

## An Electrocardiographic Study of the Effects of The Topical Application of Certain Fluoride Salts on The Heart of the Turtle *Pseudemys Scripta Elegans*

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*Materials and Methods*—Twenty-six adult specimens of both sexes were used. The plastron measurements varied from 18.5 cm to 28.9 cm in length and from 14.2 cm to 22.2 in width. The weights varied from 913.6 g to 2,755.4 g. Except for frequent plastron infections, the animals were all well nourished and in apparent good health. The room temperature varied from 24.1°C to 27.2°C.

The animals were all singly pithed, and the plastrons were opened with a steel circular drill saw (Davis, 1961).

The electrocardiograms were made on a standard General Electric Model B Type 5 electrocardiograph.

After the animals were prepared and the electrocardiograph properly calibrated, the gauze wick electrodes were placed on the base of the ventricle. The animal's heart was washed with normal Ringer's at the rate of 10 cc per minute and an electrocardiogram was made.

The operative cavity was aspirated free of Ringer's solution and the fluoride salts were allowed to flow on the heart at 10 cc per minute. After approximately 7 minutes, an electrocardiogram was made. The cavity was then washed with 150 cc of normal Ringer's and aspirated.

Four successive recordings were made in the above manner. The following fluoride salts were taken into solution in the Ringer's base: NaF, KF, NH<sub>4</sub>F, CaF<sub>2</sub>, MgF<sub>2</sub>, and Na<sub>2</sub>PO<sub>4</sub>F. These salts were applied to the heart topically at concentrations of 1:10,000,000, 1:1,000,000 and 1:500,000. CH<sub>3</sub>FCOONa and KPF<sub>6</sub> were applied topically at a concentration of 1:10,000,000 only.

Each animal acted as its own control.

*Results and Discussions*—The mean data and range of the waveform upon topical application of the salt solutions reveal that the sinus duration is 0.08 seconds with a magnitude of 3mm. The sinu-atrial wave is 0.20 seconds with a magnitude of 10mm. The atrio-ventricular interval is 0.56 seconds. The duration of the ventricular spike is 0.16 seconds. The ventriculo-atrial interval is 0.36 seconds. The complete cardiac cycle is 1.60 seconds.

The slower heart rate produced by the application of NaF, KF and NH<sub>4</sub>F at concentrations of 1:10,000,000, 1:1,000,000 and 1:500,000 was due primarily to an increase in the sino-atrial interval.

A comparison of the results of the application of NaF, KF and NH<sub>4</sub>F reveals no significant differences in the reactions of the heart to the salt solutions. Also, there is no evidence that variation in concentration within the described ranges produced any variation in effects.

<sup>1</sup>This work was done at the University of Tulsa under the direction of Professor C. A. Levegood of the Department of Life Sciences.

The salts  $\text{CH}_3\text{FCOONa}$  and  $\text{KPF}_6$  produced more singular effects. The  $\text{CH}_3\text{FCOONa}$  produced immediate tachycardia which degenerated into complete cardiac arrest. The  $\text{KPF}_6$  produced a brief period of irregular cardiac contraction which also was followed by complete cardiac arrest. Irreversible arrest having been produced by the 1:10,000,000 solution, tests were not run for the other concentrations.

The  $\text{Na}_2\text{PO}_3\text{F}$  solution produced a temporary tachycardia due to a decrease in the sinu-atrial interval, but of such short duration that it could not be regarded as truly significant.

The solutions of  $\text{CaF}_2$  and  $\text{MgF}_2$  produced no notable effect.

*Conclusion*—Solutions of  $\text{NaF}$ ,  $\text{KF}$ , and  $\text{NH}_4\text{F}$  at concentrations of 1:10,000,000, 1:1,000,000 and 1:500,000 produce temporary bradycardia upon topical application to the turtle heart. The bradycardia results from an increase in the sinu-atrial interval. At similar concentrations, solutions of  $\text{CaF}_2$  and  $\text{MgF}_2$  produce no significant effects,  $\text{CH}_3\text{FCOONa}$  and  $\text{KPF}_6$  produce irreversible cardiac arrest, and  $\text{Na}_2\text{PO}_3\text{F}$  produces temporary tachycardia due to a decrease in the sino-atrial interval. From these experiments it is concluded that the action of the fluoride salts has its greatest effect on the sino-atrial region of the heart.

#### LITERATURE CITED

- Davis, George D. 1961. A simple method for opening the turtle plastron. Proc. Okla. Acad. Sci. 41:82.
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