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What is the Most Endorsed Test for Diabetic Screening and Monitoring?

Before 2010 virtually all the diabetes societies recommended blood glucose analysis as the exclusive method to diagnose diabetes. ¹ In 2009, the Report of the International Expert Committee recommended the use of A1C for diagnosis of diabetes, a position that has been endorsed by the American Diabetes Association (ADA) since 2010 as well as the Endocrine Society.¹

What is A1C?

Hemoglobin A1C measure glycosylated hemoglobin which is formed in the blood when glucose reacts with the hemoglobin in red blood cells. The measure of A1C correlates with the level of glucose found in the blood over the life of the RBCs (approximately 60 days in cats, and 110-120 days in dogs).

What are the advantages of A1C testing?

- No need to fast
- Blood draw NOT dependent on time of insulin administration
- Sample stability – no worries about glucose deterioration
- Unaltered by patient stress, exercise, etc.
- Single small sample size
- Assay standardized
- Measures amount of glucose in blood over life of RBCs

What makes A1C testing the gold standard in human medicine?

A1C tests can be referenced to an accepted laboratory method (or National Glycohemoglobin Standardization Program certified) ngsp.org

[What else?]

How was A1C testing developed for humans?

In 1977 an American medical physicist, Rosalyn Yalow, was the second woman to win the Nobel Prize in Physiology or Medicine for the development of the radioimmunoassay (RIA) radioisotope tracing technique widely used to measure tiny quantities of biological substances in the blood. Originally used to study diabetes, the technique has been applied to hundreds of other substances, including enzymes, vitamins, and hormones which are present in very small amounts and immeasurable by other tests.

Why was A1C testing not used for dogs and cats? [am I lying?]

The human test had a poor correlation to dogs and cats, so the “gold standard” in human medicine was unavailable to veterinarians.

What are the disadvantages of glucose testing?

- Inconvenience of fasting and timing of sample
- Instability of glucose levels in sample
- Biological variability between individuals
- One data point in time for single test
- Expense and time commitment by owner for glucose curve and stress for patient
- Inability to differentiate diabetic hyperglycemia from stress reaction (cats)

How good is fructosamine testing?

Fructosamine testing is rarely used in human clinical practice. Fructosamine determines the fraction of total serum proteins that have undergone glycation. Albumin is the most abundant blood protein so fructosamine levels typically reflect albumin glycation. Its disadvantages include:

- Lack of standardization
- Short half-life of albumin means only recent (1-2 week) fluctuations in blood glucose and good diabetes control is rarely obtained within such short time periods
- Higher variability than A1C testing

Fructosamine test shows a moderate sensitivity with a high specificity. The considerable overlap between diabetics and non-diabetics limits its usefulness. The fructosamine test is not a suitable screening test for the disease.² Cats with recent onset of DM (<1-2 weeks) or cats with only mild DM may have normal fructosamine levels. Furthermore, diabetic cats with concurrent hyperthyroidism or hypoproteinemia may have normal fructosamine levels due to lower plasma protein levels and protein turnover rates.³

Is the incidence of Type I diabetes rising in humans?

A series of studies have reported a constant global rise in the incidence of type 1 diabetes. Epidemiological and immunological studies have demonstrated that environmental factors may influence the pathogenesis, leading to a cell-mediated pancreatic β -cell destruction associated with humoral immunity.⁴

Is the incidence of Type II diabetes rising in humans?

The incidence of diabetes is rising and is expected to double within the next 20 years due in part to an aging population. According to the most recent surveillance data the prevalence of diabetes among US adults aged greater than or equal to 65 years varies from 22-33%. One third of older adults with diabetes are undiagnosed.⁵

The increased incidence of Type I is likely multifactorial, but what about Type II?

The epidemic of type 2 diabetes is clearly linked to increasing rates of overweight and obesity in the US population. Age-related insulin appears to be primarily related associated with adiposity, sarcopenia and physical inactivity.³ Additionally, the exclusion of older participants from most traditional randomized controlled trial of diabetes interventions has left large gaps in knowledge of how best to address diabetes in the age groups with the highest prevalence rate.

If obesity is related to the increase in diabetes in humans, is obesity related to diabetes in pets?

According to the Association for Pet Obesity Prevention, roughly 53 percent of dogs and 58 percent of cats in the U.S. are overweight or obese. The group's research shows that that rate continues to rise. New data from Nationwide, a national provider of pet health insurance, found that insurance claims for conditions and diseases related to pet obesity rose by 10 percent over the past two years and diabetes appears in the top 10 most common obesity related illnesses in pets in both cats and dogs.⁶ Obesity contributes to insulin resistance and is a risk factor for pancreatitis, which can lead to diabetes in dogs⁷ The most common causes of diabetes in cats are obesity, pancreatitis and amyloidosis of the pancreatic beta cells⁸ . Obese cats are approximately 3.9 times more likely to develop DM compared to cats of optimal weight.¹ In one study, approximately 50-60% of diabetic cats were overweight. Risk factors also include sedentary lifestyle, glucocorticoids, increasing age, and being male.⁹

How common is diabetes mellitus in dogs and cats?

Diabetes mellitus is estimated to affect one in 500 dogs and one in 250 cats.¹⁰ Approximately 0.5% of cats seen in private practice have diabetes. Around 80% of them have Type II diabetes.

What are the clinical signs of diabetes in dogs?

The onset of diabetes can be insidious. Common signs include polyuria, polydipsia, weight loss and polyphagia. Bilateral cataracts and weakness may be present. Bacterial and/or fungal infections are more common in diabetics and recurrent infections are possible. Dogs may have hepatomegaly due to fatty liver from increased fat mobilization from adipose tissue.¹¹

What are the clinical signs of diabetes in cats?

Cats often have a history of polyuria, polydipsia, and polyphagia with or without weight loss and lethargy. Dehydration, poor hair coat and hepatomegaly secondary to hepatic lipidosis may be present. Approximately 10% of diabetic cats have signs of hind limb weakness, plantigrade posture and difficulty jumping due to neuropathy.

When is the A1C test inappropriate for use in dogs and cats?

A1C is not reliable in cases of significant anemia, blood loss or pregnancy.

What are median survival times for cats?

Prognosis for DM varies depending on a few factors, including an owner's willingness to treat and monitor appropriately; the ability to achieve diabetic remission; response to insulin therapy; and the presence of concurrent disease(s). In one study of 114 diabetic cats, the median survival time was 516 days, with 25% of cats living >1,420 days. Negative prognostic factors included hyperkalemia, concurrent diseases, and detection of ketoacidosis during follow-up. Age, serum glucose levels, fructosamine levels, and type of insulin administered have not been associated with survival rates.¹²

What are median survival times for dogs?

In one study, median survival time was 57 days after the 1st insurance claim. In the 860 dogs studies, if the 223 dogs that died within one day are excluded, the median survival time was 2 years. [Fall, T, et. Al. JVIM 2007]

Are certain breeds more likely to develop diabetes?¹

Studies have shown the risk of disease is higher in certain dog breeds. [Fall, t}

What are the issues for owners of diabetic pets?

Diabetes mellitus is an overwhelming diagnosis for most clients; several times clients have admitted to not even knowing that animals get diabetes. Not only will they need to understand the financial commitment involved in caring for a diabetic pet, they will also need to learn about diabetes, insulin administration, home glucometry, and diabetic warning signs of

potential emergencies. In addition, there is the daunting responsibility of blood sugar curves, proper diet, and monitoring clinical signs.⁹ The number one cause of death in diabetic dogs and cats is not the disease itself, rather, it is the owner's frustration with the disease. This is an extremely important point to remember when treating diabetic animals. Good communication with the pet owner is perhaps the most important component of managing the disease.²

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¹¹ Sacks, D. Diabetes Care. 2011 Feb; 34(2): 518-523

¹ Bruyette, Treatment Canine Diabetes Mellitus: What Are My Options. WVC 2010 Proceedings

¹ Mula-Abed, WA, Al-Naemi, AH. Performance indicators and validity of serum fructosamine assay as a diagnostic test in a screening program for diabetes mellitus. Saudi Med J, 2003 May;24(5): 477-84

¹ Reusch C: Feline Diabetes Mellitus . Textbook of Veterinary Internal Medicine, 7th ed. St. Louis, Saunders Elsevier 2010 pp. 1796-1816.

¹ [Endocrinol.](#) 2013 Jul 12;51(1):R1-13. doi: 10.1530/JME-13-0067. Print 2013

³ Reusch C: Feline Diabetes Mellitus . Textbook of Veterinary Internal Medicine, 7th ed. St. Louis, Saunders Elsevier 2010 pp. 1796-1816.

⁴ [Endocrinol.](#) 2013 Jul 12;51(1):R1-13. doi: 10.1530/JME-13-0067. Print 2013

⁵ Kirkman, MS, et.al, Diabetes in Older Adults, Diabetes Care, Vol 25, Dec 2012 2650-2664.

⁶ <http://www.cbsnews.com/news/dog-cat-obesity-rate-continues-to-rise/>

⁷ <http://www.akc.org/content/health/articles/diabetes-in-dogs/>

⁸ Bruyette,D. WWVC 2015 Diabetes Mellitus in Dogs and Cats

⁹ Rothrock,K.

<http://www.vin.com/Members/Associate/Associate.plx?from=GetDzInfo&DiseaseId=901>

¹⁰ Rachel Poulin, RVT, VTS (SAIM), Canine and Feline Diabetes and Diabetic Ketoacidosis, ACVC 2016 Proceedings

¹¹ <http://www.merckvetmanual.com/endocrine-system/the-pancreas/diabetes-mellitus#v3271677>

¹² Lien YH, Huang HP: Factors of Clinical Remission in Cats with Diabetes Mellitus. , 21st ed. ECVIM-CA Congress 2011.