

ACCURACY OF A PORTABLE MONITOR (LACTATE SCOUT) FOR MEASUREMENT OF LACTATE CONCENTRATIONS IN CANINE BLOOD

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AIMS & OBJECTIVES

The measurement of blood lactate concentration has become common practice in canine medicine. For a widespread use in both field and hospital settings, the lactate analyser needs to be inexpensive, portable, simple, rapid, accurate and with a wide range of measurements. Several hand-held lactate devices with these characteristics have been validated in human patients. However, to the best of the authors' knowledge, the validation of similar devices in dogs has not been reported. The aim of this study was to evaluate the accuracy of a new portable lactate analyser (Lactate-Scout), which combines easy and fast operability, wide measurement range and very small sample (0.5 µl) requirement¹. Furthermore, a preliminary study was performed to assess the effect of sample storage time and temperature on canine plasma lactate concentration.



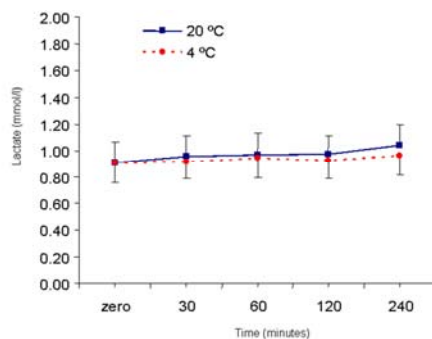
Preliminary study

Materials and methods

Blood samples (2 ml) were collected from the jugular vein of 6 dogs, placed in NaF/Ox tubes and subsequently divided in 8 x 200 µl aliquots. The remaining part of the sample was immediately centrifuged at 1600 x g for 5 minutes (time zero). Plasma was separated and lactate measured in duplicate using an enzymatic method employing lactate oxidase specific for L-lactic acid, and spectrophotometric reading at 540 nm on an automated analyser (Konelab 30i). Four aliquots were stored at 4 °C, while the remaining 4 were kept at room temperature (20 °C). Samples were centrifuged after 30, 60, 120 and 240 minutes for spectrophotometric analysis in duplicate, using the same method described above. General linear model (GLM) repeated-measure analysis was conducted to assess the effects of time between sample collection and analysis and the effect of sample storage temperature on lactate level.

Results

The mean lactate concentrations measured over the 4-h period in the NaF/Ox plasma samples stored both at 20 °C and in those stored at 4 °C are displayed in the figure below. Statistical analysis revealed no significant effects of time (P=0.89) or temperature (P=0.51) on lactate levels. No significant interaction was found between the effects of temperature and time since sample collection (P=1.00). Furthermore, the greatest difference observed in comparison to the initial lactate value (time zero) was not clinically relevant (0.13 mmol/l).



Therefore, it was concluded that values obtained from specimens stored at 4 °C and processed in the laboratory (Konelab system) within 1h from sampling would be reliably comparable with the same specimens analysed immediately after blood sampling (Scout system).

Bibliographic references

[1] Senslab (2003) Bericht Verifizierung und validierung. Senslab Leipzig, Germany, pp 1-22; [2] Bland & Altman (1986) Lancet; 1:307; [3] Steiss et al. (2004) J Vet Intern Med; 18:147; [4] de Papp et al. (1999) J Am Vet Med Assoc ; 215:49; [5] Lagutchik et al. (1998) J Vet Emerg. Crit Care; 8:117; [6] Nel M et al. (2004) J Vet Intern Med;18:471

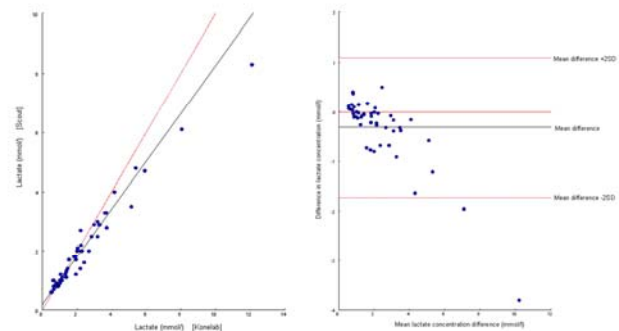
Validation of Lactate Scout

Materials and methods

Venous blood samples were collected from 48 dogs. A single whole blood droplet was used for direct lactate measurement within 1 min, while a 1 ml aliquot was placed in a NaF/Ox tube and delivered to the laboratory at 4 °C within 1h from collection. The direct measurement was performed by an enzymatic-amperometric system for lactate detection in whole blood (Lactate-Scout). The NaF/Ox specimens were centrifuged and analysed in the laboratory using the automated analyzer described above (Konelab). PCV values were also obtained from a heparinised aliquot of the same blood samples, by using a microhaematocrit centrifuge. The comparison of lactate values obtained by the portable method (Scout) with those obtained by the reference chemistry analyser (Konelab) was performed with Pearson's correlation analysis, level of agreement, and standard linear regression (Bablok's regression analysis). The level of agreement was calculated by Bland & Altman analysis², where bias is defined as the mean difference between methods, and precision is the SD of the mean difference. Since the Scout system measures the lactate concentration in whole blood, the effect of PCV on lactate concentration was also assessed by using a Pearson's correlation.

Results

The results of the comparison between the 2 methods are presented below in two graphical formats (regression analysis and Bland Altman plot). The correlation coefficient between lactate values measured with the Lactate Scout and the Konelab method was $r = 0.98$ (slope = 0.81; 95% CI 0.73-0.87; intercept = 0.20; 99% CI 0.13-0.31). The level of agreement was determined over the range 0.49-12.1 mmol/l. Statistical correlation was not observed ($r=0.04$; $P=0.77$) between the measured lactate concentration and PCV of the samples (median 45 percent, range 14 to 57.5 percent).



Discussion

The comparison between results obtained with the portable instrument and the reference laboratory analyser indicate that the Lactate Scout would be suitable for canine blood lactate analysis in the clinical environment. Readily available lactate measurements may also find useful applications in sports medicine for the evaluation of the lactate threshold³ and in emergency/critical care, since lactate concentrations correlate with total oxygen debt, magnitude of hypoperfusion, and severity of shock^{4,6}. Therefore, the availability of a rapid and accurate lactate measurement may contribute to a more efficient management of critically ill patients. In conclusion, the results of this study suggest that the portable Lactate-Scout meter exhibits a good comparability with the Konelab system in the range from 0 to 5 mmol/l.

Acknowledgments

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