AN ELECTROPHYSIOLOGICAL INVESTIGATION OF THE STATE OF THE CENTRAL NERVOUS SYSTEM IN EXPERIMENTAL BRUCELLOSIS

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It is known, from numerous clinical observations, that the brucellosis infection is associated with well defined pathological phenomena, related to disturbances in the activity of the nervous system. Investigations, employing clinico-physiological methods, have indicated the presence of profound functional disturbances in the cerebral cortex associated with brucellosis [1, 8, 9, 10]. However, clinical observations do not make it possible to study the complete dynamics of the functional changes in the cerebral cortex of patients with brucellosis, nor the effect of different therapeutic methods on the upper divisions of the central nervous system.

Our goal was to study the state of the central nervous system in brucellosis, using the method of electroencephalography.

EXPERIMENTAL METHOD
Electrodes made of Nichrome wires 0.25 mm in diameter were set in place in the occipital division of the cerebral cortex of guinea pigs. The distance between electrodes was equal to 4 mm. Fixation of the electrodes was accomplished by the use of dental phosphate-cement. Recording of the bioelectric potentials was carried out on a phototape, using a loop encephalograph. The apparatus permitted passage of frequencies within the diapason of 0.3 to 500 cycles per second. The electroencephalograms were photographed on a film moving at a rate of 50 mm/sec.

The experiments were performed on 20 guinea pigs, inoculated subcutaneously with Br. melitensis, strain No. 1098, using a dose of 500 microbial cells. The injection was administered 3 weeks after implantation of the electrodes. The biopotentials were recorded before the inoculation, and during the development of the infectious process.

At the same time, another group of animals (14 guinea pigs), inoculated at the same period and with the same dose of brucella, were used for determinations of the immunobiological reactivity (the reactions of Heddleson and Wright, the Bjorne test, opsono-phagocytic activity of the leukocytes) and the bacteriology of the infectious process.

Regular measurements of the rectal temperature were carried out in both groups of experimental animals, using an electrothermometer.

EXPERIMENTAL RESULTS
A temperature reaction in the animals began to be observed on the 15-20th day following the inoculation. Immunological reactions began to appear 10 days after the inoculation, in the following order: the Heddleson reactions, the Wright reactions, opsono-phagocytic activity, and 20 days after the inoculation, the allergic skin test. At 30 days after the inoculation the indicated reactions attained their most positive levels.

Up until the 10th day after the inoculation, the brucellae were manifested only in the regional lymph nodes. Subsequently (10th-15th day), brucellae were observed in distant nodes and in the spleen. At 20 days after the inoculation, brucellae were grown out of seedlings from the majority of organs, i.e. the infection became generalized in character. After 50-80 days, the number of positive seedings from the organs, as well as the number of brucella colonies that grew out, decreased markedly. Analysis of the electroencephalogram (EEG), recorded prior to inoculation of the animals, showed that the bioelectric activity of the brain in the healthy guinea pigs was represented
basically by waves with a frequency of 8-14 per second, and an amplitude of 18-25 microvolts, sometimes interrupted by slower waves (3-7 per second) with an amplitude of 40-50 microvolts. In a series of experiments, the basic bioelectric activity was expressed in low amplitude (10-15 microvolts), rapid waves with a frequency of 25-40 per second. A repeat recording of the biopotentials showed that the bioelectric activity was relatively stable for each experimental animal.

Fig. 1. Electroencephalograms from guinea pig No. 4325, inoculated with brucella. 1) Before inoculation; 2-13) after inoculation; 2) after 5 days; 3) after 10 days; 4) after 14 days; 5) after 17 days; 6) after 23 days; 7) after 26 days; 8) after 28 days; 9) after 31 days; 10) after 34 days; 11) after 38 days; 12) after 43 days; 13) after 57 days.

In the majority of cases, a topographical change in the bioelectric activity of the guinea pigs' cerebral cortex occurred as early as the 1st-3rd day after the inoculation. These changes expressed themselves by a shift in the frequency spectrum toward the slower side, and an increase in the amplitude of the biopotentials. The tendency toward similar changes in the biocurrents of the brain subsequently increased, and by the 5th day, we recorded slow (2-4 per second), high waves with an amplitude of 60-100 microvolts in all the experimental animals.