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BESTRAHLUNG VON PERIPHEREN NERVEN MIT RÖNTGEN- UND RADIUMSTRAHLEN

VON DER

EIDGENÖSSISCHEN TECHNISCHEN HOCHSCHULE IN ZÜRICH

ZUR ERLANGUNG

DER WÜRDE EINES DOKTORS DER NATURWISSENSCHAFTEN

GENEHMIGTE

PROMOTIONSARBEIT

VORGELEGT VON

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Bestrahlung von peripheren Nerven mit Röntgen- und Radiumstrahlen

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Summary

a) Bundles of peripheral nerve (frog scliatic, 40 single fibres) were irradiated with X rays (moist chamber) and Ra rays (contact with Ra-Ringer solution).

b) Ra-irradiation: it produced an increase in duration of the action potential, the new value devided by the control value being proportional to the Ra-concentration.

c) X-ray irradiation: 700 000 r within 15′ produced (i) a reduction of conduction velocity to one third of its normal value, (ii) a change in shape of the monophasic action potential (longer duration, lower amplitude).

The change in shape was found to be more pronounced at a distance of 5 cm from the stimulating electrodes than at the very site of stimulation. This indicates that irradiation increases the existing differences of the conduction velocity between different fibres.

d) The decrease in conduction velocity may have different reasons, thus (i) an increase of the membrane capacity, possibly due to an increase in the dielectric constant, (ii) a drop of the security factor, either by an increase in threshold or by a decrease of the action potential, (iii) a decrease of the strenght of inward current at excited nodes of Ranvier, (iv) a change of the electrical characteristics of the internodes (decrease of the myelin resistance and increase of myelin capacity).

e) X and Ra-rays are know to breakup macro-molecules. This fact may provide a basis for explaining an increase of the dielectric constant in exitable and passive membranes.