

**SPECIAL ASPECTS OF PSYCHOPHYSIOLOGICAL STATUS OF
PRESCHOOL CHILDREN UNDER THE INFLUENCE OF LEAD OF
TECHNOGENIC ORIGIN**

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Introduction. Comprehensive analysis of the world literature demonstrates that the problem of the study of children’s health condition due to intensive human activity is almost the leading one in contemporary publications of national and foreign scientists [1, 3]. This problem is particularly acute for the conditions of Ukraine, considering the difficult demographic situation in our country.

Goal. To set the relationship and the nature of the impact of environmental objects pollution, including air, lead on psychophysiological indicators of children's health.

Materials and methods. Relying heavily on data regarding the content of lead as the most common pollutant in the atmospheric air of the industrial district of Dnipro city and data on psychophysiological testing of preschool children in this area, we studied the relationship and the nature of the impact of pollution.

Results. Contrary to the low level of external lead exposure of population in the industrial areas, we defined the worsening of physiological parameters, including mental performance and learning ability that to some extent may be due to the negative impact of high content of lead in the air.

Conclusions. The obtained results allowed to substantiate scientifically the necessity of development and implementation of preventive methods for reducing lead "pressure" on the health of children and to recommend the implementation of measures for strengthening of children's health.

Key words: environment, lead, children, psychophysiological status.

Introduction. Industrialization of society irreversibly impairs human living environment that forms the most important hygienic problem of anthropogenic pollution. In turn, it is the most relevant to such a global pollutant as lead, affecting the various structures of the central nervous system, leading to violations of intellectual activity, loss of memory, language skills, attention concentrating and others [4, 5, 10]. Especially dangerous neurotoxic effect is for the child population. Infant children are the most sensitive to the toxic action of lead that is associated by many authors with the delay of neuropsychic development, reducing of capabilities for learning, motor dysfunction, memory impairment, hearing disorders, etc [7, 8]. Researches conducted by leading scientists determined the existence of a direct connection between the accumulation of lead in the body of the child and the lowering of IQ coefficient [8], a decrease in attention, speech disorders and impaired ability of perception of the curriculum and adaptation to the school environment. It is found out that the indices of psychophysiological tests that characterize the emotional sphere, the spatial ability, some motor functions in children at higher levels of lead in the blood reliably decrease.

Goal. The aim of the actual research was to determine the adverse effects of the environment on psychophysiological health condition of preschool children.

Research methods and techniques. A powerful Industrial district of Dnipro city was selected for the research. Its residential area is located near the territory of sanitary protection zone of manufacturing enterprises. The probable impact of lead on the physiological indices of preschool children was evaluated in accordance with the requirements of the conceptual method of epidemiological studies. For the study of features of the state of psychological functions of children, observations were conducted in preschool and industrial control areas. The investigated group included 57 children aged 5-6 years, the inhabitants of the industrial area. Another investigated control group of children, the number of 20, consisted of ones who live in an environmentally clean area and visit a local kindergarten. To determine the psychological development of preschool children we used a standard set of psychodiagnostic methods [2, 4, 6]. Psychophysiological tests were carried out with the

study of ideation peculiarities (verbal and nonverbal mind), attention, memory specifics (visual, auditory), level of working capacity, endurance, and level of language development. Results have been worked out by traditional methods of variation statistics using licensed software Excel.

Results. Hygienic monitoring of lead showed that the atmospheric air of residential zone of the observable district consisted it in concentrations that statistically credibly exceeded both maximum and average values for the corresponding concentrations of the control district ($p < 0.001$).

One of the most important health condition indices of preschool children is intellectual development. At this age, there are significant changes in the character and content of the child, the development of certain cognitive processes. Sensory development of the child during this period depends on the ability to mark forms and match shapes appropriately. In the background examination of children of the industrial district it was determined that 45% of these children have a weak type of nervous system, while 39.2% of them have a low level of aptitude for learning (speed of mental operations). It proves that every second child under the influence of prolonged and intensive psycho-emotional loads tends to rapid exhaustion (45%). Only 36.7% of children in industrial district have well-developed abilities to compare and analyze objects in shape, size and color. Children examination findings of the control district show that 89% of them have medium and strong type of nervous system. This data proves that children are capable, enduring, stress-resistant, fare long and intense psycho-emotional loads well, are able to learn and work without rest pauses for a long time. The same number of children (89%) feature sufficient level of perception of objects; 84.3% easily distinguish geometric shapes; 73.5% of the examined children have sufficient indicator of attentiveness.

In this period of life memory has its age peculiarities. Thus, involuntary memory and reproduction have a significant advantage, image and verbal memory develops. Analysis of the data determined that visual memory is well developed only in 31.4% of children from the industrial district and in 73.6% of children from control area. At the same time, auditory memory, which is more associated with learning in

group sessions, is highly developed in 45.1% of children, residents of contaminated territories, and in preschoolers of unpolluted district it is developed insufficiently - every second examined child (53%) showed the weak level of auditory memory.

Perception plays the leading role in the development of cognitive activity. During this period in children a concept of the correspondence between objects improves, spatial awareness forms actively, the perception is consistent with practical actions [5, 6, 9]. It is found that 32.7% of the preschoolers from conditionally clean district managed with perception assessment tasks, while from the polluted one - 29.5%.

In this age attention has a prominent feature. The stability of attention grows, its volume increases. The attention stability is characterized by an interval of time during which the child can be engaged in conditioned activity. Thus, this indicator was determined at a low level in 48% of children in the control area. In every second child (55%) from the industrial district a low level of attentiveness was found. This shows the difficulty in the perception of monotonous information and the weakness of volitional effort in holding the attention in one direction. In addition, in 39.2% of children the low levels of operational processing of new information were determined, that indicates the insufficient development of memory, thinking and attention. But 94% of children - residents of industrial district have high and medium level of general experience that in combination with good indicators of auditory memory speaks of the well delivered educational and pedagogical work with children in preparation for school. Despite the fact that about 70% of children of the control district have quite developed thinking and a good level of aptitude for learning, more than half of surveyed children (68%) showed a low level of general erudition. Only 30.5% of surveyed children satisfy the necessary requirements for this indicator.

So in children of preschool age from industrial district a significant ($p < 0.001$) reduction in almost all of psycho-physiological parameters in comparison with control residents is found. The conducted psycho-physiological research allowed to reveal some changes in the functional state of the central nervous system of

preschoolers from the industrial districts and is an evidence of neuromotor disturbances and disorders of higher forms of regulation and cortical functions.

So, the increased intake of lead that we found in the organisms of preschool children, who lives in the industrial city in comparison with the control, is accompanied by significantly higher frequency of violations of psycho-physiological indicators. Together with other findings it confirms the conclusion about the negative impact of lead on the health status of children in technologically contaminated areas.

Summarizing the results of the research, it should be emphasized that despite the relatively low outer concentration of lead in environmental objects, it enters the organisms of children that live in industrial area of the city and causes some changes, including the central nervous system disorders. This fact is another proof of the global spread of lead in life-supporting environments and highlights the potential danger of even its small concentrations in the environment for child's organism.

Psycho-physiological investigation established the weak type of nervous system, low level of capacity to study, derangement of logical tasks execution sequence, poorly developed visual memory in 34-45% of children from industrial districts. Only 36.7% of children from industrially polluted areas were characterized by well-developed ability to compare and analyze objects in shape, size and color. 89% of children of control area have an average and strong type of nervous system, 70% have a developed thinking, level of capacity to study and visual memory, the same number - 89% distinguish themselves by good level of perception of objects, a sufficient level of attentiveness.

Thus, in preschool children who live near the industrial zone, a decrease of a number of psycho-physiological indicators is determined in comparison with the control group of children. Its neurotoxic effect is especially dangerous for growth and development of the child population.

Conclusions. In the air of the industrial district the lead was determined in concentrations that are at maximum and the average values reliably higher than the relevant concentration of the control area. The true-to-fact worsening of psycho-physiological indicators of the central nervous system was found in children of the

industrial district in comparison with the control one, it was registered in 70-89% of children in the industrial district against 34-45% of children in the control area that to some extent is due to negative impact of high lead content in the air.

The results of the conducted research allowed scientifically justifying the need of further studies on developing and implementing the efficient means in preventing the negative impact of lead on children of industrially polluted areas in order to increase adaptive and compensatory reserves of the organism, to accelerate rehabilitation and strengthen children's health.

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Особливості психофізіологічного статусу дітей дошкільного віку під впливом свинцю техногенного надходження

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Вступ. Всебічний аналіз світової літератури свідчить, що проблема дослідження стану здоров'я дітей у зв'язку з інтенсивною людською діяльністю є практично провідною у сучасних публікаціях вітчизняних та іноземних науковців [1, 3]. Ця проблема особливо гостра для умов України, враховуючи складну демографічну ситуацію в нашій державі.

Мета. Встановити взаємозв'язок і характер впливу забруднення об'єктів навколишнього середовища, зокрема атмосферного повітря, свинцем на психофізіологічні показники стану здоров'я дітей.

Матеріали і методи. На підставі даних щодо вмісту свинцю, як найбільш поширеного забруднювача в атмосферному повітрі промислового району м. Дніпро, та даних психофізіологічного тестування дошкільнят цього району, вивчено взаємозв'язок і характер впливу забруднення.

Результати. В супереч низькому рівню зовнішньої експозиції свинцю у атмосферному повітрі промислового району, визначено погіршення всіх психофізіологічних показників, в тому числі, розумової працездатності та здатності до навчання у дітей, які мешкають у цьому районі. Це певною мірою може бути обумовлено негативним впливом підвищеного вмісту свинцю у повітрі.

Висновки. Результати проведених досліджень дозволили науково обґрунтувати необхідність розробки та впровадження методів профілактики щодо зменшення свинцевого «пресингу» на здоров'я дитячого населення, а також рекомендувати впровадження заходів для зміцнення здоров'я дітей.

Ключові слова: довкілля, свинець, діти, психофізіологічний статус.

Особенности психофизиологического статуса детей дошкольного возраста под воздействием свинца техногенного происхождения

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Введение. Всесторонний анализ мировой литературы показывает, что проблема исследования состояния здоровья детей в связи с интенсивной деятельностью человека является практически ведущей в современных публикациях отечественных и иностранных ученых. Эта проблема особенно остра для условий Украины, учитывая сложную демографическую ситуацию в нашей стране.

Цель. Установить взаимосвязь и характер влияния загрязнения объектов окружающей среды, в частности атмосферного воздуха, свинцом на психофизиологические показатели состояния здоровья детей.

Материалы и методы. На основании данных содержания свинца, как наиболее распространенного загрязнителя в атмосферном воздухе промышленного района г. Днепр, и данных психофизиологического тестирования дошкольников этого района, изучена взаимосвязь и характер влияния загрязнения.

Результаты. Вопреки низкому уровню внешней экспозиции свинца в атмосферном воздухе промышленных районов, определено ухудшение всех психофизиологических показателей, в том числе, умственной работоспособности и способности к обучению у детей, которые проживают в этом районе. Это в определенной степени может быть обусловлено негативным влиянием повышенного содержания свинца в воздухе.

Выводы. Результаты проведенных исследований позволили научно обосновать необходимость разработки и внедрения методов профилактики по уменьшению свинцового «прессинга» на здоровье детского населения, а также рекомендовать внедрение мер по укреплению здоровья детей.

Ключевые слова: окружающая среда, свинец, дети, психофизиологический статус.

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