What's new in the monitoring of canine diabetes mellitus?

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Diabetes mellitus can be an extremely frustrating condition to treat. Establishing the correct insulin dose to ensure clinical signs and the pathological consequences of the disease improve is fundamental to good control. In addition, avoiding life-threatening complications, such as hypoglycaemic seizures and ketoacidosis, is paramount. A myriad of both traditional and novel monitoring methods exist.

- Clinical signs and physical examination findings including weight, demeanour, exercise tolerance, appetite, presence or absence of polyuria and polydipsia, vomiting, diarrhoea or hypoglycaemic events. It cannot be underestimated how important the owner's observations and basic physical examination findings are when monitoring this condition. All other results should be interpreted in combination with these observations
- Urinalysis results including glucose and ketone measurement and urine specific gravity. At home urine glucose and ketone measurement is a frequently overlooked basic method. The timing and frequency of testing and interpretation of the results is, however, fraught with difficulty. In scenarios where alternative methods cannot regularly be used, these results can provide guidance
- Glycosolated plasma proteins. Fructosamine is a quantitative method of indirectly determining the average blood glucose over the preceding 2 weeks. Although there are published target levels, its ability to guide insulin adjustments accurately and safely to positive effect has never fully been established
- Glycosolated haemoglobin. HbA1c, which indirectly determines the average blood glucose over the preceding 2–3 months, is gaining momentum as an alternative monitoring method. In human diabetics, HbA1c has been established as a highly specific and reliable biomarker for long-term control
- Glucose measurements at various time points, using different analytical methods. Spot blood glucose or curves performed at home or in practice, over varying time frames with differing frequency of measurements are all recommended. Continuous glucose monitoring systems that measure interstitial fluid glucose concentration and record the result every 1–5 minutes over a period of up to 14 days are also used. Older systems required regular calibration with blood glucose measurement input. A novel cost-effective factory-calibrated flash glucose monitoring system (FreeStyle Libre) that can transmit data to a mobile phone app has been shown to be accurate in dogs. Although there are published glucose target ranges and durations, validation of these goals has never been

demonstrated. Indeed, there is huge variability in results achieved. Recently a project (ALIVE) founded by the ESVE reached a consensus regarding diabetic control which stated that specific blood glucose targets were not a goal.

As yet, an independent objective assessment of canine diabetic control (ideally a systematic and standardized assessment incorporating a scoring system) has not yet been developed. Until this exists, assessing the ability of each monitoring method to guide dose adjustments to positive effect is, at best, challenging.

KEY LEARNING OBJECTIVES

- Learn that novel techniques such as HbA1c could provide an insight into long-term control
- Understand that glucose measurement remains the cornerstone of monitoring, with novel flash glucose systems showing potential
- Be aware that an independent objective assessment of diabetic control has not been established, making comparison of each monitoring method difficult

MULTIPLE CHOICE QUESTIONS

1. Which of the following is true regarding fructosamine?
  - (A) Hypothyroidism can increase fructosamine, independent of glucose control
  - (B) Azotaemia can increase fructosamine, independent of glucose control
  - (C) Hyperlipidaemia can increase fructosamine, independent of glucose control
  - (D) Hypoalbuminaemia can increase fructosamine, independent of glucose control
2. The results of hand-held glucometers are not affected by which of the following?
  - (A) Breed of the patient
  - (B) Species monitor is designed for
  - (C) Anaemia
  - (D) Age of the patient
3. It has been shown that blood glucose curves are which of the following?
  - (A) Repeatable when performed in the same patient on the same dose on a different day of the week
  - (B) Repeatable when performed in the same patient on the same dose when performed during the first 12 hours of the day compared to the second 12 hours of the day
  - (C) Repeatable when performed in the same patient on the same dose when performed at home compared to when performed in hospital
  - (D) Highly variable, even when performed on the same patient receiving the same insulin dose, under the same test conditions

Guest (quest)

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