SERUM FRUCTOSAMINE: A REFERENCE INTERVAL FOR A HETEROGENEOUS CANINE POPULATION

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ABSTRACT

Eighty-nine healthy dogs (44 males, 45 females) of different breeds, 1–12 years of age, living under varied feeding and environmental conditions, were sampled to evaluate a reference interval for serum fructosamine using a nitroblue tetrazolium photocolorimetric method. The analytical assay was evaluated by calculation of within-run and between-day variations. The results were approximately normally distributed and the calculated reference interval was 192.6–357.4 μmol/L (mean 275.0 μmol/L, standard deviation 41.2 μmol/L). No significant differences attributable to sex or age were observed. This reference interval is wider than those previously reported in less heterogeneous groups of dogs and in those from other geographical zones. The fructosamine values in serum from 3 diabetic dogs all exceeded the upper limit of the reference interval.

*Keywords*: diabetes, dogs, fructosamine, healthy, normality

*Abbreviations*: CV, coefficient of variation

INTRODUCTION
The development of methods for monitoring long-term glycaemic conditions, such as assays for glycated blood proteins, has greatly enhanced the evaluation of carbohydrate metabolism, especially in the diagnosis and monitoring of diabetes mellitus.

Glycated proteins are elevated in diabetes mellitus and in various ageing disturbances, such as crystalline opacity, intercellular collagenous modifications, and demyelination; the glycation of serum proteins results in disruption of their functions: albumins lose their affinity for bilirubin and fatty acids, low-density lipoproteins are captured by fibroblasts to a minor degree, fibrin is poorly degraded by plasmin, and many enzymes are inactivated (McCarthy, 1995).

The use of fructosamine assays has recently been introduced into veterinary laboratories. This parameter reflects the degree of glycation of serum proteins and the mean canine serum glucose concentration from the previous 1–3 weeks (Jensen, 1992) or 8–12 days (Reusch and Hoyer-Ott, 1995). This makes serum fructosamine concentration an effective tool for diagnosing and monitoring the treatment of diabetes mellitus in human beings (Actis Dato and Rebolledo, 1991), dogs (Jensen, 1992; Reusch and Hoyer-Ott, 1995), cats (Reusch *et al.*, 1995), and rodents (Gronbaek, 1995).
Prolonged hyper- or hypoglycaemia will modify the serum fructosamine concentration (Jensen and Aaes, 1992), which may also vary in prolonged hyper- or hypoprotein-aemias (Thoresen and Bredal, 1995), although this change only occurs following great variation in the plasmatic protein concentration (Jensen, 1993). Serum fructosamine levels can also be used to distinguish hyperglycaemic non-diabetic dogs from hyperglycaemic diabetic dogs (Jensen, 1994) with high sensitivity and specificity (Jensen, 1995). In addition, estimations of fructosamine can be applied to improve the diagnosis of ovine pregnancy toxaemia (Cantley et al., 1991), bovine subclinical ketosis (Jensen et al., 1993), and canine pancreatic insulin-secreting carcinoma (Thoresen et al., 1995).

The purpose of the present study was to determine the serum fructosamine reference interval in a healthy but non-homogeneous canine population in our area. This would reflect the range of values in a heterogeneous population of dogs, and so might have more clinical value than data originating from defined breeds, types of feeding and housing, or other specified circumstances.

MATERIALS AND METHODS

Animals

Eighty-nine healthy dogs (44 males and 45 females) of various breeds (Dobermann, Boxer, German Shepherd, Basset Hound, Cocker Spaniel, Fox Terrier, Airedale Terrier, Pointer, Dachshund, Dalmatian, Collie, Setter, Poodle, and undefined) were used. Their ages were up to 1 year (16 dogs), 1–3 years (21 dogs), 4–6 years (21 dogs), 7–9 years (18 dogs), and 10–12 years (13 dogs). Eleven of the females had been neutered. The dogs came from family houses or security institutions in Corrientes city (Argentina); they were fed in different ways (balanced pellets, meat, food residues), and employed for various uses (pets, guard dogs, hunting).

There were no abnormalities on physical examination. A complete haematological and clinical chemistry examination, including assays for glucose, total proteins, cholesterol, urea, total and direct bilirubin, and various electrolytes and enzymes, was performed on blood from each dog, with no abnormal findings according to our local reference ranges. Their fasting serum glucose and total protein concentrations (glucose oxidase and biuret methods, respectively) were all within the reference limits for our laboratory (3.5–6.5 mmol/L and 63–81 g/L, respectively). None of the dogs had received medication during the 2 weeks prior to the study, and they were fasted for 12 h prior to collection of the blood samples. Water was offered ad libitum throughout the study period.

Three dogs with diabetes mellitus were detected and their serum fructosamine concentrations were estimated. Subsequently, all three dogs responded favourably to insulin therapy.