Journal of Animal and Veterinary Advances 11 (19): 3604-3608, 2012
ISSN: 1680-5593

The Effect of the Cinnamon on Dog's Heart Performance by Focus on Korotkoff Sounds

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Abstract: Cinnamon is harvested by growing the tree for 2 years then coppicing it. The next year, about a dozen shoots will form from the roots. The branches harvested this way are processed by scraping off the outer bark then beating the branch evenly with a hammer to loosen the inner bark. The inner bark is then prised out in long rolls. Only the thin (0.5 mm (0.020 in)) inner bark is used; the outer, woody portion is discarded, leaving metre-long cinnamon strips that curl into rolls (quills) on drying. Once dry, the bark is cut into 5-10 cm (2.0-3.9 in) lengths for sale. The aim of this study was to evaluation of the cinnamon on dog's heart performance especially Korotkoff sounds and electrocardiogram. In this study, 10 dogs aged between 2-3 years old were selected by chance. Before onset of the experiment, clinical examination of animals from wellness aspect was done and hearts of each animal from existence of any problem such as congenital or acquired and auscultable murmurs was examined. Then, all animals were fed with cinnamon for 2 weeks. After day 14 and concurrent with last extract administration, electrocardiogram and sphygmomanometric blood pressure obtained from left brachial artery at the times of 2, 4 and 8 h after administration. Then, P-R interval, R wave amplitude, Q-T segment were assayed from electrocardiogram. In the study revealed that cinnamon has protective effect on heart performance because cinnamon improved all measured parameters and researchers recommended use of this medicinal plant but we suggest that more studies required to approving this matter.

Key words: Cinnamon, heart markers, electrocardiogram, Korotkoff sounds, dog

INTRODUCTION

Estimation of systemic arterial pressure by sphygmomanometry is an example of an empirically validated technique based on subjective judgments for acquisition of quantitative physiological and clinical data. Despite widespread use, the understanding of the mechanism by which the characteristic sounds are produced has not greatly improved since the technique was first reported by Korotkoff (1956) before the Imperial Military Medical Academy in St. Petersburg. The cuff of Riva-Rocci is placed on the middle third of the upper arm; the pressure within the cuff is quickly raised up to the complete cessation of circulation below the cuff. Then, letting the mercury or the manometer fall, one listens to the artery just below the cuff with a children's stethoscope. At first, no sounds are heard. With the falling of the mercury in the manometer down to a certain height, the first short tones appear; their appearance indicates the passage of part of the pulse wave under the cuff. It follows that the manometric figure at which the first tone appears corresponds to the maximal pressure. With the further fall of the mercury in the manometer the systolic compression murmurs are heard which pass again into tones (second). Finally all sounds disappear. The time of the cessation of sounds indicates the free passage of the pulse wave in other words at the moment of the disappearance of the sounds, the minimal blood pressure within the artery preponderates over the pressure in the cuff. Consequently, the manometric figures at this time correspond to the minimal blood pressure.

Korotkoff sounds have been attributed to various types of fluid-induced vibrations such as turbulent jets (Chungcharoen, 1964), turbulent wakes (Bruns, 1959; Fruehan, 1962), cavitation (Malcolm, 1957), systolic impact, stenotic flow and protodiastolic recoil (Edwards and Levine, 1952), resonating of the arm as the pulse enters (Flack *et al*., 1915) and Bernoulli effects or flitter (Rodbard and Saiki, 1953). Most recently Vidya (1965) and Raman (1966) studied rubber tubes and developed a mathematical derivation which exhibited transient instability in response to small perturbations. They postulate a type of hydraulic amplification of local flow disturbances to the point that they become audible. Thus, Korotkoff sounds were attributed initially to wall movements, later to unstable flow and finally to a diverse combination of factors. No hypothesis of sound production is generally accepted as the cause of Korotkoff sounds.

Cinnamon is one of the oldest spices used in naturopathic medicine, cited in Chinese books 4000 years ago (Qin *et al*., 2003) and traditionally used in Ayurvedic and Chinese medicine to treat diabetes (Modak *et al*., 2007). Interest in this spice has increased since the discovery of its insulin potentiating properties (Khan *et al*., 1990) and initial findings illustrating cinnamon's ability to reduce Fasting Blood Glucose (FBG) and plasma lipids (Khan *et al*., 2003). However, subsequent studies have reported conflicting results, questioning the hypothesis that cinnamon can reduce FBG and clouding the potential of a natural remedy for diabetes.

The aim of this study was to evaluation of the Cinnamon on dog's heart performance especially Korotkoff sounds and electrocardiogram.

MATERIALS AND METHODS

This experimental study was carried out in Islamic Azad University Research Center and all procedures and works on animals was conducted under Animal Rights Monitoring Committee of the Islamic Azad University Research Center.

In this study which was from experimental-intervention types of studies, 10 dogs aged between 2-3 years old were selected by chance. Before onset of the experiment, clinical examination of animals from wellness aspect was done and hearts of each animal from existence of any problem such as congenital or acquired and auscultable murmurs was examined. Then, electrocardiogram was obtained from animals to approve complete healthy. Basic biochemical profile also was assayed so existence of any disturbance in other organs, are excluded from the study. All animals were weighted in order to calculating of the accurate drug dose.

All animals were fed with standard diets for 2 weeks and environmental situation considered as stable to avoidance from stress effects on them. Hairs of the areas which had close contact with the leads of electrocardiogram were shaved 4×6 in sized.

Sphygmomanometric blood pressure obtained from left brachial artery and electrocardiogram was achieved by using of leads II and IV. Achievement of blood pressure was done for 4 different times with an interval of 5 min to prevention of bias. Then, mean value of data obtained from these 4 times calculated and assigned as blood pressure of control group. In continuo, animals were treated by cinnamon at the dose of 50 mg kg^{-1} once a day for 2 weeks as orally. After day 14 and concurrent with last extract administration, electrocardiogram and Sphygmomanometric blood pressure obtained from left brachial artery at the times of 2, 4 and 8 h after administration. Then, P-R interval, R wave amplitude, Q-T segment were assayed from electrocardiogram.

The Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA), Version 13.0 was used for statistical analysis. All data are presented as mean±SEM. Before statistical analysis, all variables were checked for normality and homogeneity of variance by using the Kolmogorov-Smirnoff and Levene tests, respectively. The data obtained were tested by ANOVA followed by Tukey's post-hoc multiple comparison test. The Kruskal-Wallis test, followed by Mann-Whitney U post-test was used for the analysis. $p<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Blood pressure: The related curve (Fig. 1) has shown that systolic blood pressure in treatment group is lower than control group. Also, revealed that among treated animals, systolic blood pressure at the time 8 h after administration was <2 and 4 h. Since, blood pressure is resulted from stroke volume with systemic vascular resistance, thus researchers cannot be certainty stated that whether reduction of systolic blood pressure is due to reduced stroke volume or is related to decrease in vascular resistance.

Heart rate: The related curve (Fig. 2) has shown that heart rate in treatment group is lower than control group. Also, revealed that among treated animals, heart rate at the time 8 h after administration was <2 and 4 h. As shown in Fig. 2, there is a significant difference between times 0 and 2 in R-R interval.

Q-T interval: This item is considered as one of the most important factors in the diagnosis of bradycardias. As shown in Fig. 3, Q-T segment obviously has been long in the treatment groups.

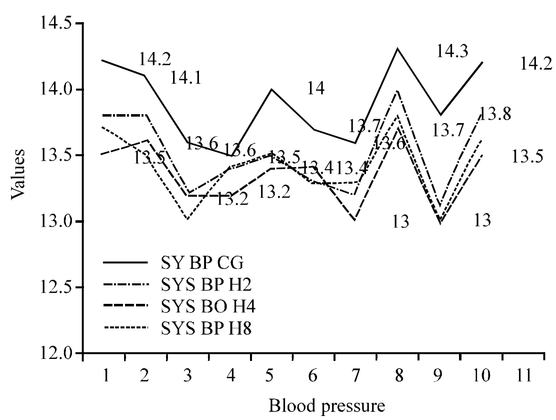

Fig. 1: Comparison of blood pressure in control and treated groups

Table 1: Statistical analysis of data obtained from comments of electrocardiogram

Groups	No.	Mean	SD	SE	p-value	t-test	95% confidence interval of the difference Lower	Upper
Control group	10	2.67	0.149	0.047	0.000	56.498	2.5631	2.7769
2 h post administration	10	2.29	0.110	0.034	0.000	65.803	2.2113	2.3687
4 h post administration	10	2.27	0.048	0.015	0.000	148.606	2.2354	2.3046
8 h post administration	10	2.20	0.081	0.025	0.000	85.206	2.1416	2.2584

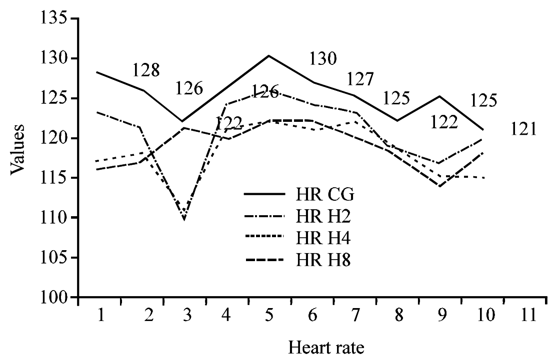

Fig. 2: Comparison of heart rate in control and treated groups

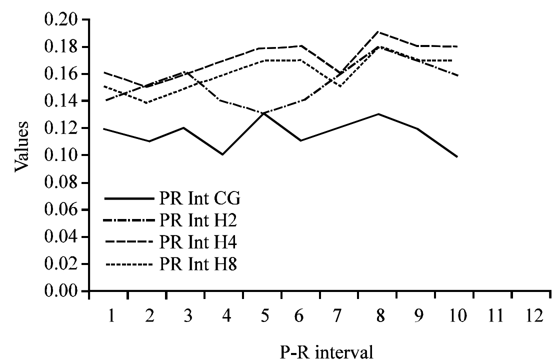

Fig. 4: Comparison of P-R interval in control and treated groups

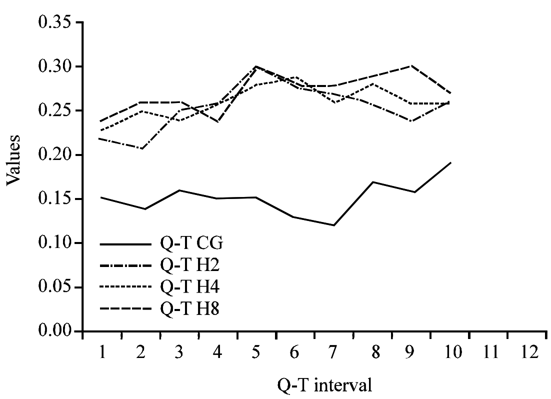

Fig. 3: Comparison of Q-T interval in control and treated groups

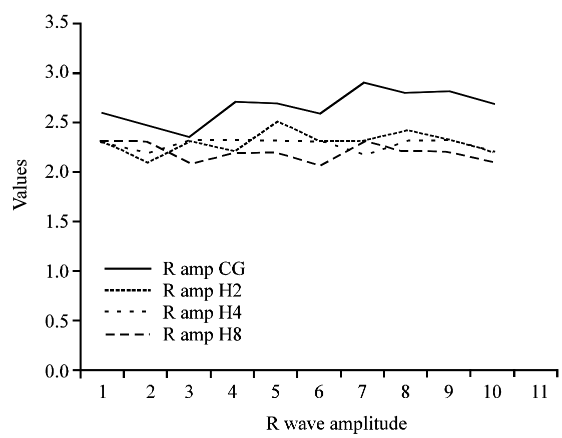

Fig. 5: Comparison of R wave amplitude in control and treated groups

P-R interval: As shown in Fig. 4, P-R interval in the treated animals has significant increase in the duration than control group.

R wave amplitude: Based on Fig. 5 revealed that treatment groups have shorter R wave amplitude than control group that is associated with decreased blood pressure. Statistical analysis of obtained data is showed in Table 1.

In traditional medicine, cinnamon has been used for digestive ailments such as indigestion, gas and bloating, stomach upset and diarrhea. More recently, modern medical research has turned its eye on cinnamon and is coming up with some intriguing results. It has a mild anti-inflammatory effect. It also slows the spoiling of food (which is probably related to why it was used as an embalming agent in ancient Egypt) and has anti-fungal properties as well.

In one fun study, researchers found that sniffing cinnamon resulted in improved brain and heart function-subjects did better on memory and attention tasks when taking whiffs of cinnamon as opposed to other odors or no odor. However, the potential health benefits of cinnamon that have received the most attention have to do with its effects on blood glucose and cholesterol.

Although, Ziegenfuss *et al*. (2006) used a concentrated supplement made from *C. burmannii*, *C. verum* remains otherwise untested in clinical trials. Supplement preparation may have influenced the outcome of several studies as cinnamon contains a number of active agents with varying antihyperglycaemic actions (Anderson *et al*., 2004; Kim *et al*., 2006) and although it is proposed that the active components appear in both aqueous extract and powdered bark (Anderson *et al*., 2004; Verspohl *et al*., 2005), information regarding the concentration of these components in the *C. cassia* and *C. burmannii* used remains largely unknown. Some studies may have used preparations with low levels of the active components and with cellular bioavailability of cinnamon in the nanomolar range, low physiological concentrations create a challenge for research methodologies and accurate deductions. This may explain why animal studies using higher doses have resulted in greater blood glucose reduction (Verspohl *et al*., 2005). Animal studies presenting significant results have commonly used higher cinnamon dosage against body weight in comparison with human studies. For example, the equivalent human dosage if applying the measure per body weight administered by Kannappan *et al*. (2006) to rats would be 17.08 g cinnamon day^{-1} rather than the 1.5 g used by Vanschoonbeek *et al*. (2006). It appears that both cinnamon extract and powder are effective, the level of bioactive ingredients in the preparation a more important factor. Based upon the results of the diabetic studies reviewed, it is possible that the therapeutic dose of cinnamon may depend upon the subjects' baseline FBG rather than there being a significant dose-dependent effect. However, Ziegenfuss *et al*. (2006) report an 8.4% FBG reduction in subjects with a mean baseline FBG of 6.46 mmol L^{-1} ingesting 10 g of cinnamon daily for 12 weeks, illustrating that a higher cinnamon dose can bring about a significant reduction in blood glucose ($p<0.01$) in subjects with lower baseline FBG.

There are many more studies about protective effect of cinnamon against cancer (Wondrak *et al*., 2010; Kwon *et al*., 2010; Koppikar *et al*., 2010), diabetes mellitus (Ballali and Lanciai, 2012; Bandara *et al*., 2011; Xie *et al*., 2011), cholesterol (Javed *et al*., 2012) and antimicrobial effects (Unlu *et al*., 2010) but there is no any documented study about cinnamon and heart function. Thus, can be state clearly that the study is unique.

CONCLUSION

The study revealed that cinnamon has protective effect on heart performance and researchers have recommended use of this medicinal plant but researchers suggest that more studies required to approving this matter.

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