

Summary. A positive inotropic effect of ouabain has been demonstrated on the rat ventricle strip. At a given ouabain concentration the magnitude of the response was quite uniform. The effects of variation in

the concentration of ouabain, calcium, and phosphate, and in initial tension on the positive inotropic response have been investigated.

Received July 24, 1950. P.S.E.B.M., 1950, v74.

Band-Pass Filter Action of the Cochlea During Nembutal Anesthesia.* (18077)

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In the course of studies of the potentials evoked in the cerebral cortex by auditory stimulation, we have noted changes in the threshold of the electrical response of the cochlea which merit further description.

Experimental. The observations were made in cats anesthetized with nembutal. The auditory stimuli, provided by a variable frequency sine-wave generator (Hewlett-Packard No. 202B) were led into the ear from a headphone via a plastic tube fixed in the external meatus. Recording of the cochlear potential was accomplished through a wick electrode placed at the round window and led through a suitable amplifier to a cathode-ray oscilloscope. The cochlear audiograms were recorded by determining the threshold intensity of stimulus at various frequencies from 100 to 5000 cycles/sec.

Results and discussion. Typical audiograms in 3 cats, A, B, and C, are charted in Fig. 1. The duration of anesthesia, the body temperatures, and the respiratory rates are indicated at the right of the chart.

During nembutal anesthesia the change in the cochlear response consists of a rise in threshold, initially for the higher frequencies, and later for the lower frequencies. Characteristically, there is a relative sparing of

the frequency band around 1700 cycles, as recorded in the audiograms of cats B and C. This differential sparing may result in a relatively narrow frequency band with a threshold 6 or more db below any other.

At low intensities of stimulation, therefore, the cochlea may respond only to a narrow frequency band and its functioning may be likened to that of a band-pass filter.

Riesco-MacClure *et al.*(1) have reported antemortem failure of the cochlear response, especially to higher frequencies, in guinea pigs under Dial anesthesia. They considered this failure as possibly due to "cumulative irreversible or slowly reversible effects of prolonged partial anoxia." Our observations with nembutal anesthesia confirm the finding of these authors that the level of anesthesia, *per se*, and the usual fall in body temperature are not necessarily implicated in the depression of the cochlear response. This depression may occur when the level of anesthesia is light as judged by the electrical activity of the cerebral cortex and by the presence of reflex withdrawal responses. An audiogram with normal frequency distribution may be obtained when body temperature has fallen as in cat A, and a depressed cochlear response may be obtained with a similar fall in body temperature, as in the audiogram B₂.

Although the depression of the cochlear

* Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are a result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

1. Riesco-MacClure, J. S., Davis, H., Gernandt, B. E., and Covell, W. P., *Proc. Soc. Exp. Biol. and Med.*, 1949, v71, 158.

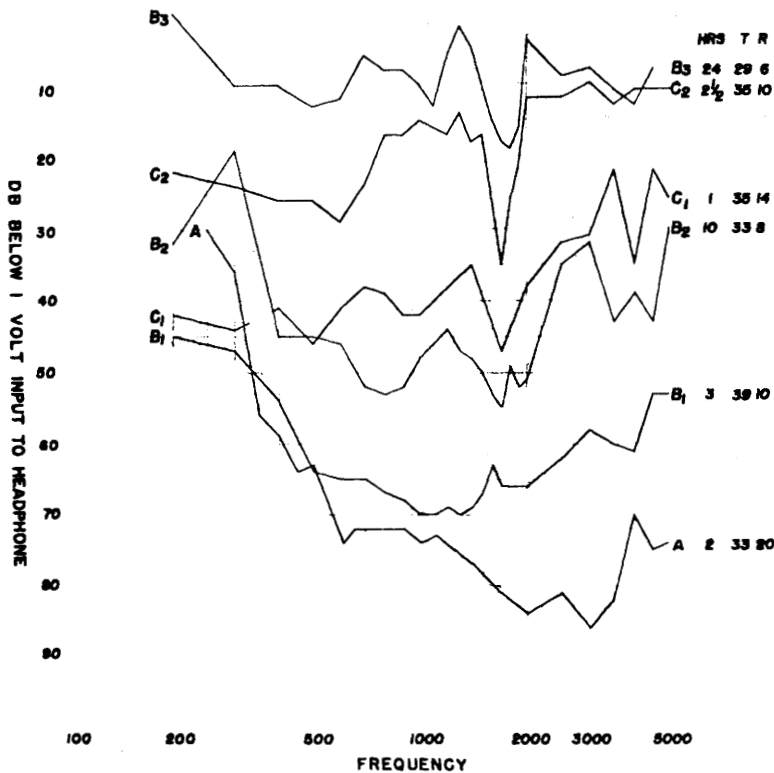


FIG. 1.

Overall cochlear audiograms of Cats A, B, and C, anesthetized with nembutal. Duration of anesthesia, body temperature (°C), and respiratory rate at right.

response is usually seen in long-lasting experiments, it may appear quite early, *i.e.*, within 2½ hours, as in cat C. The most constant finding has been an associated depression of the respiratory rate which may occur early or late in anesthesia. Such a depression of the rate of respiration may support the thesis that anoxia is a causal factor, but its presence does not necessarily indicate that the preparation is moribund. Cat B, for example, at 24 hours had a low body temperature and depressed respiration, but had an electrically active cerebral cortex and active reflex withdrawal responses. An animal in this state may go on for many hours

giving good cortical responses to auditory stimulation, without other evidence of deterioration.

Summary. In cats under nembutal anesthesia, there is a selective depression of the cochlear response so that with threshold stimulations it functions as a band-pass filter for frequencies around 1700 cycles/sec. This depression does not appear to be due to the anesthetic, *per se*, nor to fall in body temperature, but occurs in association with depression of the respiratory rate.

Received July 24, 1950. P.S.E.B.M., 1950, v74.