

# RELIABILITY ASSESSMENT OF A NOVEL HOME SCREENING TEST FOR FELINE GLUCOSURIA

## Introduction

Diabetes mellitus (DM) is one of the most common feline endocrinopathies, occurring in 0.4%–0.7% of cats<sup>1,2,3,4</sup>, with increasing prevalence<sup>3,4</sup>; it may be transient in this species<sup>1</sup>. Glucosuria secondary to hyperglycemia is one of the first clinical signs of DM<sup>1,2</sup> but stress-induced hyperglycemia and glucosuria in non-DM cats can be confusing when presented at the veterinarian.

So, a non-invasive, at-home, easy-to-use test to detect glucosuria would be of interest to suspect or to monitor DM.

A novel screening test for feline glucosuria has been developed. It consists of white, absorbent granules, which are sprinkled on mineral-based cat litter, turning blue in contact with glucose.

## Objectives and hypothesis

- Hypothesis** The metric characteristics of the product are adequate for clinical monitoring of feline glucosuria
- Objectives** Assess the reliability of the screening test at home and in a clinical setting

## Materials and methods

### At home evaluation:

- 16 cats: 10 healthy and 6 diabetic (parallelly controlled with Free Style Libre® and glycemia measurements)
- 20g of granules poured on standardized bentonite-based clumping litter
- Intensity of the coloration of the granules trapped in the urinary clumps recorded by the owner according to a visual color scale from 0 to 3+ (Fig. 1), twice a day for 14 days.



Figure 1: Chromogenic intensity scale

### Clinical trial:

- 132 cats at risk of glucosuria (group #1: aged > 6 years, overweighted, or receiving corticosteroids, n=118) or diabetic (group #2, n=14) recruited in private practices

Urine obtained by cystocentesis; standard urinalysis performed: urinary specific gravity (USG), chemical analyses by dipstick (pH, glucosuria etc.)

Parallelly, 2 drops poured on 4 granules. Color evaluated 3 minutes later, using the color scale (Fig. 1)

0,3mL of each urine sample stored at -20°C. Glucosuria determined 2 months later by chemistry analyzer (ADVIA® 1800)

**Cat = glucosuric if glucosuria  $\geq 1.4$ mmol/L (25mg/dL)**

**Test = positive if the mean score of the 4 granules  $\geq 1+$**

Test sensitivity (Se), specificity (Sp), and positive and negative predictive values (PPV, NPV) determined using chemistry analysis as gold standard.

## Results

### At home:

- Granules were **easy-to-use** for owners and **well-tolerated** by cats
- Granules Score depended of the DM status of cats** (Table 1)




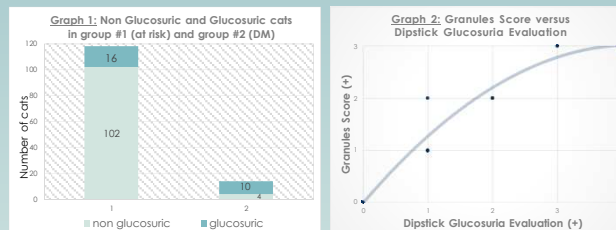
Healthy cats	100% granules remained white (n=260/260)	
Well-controlled diabetic cats	91.2%* granules $\leq 1+$ (n=52/57)	
Cats with severe hyperglycemic episodes	67.3%* granules $\geq 2+$ (n=37/55)	

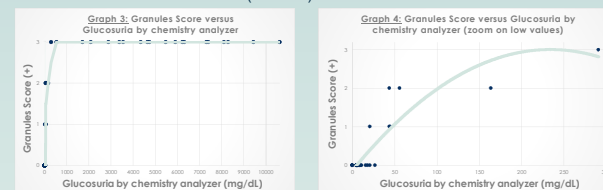
Table 1: At home chromogenic intensity of the granules (\* p<0.0001)

### Clinical trial:

- 19,7% (n=26/132)** of the cats were **glucosuric**: 13,6% (n=16/118) among cats at risk of glucosuria, 71,4% (n=10/14) among diabetic cats (Graph 1)
- Color of the granules were **in accordance with the results of the dipstick glucosuria evaluation** (=0 or >0) in 132/132 cases (Graph 2)



Color of the granules was **strongly correlated** ( $r=0.823$ ,  $p<0.0001$ ) with glucosuria evaluated by chemistry analyzer (Graphs 3 and 4), resulting in **excellent metric values** (Table 2).



Test (granules)	Cats with Condition (Glucosuric at chemistry analyzer)	Cats WITHOUT Condition (non-glucosuric at chemistry analyzer)		
Test Positive (granules $\geq 1+$ )	True Positive: 25	False Positive: 1	PPV Pos. Pred. Value = TP / (TP+FP)	96,15%
Test Negative (granules =0)	False Negative: 1	True Negative: 105	NPV Neg. Pred. Value = TN / (TN+FN)	99,06%
	Se Sensitivity = TP / (TP+FN)	96,15%	Sp Specificity = TN / (TN+FP)	99,06%

Table 2: Glucosuria granules metric values

	pH $\geq 8$	USG > 1,060	Note
Total False Positive = 1/26	No	No	Glucosuria really close from the physiological threshold (21mg/dL)
Total False Negative = 1/106	Yes	Yes	Glucosuria really close from the physiological threshold (27mg/dL)

Table 3: Potential status modifiers (high pH, high USG) of false test results

## Discussion

- This test has proved as reliable as dipstick urinalysis to detect glucosuria in cats and can be easily used at home by the owner**
- It correlates also very well with the spectrophotometric method.

### Relevance of this detection threshold:

- Mean glucosuria among DM cats is 864mg/dL, and  $\leq 7$ mg/dL in healthy cats. Glucosuria > 25mg/dL is considered as pathologic<sup>6</sup>. The variation factors are in accordance with the response modifiers described in the ex vivo study parallelly presented (sensitivity and robustness of the test).

### Relevance of this test:

- An early diagnosis of DM is important in cats in order to treat adequately, allowing in some cases the resolution of the DM<sup>1,5</sup>. This test would be adequate to detect glucosuria and to suspect DM in polyuric cats **at home**, without the stress-induced modifications that can occur in veterinary clinics<sup>1</sup>.
- This test and the evaluation of urine glucose at home could be also of interest in the monitoring of DM<sup>5</sup>, as the results tend to be different in well-controlled *versus* less-controlled cats. This has to be studied in a larger population of diabetic cats.

## Conclusion

- The study suggests that these granules would be useful in order to easily diagnose glucosuria at home and may be of interest in detection and management of feline diabetes mellitus**

## Bibliography

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## For further information

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