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Comparison between a Handheld Blood Glucometer and a Laboratory Analyzer for Measurement of Blood Glucose in Blue-Fronted-Amazons (*Amazona aestiva*) kept in a Zoo

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Abstract

Measuring blood glucose is a very important parameter to observe, as it is related to the age of the animals, stress levels, pathological, genetic, nutritional issues and endocrine and liver disorders. The portable glucometer and a laboratory glucose analyzer are the main methods chosen to assess blood glucose quickly and effectively. The main objectives of using a portable glucometer are practicality, precision, reduction of sample size and cost retention, as it is a cheaper method. The laboratory glycemic analyzer requires more blood volume to carry out the test, qualified labor to handle the samples and keep the device in good working order, as it is expensive equipment. However, laboratory analyzers are highly accurate and provide accurate measurements of the patient's blood glucose levels, being considered the gold standard for this type of exam. The study aims to evaluate the accuracy, reliability and practicality of both methods of monitoring animals' blood glucose levels. For this work, 31 blood samples were collected from adult birds of the *Amazona aestiva* species, weighing between 305 and 505 grams. The birds were subjected to inhalation anesthesia with isoflurane to remove 1 ml of blood, in order to compare the values obtained after measuring blood glucose using a portable glucometer and the laboratory analysis method. The results obtained differ between techniques as 30,15% of blood glucose is underestimated by the portable glucometer. Therefore, we conclude that the use of this portable glucometer is not suitable for measuring blood glucose in blue-fronted parrots (*A. aestiva*).

Keywords: Portable Glucometer; Bird; Parrot

Introduction

Blue-fronted amazon (*Amazona aestiva*) is a common bird in zoos, especially in Brazil.

This species is a common result of illegal animal trafficking in South American countries, and, for many reasons, it is not able to be reintegrated to their natural habitat [1].

The measurement of blood glucose is a parameter that is intrinsically related to several elements, such as the individual's age, stress caused by external factors, genetic pathological issues or those resulting from malnutrition,

endocrine and liver disorders and the level of physical activity [2]. Thus, measuring blood glucose can provide important information about the patient's health.

Small birds rely on imprecise accuracy, as only 1% of their body weight, in blood, can be safely recovered. The advantage of using portable glucometers is given by the small amount of blood that is used to perform the test and rapid results [3,4].

Comparison between hand-held blood glucometers and laboratory analysis on blood glucose levels in birds have been described in rhinoceros auklets *(Cerorhinca monocerata)* [5]; hispaniolan amazon parrots (*Amazonaventralis*) [6,7], pigeons *(Columba livia)* [3] and other eighteen wild bird species with mixed results [4].

The studies on pigeons and eighteen bird species agrees that portable human blood glucometers can be used to measure blood glucose levels in these species [3,4].

On the other hand, the study on *C. monocerata*, affirms that the portable glucometers underestimate the blood glucose in these birds by 33% [5]. With *A. ventralis*, a closed related species to *A. aestiva*, the studies did not find a good correlation between a veterinary glucometer, human glucometer and laboratory analysis and did not recommend using these devices for this species [6,7].

Materials and Methods

In this study we aim to compare one point-of-care blood glucometer (Prestige IQ Accumed) with a laboratory autoanalyzer, in search of a rapid method to evaluate blood glucose in birds kept in zoos or private-owned.

Thirty one adults *A. aestiva*, not sexed, weighing 305 to 505 grams were physically restrained and put under anesthesia on oxygen mixed with isoflurane. They had 1 ml of their blood drawn off the ulnar or jugular vein, as part of a routine checkup. All birds were kept with the same source of food, water and lived in a similar environment.

Results are shown in Table 1.

Individual number	Weight	Point-of-care glucose (mg/dL)	Laboratory glucose (md/dL)
1	390	161	209,7
2	375	248	224,9
3	315	198	259
4	410	167	242,8
5	415	196	252,9
6	460	188	234,6
7	455	294	231
8	430	185	268,4
9	365	182	200
10	465	206	220,4
11	430	137	220,4
12	400	139	215,8
13	395	139	243
14	380	160	218
15	365	145	200,4
16	335	133	243
17	450	148	284,4
18	420	167	231
19	305	196	231
20	370	129	222
21	445	128	218
22	420	176	228

23	395	108	230
24	440	136	321,5
25	360	116	240
26	380	161	224
27	360	169	215
28	385	151	220
29	440	212	231
30	410	388	230
31	505	191	221

Table 1: Results of blood glucose levels with point-of-care glucometer and laboratory analysis in blue-fronted amazon *(Amazona aestiva*).

Discussion

In a study with juvenile and adult orange-winged amazon parrots (*Amazona amazonica*) their blood glucose levels were 219 to 362 mg/dL by laboratory methods [8]. This range agrees with values found in our study, with the exception of one bird that showed 388 mg/dL in the handheld glucometer but 230 mg/dL in laboratory methods.

Our data showed an underestimated value of blood glucose on the hand-held method (with exception of three measurements) compared to laboratory methods from 19 to 185,5 mg/dL, with the average being 69,72 mg/dL. These results are very similar to the study with *A. ventralis* [7].

In the study by Lieske, et al. [5] with *C. monocerata,* the blood glucose was underestimated by 33%, similar to our study where we found an average of 30,15%.

We conclude that the hand-held glucometer used in this study is not suitable to measure blood glucose in blue-fronted amazon (*A. aestiva*).

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