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THE EFFECT OF VIBRATION ON SOME PHYSIOLOGICAL FUNCTIONS OF THE BODY

Fathullayev Shokhrukh Shukurulla o`g`li
Research institute of Sanitation,
Hygiene and Occupational Diseases

Abstract.

Numerous studies have established that under the influence of vibration, various pathological abnormalities develop in the human body, causing not only a decrease in labor productivity and performance, but also threatening the health of workers, up to the development of vibration disease. As a result, the number of cases of vibration disease has increased in recent years.

Studying the characteristics of the influence of harmful production factors and their impact on the nervous system with the development of new methods of prevention with the study of the diagnostic and prognostic significance of more informative, sensitive and specific indicators is an urgent problem that requires a solution.

Keywords: Vibration, body functions, vibration disease, sensitivity.

Vibration is one of the factors with great biological activity. The nature, depth and direction of physiological and pathological changes on the part of various body systems depend on the parameters of the influencing vibration, as well as the individual characteristics and physical properties of the human body. At the same time, vestibular, motor, and visual analyzers play an important role in the genesis of these reactions.

The vestibular analyzer is a converter of the energy of angular and linear movements of the body into signals about its position and movement, that is, it is functionally connected with the motor analyzer.

According to researchers, the otolith apparatus is an adequate organ that perceives vibration, namely linear accelerations in the vertical plane.

Under the influence of low-frequency vibration, in addition to rectilinear accelerations, angular acceleration also acts on the human body. Regardless of the

direction of the specified vibrations, the head and cervical-shoulder girdle, cervical and lumbar spine perform ellipsoidal or circular movements.

The vestibular apparatus, due to the presence of three pairs of semicircular canals located in different planes, as well as close connections with other sensory systems, forms a complex system for controlling the position of the head and body in space. Thanks to the wide connections of the vestibular analyzer, the afferent impulses of which reach the vestibular nuclei of the brain stem, cranial nerves, reticular formation, cerebellum, thalamus optic, cerebral cortex and anterior horns of the spinal cord, excitation of its receptors by such an adequate stimulus as low-frequency vibration leads to the occurrence of vestibulosensory, vestibulosomatic, vestibulo-vegetative, as well as integral reactions of the body.

Along with the well-established opinion in the literature about the predominance of vestibular-mediated reactions of the body, in recent years, works have appeared indicating the direct, specific effect of vibration on the vestibular apparatus, manifested in temporary and permanent shifts in vestibular excitability.

According to a number of authors, confirmed by experimental studies, vibration can cause degenerative changes in the otolithic apparatus and ampoules of the semicircular canals.

Otoneurological examinations revealed in persons associated with prolonged exposure to vibration (excavator operators, overhead crane operators, tractor drivers) changes in the vestibular function in the form of hyporeflexia of the labyrinths, asymmetry, changes in nystagmus, the appearance of the symptom of “floating away” of the eyeballs, pronounced autonomic reactions (dizziness. Pallor, increased heart rate, nausea, vomiting), giving grounds for a number of researchers to point to disturbances in both the peripheral and central parts of the vestibular analyzer. The motor system is anatomically and functionally connected with the vestibular and visual analyzers. Therefore, at present, a number of authors identify the optico-vestibulospinal system as a functional complex. Provides regulation of posture and organization of movements, which can play an important role during vibration exposure.

It has been proven that vibration can change the functioning of systems that determine static and dynamic control of movement and posture regulation, as a result

of excitation of the receptor apparatus of muscles and tendons that perceive vibration in the range from 1 to 100 Hz.

The propulsion system, being one of the main objects of vibration, produces qualitatively different effects depending on the frequency of the latter. At low frequencies up to 1-2 Hz, where its latency time is less than the oscillation period, it is still able to compensate for vibrational disturbances and therefore the predominant effects are the reaction of the opto-vestibulospinal system, manifested, in particular, in the symptom complex of motion sickness.

At higher frequencies (above 2 Hz), the counteraction mechanism does not have time to operate and therefore the muscular system is constantly in a state of tension due to a disruption in the relationship between afferent and efferent impulses.

In the first case, the structure of the electromyograms does not change significantly, and in the second, asynchrony of bioelectrical activity, salvo, and rhythmic impulses of a rarer rhythm appear; activation of tonic reflexes, inhibition and inhibition of phasic (tendon and H-reflexes). Besides. There is a change in the static and dynamic coordination of movement, expressed in the form of tremor, a violation of the accuracy of assessing the position of various parts of the body, up to the appearance of illusions, discoordination relationships based on the “switching” principle.

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