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Relationship Between Body Temperature and Arterial Pressure.*

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In the course of a series of investigations on the normal resting arterial blood pressures of various species of unanesthetized animals; data were obtained on the blood pressure of the turtle, *Pseudemys elegans*, at various body temperatures.

Arterial blood pressures were recorded on

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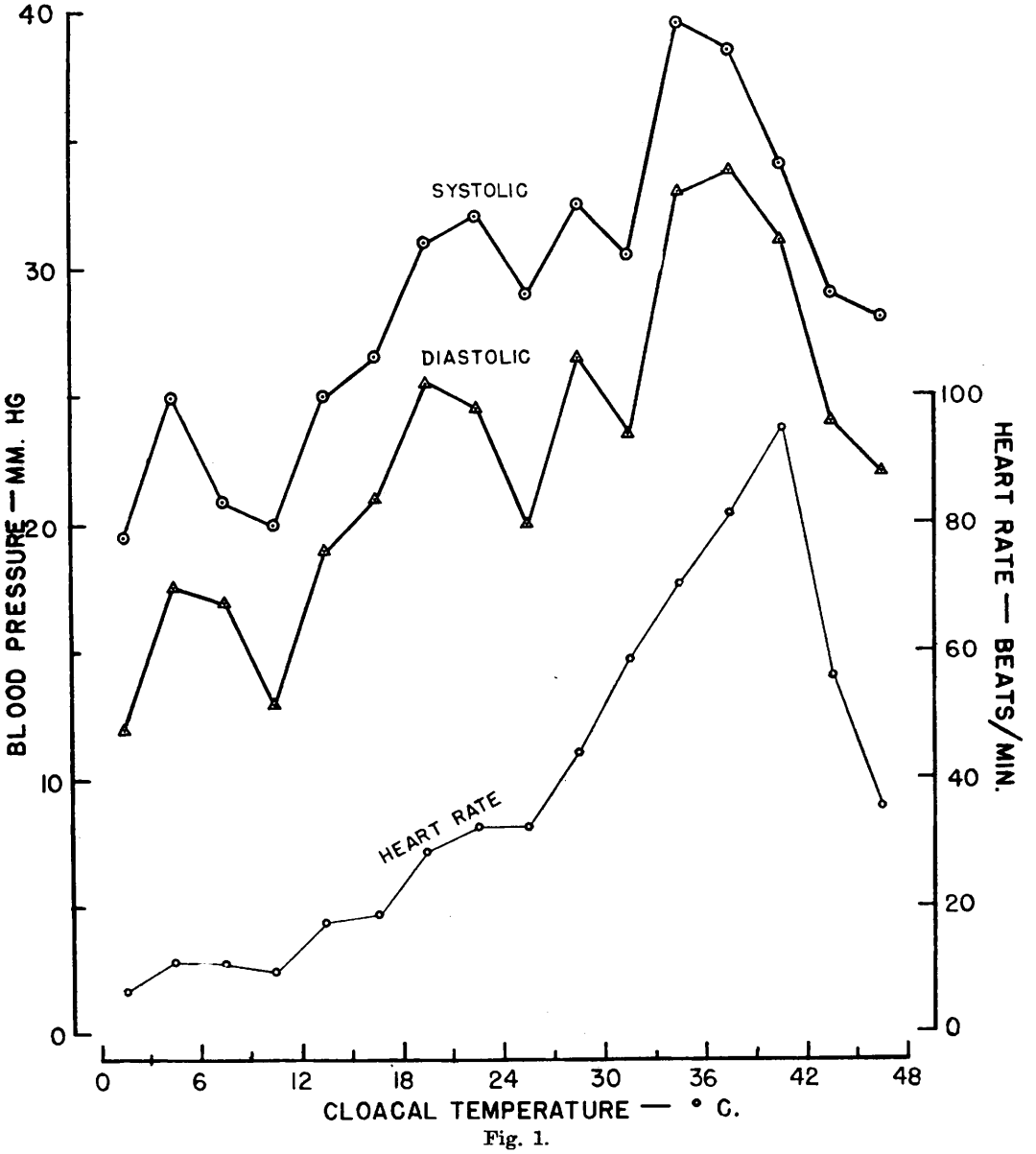

Fig. 1.

photographic paper, using the Hamilton optical recording manometer. A cannula attached to the manometer was directed cardially and tied into the left aortic arch. Body temperature was determined by means of a mercury thermometer tied into the cloaca. The animal was placed on its back in a pan of water, and the temperature of the water was changed slowly by the addition of ice cubes or by slow warming. The turtles were warmed from room temperature, 18°C, to about 40°, then cooled to about 3° and finally rewarmed to 45°. The rate of temperature change was about 0.3° per minute.

Arithmetic averages of the blood pressures and heart rates obtained in 2 heatings and one cooling of 5 turtles are given in Fig. 1. Our results show that there is a fairly consistent rise in arterial blood pressure as the cold animal is warmed until a temperature of about 38°C is obtained and with further warming the blood pressure falls rapidly. When the animals are then cooled the blood pressure increases until a temperature of about 38°C is obtained and with further cooling the blood pressure falls, so that in general the original curve is reduplicated. A second reheating gives data similar to that obtained in the first warming. The effect of temperature on heart rate is similar to that obtained with blood pressure, except that the heart rate is maximal at about 40°.

The pulse pressure remained relatively unchanged during our experiment. It decreased somewhat between 38° and 40°C when the heart rate was maximal, as can be seen in Fig. 1. It increased in 3 instances between 20° and 30°C in consequence of an unexpected fall of the diastolic pressure to zero.

Discussion. The rise in blood pressure seen with increasing body temperature may be related in some as yet undetermined way with the increased metabolic activity of the tissues. It is probably associated with an increase in cardiac output.

Comparison of our data on turtles with results on the resting blood pressure of unanesthetized mammals and birds, leads to the suggestion that there may be a general relationship between the body temperature and the level of the resting diastolic pressure. For example, the mammals (dog, rabbit, rat and man) which we have studied have all exhibited a basal diastolic arterial pressure of approximately 80 mm Hg.[1,2] These findings are in accord with scattered data found in the literature. Chickens, which have a normal body temperature of about 41°C, have a resting diastolic pressure of approximately 120 mm Hg.[3] Our data also appear to fit well with the relationship between blood pressure and body temperature in the new born rat, which has not yet attained the full development of the mechanism which assures homoiothermy.[4]

Summary. The arterial pressure of the turtle was found to vary directly with changes in body temperature between 3° and 38°C. Above 38°C the pressure declined.

[1] Katz, L. N., Friedman, M., Rodbard, S., and Weinstein, W., *Am. Heart J.*, 1939, **17**, 334.

[2] Rodbard, S., *Am. J. Physiol.*, 1940, **129**, 358.

[3] Unpublished data.

[4] Helmholz, H. F., Jr., *Fed. Proc.*, 1946, **5**, 44.

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Pressures Required to Produce Intradermal Wheals in Normal Human Subjects.*

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A search of the literature has not disclosed any previous attempts to measure the range of pressure required to produce intradermal wheals in the normal human skin. Such pressures should be a direct measurement of the force necessary to spread the closely-bound