# CORRELATIONS AMONG HEART RATE, CORE TEMPERATURE AND BLOOD PRESSURE IN TELEMETRY-EQUIPPED HYPOTHERMIC RATS

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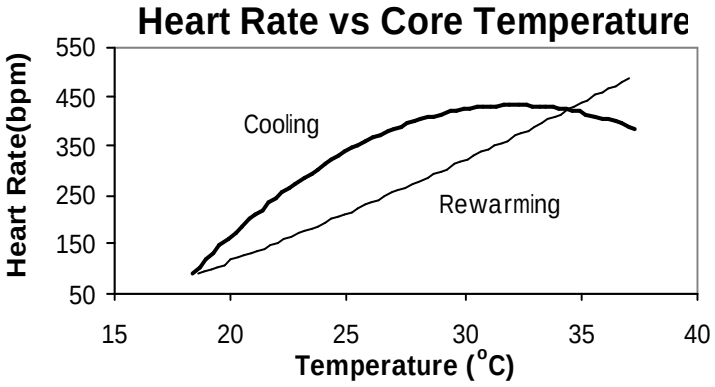
Prior to using a rat model of hypothermia and rewarming to examine heart rate and blood pressure variability for potential autonomic signatures of hypothermia and rewarming, changes in core temperature (Tc), heart rate (HR), mean blood pressure (BP), and arrhythmias were defined. *Materials and methods*: Adult, male Sprague-Dawley rats had telemetry transmitters (Data Sciences, TL11M2-C50-PXT) surgically implanted (sodium pentobarbital 50 mg/kg, i.p. supplemented as needed with methoxyflurane to maintain anesthesia), and 2 weeks recovery were allowed prior to induction of hypothermia. On the day of data collection, rats were lightly anesthetized (sodium pentobarbital 35 mg/kg, i.p.) and placed in a coil of copper tubing through which temperature-controlled water was circulated. Four animals were each subjected to hypothermia twice with at least 4 days between exposures. Animals were cooled to a Tc of 19 to 20°C, maintained there for 30 min, and then rewarmed. Tc, BP, HR from ECG and 10 sec strips of ECG waveforms were collected every 5 min throughout hypothermia and rewarming. *Results*: Rats were cooled at a rate of 0.126 $^{o}$C/min and rewarmed at 0.221 $^{o}$C/min; during cooling both HR and BP declined after initial increases with the drop in HR starting at a higher Tc than the drop in BP. Similar findings have previously been reported in human patients. The correlation between HR and Tc as well as that between BP and Tc were different during cooling than during rewarming. The Figure illustrates the correlation between Tc and HR during cooling and rewarming for a total of 8 trial; for cooling $y = -1.798x^2 + 115.5x - 1424$, $R^2 = 0.8805$; for rewarming $y = 0.1875x^2 + 11.02x - 178.8$, $R^2 = 0.9117$. A correlation between Tc and BP yielded the following equations for cooling $y = -0.4214x^2 + 24.43x - 215.6$, $R^2 = 0.6897$; for rewarming $y = -0.1809x^2 + 12.78x - 88.02$, $R^2 = 0.7412$. In several of the trials at Tc < 25 $^{o}$C the rats exhibited characteristic “J” or Osborn waves in the ECG. *Conclusion*: Thus the rats exhibited cardiac arrhythmias and other cardiovascular anomalies similar to those seen in human patients with severe hypothermia. Correlations such as these could be used in predicting physiological status under environmental extremes. These findings further validate the use of the rat for studying the pathophysiology of hypothermia and rewarming.

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