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Use of tandem mass spectrometry (LC-MS/MS) for the measurement of thyroid hormones in dogs with spontaneous hypothyroidism

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In human medicine liquid chromatography tandem mass spectrometry (LC-MS/MS) is actually considered the “gold standard” for measurement of many hormones concentration and it is widely used in clinical practice; its diagnostic performance has never been investigated in dogs with hypothyroidism (DWH).

The aim of this study was to determine whether serum concentrations of FT₄, FT₃, rT₃, 3.3-T₂, 3.5-T₂ measured with LC-MS/MS, were able to differentiate DWH (n=13) from dogs with non-thyroidal illness (DNTI) (n=12), septic dogs (SD) (n=12) and healthy dogs (HDI) (n=12). Hypothyroidism was diagnosed based on consistent clinical signs, laboratory findings, total T₄ (TT₄) and tTSH concentrations below and above the reference interval (RI), respectively; in dogs with normal tTSH, a rTSH stimulation test was performed to confirm the diagnosis. In DNTI, hypothyroidism was excluded upon a negative result of a rTSH stimulation test. SD were diagnosed based on alteration of temperature, cardiac, and respiratory frequency, differential leukocyte count and C-reactive protein concentration above RI. HD were considered healthy upon history and physical examination. Hormones evaluation were performed with LC-MS/MS on surplus serum stored at -80°C, TT₄ and tTSH were measured using a validated immunoassay (Immulite®).

Non-significant differences considering signalment, age and body weight were found between groups.

Median TT₄ and rT₃ serum concentrations were significantly higher (p<0.001) in HD compared to DNTI, DWH and SD. Median FT₄ serum concentration was significantly lower in DWH compared to DNTI (p=0.001) and HD (p=0.0128). Median 3.3-T₂ serum concentration was significantly higher in DWH compared to DNTI (p=0.0038) and HD (p=0.0447). There were non-significant differences regarding median 3.5-T₂ serum concentrations among the dogs of the four groups.

Using the ROC curve analysis to differentiate DWH from DNTI and SD an AUC of 0.86 (p=0.003), 0.76 (p=0.009) and 0.75 (p=0.012) was obtained for FT₄, FT₃ and rT₃ respectively. Values of FT₄ >0.46 pmol/L, better discriminated hypothyroidism with 69% sensitivity (95%CI: 39-91%), 83% specificity (95%CI: 63-93%) and accuracy of 0.86 (95% CI: 0.74-0.918).

Although serum FT₄ and FT₃ (LC-MS/MS) have shown better performances than the serum TT₄ (immulite)® in identifying DWH, the overlap between DWH and DNTI+SD was unfortunately relevant also for the thyroid hormones measurements with LC-MS/MS. Despite the introduction of new analytical methods, the use of dynamic tests (e.g. rTSH stimulation test) remains the better method to discriminate DWH from DNTI.

Disclosures
No disclosures to report.

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Accuracy of a flash glucose monitoring system in dogs with diabetic ketoacidosis

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A factory-calibrated flash glucose monitoring system (PGMS) (FreeStyle Libre, Abbott, UK) was recently evaluated in stable diabetic dogs. The aims of this retrospective study were to assess the performance of the PGMS in dogs with diabetic ketoacidosis (DKA) and to determine the effect of body condition score (BCS), perfusion, severity of ketosis and acidosis on the accuracy of the device.

PGMS was placed in a clipped and clean area on the dorsal part of the neck of dogs with DKA within 14 hours from the presentation. The interstitial glucose measurements were compared with blood glucose (BG) measurements, obtained by a validated portable glucometer (Optium Xceed, Abbott, UK). Overall accuracy was determined by fulfillment of ISO 15197:2013 criteria, calculating mean absolute difference (MAD), mean absolute relative difference (MARD), median absolute relative difference (mARD), mean relative difference (MRD), percentage of results within ±15 mg/dL of the BG value for glucose <100 mg/dL, and within ±15% of the BG value for glucose ≥100 mg/dL. Clinical accuracy was also illustrated using Bland-Altman plot. Senser performance during changes in metabolic variables (lactate, β-hydroxybutyrate, pH and bicarbonate) was evaluated using Spearman’s rank correlation.

Four hundred eighty-five paired results from 14 diabetic dogs with DKA were available for analysis. Good agreement between interstitial glucose measurements and BG was obtained (r=0.86; slope 0.88, intercept-18.57 mg/dL, r²=0.72). Clinical accuracy of PGMS was demonstrated, with 63.9% of results in zone A and 99.8% of results in zones A and B. Overall MAD was 18.9%, mARD was 5.6%, MRD was -4.4%; the percentage of values within 15 mg/dL or ±15% was 48%. In the low glucose range, BG=100 mg/dL (n=26), MAD was 24.9 mg/dL; in the higher glucose range, BG=100 mg/dL (n=459), MAD was 18.4%. Variations of lactate, β-hydroxybutyrate, pH and bicarbonate did not affect sensor performance. A significant interpatient variability in the accuracy of the device was observed (Kruskal-Wallis test, P<0.0001). PGMS tends to overestimate the glucose level in dogs with BCS≥3 and to underestimate in dogs with BCS≤2.

Despite the ISO 2013 requirements were partially fulfilled, PGMS provides clinically accurate estimates of BG in dogs with DKA. Accuracy of the system was apparently unaffected by metabolic variables making it suitable, not only for stable diabetic dogs, but also for dogs with DKA.

Disclosures
No disclosures to report.