration events for 20-day-precision study.

Method Comparison (CLSI EP09C-ED3)

- MC was evaluated using 123 individual and 13 pooled native human serum samples, stored frozen in aliquots at ≤-20°C. Samples were thawed and centrifugated before testing on the Atellica CI Analyzer and the Atellica IM Analyzer using three reagent lots.
- MC was completed over 5 nonconsecutive days using a single calibration event.
- One representative system/lot combination result across all lot and system combinations tested is presented (Table 2).
- One replicate processed per sample.
- Samples with results outside the assay measuring interval 0.043–24.0 ng/mL (0.307–171 pmol/L) were excluded from the analysis.
- Slope and intercept were calculated using weighted Deming regression analysis.

Detection Capability (CLSI EP17-A2)

LoB: Highest measurement result that is likely to be observed on a blank sample with a probability of 95%.

- Six undetectable analyte level samples; five replicates/sample; two runs/day, 5 days, one instrument, three reagent lots: total of 300 measurements per reagent lot. LoB was calculated non-parametrically as the 95th percentile ranked position of all blank samples using the following equation: Rank Position = 0.5 + (n x 0.95), where n is the total number of replicates. The maximum of all lots was taken as the final estimated value.

LoD: Lowest concentration of AMH detectable with a probability of 95%.

- Twelve blank and low analyte level samples; five replicates/sample; two runs/day, 5 days, one instrument, three reagent lots: total of 600 measurements per reagent lot. For each lot, the within-laboratory SD (standard deviation) precision for each sample was plotted against the mean concentration of each sample and fitted using a power function to give a precision profile. The lowest AMH concentration that could be differentiated from the LoB with 95% confidence was the LoD for that lot. The largest LoD of all lots was the final estimated LoD value.

LoQ: Lowest amount of measurand in a sample at which the within-lab coefficient of variation (CV) is ≤20%.

- Twelve low analyte level samples; five replicates/sample; two runs/day, 5 days, one instrument, three reagent lots: total of 600 measurements per reagent lot. For each lot, the within-laboratory CV precision for each sample was plotted against the mean concentration of each sample and fitted using a power function to give a precision profile. LoQ for each reagent lot was determined as the analyte concentration corresponding to 20% within-lab CV or the LoD, whichever is greater. The largest LoQ across all lots tested was taken as the LoQ for the assay.
- Prior to the start of each study, LoB, LoD and LoQ samples were prepared and frozen in aliquots. On each testing day, fresh aliquots were thawed.

Linearity (CLSI EP06-ED2)

- A dilution series composed of 11 levels prepared by mixing high and low analyte samples in a known mathematical relationship; five replicates/level; one instrument, three reagent lots.
- Expected values were calculated for each level from the measurand concentrations of the low and high samples. A best-fitted straight-line regression was fit through the mean observed values versus the expected values. Bias was calculated for each level as the difference between the mean observed value and the value predicted by the linear regression model. These biases were converted into % bias values, with respect to the predicted value for each sample, and compared to the acceptance criteria (allowable deviation from linearity) for the assay.

Results

Precision

Table 1. Precision for the Atellica IM AMH assay on the Atellica CI Analyzer

Specimen Type	Mean (n=80)		Repeatability			Within-laboratory Precision		
	(pmol/L)	(ng/mL)	SD (pmol/L)	SD (ng/mL)	CV (%)	SD (pmol/L)	SD (ng/mL)	CV (%)
Serum	0.757	0.106	0.0193	0.0027	2.5	0.0236	0.0033	3.1
Serum	1.535	0.215	0.0236	0.0033	1.5	0.0428	0.0060	2.8
Serum	7.433	1.041	0.1221	0.0171	1.6	0.1899	0.0266	2.6
Serum	27.139	3.801	0.3649	0.0511	1.3	0.6904	0.0967	2.5
Serum	49.259	6.899	0.5362	0.0751	1.1	1.1624	0.1628	2.4
Serum	50.401	7.059	0.7440	0.1042	1.5	1.2502	0.1751	2.5
Serum	124.700	17.465	2.2234	0.3114	1.8	3.4465	0.4827	2.8
Serum QC	6.647	0.931	0.1200	0.0168	1.8	0.2099	0.0294	3.2
Serum QC	39.020	5.465	0.6262	0.0877	1.6	1.1774	0.1649	3.0
Serum QC	118.860	16.647	1.6679	0.2336	1.4	3.8356	0.5372	3.2

The Atellica IM AMH assay on the Atellica CI Analyzer demonstrated ≤2.5% repeatability CV and ≤3.2% within-laboratory precision CV across the sample interval.

Method Comparison

Table 2. Method comparison for the AMH assay on the Atellica IM Analyzer and Atellica CI Analyzer

Specimen Type	Assay	Comparison Analyzer (x)	n	r	Regression Equation	Sample Range
Serum	Atellica IM AMH	Atellica IM	130	0.999	y = 1.00x + 0.001 ng/mL (y = 1.00x + 0.007 pmol/L)	0.044–22.776 ng/mL (0.314–162.621 pmol/L)

When analyzed by regression, Atellica IM AMH assay on the Atellica CI Analyzer recovered samples spanning the measuring interval, with a slope of 1.00 ± 0.05, y-intercept of 0 ± 0.035 ng/mL, and a correlation coefficient ≥ 0.950 (r) compared to the Atellica IM Analyzer.

One representative weighted Deming fit and percent difference plots on the Atellica CI Analyzer for samples ranges indicated in Table 2 are shown for the Atellica IM AMH assay (Figure 2).

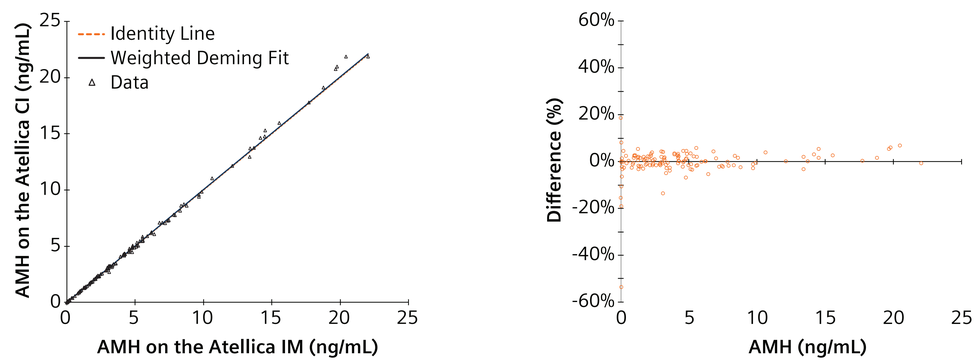

Figure 2. Weighted Deming linear regression and difference plots for the Atellica IM AMH assay on the Atellica IM and Atellica CI Analyzers.

Bias greater than 50% was observed for one sample at AMH concentration of 0.043 ng/mL on the Atellica IM Analyzer resulting at 0.020 ng/mL on the Atellica CI Analyzer. This represents a negative absolute bias difference of 0.023 ng/mL which is not expected to impact clinical interpretation.

Detection Capability

Table 3. LoB, LoD and LoQ for the Atellica IM AMH assay on the Atellica CI Analyzer

Specimen Type	Assay	Total Replicates per Reagent Lot	LoB Reported*	LoD Reported*	LoQ Reported*
Serum	Atellica IM AMH	300 (LoB) — 600 (LoD) — 600 (LoQ)	0.010 ng/mL (0.071 pmol/L)	0.020 ng/mL (0.143 pmol/L)	0.043 ng/mL (0.307 pmol/L)

**The initially reported LoB and LoD in the submitted abstract have been updated to reflect the values observed across the Atellica Analyzers. The LoQ was determined by considering both analytical and clinical performance data.The lowest amount of AMH in a sample at which the within-laboratory CV is ≤ 20% is 0.030 ng/mL. The lowest amount of AMH in a sample for which the clinical performance was verified is 0.043 ng/mL. The within-laboratory CV is ≤ 15% at an AMH concentration of 0.043 ng/mL.*

The detection capability for the Atellica IM AMH assay on the Atellica CI Analyzer was reported at 0.010 ng/mL (0.071 pmol/L) for LoB, 0.020 ng/mL (0.143 pmol/L) for LoD and 0.043 ng/mL (0.307 pmol/L) for LoQ.

Linearity

Table 4. Linear interval for the Atellica IM AMH assay on the Atellica CI Analyzer

Specimen Type	Assay	# of Sample Combinations Tested	Linearity Reported
Serum	Atellica IM AMH	11	0.043–24.0 ng/mL (0.307–171 pmol/L)

The Atellica IM AMH assays is linear on the Atellica CI Analyzer across the interval indicated in Table 4. The lower limit of the linear interval is defined by the analytical sensitivity (LoQ) estimated to be 0.043 ng/mL (0.307 pmol/L) for this assay.

Conclusion

All results indicate that the Atellica IM AMH assay demonstrated acceptable analytical performance for the serological determination of AMH when tested on the Atellica CI Analyzer. In addition, strong quantitative agreement was observed between the assay on the Atellica CI Analyzer and the Atellica IM Analyzer. Altogether, these results support that the Atellica CI Analyzer has comparable performance capability to the Atellica IM Analyzer.

References

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**The products/features mentioned here are not commercially available in all countries. Their future availability cannot be guaranteed.*

Data/some data first presented at Worldlab IFCC 2025.

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