APPLICATION OF ARTIFICIAL INTELLIGENCE FOR PREDICTING THE POTENTIAL ADVERSE EFFECTS OF HAZARDOUS OCCUPATIONAL FACTORS ON WORKERS' HEALTH

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Modern industrial processes are characterized by high intensity and technological complexity, which are accompanied by workers' exposure to a wide range of harmful and hazardous occupational factors. These include physical (noise, vibration, adverse microclimate, dust exposure, ionizing and non-ionizing radiation), chemical, biological, as well as psycho-physiological stressors. Traditional hygienic assessment methods are often retrospective in nature and do not always ensure timely identification of emerging health risks. Since such approaches are largely based on regulatory threshold values and statistical analyses, their capacity for early detection of unfavorable health changes remains limited. Therefore, the integration of artificial intelligence (AI) technologies capable of processing large heterogeneous datasets and generating predictive risk models is becoming increasingly relevant for forecasting potential adverse effects of workplace hazards on workers' health.

The application of AI in occupational hygiene enables the integration of industrial monitoring data, results of laboratory and instrumental examinations, as well as medical and physiological indicators of workers. Based on these data, predictive models can be developed to assess the likelihood of occupational disease development depending on the intensity and duration of exposure to hazardous factors. For instance, under exposure to noise and vibration, machine learning algorithms can forecast the risk of sensorineural hearing loss and vibration-induced disorders. AI-based analysis of microclimatic parameters makes it possible to estimate the probability of heat stress, hypothermia, thermoregulation disturbances, and functional impairments of the cardiovascular system. In chemically hazardous industries, intelligent analytical systems allow prediction of cumulative toxic effects and the risk of chronic intoxications.

The implementation of AI-driven technologies ensures a transition from retrospective evaluation of working conditions to preventive and proactive management of occupational

risks, ultimately contributing to the preservation of workers' health. The introduction of intelligent systems facilitates early detection of professional hazards, enables personalization of preventive strategies, and may significantly reduce the incidence of occupational morbidity.

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