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Review Article

Comparative Study of Three different Techniques for Measuring Body Temperature in Japanese Quail (*Coturnix Japonica*) - Preliminary Studies

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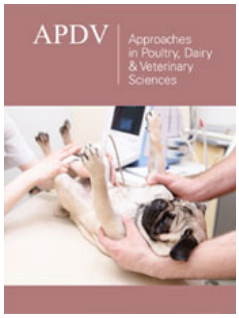

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Abstract

Thermometry is of fundamental importance to assess the general condition of a patient, and body temperature is an additional important data within a clinical context. The use of conventional mercury-based thermometers or digital devices is invasive and when measuring the temperature of small or micro birds, cloacal and rectal lesions may occur during their use. The present study compares the accuracy in the use of three thermal measurement tools, mercury thermometer, digital and laser, in Japanese quail (*Coturnix japonica*) as an experimental model. As a result, it was observed that the laser thermometer provides greater precision when compared to mercury and digital thermometers, being a great option for use in avian patients

Keywords: Semiology; Avian clinic; Thermometry; Animal health

Introduction

With the increase in demand for avian species such as pet animals, clinical semiology approaches must be improved and specialized, since an avian patient can be from a few grams (like a hummingbird) to tens of kilos (like an ostrich) and there is also big discrepancies in body size.

Thermometry is of fundamental importance to assess the general condition of a patient, and the body temperature is determined by the balance between heat gain and its respective loss by the balance between two different mechanisms: thermogenesis and thermolysis, with birds having higher temperatures compared to mammals due to their high metabolic rate, and smaller species tend to have higher temperatures than large birds [1,2].

Body temperature is an important data in a clinical context, and should not be evaluated separately, nor should it be seen as a form of diagnosis or even a disease in itself, and errors in the measurement of body temperature can seriously influence the assessment of the state health of an individual [2,3].

In general, the temperature measurement can clinically indicate four situations: Normothermia (when the body temperature values are within the limits established for the species), Hyperthermia (is the increase in temperature of non-inflammatory origin), Fever (is the elevation of the body temperature above the critical point) and Hypothermia (it is the decrease of the internal temperature below the reference values) [2].

The measurement of temperature in animals can traditionally be performed by external palpation, clinical thermometer or digital thermometer, and the internal temperature is traditionally performed rectally [2]. The measurement of temperature in small or micro-sized

animals is difficult since conventional invasive instruments, via the rectal route, depend on the introduction of it into the measuring ampoules (portion of the instruments that must come into contact with the rectal or cloacal mucosa) and in many situations they are too large to be introduced without causing mechanical damage to the cloacal pouch. Therefore, the present study aims to compare the use of three thermal measurement tools in Japanese quails (*Coturnix japonica*) as an experimental model because it is a small species, but with a relatively large cloaca.

Material and Methods

Our experimental group was composed by 100 specimens of Japanese quail (*Coturnix japonica*), 50 males and 50 females, 60 days old, belonging to the experimental Aviary of *Universidade do Oeste de Santa Catarina* (UNOESC, Xanxerê, SC, Brazil). Quails were kept in community galvanized cages with water and laying feed *ad libitum*. The birds were physically restrained and sequential measurements were made using three types of thermometers: the first measurement was carried out with a mercury thermometer (Clinical Thermometer Mercúrio Oval Premium, Accumed-Glicomed, Duque de Caxias-RJ, Brazil); the second with digital thermometer (Flexible Digital Thermometer MC-343, Omron Healthcare, São Paulo-SP, Brazil) and the third with laser thermometer (Termômetro OS418-LS, Ômega Engineering Brasil, Campinas-SP, Brazil). The measurements were carried out after 14 hours and the ambient temperature varied between 28.4-33.2 °C during sampling. All the measurements were performed into the cloacal mucosa where the ampoule of the mercury and digital thermometers were gently inserted into the cloacal pouch and the equipment maintained for 1 minute in contact with the mucosa. A light pericloacal pressure was applied to the laser thermometer, for exposure of the mucosa, with the focus of light positioned on it (Figure 1). Data were collected in triplicate and individual averages were obtained initially and then general averages. The statistical analysis of the results obtained was performed with the Assistat program (Assistat Software Version 7.7) with the experiment being completely randomized with an average test. In the days following data collection, there was no history of death or cloacal injuries in the handled birds.

Figure 1: Temperature measurement using the laser technique. After exposing the cloacal mucosa, the laser is applied at the surface without the need for mechanical contact.

Result and Discussion

The measurement of temperature in animals using laser is not a new technique in veterinary medicine, with studies in Rabbits [4], Monkeys [5], Dogs [6,7] and Swines [8], however, the cost of the device made it less accessible. However, currently there are several device options with the advantage of laser measurement having a wider temperature range and not being invasive.

Anderson et al. [9] tested laser temperature measurement in birds with some patients and noted that cloacal measurements is more reliable than in other parts of the body. In addition, showed that when comparing laser measurement with other more sophisticated techniques, the use of laser was promising in the results despite the small number of patients studied.

Our first analysis assessed whether there is a significant difference between the three methods of measuring temperature regardless of gender, with three different tests being applied: t test, Tukey test and Scott-Knott test (Table 1). A variation coefficient of 1.31% was observed and the F test result was 214.28, which gives us a mathematical significance at the level of 1% probability ($p < 0.01$), thus giving a significant difference between the means.

Table 1: Results obtained for the mean test in the different ways of measuring cloacal temperature.

Thermometer	Mean	Standard Deviation	T Test	Tukey Test	Scott-Knott Test
Mercury	40.17	± 0.52 (39.65 - 40.69)	C	C	C
Digital	40.82	± 0.43 (40.39 - 41.25)	B	B	B
Laser	41.93	± 0.31 (41.62 - 42.24)	A	A	A
msd	-	-	0.15	0.17	-

*The means followed by the same letter do not differ statistically; msd: minimum significant difference.

In the second analysis, it was verified if there are sexual differences in the temperature measurements between the devices and also if there is a difference in the body temperature of males and females (Table 2). When comparing body temperature averages between males and females, the F test result was 0.0310, which shows that there was no significant difference even though there were slight differences in the averages between males and females.

Table 2: Analysis of difference in body temperature between males and females.

Sex	Mercury Thermometer	Digital Thermometer	Laser Thermometer
Female	40.1900 aC	40.9140 aB	41.6480 aA
Male	40.1600 aC	40.7320 aB	41.8220 aA

*msd for columns = 0.2096 Classific.c/ small letters, msd for lines = 0.2278 Classific.c/ capital letters;

** The averages followed by the same letter do not differ statistically from each other.

To assess whether there is a significant difference between the measurement and temperature methods separated by male and female, the F test found for the sex versus method interaction was approximately 3.44, which gives us a significant test at the 5% of probability level ($0.01 =< p < 0.05$). Thus, we conclude that there is a significant difference between the averages, and consequently between the methods of measuring temperature, with the largest temperature range obtained by the laser thermometer, for both males and females (capital letters). This result is also observed by analyzing the general average of the entire sample.

The average body temperature of healthy birds varies around 40-42 °C, with normal temperatures for birds at rest at 29.54 ± 0.96 °C, in active birds at 41.02 ± 1.29 °C, and in birds with high metabolic activity at 43.85 ± 0.94 °C [10,11]. All quails in this study remained within the normal range, demonstrating the absence of pathophysiological changes and giving reliability to the data obtained. The fact that they are often handled birds has reduced stress factors by containment, which also contributes to the safety of results.

The measurement of temperature in birds is traditionally through cloacal via [12] being an invasive form and normally requires the containment of the animal, as well as the size of the bird is a limiting factor for insertion of conventional thermometers into the cloaca. With the use of the laser, the procedure becomes non-invasive and can be applied even in small birds, since it is enough to expose the bird's mucosa to check the temperature.

It is important to emphasize that another non-invasive option that does not require physical restraint is the measurement by the thermography technique [13], however, the costs of thermographic devices are still very high, which makes it difficult to use them in hospitals and veterinary clinics today. According to our study, we observed that there is confidence in the difference in values between the temperature measurement methods, and the values obtained by the laser thermometer were higher, with a lower variation index, that is, greater uniformity of parameters when comparing the measurements by mercury and digital thermometers. Therefore, we conclude that the use of the laser thermometer provides greater precision when compared to mercury and digital thermometers, being a great option for use in avian patients.

References

1. McNab BK (1966) An analysis of the body temperatures of birds. The Condor 68(1): 47-55.
2. Feitosa FL (2014) General or routine physical examination. In: Feitosa FL (Ed.), Veterinary Semiology, 3rd (edn), FL. Feitosa, Roca, São Paulo, Brazil, pp. 51-67.
3. Sund LM, Grodzinsky E, Wahren LK (2004) Errors in body temperature assessment related to individual variation, measuring technique and equipment. Int J of Nurs Pract 10(5): 216-223.
4. Chen PH, White CE (2006) Comparison of rectal, microchip transponder, and infrared thermometry techniques for obtaining body temperature in the laboratory rabbit (*Oryctolagus cuniculus*). J Ame Assoc Lab Anim Sci 45(1): 57-63.
5. Brunell MK (2012) Comparison of noncontact infrared thermometry and 3 commercial subcutaneous temperature transponding microchips with rectal thermometry in rhesus macaques (*Macaca mulatta*). J Am Assoc Lab Anim Sci 51(4): 479-484.
6. Greer RJ, Cohn LA, Dodam JR, Colette CW, Mann FA, et al. (2007) Comparison of three methods of temperature measurement in hypothermic, euthermic, and hyperthermic dogs. J Am Vet Med Assoc 230(12): 1841-1848.
7. Kreissl H, Neiger R (2015) Measurement of body temperature in 300 dogs with a novel noncontact infrared thermometer on the cornea in comparison to a standard rectal digital thermometer. J Vet Emerg Crit Care (San Antonio) 25(3): 372-378.
8. Jara AL, Hanson JM, Gabbard JD, Scott KJ, Emery TR, et al. (2016) Comparison of microchip transponder and noncontact infrared thermometry with rectal thermometry in domestic swine (*Sus scrofa domestica*). J Am Assoc Lab Anim Sci 55(5): 588-593.

9. Anderson S, Kaplan Stein S, Adolph, Jose MP (2019) Assessment of non-contact infrared thermometer measurement sites in birds. J Appl Anim Welf Sci 23(2): 1-9.

10. Preinzinger R, Prebmar A, Schleucher E (1991) Body temperature in birds. Comparative Biochemistry and Physiology 99(4): 499-506.

11. Marietto Gonçalves GA (2016) Manual de Emergências Aviárias, Medvet, 2nd (edn), São Paulo, Brazil.

12. McCafferty DJ, Gallon S, Nord A (2015) Challenges of measuring body temperatures of free-ranging birds and mammals. Animal Biotelemetry 3(33):

13. Jerem PK, Herborn D, McCafferty D, McKeegan D, Ruedi Nager, et al. (2015) Thermal imaging to study stress non-invasively in unrestrained birds. J Vis Exp (105): e53184.