A Comparison of the Baroreflex Response in Normotensive and Spontaneously Hypertensive Rats Before and After Treatment with Rutin
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ABSTRACT
In organisms that suffer from hypertension, often there is an impairment in the baroreflex response that inhibits them from correcting the condition. Antioxidants such as rutin have been known to improve the baroreflex response in hypertensive rats. In this experiment, we compare the baroreflex sensitivity in normotensive Wistar rats, SHR rats, and SHR rats treated with rutin. It was determined that rutin improved both the parasympathetic and sympathetic baroreflex response in SHR rats. It was also determined that the sympathetic BRS response was not significantly different between normotensive and SHR rats. This could be due to the nature of the SHR rats and could be corrected by a greater sample size. However, it has been suggested that hypertension impairs baroreceptor function in the carotid sinuses but not in the sympathetic nervous pathways, which could be the case in this experiment.

BACKGROUND
• The baroreflex response is a mechanism that works to regulate changes in blood pressure. It relies on baroreceptors located in the carotid sinuses and aortic arch. These nerves sense changes in blood pressure via stretching of the artery and send signals to the nucleus tractus solitarii (NTS). The NTS regulates parasympathetic and sympathetic neurons in the medulla which influence vasoconstriction and cardiac output.
• In cases of chronic hypertension, there is a decrease in baroreceptor sensitivity that results in a failure of the baroreflex system (BRS).
• Certain drugs have different effects on the BRS. Sodium nitroprusside (NPS) acts as a muscle relaxer and induces vasoconstriction and increases blood pressure, causing the BRS to compress with a sympathetic response of an increase in heart rate. Phenylephrine (PHE) induces vasoconstriction and cardiac output.
• In SHR specimens, excessive formation of reactive oxygen species (ROS) is a factor in the development and continuation of hypertension. Antioxidants reduce the amount of ROS and lessen the effects of hypertension. Rutin one antioxidant that has been shown to have corrective effects on the BRS.

RESULTS

Figures:
A. The resting mean arterial blood pressure (mmHg) of the rats before injection of any drugs.
B. The resting heart rate (bpm) before injection of any drugs.

Parasympathetic baroreflex response after the insertion of Phenylephrine and Sympathetic baroreflex response after the injection of sodium nitroprusside.

MATERIALS AND METHODS
Animals:
Five male SHR and Wistar rats (230g-300g) given free access to standard rat chow (Labina, Purina, São Paulo, Brazil) and water.

Surgical Procedure:
Rats were anesthetized with ketamine and xylazine (75 and 10 mg/kg) and fitted with polyethylene catheters. Some catheters were inserted into the femoral artery into the lower abdominal aorta and through the femoral vein into the caudal vena cava. Saline was used to fill the catheters and heparin was inserted to prevent clotting. The catheters were then guided subcutaneously to a dorsal opening and the rat was sutured.

Recording:
Experimental recording was done on the conscious rats 24 hours after completion of catheterization surgery. The arterial catheter was connected to a precalibrated system which measured heart rate and blood pressure using a pressure transducer through the program LabChart®.

Baroreflex testing:
Each animal was administered 25 mL of NPS per 1 kg of body weight. The drug was administered and the results were recorded. The rat’s parameters were allowed to stabilize before administering the second drug (PHE) in the same ratio. The results were recorded. For the SHR rats, a dose of rutin (10mg/kg) was then given and the baroreflex response was tested again after fifteen minutes.

Analysis:
The mean arterial blood pressure and heart rate for each group was found for the twenty seconds before injection of the drugs. These values were found again after the insertion of the drug, before the parameters started to stabilize. Baroreflex values were determined for the different groups using the formula BRS=SHR/AMAP.

CONCLUSIONS
• Rutin improved both the parasympathetic and sympathetic baroreflex response in SHR rat
• Parasympathetic BSR response was greater in normotensive and rutin treated rats than SHR rats
• Sympathetic BSR response was not significantly different between normotensive and SHR rats

REFERENCES