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AN IMPORTANT CONTRIBUTION TO SPACE MEDICINE:
SOME RESULTS OF THE EXPERIMENT ON THE
AES "COSMOS - 110"

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A TASS COMMUNIQUE

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Flights of Soviet and American astronauts have shown that a comparatively short stay of men under weightlessness conditions is not attended by significant organism variations hazardous for life. However, at the same time, data were obtained on the appearance in astronauts of some unfavorable symptoms, capable of leading, as flight duration increases, to the disruption of certain physiological functions. The lowering of the so-called orthostatic stability is the principle of these symptoms, that is the weakening of the regular function of the cardiovascular system at passage from the horizontal to vertical position of the body. The second symptom is the increased discharge of calcium salts at their sufficient admission with the food. This is evidence of ionic equilibrium variation and of water-salt exchange.

Thus, the lengthy space raids and the working out of means of protection from their possible unfavorable effect have confronted the space medicine with certain questions, the solution of which must necessarily be based upon the understanding of the weightlessness mechanisms acting upon the organisms. It should be noted that the information obtained from manned flights is to some extent limited as a consequence of methodical peculiarities of investigations. Experiments with animals broaden considerably the possibility of studying the physiological experiment on animals in space flight is an important stage for the solution of a series of problems of space medicine.

The results on the AES "Cosmos-110" constitute in this regard an unquestionable interest. Important first of all is the lengthy stay of animals in the state of weightlessness. It should be stressed that a sufficiently hard fixation regime for animals was determined in flight allowing to assume standing, lying, and sitting postures. The utilization of a series of new methodical approaches

was found to be quite justified. As is well known, Ugolek and Veterok were subjected to forced feeding, which allowed a strict ration control. Over specific flight trajectories action by pharmacological means and electric current was made possible by the introduction of sondes and electrodes. Physiological indicators were telemetered to radiocommunication channels in the course of the entire flight and they were fixed by the registering devices on board.

The information obtained from Cosmos-110 is enormous and requires further processing and analysis. However, some results may already be compiled at present.

Immediately upon flight termination rather significant disruptions of the motor apparatus were noted in animals, that is a decrease in the volume of the muscular mass, and the disruption in movement coordination. These phenomena were quickly liquidated; however, the complete coordination of movements was restored to the pre-flight level only 8-10 days after landing. It is not excluded that such a muscular state might become the cause in the variation of the operation of other systems of the organism.

During the first day after flight there was observed in the urine and blood of the animals an increased calcium content. The calcium "washout" from the organisms of Ugolek and Veterok was corroborated by X-ray investigation of their bones. Therefore, experiment with animals confirmed more clearly the data on calcium exchange disruption in condition of long flight. This fact requires further study.

Attention was also drawn to a rather sharp thinning of animals. At the same time it should be noted that the investigation of the functions of the liver and other organs attested to sufficient feeding of animals during flight. Consequently, the losses of weight mainly took place at the expense of the muscular mass and of dehydration.

Soviet and foreign scientists give in their numerous works great attention to the analysis of the cardiovascular system's activity under the influence of overloads, weightlessness, and other factors of space flight. The data on the function of this important system, obtained in the experiment with Veterok and Ugolek offer a substantial interest.

At the beginning of the flight rather sharp frequency oscillations of the heart contractions were observations. After 10-14 days the pulse frequency of the dogs decreased and stabilized at usual figures. Therefore, the impression was created of the development of an adaptation process of the cardiovascular system to weightlessness conditions.

After flight a certain increase in pulse frequency was again noted. The normal activity of the blood-circulatory apparatus was restored by the 4th-5th day of stay on the ground.

The first day of the after-flight survey did not indicate any substantial shifts in the morphological composition of the blood of experimental animals. Per contra, on the third, and more particularly on the fifth day, a rather significant increase was noted in the erythrocyte sedimentary reaction and in the

number of leucocytes. This is apparently linked with the general reaction of the organism to normal gravitation conditions upon return from such a prolonged space flight. Microbiological and immunobiological investigations corroborate this assumption to a known degree. However, the mechanism of the phenomena themselves is still insufficiently studied. Obtained also are data attesting to variations of the ferment-forming function of the intestinal tract. The impression is created that this was linked with the transition to the ground diet from the cosmic rationing to which the animals have already become accustomed. The gastrointestinal disruptions observed in both animals upon landing ceased after 6-8 days.

As to the general estimate of the data obtained, it may be noted that the observed variations are reversible. This is evident from the integral restoration of the initial data in a relatively short period. It should, however, be noted that the return from space and the first days on the ground became for Veterok and Ugolek filled with considerable stress having induced the deterioration of certain indicators by comparison with those in flight. Hence, the conclusion may be derived that during space flights of long duration the organism's transition to ground conditions may be attended by well expressed shifts in the activity of its main systems.

In conclusion, we should particularly stress the fact that the transference to men of data obtained in the experiments with animals must be effected with great care. Some regularities of general nature, however, may be noted.

It is still not clear at present whether or not the prolonged stay in space in the state of weightlessness may so modify the functional state of the organism that the return to the normal conditions of its gravitational field may be too great a stress. As was shown by the flight of Ugolek and Veterok, the variations in some of the organism's systems continued to accrue during the first few days as if a new adjustment to ground conditions had taken place. But then it should not be forgotten that during flight the animals were in far heavier conditions than men would be, and this naturally aggravated a series of the noted variations. However, the important circumstance is that all these phenomena vanished after a comparatively short lapse of time.

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