Diabetes Prevention and Treatment in Dogs and Cats

A Background of the Disease

Robert Ross, BSPS
ACVP Rebel Vets President-Elect
PharmD Candidate 2019
University of Mississippi School of Pharmacy
Disclosures

Robert Ross “declare(s) no conflicts of interest, real or apparent, and no financial interests in any company, product, or service mentioned in this program, including grants, employment, gifts, stock holdings, and honoraria.”

The American College of Apothecaries is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education.
Learning Objectives

At the conclusion of this program, the participating pharmacist or technician will be able to:

- Compare canine and feline diabetes with human diabetes
- Describe risk factors for canine and feline diabetes
- Discuss preventative measures that can be taken for canine and feline diabetes
- Identify the current available treatment options for diabetes in canines and felines
What is Diabetes?

• The endocrine pancreas is made up of the islets of Langerhans, composed of four cell types
  – Alpha cells = glucagon
  – Beta cells = insulin
  – Delta cells, and pancreatic polypeptide cells

• Diabetes mellitus in the dog and cat is the result of absolute or relative insulin deficiency, often seen with concurrent insulin resistance
Canine Diabetes

• The most common form of diabetes in dogs is insulin dependent.

• Characterized by permanent hypoinsulinemia

• Can be caused by many factors
  – Genetics
  – Environmental factors

• Obesity-induced insulin resistance occurs in dogs, but does not lead to diabetes
Risk Factors for Canine Diabetes

• **Age of the Dog** – Highest risk is dogs between 5 and 15 years old
  – Juvenile-onset diabetes is uncommon and occurs in dogs under 1 year old

• **Sex of the Dog** – Females are at a higher risk
  – Neutered male dogs are at an increased risk compared to male dogs not neutered

• **Weight of the Dog** – Highest risk is dogs weighing less than 22.7 kg
**Breeds at Risk**

The Veterinary Medical Data Base comprises medical records of 24 veterinary schools in the United States and Canada.


<table>
<thead>
<tr>
<th>BREED</th>
<th>CASES</th>
<th>CONTROL</th>
<th>ODDS RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Terrier</td>
<td>37</td>
<td>1</td>
<td>32.10</td>
</tr>
<tr>
<td>Standard Schnauzer</td>
<td>105</td>
<td>19</td>
<td>4.78</td>
</tr>
<tr>
<td>Samoyed</td>
<td>175</td>
<td>45</td>
<td>3.36</td>
</tr>
<tr>
<td>Miniature Schnauzer</td>
<td>624</td>
<td>172</td>
<td>3.13</td>
</tr>
<tr>
<td>Fox Terrier</td>
<td>91</td>
<td>26</td>
<td>3.02</td>
</tr>
<tr>
<td>Keeshond</td>
<td>57</td>
<td>20</td>
<td>2.45</td>
</tr>
<tr>
<td>Bichon Frise</td>
<td>50</td>
<td>18</td>
<td>2.40</td>
</tr>
<tr>
<td>Finnish Spitz</td>
<td>35</td>
<td>13</td>
<td>2.32</td>
</tr>
<tr>
<td>Cairn Terrier</td>
<td>67</td>
<td>28</td>
<td>2.07</td>
</tr>
<tr>
<td>Miniature Poodle</td>
<td>737</td>
<td>356</td>
<td>1.79</td>
</tr>
<tr>
<td>Siberian Husky</td>
<td>80</td>
<td>45</td>
<td>1.53</td>
</tr>
<tr>
<td>Toy Poodle</td>
<td>208</td>
<td>139</td>
<td>1.29</td>
</tr>
<tr>
<td>Mixed breed</td>
<td>1860</td>
<td>1609</td>
<td>1.00</td>
</tr>
<tr>
<td>Beagle</td>
<td>73</td>
<td>94</td>
<td>0.67</td>
</tr>
<tr>
<td>English Setter</td>
<td>30</td>
<td>42</td>
<td>0.61</td>
</tr>
<tr>
<td>Labrador Retriever</td>
<td>246</td>
<td>364</td>
<td>0.58</td>
</tr>
<tr>
<td>Basset Hound</td>
<td>33</td>
<td>50</td>
<td>0.57</td>
</tr>
<tr>
<td>Dalmatian</td>
<td>28</td>
<td>45</td>
<td>0.53</td>
</tr>
<tr>
<td>Doberman Pinscher</td>
<td>109</td>
<td>182</td>
<td>0.51</td>
</tr>
</tbody>
</table>

© The American College of Veterinary Pharmacists 2017
Goals of Therapy

• Canine Diabetes cannot be prevented, but it can be controlled

• Two main goals of therapy:
  – Eliminate owner-observed signs and development of complications occurring secondary to hyperglycemia and glycosuria
  – Minimize the impact of therapy on the owner’s lifestyle
Insulin Therapy

• Lente insulin (Vetsulin, Caninsulin) is the only FDA approved insulin for canine diabetes (U40)
  — 100% purified pork-source insulin
• Other insulin products can be used with dose modifications, but are not FDA approved for use in dogs with diabetes
  — NPH, PZI, Glargine, and Detemir
• U40 insulin preparations
Insulin Therapy, cont.

• Initially dosed at 0.25U/kg with food to establish BGC
  – >150 mg/dL = send home and repeat in 1 week
  – <150 mg/dL = decrease next dose by 10-25%

• Monitor and adjust insulin in the first month
• Every 3 months, visit clinic for examination
• Every 6 months, retrieve lab work
• At home, monitor for any changes
Dietary Therapy

• Most premium pet food companies have diets for diabetic dogs
  – High in fiber to treat obesity and improve glycemia
• The feeding schedule is designed around insulin doses to minimize postprandial hyperglycemia
• Some diets may need modifying for other disease states
  – Ex. Chronic pancreatitis, CKD, or IBD
Exercise

- Promotes weight loss and eliminates insulin resistance induced by obesity
- Lowers glucose levels by increasing insulin mobilization from injection site
- Should receive exercise at the same time each day, not around peak insulin time
- Strenuous exercise should be avoided
Monitoring Diabetic Control

• Objective of insulin therapy is to eliminate clinical signs and avoid the onset of common complications
  – Physical examination by the owner
  – Single blood glucose determination
  – Occasional urine glucose monitoring
  – Continuous glucose monitoring systems
Long-Term Complications of Canine Diabetes

• The following complications are the result of chronic, uncontrolled hyperglycemia
  – Cataracts – most common
  – Lens-induced Uveitis
  – Corneal Ulceration
  – Diabetic Retinopathy
  – Diabetic Nephropathy
  – Systemic Hypertension
Canine Diabetes Prognosis

• If a dog survives 30 days of treatment:
  – Living 1 year: 40%
  – Living 2 years: 36%
  – Living 3 years: 33%

• Survival times vary and are somewhat skewed

• Predicted to maintain a good quality of life for over 5 years if they can survive the first 6 months of treatment
Feline Diabetes

• About 80% of diabetic cats suffer from type 2-like diabetes mellitus (type 1 is very rare)
  – May develop because of another disease (≈20%)

• Heterogeneous disease caused by impaired insulin action

• Can be caused by:
  – Genetics – polygenic disease similar to humans
  – Environmental risk factors
Risk Factors for Feline Diabetes

- **Breed** = Burmese cats are at an increased risk
- **Obesity** = overweight cats are several times more likely to develop diabetes
- **Age** = older cats develop a sedentary lifestyle
- **Gender** = males at higher risk (not Burmese)
- **Neutering** = greater risk of gaining weight, contributing to developing diabetes
- **Medications** = glucocorticoids increase risk
Goals of Therapy

• Primary goal is to eliminate the clinical signs and prevent complications

• Treating early and maintaining glycemic control can prevent remission

• Success of treatment requires a motivated owner to adapt to treatment plan
  — Biggest worries are boarding difficulties, cost of treatment, and access to home monitoring
Insulin Therapy

- Lantus (glargine, U-100) or protamine zinc insulin (PZI, U-40) is used first for longer DoA.
- Starting dose is 0.25U/kg every 12 hours based on lean body weight (≈1U q12 hours).
- Monitor BG every 2-3 hours on PZI or every 4 hours on glargine for 10-12 hours after dose.
  - If BG is ever <150 mg/dL, decrease dose 0.5 U.
  - Reevaluate in 7 days or if signs worsen.
Oral Therapy

• Used as first line in humans with newly diagnosed type-2 diabetes mellitus

• Used second-line to insulin in cats
  – Sulfonylureas – Glipizide
    • Used in diabetic cats in good physical condition, non-ketoic, have mild signs of diabetes, and can be monitored closely
  – Other therapies are still being tested
Dietary Therapy

• Diet is important to achieve glycemic control
• High-protein, low-carb diet recommended
  – Canned food is preferred
• Caloric Needs
  – 45 – 55 kcal/kg per day
  – 5.2 g/kg of protein per day
• Half of daily calories with each insulin dose
Exercise

• Cats have limited ways of exercise compared to dogs

• Exercise enrichment strategies for the cat include use of toys, food balls, cat trees, and play tunnels
Diabetes Monitoring

• Home monitoring BG is strongly encouraged
  — Identifying hypoglycemia

• Ongoing home monitoring
  — Daily: log food, water, appetite, insulin dose
  — Test urine for (-) glycosuria or (+) ketonuria

• Follow-up monitoring
  — At 1 week of starting, at one month

• Long-term monitoring
Long-Term Complications

- The following complications are the result of chronic, uncontrolled hyperglycemia
  - Diabetic Neuropathy — most common
  - Diabetic Cataracts
  - Diabetic Nephropathy

*FIGURE 7-12* Plantigrade stance due to diabetic neuropathy in a 15-year-old, castrated male, Domestic Short-Hair (DSH) with diabetes mellitus. The gait improved slightly during insulin therapy.
Feline Diabetes Prognosis

• Mortality during the first 10 days was 16.7%, mostly caused by concurrent diseases

• Median survival time was 516 days (1-3468)
  – 3 months = 70%
  – 6 months = 64%
  – 24 months = 46%

• Cats are usually old when diagnosed, and study was performed in a referral center
References

• Diabetes in Dogs: Symptoms, Causes, & Treatment [Internet]. American Kennel Club. 2016 [cited 2017 Mar 02]. Available from: http://www.akc.org/content/health/articles/diabetes-in-dogs/


Special Thanks

• I would like to recognize the following people for their help with this presentation:

Erin Holmes, PharmD, PhD
Associate Professor of Pharmacy Administration
University of Mississippi School of Pharmacy

Mary Milewski, PharmD
Senior Pharmacist, Animal Health Center
Mississippi State University

Patty Lathan, DVM, MS, DACVIM
Associate Professor, Small Animal Internal Medicine
Mississippi State University College of Veterinary Medicine
Need More Information?

Robert Ross, BSPS
ACVP Rebel Vets President-Elect
PharmD Candidate 2019
University of Mississippi School of Pharmacy
rcross1@go.olemiss.edu