Electrolyte Assay Performance on the IDEXX VetStat™ Electrolyte and Blood Gas Analyzer

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Introduction

The VetStat™ Electrolyte and Blood Gas Analyzer provides reportable ranges that cover canine, feline and equine variability and species-specific reference ranges. We investigated its performance on sodium, potassium and chloride by comparing VetStat analyzer results to results from an ion-selective electrode system, which is a recognized reference methodology.

Material and Methods

Canine, feline and equine whole-blood samples were analyzed at 15 different laboratories including practices, a top U.S. veterinary hospital and our own research-and-development laboratory. Assays were run on the VetStat analyzer and the IDEXX VetLyte® reference system within two hours. The results for each sample at our site are from three of six different VetStat analyzers. Other results are from one VetStat analyzer at each of ten sites and two VetStat analyzers at each of four sites. There was one VetLyte analyzer at each site.

There were several sources of variability in the study, in addition to different analyzers and laboratories. Three different VetStat cassettes were used: Electrolyte, Fluid Therapy and Respiratory Therapy. Some samples were analyzed fresh; others were stored on ice for 23–27 hours for canine and feline, and 4–6 hours for equine. The complete study spanned one year and used multiple lots of each cassette type.

Table 1 gives other details of the study:

	Sodium	Potassium	Chloride
Number of Samples	594	609	570
Concentration Range [mmol/L]	91–188	1.9–9.55	77–158
Number of Cassette Lots	26	26	24

Data was analyzed by standard linear regression.

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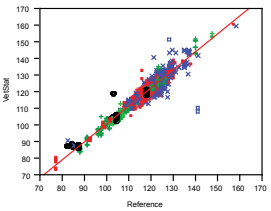
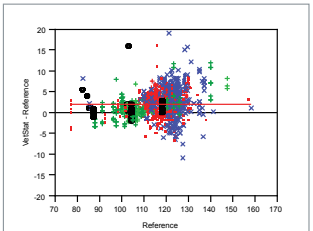
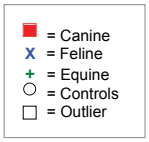
Results

Chloride



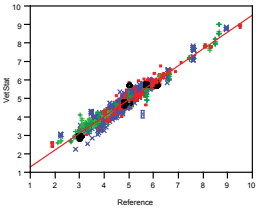
Slope:	1.08
y-Intercept:	-7.5
r^2:	0.950
Mean Bias:	1.9 mmol/L
Mean Result:	116 mmol/L



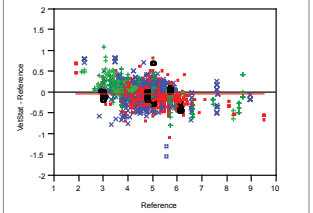


The reportable range for Cl is 50 to 160 mmol/L. The Cl correlation was good, with slope <1.10 and the *y*-intercept 6.5% of the mean result. The r^2 was excellent. The mean bias is 1.6% of the mean result.

Potassium

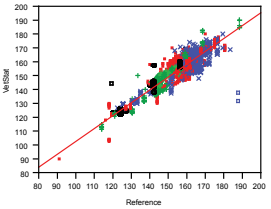


Slope:	0.911
y-Intercept:	0.39
r^2:	0.953
Mean Bias:	-0.04 mmol/L
Mean Result:	4.80 mmol/L

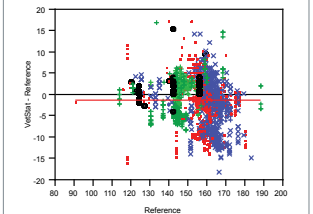


The reportable range for K is 0.8 to 10 mmol/L. The K correlation was good, with slope >0.90 and the *y*-intercept 8.1% of the mean result. The r^2 was excellent. The mean bias is 0.8% of the mean result.

Sodium



Slope:	0.926
y-Intercept:	10.2
r^2:	0.840
Mean Bias:	-1.3 mmol/L
Mean Result:	153 mmol/L

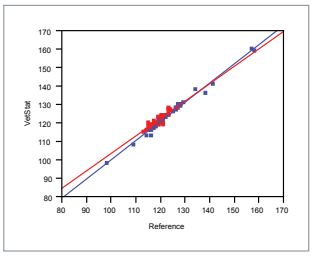


The reportable range for Na is 100 to 180 mmol/L, and slightly more than that range was tested. The Na correlation was acceptable, with slope >0.90 and the *y*-intercept 6.7% of the mean result. The r^2 was acceptable. The mean bias is 0.8% of the mean result.

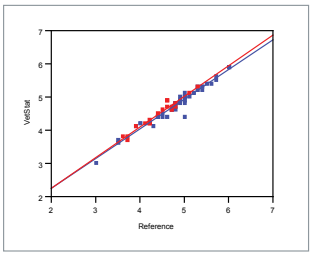
Evaluation of r_2:

Ion-selective electrodes require periodic maintenance and should be replaced every 9 to 12 months. As these electrodes age, the results they give for the same sample tend to decrease. In addition, the range of results that can be reported becomes narrower. The sodium electrode is the most sensitive to aging. If a laboratory does not replace its sodium electrode regularly, performance of this reference method can change. For example, the following graphs show correlation data from two of the sites in this study. This data is for the same cassette lot that was used at both sites.

Chloride



Potassium

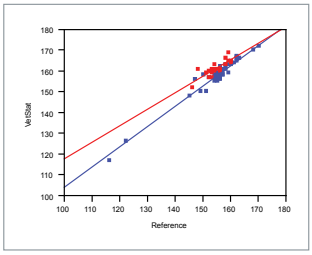


= veterinary hospital laboratory

= veterinarian in-house testing

Regression through the Cl and K data gives very similar slopes.

Sodium



The practice Na results give a slope that is 81% of the slope from the in-house laboratory. The veterinarian's sodium electrode was in need of replacement. Several of the results from veterinarian in-house laboratories in this study showed such aging patterns. Such patterns broadened the distribution of results around the regression line, and decreased the r_2.

Conclusions

The VetStat™ analyzer gives accurate and reproducible results on veterinary whole-blood samples compared to ion-selective electrode methodology. Greater scatter in the sodium comparison can be attributed to lack of strict maintenance of the ion-selective reference method at some of the sites. Performance characteristics were considered acceptable for use with canine, feline and equine samples.

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