To determine the precise mechanism of action of starch on vascular permeability and, in particular, the ability of its granules to disturb permeability directly, i.e., without the participation of the mast cells, experiments were carried out in which 1 ml of a 3% sterile starch suspension was again injected intraperitoneally into rats on the 4th day of development of peritonitis when, as results of previous experiments showed, no mast cells were present in the focus of inflammation. The vascular permeability was undisturbed after repeated injection of starch.

These results suggest that the trigger mechanism of disturbance of vascular permeability in rats with "starch" peritonitis is degranulation of the mast cells and liberation of mediators of inflammation from them. This model of inflammation is particularly interesting because in this case a local focus can be formed, in which not only do all the mast cells disappear acutely, but their population is not restored for a long time, at least until after 3 weeks.

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ROLE OF SOME BRAIN FORMATIONS IN THE GENERATION AND SPREAD OF ALPHA-LIKE ACTIVITY IN DOGS IN THE EARLY POSTRESUSCITATION PERIOD

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Analysis of the electroencephalogram (EEG) of dogs in the early postresuscitation period revealed a regular appearance of definite forms of activity. In particular, in the presence of relatively severe hypoxia of the CNS, generalized rhythmic activity with the frequency of the α-rhythm and with maximal amplitude in the region of the amygdaloid nucleus (AN) and minimal in the cortex, appears on the EEG of dogs in the early stages of resuscitation [3]. It has been shown [3] that this activity appears earlier in AN than in other brain formations, and that a physical factor and the properties of the brain as a bulk conductor participate in its spread. These facts served as the basis for the suggestion that AN plays the leading role in the generation and spread of alpha-like activity over the brain. It is also known that when this activity reaches sufficient abundance on the EEG, delay is observed in recovery of other of activity [4, 5], possible evidence of the existence of physiological interaction with other formations in the generator of this activity.

The object of the present investigation was to clarify the role of AN and to discover the role of other formations of the cerebral hemispheres in the spread of generalized alpha-like activity over the brain.

EXPERIMENTAL METHOD

Experiments were carried out on 12 dogs weighing 10-14 kg. Before the experiment and after premedication with pantopon (8 mg/kg subcutaneously), glazed metal electrodes were inserted into AN, the ventral

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TABLE 1. GCF and PCF for Alpha-like Activity Recorded on EEG of Dogs in Early Post-resuscitation Period (n = 18, M ± m)

Experimental conditions		Brain regions for whose activity GCF is calculated						
		cortex and AN	cortex and CN	cortex and T	AN and CN	AN and T	CN and T	AN (right) and AN (left)
GCF		0,63±0,04	0,69±0,04	0,70±0,04	0,82±0,04	0,90±0,02	0,89±0,03	0,15±0,11* (maximal 0,35)
PCF during blocking of activity of specified brain region	cortex	—	—	—	0,65±0,04	0,82±0,03	0,83±0,04	—
	AN	—	0,39±0,06	0,37±0,06	—	—	0,61±0,05	—
	CN	0,26±0,05	—	0,30±0,04	—	0,59±0,04	—	—
	T	0,29±0,05	0,33±0,05	—	0,24±0,03	—	—	—

*n = 3.

Legend. ± m) Error of mean for given number of EEG cuts processed by computer.

thalamic nucleus (T), and the head of the caudate nucleus (CN) of one or both hemispheres under ether anesthesia, using stereotaxic coordinates [9]. Epidural steel electrodes were fixed above the motor, parietal, and occipital regions of the cortex. The reference electrode was fixed into the bones of the frontal sinus. The circulation was stopped for 13-15 min by electric shock from the ac supply (ventricular fibrillation). The animals were resuscitated by direct or indirect cardiac massage combined with intra-arterial injection of 30-50 ml physiological saline with adrenalin (1:1000; 0.1 ml/kg), artificial ventilation of the lungs with oxygen, and electrical defibrillation of the heart with pulses from the DI-03 defibrillator. In 6 experiments, after restoration of EEG activity, 0.1-0.3 ml of 0.5% procaine solution was injected into the region of AN of both hemispheres through a burr-hole in the skull at the level of the upper part of the zygomatic arch (the region of lateral projection of AN), or the tissue of AN was removed by surgical suction. The accuracy of the procedure was then verified morphologically. In six other experiments alpha-like activity from the cortex, AN, CN, and T was recorded on magnetic tape and then processed on the EC-1020 computer. The program used enabled the power spectrum (autospectrum) function to be assessed for activity of each of the four formations tested: the general coherent function (GCF) and the partial coherent function (PCF) when the influence of activity of the third source was blocked [6]. All evaluations were made from separate cuts of the record 6 sec in duration. Model experiments showed that using 5-sec cuts of the records for analysis and with the method of calculation chosen, the 95% confidence limits (difference from zero significant) for GCF and PCF were 0.5 and 0.35 respectively [6]. The significance of differences between the two values of GCF and PCF was determined by the usual method [2].

EXPERIMENTAL RESULTS

In all the first six experiments initial depression of electrogenesis in one of the AN led to disappearance of or a decrease in amplitude of the waves of that activity in other structures tested in the same hemisphere on average by 54 ± 12.3%, and in four of them it led to a decrease in amplitude of the alpha-like activity in formations of the opposite hemisphere, including in AN, on average by ±9.7%. In the remaining two experiments initial depression of electrical activity in AN of one hemisphere had no effect on the amplitude of waves of the form of activity studied in the opposite hemisphere, in which the process tested continued to develop and a further increase in amplitude of the alpha-like waves took place. In all six experiments of this series pharmacological inhibition or destruction of both AN led to disappearance of the alpha-like activity in all other formations tested. The results of these experiments were direct proof of the leading role of AN in the spread of alpha-like activity over brain structures and they also demonstrated that the generation of this activity took place relatively independently in each AN.

The results of coherent analysis of three cuts of the EEG obtained in one of the experiments provide a basis for the suggestion that alpha-like activity is generated independently in the two AN. This analysis showed that the values of GCF for a given activity between two AN are substantially below the level of significance (Table 1) and that the mean value of GCF does not differ from zero with a level of significance of $P < 0.01$. The results of this experiment also show that AN evidently affects the spread of alpha-like activity mainly to brain formations in the ipsilateral hemisphere. Evidence of this is given by the high values of GCF between potentials of AN and CN, and also between AN and T within the same hemisphere, significantly higher ($P \leq 0.01$) than the values of GCF for that activity recorded from AN and CN, and also from AN and T of the contralateral hemisphere (the values of GCF were 0.35 and 0.33 respectively).

The results of analysis of the spectral correlation characteristics of 18 EEG cuts, undertaken in six experiments for alpha-like activity recorded from the cortex, AN, CN, and T of the same hemisphere, are evidence of the closest statistical dependence for alpha-like activity between potentials of AN and T, and also T and CN (Table 1). Significant values of PCF between potentials of CN and T when activity in AN was blocked point to an independent character of alpha-like activity or, at least, one not determined purely by activity in AN. Relations between alpha-like activity in AN and CN are characterized by low values of PCF between the potentials in AN and CN when activity of T is blocked, despite high values of GCF between the potentials in these formations. The most likely interpretation of this distribution of EEG correlations is to accept an active role of T in the spread of the test activity between AN and CN. The character of alpha-like activity in the cortex differs from that in the deep brain formations studied, as is shown by the significant values of PCF for activities in AN and T, T and CN, and AN and CN when cortical activity is blocked.

The discovery of close relations between potentials in AN and T, and T and CN during recovery of the EEG in the early postresuscitation period is confirmed morphologically by the existence of direct efferent connections between AN and T [7, 8] and also between T and CN [1]. The physiological character of the spread of this activity over the brain structures explains the connection described above between the test process and recovery of other forms of activity on the EEG.

In the writers' opinion, the results of this investigation must be taken into account when the nature of alpha-like waves observed in cases of what is called α-coma in patients sustaining circulatory arrest is analyzed [10].

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