

# Diabetes Mellitus



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# Conflict of Interest Disclosure

I have financial interest, arrangement or affiliation with:

**Name of Organization**



**Relationship**

Tech Champion

Speaker Bureau



# Diabetes

- Introduction
- Disease overview
- Treatment
- Monitoring

Role of the veterinary technician



# Introduction

- Common small animal endocrinopathy
- Varying degrees of stabilization
- Long-term management
- Dynamic disease
- Individual assessment & plan
- Role of the veterinary technician

1 in 230

At increased risk:  
neutered cats.<sup>1</sup>



are diagnosed with diabetes<sup>11</sup>

During a recent four-year study, diabetes diagnosis in pets have increased by 32 percent in dogs and 16 percent in cats.<sup>2</sup>

1 in 308

At increased risk:  
female dogs.<sup>1</sup>



# Diabetes Mellitus

- Chronic hyperglycemia
- Pancreatic beta cells
  - Type 1
    - Immune-mediated beta cell destruction
  - Type 2
    - Insulin resistance
    - Beta cell dysfunction



# Insulin Resistance

- Obesity
- Disease states
  - HAC, acromegaly, renal disease, dental disease, pancreatitis, pregnancy, diestrus
- Medications
  - Steroids, cyclosporine
- Genetics



# Patient History & Clinical Signs

- Polyuria, polydipsia
  - Polyphagia, weight loss
  - Lethargy, weakness



# Patient History & Clinical Signs

- Cats
  - Change in jumping behaviors, rear limb weakness, abnormal gait
  - Neurologic findings
    - Ataxia, rear-limb weakness, plantigrade stance
- Dogs
  - Vision loss, cloudy eyes
  - Ocular findings
    - Cataracts, uveitis, keratoconjunctivitis sicca (KCS)





# Physical Exam

- Variable
  - Maybe be unremarkable
  - Body condition
  - Lethargy
  - Poor haircoat



# Diagnostics

- Laboratory tests
- Abdominal ultrasound
- +/- Thoracic radiographs



# Laboratory

- Hyperglycemia, glucosuria, and elevated fructosamine – oh my!
  - Complete blood count (CBC)
  - Biochemistry profile
  - Urinalysis
  - Urine culture
  - Fructosamine
  - cPLI/fPLI



# Laboratory

- Hyperglycemia – is it or isn't it?
  - STRESS
  - Reassess in a non-stressful situation
  - Monitor urine glucose levels in the home
  - Measure serum fructosamine levels



# Treatment

- Complications
  - Diabetic neuropathy
  - Cataracts
  - Immunosuppression
  - Skin infections, UTI
  - Impaired wound healing



# Treatment

- Guidelines

- AAHA Diabetes Management Guidelines for Dogs and Cats (2018)



- <https://www.aaha.org/aaha-guidelines/diabetes-management/diabetes-management-home/>
- <https://www.aaha.org/aaha-guidelines/diabetes-management/resource-center/>



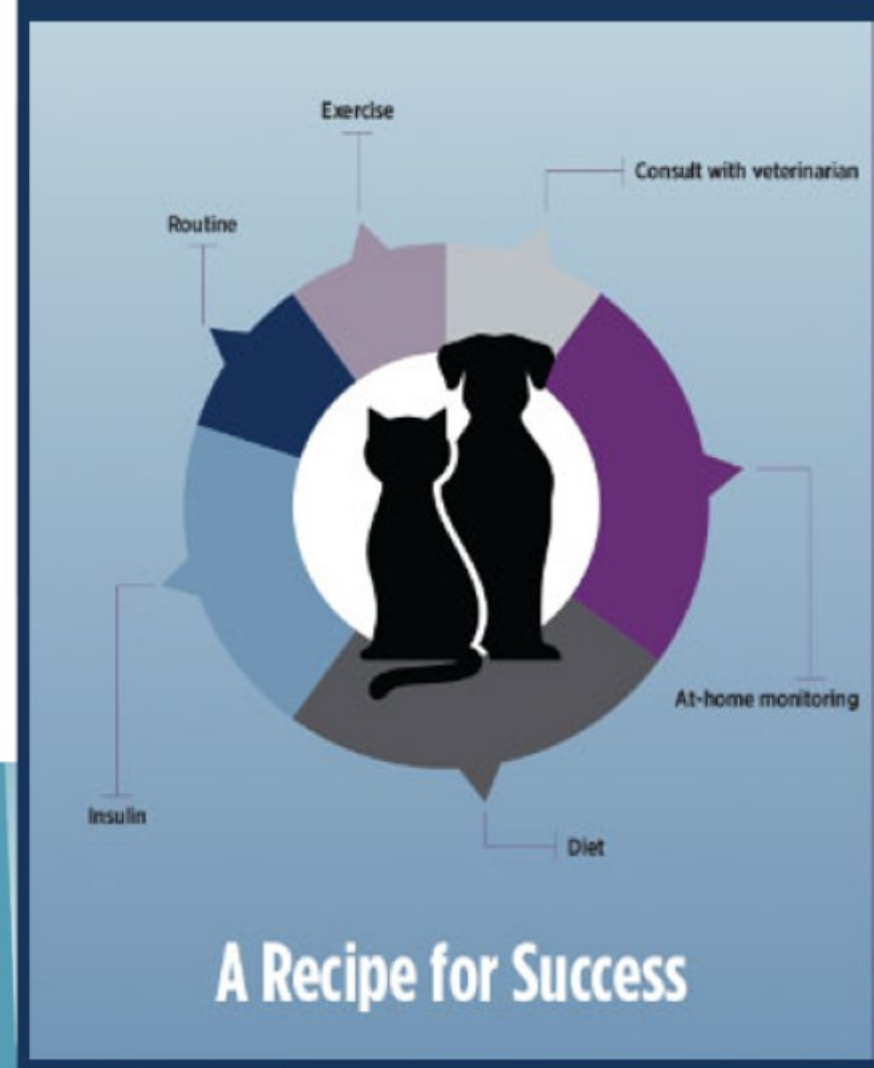
- ISFM Consensus Guidelines on the Practical Management of Diabetes Mellitus in Cats (2015)

- <http://journals.sagepub.com/doi/full/10.1177/1098612X15571880>



# Treatment

- Dogs
  - Twice daily meals with insulin administration
  - Diet based on nutritional assessment
  - Diet rich in fiber ideal
  - Maintenance diet can be successful
    - ↓ simple sugar



# Treatment

- Dogs
  - Consistency
    - Insulin
    - Diet
    - Exercise

**CONSISTENCY**  
**IS** 





# Treatment

- Dogs
  - Beware the “Honeymoon Period”



# Treatment

- Cats
  - Diabetic remission?
  - Tight glycemic control  $\leq$  6 months
    - Breaks the cycle
    - Resumption of insulin production



# Treatment

- Cats
  - High protein diet (>40%)
  - Reduced carbohydrate = reduced beta cell demand
  - Maximizes metabolic rate
  - Improves satiety
  - Reduces lean muscle loss & hepatic lipidosis



# Treatment

- Cats
  - Twice daily meals with insulin administration
  - Free-feed? Divide daily ration
  - Canned food
    - Lower carbs
    - Increased water content
    - Portion control



# Treatment

- What about oral hypoglycemic drugs?
- Is that a thing??



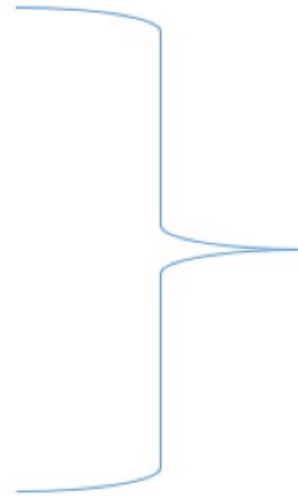
# Treatment

- Goals
  - Resolution of clinical signs
  - Maintain BG below renal threshold
    - Dogs 180-220 mg/dL
    - Cats 250–300 mg/dL
  - Avoid hypoglycemia



# Monitoring

- Owner observations
- Physical examination
- Laboratory tests



Assessment



# Monitoring

- Daily log/diary
  - Appetite
  - Diet change
  - Water intake
  - Urination habits
  - Exercise
  - Changes in the routine





# RVC Diabetic Clinical Score

Helping vets and diabetic pet owners speak the same language

Factor	Score
<b>Unintended Weight Loss over past 2 months</b> 0 = None or gained since last examined 1 = Mild (<5% loss) 2 = Moderate (5-10% loss) 3 = Severe (>10% loss)	<b>2</b>
<b>Increased Drinking and/or Urination</b> 0 = Normal 1 = Mild (Some increase noted by owner) 2 = Moderate (Increased filling of water bowl) 3 = Severe (Constantly seen to drink)	<b>1</b>
<b>Increased Appetite</b> 0 = Normal appetite 1 = Mild (Finishing food eagerly) 2 = Moderate (Finishing food eagerly and begging for more) 3 = Severe (Obsessed with food)	<b>1</b>
<b>Decreased Attitude/activity</b> 0 = Normal or increased 1 = Mild decrease (A bit less active) 2 = Moderate decrease (Certainly less active) 3 = Severe decrease (Mostly lying about)	<b>2</b>
<b>Total Score =</b>	<b>6/12</b>



Included in the free  
RVC Pet Diabetes  
App! – download it  
now!

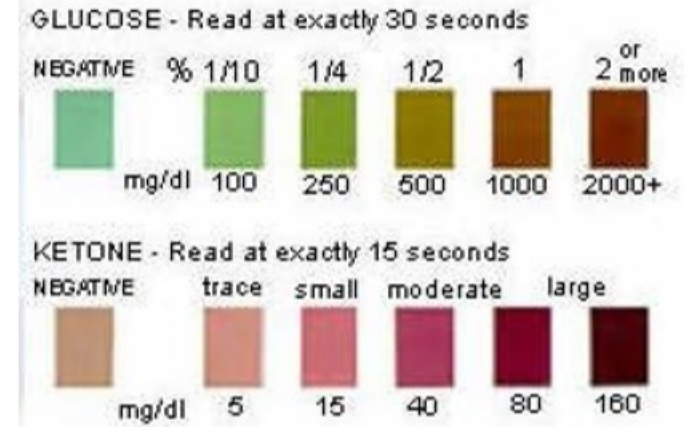
[www.facebook.com/RVC.Diabetic.Remission.Clinic](http://www.facebook.com/RVC.Diabetic.Remission.Clinic)

RVC



# Monitoring

- Urine glucose (UG)
  - Reflects average blood glucose
  - Degrees of glucosuria is OK
  - Negative UG?
    - Too much insulin OR tight glycemic control
    - Not recommended to adjust dosing based on UG
  - Canine – underestimates



# Monitoring

- Fructosamine
  - Reflects *average* glycemic control
  - ~ Two weeks
  - Stress hyperglycemia
- Can be skewed
  - Poor sample handling
  - Concurrent conditions
  - Patient status



# Monitoring

- Fructosamine
  - Individual levels do not correlate to regulation
  - Monitor trends
  - Valuable in clinically stable patients
    - Instead of BCG



# Somogyi Phenomenon

- “Hypoglycemia-induced glucose counter-regulation”
  - Impending hypoglycemia
  - Rapid decrease in glucose
  - Followed by insulin resistance
- High dose of insulin



# Somogyi Phenomenon

- Value of BG curves vs. spot checks

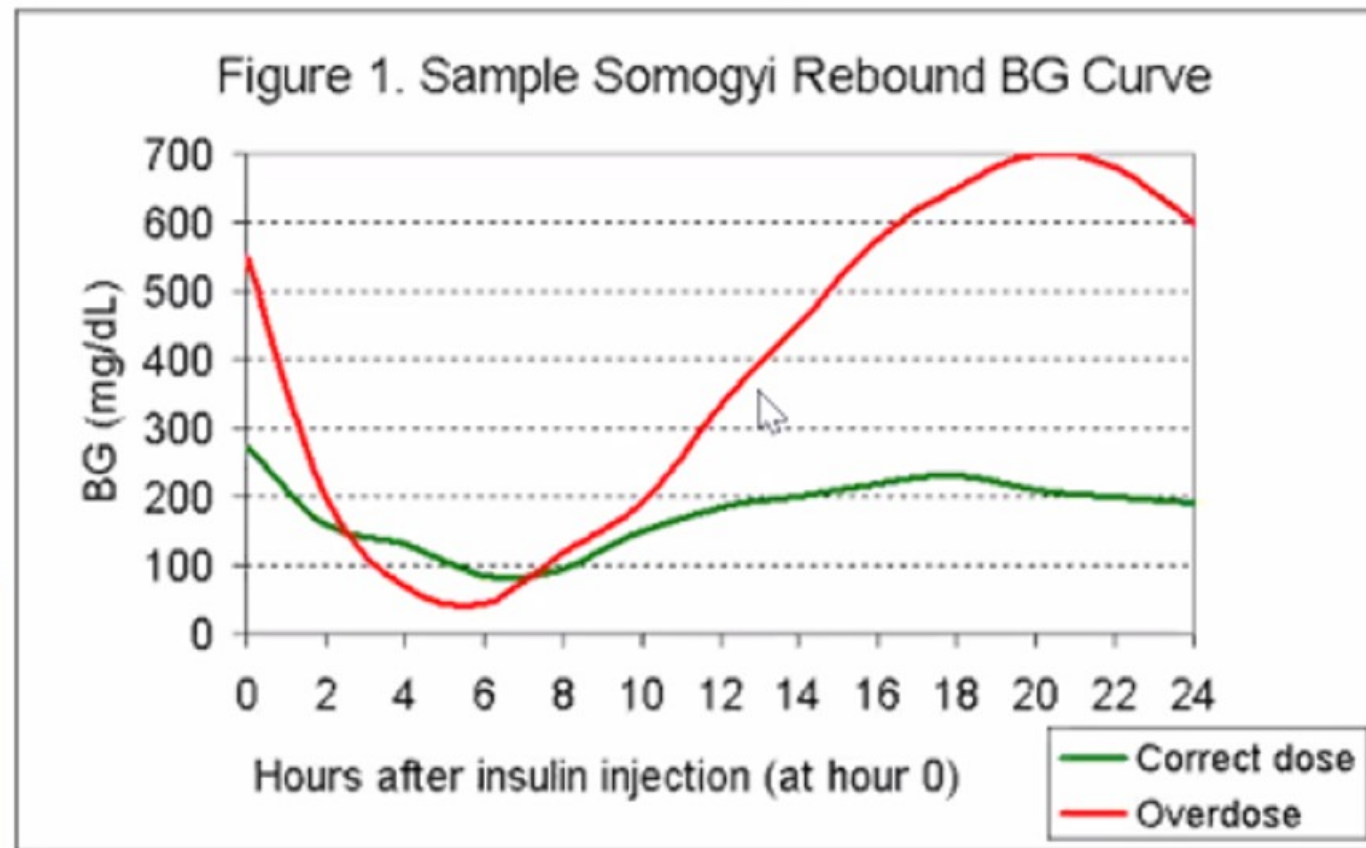


Photo credit: <http://www.petdiabetes.com/pdorg/somogyi.htm>



# Monitoring

- Blood glucose curves
  - Measure insulin duration AND nadir
  - Obtain a representative curve - “normal”
  - Feeding routine, insulin, activity
  - Fluctuate day to day



# In-hospital BGC

- Advantages

- Reliable values
- Physical exam
- Patient weight
- Interpretation
- Human/animal bond?

- Disadvantages

- Patient stress
  - Transport/hospitalization
- Disrupts normalcy
  - Mimic daily routine
- Not cost-effective
  - Practice & owner





# In-home BGC

- Advantages

- Normalcy
- Reduced patient stress
- Facilitates owner education
- Team oriented management
- Owner empowerment
- Cost-effective (owner)

- Disadvantages

- Reliable values
  - Learning curve
- Education takes time
- Human/animal bond
- Patient cooperation



# Flash glucose monitoring system (FGMS)

- FreeStyle<sup>®</sup> Libre
  - Subcutaneous interstitial fluid

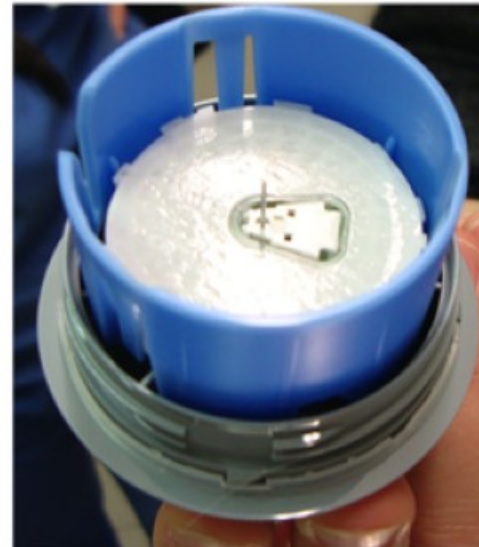
A



B



C



# FreeStyle<sup>®</sup> Libre

- Advantages

- Normalcy
- Reduced patient stress
- Reduced whole blood sampling
- Real time data over a longer time

- Disadvantages

- Not validated in vet med
- Possible skin irritation
- Learning curve IG vs BG
- Education takes time





Courtesy: Ellen Carozza, LVT

# On glucometers...

- Human vs veterinary
- Venous vs capillary
- Routine calibration
- Whole blood most accurate
  - Hemodilution – falsely increases BG
  - Hemoconcentration – falsely decreases BG
- FDA accuracy standards
  - “95% of all measured blood glucose meter values must be within 15% of the true value (a lab measurement); and 99% of meter values must be within 20% of the true value”



# Pet Owner Education

- <https://www.aaha.org/aaha-guidelines/diabetes-management/resource-center/>
- <https://www.vetsulin.com/dogs/tools-resources/downloads.aspx>
- <https://www.zoetispetcare.com/products/alphatrak>



# Want to learn more?



**AAHA  
DIABETES  
EDUCATOR**  
Certificate  
Course



<https://www.aaha.org/education/online-training/aaha-diabetes-educator-certificate-course/>

<https://www.aaha.org/aaha-guidelines/diabetes-management/resource-center/>



# Questions?

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*\* Sources available upon request*

