

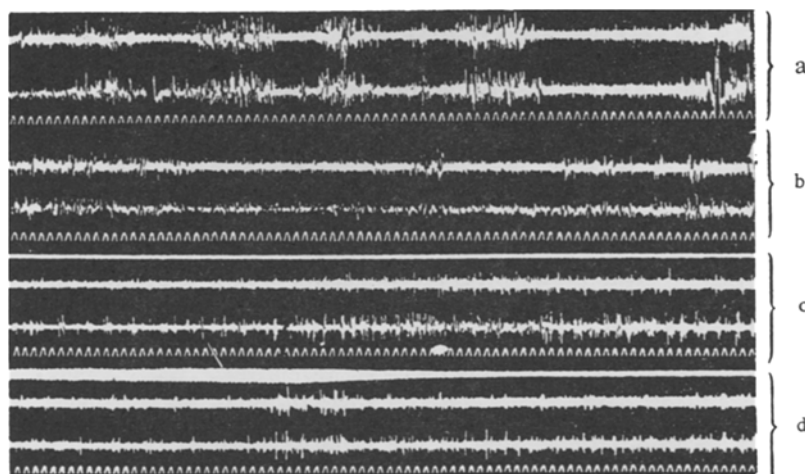
NEW METHOD OF IMPLANTING ELECTRODES INTO THE LEG MUSCLES FOR RECORDING THE ELECTROMYOGRAM DURING VOLUNTARY MOVEMENTS IN RATS

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The authors have developed a method of implanting electrodes into the leg muscles of rats for use when recording the electromyogram (EMG) of the antagonists of the ankle during walking, swimming, and other voluntary movements.

The animal was anesthetized by intraperitoneal injection of pentobarbital sodium (30 mg/kg body weight). The tibia was exposed for a small distance in its middle part. Three turns of nichrome wire, 100 μ in diameter, were wound around the bone, and the end of the wire was brought out on to the dorsal surface of the leg and inserted into the heads of the gastrocnemius muscle which were to be studied. The wire was coated with insulating varnish except for the points, which were cleaned for a distance of 1 mm. If the EMG of the tibial muscles was to be recorded, the ends of the electrodes were inserted into these muscles. The diameter of the electrodes (100 μ) was large enough for them to be inserted into the muscle by puncture. The interelectrode distance was 0.5-1 mm, and they were inserted into the muscle for a depth of 2-3 mm. The free ends of the electrodes were brought out onto the skin of the dorsal region, near the scapulae. The region is convenient because the wires connecting the rat to the recording apparatus do not interfere with walking or with swimming movements. Furthermore, the interscapular region is a safe place for the free ends: the rats cannot reach them with their teeth, they do not break, and they can be used to give reliable recording of the EMG for several months. The experiments showed that it is better



Electromyogram of the gastrocnemius muscle during swimming movements (a), a few minutes after applying a clamp to the tail (b), during the orienting reflex (c), and during the reaction to lifting (d). The narrowing of the top line (d) denotes the beginning of the rat's rapid fall. On all the oscillograms the top beam records the EMG of the medial head, and the bottom beam the EMG of the lateral head of the gastrocnemius. Time 20 msec.

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to bring out a multistrand wire in a polyvinyl chloride cover rather than the nichrome wire on to the skin in the interscapular region. Accordingly, a suitable length of multistrand wire (of mark M 312-10 or M 312-4) was soldered to the nichrome wire inserted into the muscles. The junctions were carefully covered with insulating varnish and cambric.

After implantation of the electrodes no disturbances of the animals' posture or locomotion were observed.

The oscillograms illustrated in the figure demonstrate that this method of implantation of electrodes can be used to study the voluntary movements of rats in a wide range of experimental conditions.