

PRETRIGEMINAL CAT AS AN INSTRUMENT FOR CEREBRAL INVESTIGATIONS

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The pretrigeminal cat is obtained by sectioning the brain stem in front of the trigeminal roots (Batini et al. 1959). During the day of transection the isolated cerebrum of the pretrigeminal cat is continuously awake, and during the following days it remains alternatively in the states of wakefulness and synchronized sleep (Ślósarska and Żernicki 1971). The integrative abilities of the isolated cerebrum are essentially retained. For example, to visual stimuli the ocular and EEG conditioned reflexes (both positive and differentiated) can be easily elaborated (for references see Żernicki 1968).

The pretrigeminal cat is obviously a unique instrument for investigations concerning the functions of an *awake* cerebrum; however, it has been used unsatisfactorily for such purposes. From the methodical point of view two features of the pretrigeminal cat are of first importance: (i) pain input to the cerebrum is eliminated, and (ii) neural input to the cerebrum is dramatically reduced.

1. Due to the lack of pain the head of the animal can be restrained in a holder. As it is well known this is essential in research on visual perception, in which the precise location of the stimulus in the visual field is usually needed. In this context two lines of investigations will be mentioned.

a) The microelectrode study of units at higher levels of the visual system. To satisfy the demand of the head restraining, such investigations have been done mostly on animals under narcosis. In consequence, the data collected so far are relatively simple, and perhaps the hypercomplex cells are those of utmost complexity which can be detected under narcosis. In the experiments on the pretrigeminal cat the visual stimuli can

be, of course, complex and include natural objects, and then the records should be taken mainly from the gnostic cortical areas (*see* Konorski 1967). In addition, during at least some experiments ocular reflexes should not be excluded by the administration of flaxedil and atropine, but carefully recorded.

b) The study of the fixation and accommodation reflexes. These reflexes are absent under narcosis and, therefore, they were mainly investigated in man (the restraining of head was achieved due to the co-operation of the subject). In the pretrigeminal cat the accommodation reflex and the vertical component of the fixation reflex are intact.

2. Due to the strong reduction of the neural input to the cerebrum of the pretrigeminal cat, the mechanism of the effects of some stimuli on the cerebral activity can be simplified. Two examples will be given.

a) In an intact animal the effect of a drug on the cerebral activity may be due to its direct action on the cerebrum and/or due to its action on other sites in the nervous system. In the pretrigeminal animal the effects of an indirect action, if mediated to the cerebrum neurally, are eliminated. In the appropriate experiments in pretrigeminal cat not only EEG and ocular effects of a given drug can be investigated, but also the changes in responsiveness to visual and olfactory stimuli.

b) In an intact animal the odors usually act on the cerebrum via both the olfactory and the trigeminal nerves, whereas in the pretrigeminal cat only the olfactory nerve is available in this respect.

From the above-mentioned lines of investigation only the ocular reflexes have been systematically studied in the pretrigeminal cat (Dreher and Żernicki 1969, Elul and Marchiafava 1964). Thus this preparation still remains the preparation of great hopes as an instrument for cerebral investigations.

REFERENCES

- BATINI, C., MORUZZI, G., PALESTINI, M., ROSSI, G. F. and ZANCHETTI, A. 1959. Effects of complete pontine transections on the sleep-wakefulness rhythm: the midpontine pretrigeminal preparation. *Arch. Ital. Biol.* 97: 1-12.
- DREHER, B. and ŻERNICKI, B. 1969. Visual fixation reflex: behavioral properties and neural mechanism. *Acta Biol. Exp.* 29: 359-383.
- ELUL, R. and MARCHIAFAVA, P. L. 1964. Accommodation of the eye as related to behavior in the cat. *Arch. Ital. Biol.* 102: 616-644.
- KONORSKI, J. 1967. Integrative activity of the brain. An interdisciplinary approach. Univ. Chicago Press, Chicago. 531 p.
- ŚŁÓRSKA, M. and ŻERNICKI, B. 1971. Wakefulness and sleep in the isolated cerebrum of pretrigeminal cat. *Arch. Ital. Biol.* (in press).
- ŻERNICKI, B. 1968. Pretrigeminal cat. *Brain Res.* 9: 1-14.

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