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Physiology

HEART CONDITIONED RESPONSE IN *SALMO TRUTTA* (L.) IN THE  
FIELD OF INDUCTIVE CURRENT

REAKCJA ODRUCHOWA SERCA U *SALMO TRUTTA* (L.)  
W POLU PRĄDU INDUKCYJNEGO

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Heart conditioned responses in *Salmo trutta* (L.) in the field of inductive current were investigated by means of the cardiographic method. High excitability grade was proved. Heart responses appeared after the use of subthreshold stimuli for smooth muscles.

The influence of inductive current on the reaction of fish heart in situ was made a subject of few investigations (Mohr, 1960; Bodrova, Krajuchin, 1948). Investigations within this range were, for the most part, carried out on isolated hearts or by means of vivisection.

By the method of cardiography in chronic experiments there were carried out investigations upon conditioned heart responses of fishes under aquarium conditions in the field of inductive current activity.

EXPERIMENT

Investigations were carried out on *Salmo trutta* (L.) of the length from 54 cm to 66 and weight from 1,5 to 3,5 kg taken from the river shortly before the experiment. After the operation facilitating the recording of heart work (Węgrzynowicz, Zbanyszek, 1969), the fish was transferred to the darkened aquarium filled with river water the temperature of which was unchanged, additionally aerated. The fish was left there for adaption. Stopping of increased locomotory movements and the appearance of regular heart action, with allowance for slight variability being within the range of physiological rest, had been accepted as the end of the adaption period.

An accumulator of the initial voltage 2 V and amperage 3,5 A supplying Dubois Reymond's induction coil was the source of current. Electrodes were

immersed in water, each of them placed on the opposite wall of the aquarium (150x80x60 cm).

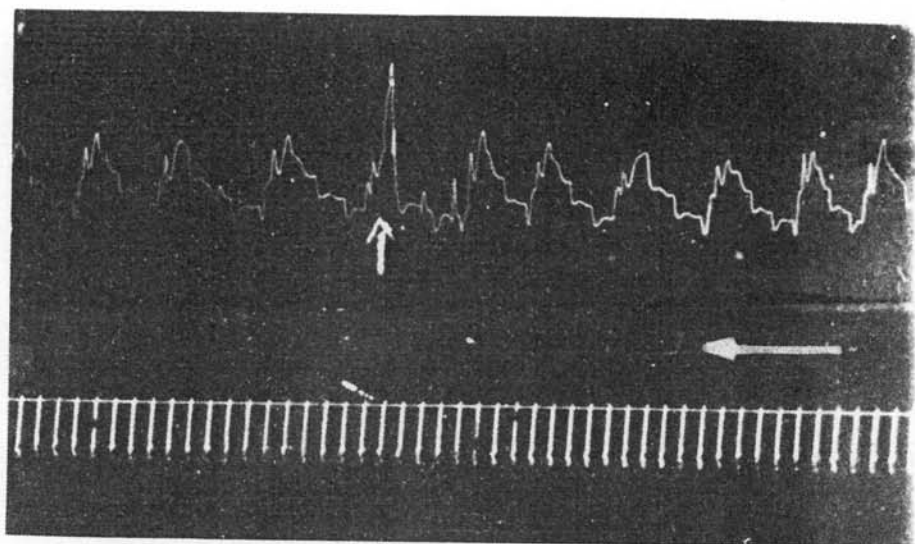


Fig.1. Cardiogram of *Salmo trutta*, extrasystole as a reaction on single stimulus, bottom: time in sec

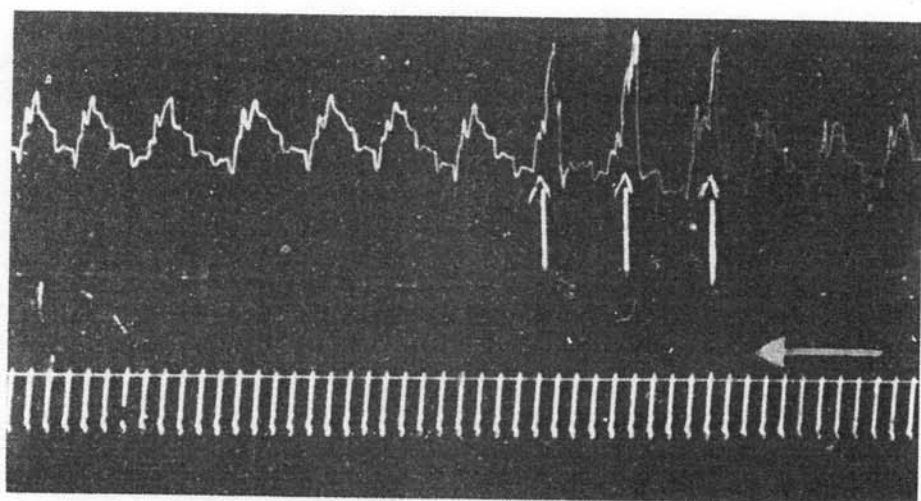


Fig.2. Cardiogram of *Salmo trutta*, extrasystole as a reaction on single stimulus to the rythme of successive heart systoles, bottom: time in sec

In the first part of experiments there was defined the threshold of response to single stimuli lasting 1 sec. The experiments showed that the response threshold to single stimuli (1 sec. Fig.1) under the above-aquarium described conditions, was within 8-12 cm of the induction coil gap.

In the second part of investigations there were recorded changes in the heart function influenced by single stimuli repeated to the rhythm of successive heart systoles. Fig.2 illustrates the obtained results.

## DISCUSSION

The investigations show that there exist heart reactions in fishes examined in the field of inductive current impulses. Heart reaction was marked by extrasystole on a cardiographic curve. The lack compensatory interval after extrasystole should be explained by the influence upon sinus which is the source of physiological stimuli. Impulses applied during the experiments did not cause any reactions either within accelerated locomotory movements or in muscle reactions (so called tension) hithertostated, to be the first degree of reactions to electric stimuli. Thus stimuli applied were subliminal for these reactions. The results show that single impulses (within the range used in experiments) applied even during successive heart systoles following one after another did not change heart action evidently, except for extrasystoles resulting from the activity of the stimulus itself.

As it follows from the carried out experiments, the circulatory system of fish shows a high degree of excitability and it may be the base of investigations upon reactions to electric stimuli of little strength not yet bringing about muscle reactions.

## REFERENCES

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### S t r e s z c z e n i e

W oparciu o metodę kardiografii przeprowadzono badania reakcji serca u troci *Salmo trutta* (L.) pod wpływem działania prądu indukcyjnego w wa-

runkach akwaryjnych. Impulsy pojedyncze (2 V i 3,5 A) trwające 1 sek. wywoływały extrasystole, jak również reakcję odruchową mięśni szkieletowych.

РЕФЛЕКТОРНАЯ РЕАКЦИЯ СЕРДЦА У SALMO TRUTTA L.  
В ПОЛЕ ИНДУКЦИОННОГО ТОКА

Р е з ю м е

Исходя из метода кардиографии проиоводились испытания по реакции сердца у лосось-туйменей (*Salmo trutta L.*) под влиянием воздействия индукционного тока в аквариумных условиях. Единичные импульсы (2 V и 3,5 A) продолжительностью в 1 сек. вызывали extrasystoli, а также рефлексорную реакцию шкелетовых мышц.

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Received 20. VII. 1968