appearance of the emf for the chloride current producing the DRP. If this is true, the resistance of the presynaptic inhibition of monosynaptic reflexes to the action of ammonium can logically be explained on the grounds that during blocking of the chloride current evoked by GABA the increase in conductance of the presynaptic membrane may itself weaken the excitatory synaptic action of impulses in Ia afferents to motoneurons.

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EFFECT OF BLOCKING PROJECTION (SOMATOSENSORY AND VISUAL) AREAS OF THE BRAIN ON EVOKED POTENTIALS IN PARIETAL ASSOCIATION AREAS OF THE OPPOSITE HEMISPHERE

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Compensatory-repair processes are the basis of the restoration of health, and their study is therefore of great practical clinical experience as well as of theoretical interest. Recent investigations have shown several possible mechanisms for these processes. First, there is hyperfunction of structures remaining intact or only partially injured, interhemispheric (bilateral) interaction, definite duplication of certain brain systems, and so on [1-3, 5, 6]. Meanwhile an important pathway for the restoration of function is the intensive activation of polymodal (nonspecific) neurons and their constellations, which because of their polysensory nature, may to some degree perform certain simple functions of specific systems. This hypothesis may apply above all to the association structures (cortical and subcortical) and to the reticular formation.

The object of this investigation was to study the character of changes in bioelectrical reactions on the parietal association areas of one hemisphere after reversible blocking by cold of the cortical projection structures of the opposite hemisphere.

EXPERIMENTAL METHOD

Acute experiments were performed on 40 cats anesthetized with chloralose (60-70 mg/kg) with the addition of pentobarbital (20-30 mg/kg). Evoked potentials (EP) were recorded by a monopolar technique; the reference electrode was fixed to the bones of the frontal sinus and recording electrodes were located in the parietal region of both hemispheres.

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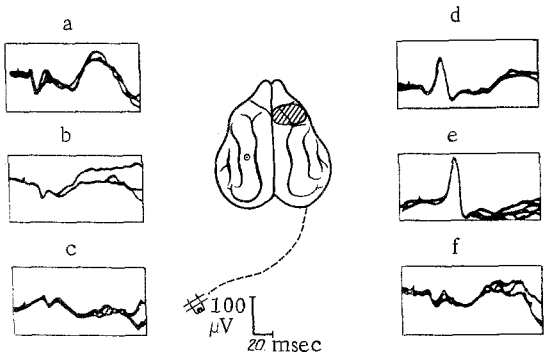

Fig. 1

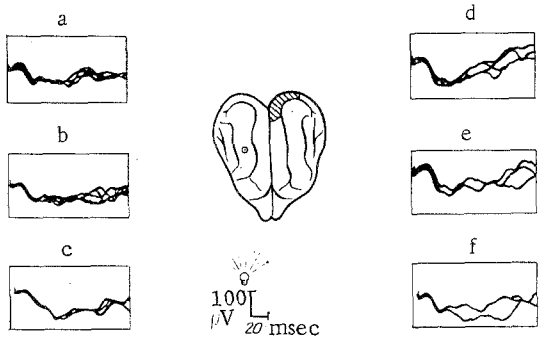

Fig. 2

Fig. 1. EP in parietal cortex in response to stimulation of ipsilateral radial nerve before and after cold inactivation of area SI of opposite hemisphere. Here and in Figs. 2 and 3, shaded area represents region of application of ice; a) background, b) action of ice for 2 min, c) 5 min, d) 25 min, e) 31 min; f) after warming the cortex.

Fig. 2. Visual EPs in parietal cortex before and after cold blocking of area VI of contralateral hemisphere; a) background, b) action of ice for 2 min, c) for 10 min, d) 17 min, e) 25 min; f) after warming the cortex.

Projection areas SI and VI of one hemisphere were subjected to reversible cold block by the method in [7, 8]. The techniques adopted in this investigation were those used by Polyakova [10, 11], in investigations in which the temperature was monitored in intact parts of the brain. A piece of ice, prepared from physiological saline, was applied to the cortex. The cooled region was separated from neighboring areas of the neocortex by a barrier of cotton, soaked in mineral oil warmed to 36-38°C. Throughout the period of recording, the region to which the ice was applied was thoroughly and continuously dried in order to prevent water formed during melting of the ice from leaking to neighboring areas. Intact cortical structures were flooded with warm mineral oil. Absence of EP in the region of cooling was used as the test of adequacy of the cold block to the cortical structures. Flashes (from a type FS-01 photostimulator) and stimulation of the radial nerve (10 V, 0.5 msec) were used as peripheral stimuli. The animal's eyes were atropinized.

EXPERIMENTAL RESULTS

Under chloralose-pentobarbital anesthesia complex EP consisting of two components (Fig. 1a) were recorded in the parietal association cortex in response to stimulation of an ipsilateral somatic nerve of the forelimb. The latent period of the early components of the association EP was 8-10 msec and the amplitude of the positive and negative waves was 55-60 and 15-20 μV, respectively. The early components was followed by a late positive–negative complex with a latent period of 40-42 msec.

The positive wave of the early component of the EP was reduced by 38 ± 4%, the negative by 33 ± 6%, and the positive and negative waves of the late component by 64 ± 7% and 40 ± 3%, respectively, 2 min after the beginning of cold blocking of the somatic projection area of the opposite hemisphere (Fig. 1b).

At the 5th minute (Fig. 1c) the late component of EP was completely blocked in the parietal cortex of the intact hemisphere and only a sharply reduced early component was recorded.

In the late stages of cooling (25-31 min; Fig. 1d, e) considerable enlargement of the negative wave of the early component of the association EP was found, for its amplitude was 300 ± 23% greater than initially.

Similar results were obtained when the visual cortex was blocked by cold. Reversible blocking of area VI of one hemisphere was found to be accompanied by changes in the visual EP in the parietal association region of the contralateral, intact hemisphere. In that case, however, mainly the positive phase of the early component of the association response was changed. It will be clear from Fig. 2 that the amplitude of the positive wave of the early

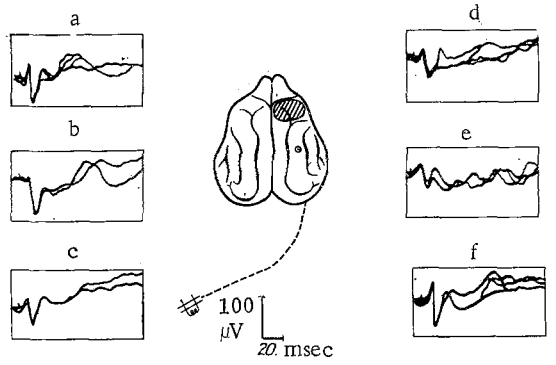

Fig. 3. Somatic EP in parietal cortex of hemisphere on same side on cold blocking of area SI. a) Background, b) action of ice for 2 min, c) for 7 min, d) 17 min, e) 25 min; f) after warming the cortex.

component of EP increased during the period of action of ice. After 10 min (Fig. 2c) the positive wave was increased by 46 ± 2%, and after 17-25 min (Fig. 2d, e) it was increased by 21 ± 5% above its initial level.

When EPs were recorded in the parietal region of the hemisphere in which the projection area was inactivated, the dynamics of transformation of EPs were different. After cold blocking of area SI, for instance, a decrease in amplitude of the positive and negative waves of the early component of somatic association EP and disappearance of the late component during cooling were observed. No increase was found in individual phases of EPs (Fig. 3).

The investigation thus showed that during cold inactivation of projection areas of the neocortex (somatic, visual) changes in EP were observed in the parietal cortex of the contralateral intact hemisphere and were expressed as an increase in amplitude of individual phases of the early component of the association responses during the late period of action of cooling. According to data in the literature [9, 10], long-term cold blocking of cortical projection areas leads to transformation of the homonymous EP in the thalamic nuclei. With these data in mind, and also the connection between the genesis of the early component of the association EP with afferentation from specific thalamic nuclei [11, 12, 13], it can be considered that the dynamics and character of ascending activation of somatic and visual modalities from these nuclei plays an important role in the changes observed.

These changes take place with the participation of interhemispheric interrelations, by means of transcallosal connections through which one hemisphere exerts its modulating influence on the other [4, 6].

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