THE PROGRESS OF DYSTROPHIC CHANGES WITHIN THE NERVOUS SYSTEM (AS SHOWN BY VITAL STAINING)

Ya. I. Azhipa and O. Ya. Ostryi

Laboratory of Neurotrophy (Head—Dr. Med. Sci. O. Ya. Ostryi), Institute of Normal and Pathological Physiology (Dir.—Academician V. N. Chernigovskii) of the AMN SSSR, Moscow

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The study of the mechanisms of development of a nervous dystrophy in association with various forms of injury to the nervous system is of great importance for the analysis of the pathogenesis of many diseases and manifestations of compensatory reactions of the body, aimed at restoration of the deranged functions.

From a large volume of factual evidence, A. D. Speranskii [5] discovered a series of laws governing the character and the stages of development of a nervous dystrophic process in the peripheral tissues; at the same time he directed attention to the changes arising under these conditions in the various divisions of the nervous system itself.

The progress of dystrophic changes within the nervous system [5] has been the subject of detailed neurohistological investigations of the peripheral and central division of the nervous system. Work by B. S. Doinikov [3], M. L. Borovskii [2] and their co-workers has revealed both specialized and regular forms of lesion in the various nerve formations.

In summing up these findings, A. D. Speranskii [5] concluded that specialized and standard forms of dystrophic changes could take place in the nervous system. He emphasized the necessity of taking into consideration not only the properties of the pathogenic stimulus, but also the properties of the pathogenic stimulus in changing the state of the tissue by a reflex means. This is shown by the fact that the histopathological changes developing in the nervous system itself are not continuous in character and may be localized beyond the bounds of the segment in which the nervous trauma has been applied. In Speranskii's words [5], the pathological process "leap-frogged" over extensive and entire regions of the nervous system.

Of particular importance were experimental findings showing the asymmetrical character of the lesions in the various nerve formations, both in the same segment and in the more remote areas of the nervous system. In some cases the lesions of the nerve cells were more severe not on the injured but on the contralateral side. These and other facts of a similar character, and also the analysis of the qualitative and quantitative forms and variants of development of dystrophic changes within the nervous system, demonstrated the necessity of taking into consideration here not only the direct action of the pathogenic stimuli, but also the action of pathogenic stimuli operating through the nervous system.

Because the special features of the development and localization of dystrophic changes in the nervous system may shed light on certain aspects of the pathogenesis of many diseases and on the forms of the compensatory mechanisms of a protective and adaptive character brought into play under those circumstances, many authorities have sought suitable approaches to the investigation of these processes, paying great attention to the technique of their detection and study.

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Changes in the vital staining power of the spinal cord (a), the brain stem (b), the cerebellum (c) and the cerebral hemispheres (d) of white rats after trauma to the left sciatic nerve. I) Content of dye in the tissues 1 hr after injection (sorption); II) Content of dye in the tissues 2.5 hr after injection (residue); III) ratio of sorption to residue (trophic potential).

From our previous work [1, 4] devoted to the investigation of the state of muscle tissue after trauma to the sciatic nerve, as shown by vital staining, we came to the conclusion that a close connection exists between processes of paranecrosis and processes of a neurodystrophic character. The phenomena of paranecrosis, expressing changes in the physico-chemical state of the protein substrate of the tissues in response to the action of the most widely differing stimuli in the environment, also reflect those changes in the tissues which are the result of the developing neurodystrophic process, underlying which are metabolic changes of varying severity.

In the present work we set out to use the method of vital staining to detect physico-chemical changes in the various divisions of the nervous system in connection with the development of dystrophic changes.

**METHOD**

The investigations were carried out on white rats weighing 130-150 g. In order to study the development of dystrophic changes within the nervous system, in these animals the sciatic nerve was divided and its central end was fixed with 0.02-0.05 ml of a 2% formalin solution. After 3, 7, and 14 days the animals were given an intra-