МЕДИЦИНА
MEDICINE

UDC 631.4:546.3:001.18

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Prenosological diagnostics in the problem of «Environment – health of the population» (review)

Pathogenetic basis of diseases associated with exposure to chemical pollution of various environmental objects constitute a violation of the process of adaptation, i.e. change of those or other systems of the body, which are called premorbid (prepathological) conditions, differing from diseases of the predominance of non-specific changes on specific. In this regard, the most important direction of research in the field of human ecology and environmental hygiene is the use of high technologies on the basis of informative non-invasive methods of diagnosis of early changes in human health caused by adverse factors.

Keywords: donosology, environment, hygiene, diagnostics, public health, health assessment, human ecology, non-invasive method, adverse factors, chemical pollution.

A significant body of research on the impact of environmental factors on the health of the whole population, operates demographic indicators, morbidity, disability and physical development [1, 2]. The modern view of this scientific question, proves insufficient and incomplete database, to create a qualitative picture of the health status of the population, and the nature of the relationship in the system environment — health of the population [3, 4]. Less attention is given to identify early adverse changes in the health status of the population, which would allow us to recommend preventive measures. However, to assess early changes requires highly sensitive techniques, which are based on the analysis of the biomaterial [5–7].

In this regard, the most important direction of research in the field of human ecology and environmental hygiene is the use of high technologies on the basis of informative non-invasive methods of diagnosis of early changes in human health caused by adverse factors. These studies involve the analysis of immune, biochemical, cytological and genetic status, and a variety of other specific (in relation to the factor or factors) or non-specific indicators [8, 9].

Prenosological state are in the process of organism adaptation to environmental conditions as a result of tension of regulation mechanisms and exhaustion of reserve capacity, however, they differ from each other according to the degree of adaptation. For the protection and preservation of health is necessary to develop a system of reliable indicators and the diagnostic algorithm of non-invasive methods for diagnosis and prognosis of pathological conditions [3, 10].

Cytological and cytogenetic indicators of the state in the mucous membrane of the mouth and nose of complex biochemical indices in the functional state of systems detoxification and excretion of toxic products also has a certain significance criteria for the assessment of health status, including the initial stages of its violation [10, 11]. Nonspecific response to the first stage of development prepathological changes may be replaced by the emerging specific syndrome complex. Therefore an integrated approach to the study of health status using indices allows us to characterize different levels of population health [10, 12]. It is appropriate to consider methods of health assessment from the perspective of environmental epidemiology and their use in risk assessment methodology health [12, 13]. It is known that the integral part of ecological and epidemiological studies is biomonitoring. Biomarkers in the broadest sense of the word represent different

indicators characterizing the interaction of biological systems with the factors of physical, chemical or biological nature [14].

The biomarkers of effect can be attributed almost all the techniques used in traditional diagnosis specific and nonspecific effects of environmental pollution, including functional and laboratory diagnostics. For the diagnosis of genetic change of the population surveyed are informative definition of congenital morphogenetic development options (especially in children) [14, 15]. Moreover, you should pay attention to the assessment of quality factors and lifestyle, are responsible for half of the causes of morbidity (or health) that are often closely associated with the quality of the human environment. In our opinion, social and psychological research unit as well as in biomarkers of effect [15].

In the context of a sharp deterioration of the ecological situation for the primary change detection of health disorders used standardized laboratory methods. For substantiation of environmentally caused human diseases requires the development of indicators, changing with the effects of adverse environmental factors [13, 14]. The mucous membrane of a person plays an important barrier role in protecting the organism from adverse environmental factors. The respiratory tract is the gateway to environmental pollutants and the immune protection of the mucous membranes depends on the degree of contact, the measure of occurrence of the adverse factor inhaled. To date, evaluation of the cytological status of the mucous membranes in the nose and mouth includes 19 indicators [15].

Important aspect of adverse influence on health of the chronic chemical loads characteristic to the modern urbanized environment — the constant place of vital activity is the modifying action of chemical factors to small intensity, the giving non-specific biological effects. Its biological basis is systemic disturbance of a homeostasis of an organism owing to a gradual mismatch and damage of set of metabolic, neurohumoral, immune, genetic and other mechanisms of the disturbances to homeostatic equilibrium caused by chemical influences. The systemic change of a functional condition of an organism developing at the same time at all levels of integration, or an ecologically syndrome caused depression to resistance of an organism — the ESRO-syndrome, causes rising of sensitivity in an organism to influence of various adverse factors to the environment. The effect of chemical modification, i.e. augmentation of number and deterioration in a course of the diseases bound to impact on the population of the chemical pollutants having chronic organotropic toxicity and giving the remote effects and also other ecological and social factors of the environment [9] is result of development of the ESRO-syndrome.

In the last decades the concepts «clinical epidemiology» and «evidential medicine» were widely adopted. The clinical epidemiology is no other than use of an epidemiological method for studying to the clinical phenomena and scientific justification of decisions in clinical medicine. The evidential medicine is branch of rather new referral in medicine which I got the name «Assessment of Technologies of Health Care». This direction represents the systematic cross-disciplinary scientific analysis of both the new, and traditional methods used by applied medicine [16].

Thus, the analysis of literature allows to recommend as priority methods of prenosological diagnostics: assessment of the cytologic, psychological, biochemical and physiological status of an organism with use of evidential medicine which is based on use one the best of the available objective data for decision-making and use a mathematical estimates of probability.

Department of laboratory-analytical control Department of ecology of the Karaganda region together with biological-geographical faculty in recent years is in the sanitary — hygienic assessment of actual air pollution in the region, as well as improving methodological approaches to the processing of monitoring data and uses the results to reduce the harmful effects of industrial pollution on the health of child population residing in the area. The studies of domestic and foreign hygienists objectively proved the relationship between the intensity of exposure and inhalation of industrial pollution and the health status of the population, with the existing «rejuvenation» of chronic disease.

A model for the development of methods of assessing the impact risk of environmental factors on child health was selected by the city of Temirtau, where there are enterprises of metallurgical and power industries. Held the regional hygienic analysis showed that in the impact zone of the metallurgical plant, occurring technogenic biogeochemical province. The main criteria for its identification is the high concentration relative to the background of lead, cadmium and zinc in environmental objects. We conducted a study of child morbidity on materials uptake by copying data from clinics in the city, taking into account accommodation (industrial area, relatively clean area of the city) and school health cards. Applied the survey (separate guidelines), containing the issues of socio-hygienic and medico-biological nature, which is usually applied in the framework of similar works, thus, we eliminate incomplete insertion and clarity of the information provided.

Analysis of the results of the survey showed that of the total population of the surveyed children having deviations in health status, variations in one system is 10 %, while the health status of children, as the average — assessed more than half of parents, poor — 5 %, and only a third of parents assessed their children's health as good. As shown by our results, there was high prevalence of multi-system disabilities in the state of children's health. When comparing data on the results of the questionnaire and periodic medical examinations (for the school medical records), we can state that with focused questioning, providing for preclinical the focus of the issue is higher compared to school maps and detection of deviations from the functional systems. It is found that the deviation of the nervous system in school health cards have a corridor percentage from 20 to 55, when questioning parents, the percentage deviation ranges from 60 to 80 %. From the cardiovascular system respectively have a corridor percentage from 3 to 20 and 40 to 50 %. From the side of musculoskeletal system: respectively from 20 to 30 and 34 to 42 %. Given the high prevalence of disabilities in the state of children's health, noted the study, it is necessary to pay attention to the quality of preventive examinations of children with the detection of early forms of health disorders. The specified method can be used by specialists of socio-hygienic monitoring. The necessary harmonization of the statistical methods used to identify links between the analyzed social-hygienic and medical-biological indicators.

Data on the health status of children throughout the observation, obtained with the help of medical-ecological survey, attest to the low level of health of pupils, low possibilities of adaptation to increased mental and physical activity of most children, poor prognosis of formation of health of the population as a whole.

To date, according to existing recommendations, examining the dynamics and conducting analysis of the state statistical reporting and results of research programs, should rank areas by the degree of ecological danger for the population. Bringing its own statistics and their own results, we create an automated database of ecological-dependent diseases with the formation of biogeochemical territory, taking into account the environmental ill-being in accordance with international standards that will contribute to system analysis, and therefore a more effective process of monitoring socio-hygienic and medical-biological direction.

Currently, there are about 10 million chemical compounds, approximately 70 thousand of them are recorded in the international register of potentially toxic and about one thousand — like highly toxic substances [3]. To one of the groups of xenobiotics include heavy metals (lead, mercury, cobalt, zinc, copper, iron, etc.) entering the biosphere during the combustion of fossil fuels or plants, smelting these metals from ores.

Child morbidity and the reduction of immunobiological reactivity of a number of authors connects with the pollution of the external environment [1, 5]. Researchers mainly rely on the comparison of pollution of the biosphere with the frequency of respiratory infections and the increase of allergic diseases [1, 4].

Immunomodulatory properties of heavy metals are reflected in a number of experimental [9, 10], and clinical studies. It is known that patients with atopy heavy metals reinforce the insufficiency of T-suppressors [5, 7], cause high levels of IgE in the blood [6]. Autoimmune processes under the action of various xenobiotics including heavy metals [8], there is a change in the phenotype of lymphocytes and the solubilization of membrane HLA antigens. A number of important industrial contaminant, in particular zinc and copper, along with this are in certain doses is vital. Contaminate the environment may lead to their more or less significant accumulation in the body [2]. The influence of excess amounts of essential trace elements are little investigated in pathogenetic relation. Given the biological role and the close relationship the exchange of such metals as zinc, copper, iron and magnesium, we studied their effect on the immune system of children with atopic dermatitis in the environmental situation.

Patients with atopic dermatitis revealed an imbalance of the studied trace elements. The severity of the imbalance can be different and also lead to higher content of microelements in the blood serum. The most dramatic imbalance is detected in patients of this group with allergic history and recurrent bacterial infections. They observed a severe violation of the balance between zinc and copper: high levels of zinc, copper, as compared to those in rural areas, as well as in other patients remain in remission and during exacerbation.

Factor analysis showed that elevated levels of zinc and copper, as well as the content of magnesium in the blood serum data patients lead to disturbances in humoral immunity.

Most diseases that are studied in the socio-hygienic monitoring is ecologically dependent diseases related to environmental factors exists, but it is not so strong to be obvious. Consequently, the proof of communication between the health status of the population and the environment is a daunting task.

Despite some earlier studies many issues of this problem are still unresolved due to the variety of chemical elements, combinations of toxic substances in the environment and the diversity of their actions on the body. Features of the environment in the territories are connected more with the effects on health of social factors like urbanization, including particularly industrial specialization, trends in the social composition of

society, demographic changes, migration processes and living conditions. Chronic nonspecific action of environmental pollution on human health is the most common type of their adverse effects.

The combined, simultaneous or sequential action of several factors leads to mutual burdening their impact on the human body, causing rapid depletion of physiologic reserves. In response to exposure to a certain dose (intensity and duration) of adverse factors can develop state of utmost tension of adaptation mechanisms with the reversible phenomena of maladaptation [5].

Fundamental hygienic research has taken a new direction — the identification of quantitative relations of changes of environmental factors with specific disturbances of the health status of the population in prepathological and pathological levels [6, 7].

The main difficulties in this area due to the variety of existing environmental factors and the differentiation of their individual impact on public health: professional activities, living conditions, climatic conditions, heredity [8].

Intense and long-lasting impact of environmental factors on the human body causes the prenosological and premorbid States that differ from the norm and pathology. These States arise in the process of adaptation of the organism to environmental conditions, as a result of tension of regulation mechanisms and exhaustion of the reserve capacity of the organism.

In recent decades conducted researches [9–10], revealing patterns of relationships and dependencies between health condition and the factors surrounding natural, industrial and social environment. However, the approaches traditionally used to assess the degree of influence of the individual components of the environment on health, focused on the acquisition of retrospective evaluations and not on forecasting the prospective negative consequences for human health. However, it is known that without the results of the projections is impossible to plan targeted preventive measures.

The concept of risk assessment currently in most countries of the world is seen as the main mechanism for the development and adoption of managerial decisions at all levels of public health [11–12].

Evaluation of risk factors for environmental health and the system of socio-hygienic monitoring are the new innovative technology in the process of reforming health care [13].

Of great importance is the analysis of the prevalence of indicator pathologies [14, 15]. Medical-ecological approach would be zoning, which is based on the regional characteristics of causal relationships between health status and factors, its defining. At the present stage of development of the system of social-hygienic monitoring (SGM) is obvious the immense importance of identifying causal relationships in the system «environment – population health» the definition and ranking of the contribution of the main health determining factors (social, economic, ecological), assessing damage to health and priority management decisions in the sphere of sanitary–epidemiological welfare of the population [16]. Meanwhile, numerous studies on assessing the impact of complex of environmental factors on the health of the population, mostly made in the city [15, 16]. In particular, contamination of atmospheric air cause the deterioration of the health of the population [16].

Experience solving specific problems in multivariate effects of the environment on the population shows that to identify causal relationships, usually consider the loss of health only on the level of anthropogenic load [10, 12] or in the «socio-economic factors — population health» in urban areas [15]. The variety of criteria when evaluating the health status of population and habitat factors defines the tasks for substantiation of the integral assessment of population health at the population level, priority optimal private and integral criteria of anthropogenic impact on human and socio-economic living conditions. Currently, the risk assessment methodology is an essential tool for the characterization of the influence of environmental factors on the health of the population in the implementation of sanitary and epidemiological surveillance and management decisions.

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М.А. Мукашева, Г.Ж. Мукашева, Р.М. Курбаналиев

«Қоршаған орта – тұрғындар денсаулығы» мәселесіндегі донозологиялық диагностика (шолу)

Түрлі экологиялық нысандардың химиялық ластануына байланысты аурулардың патогенетикалық негізі ағзаның бейімделу үрдісінің бұзылуынан болып табылады, яғни аурулардан ерекше және ерекше емес өзгерістермен көрініс табатын преморбидті (патологияалды) деп аталатын ағзалардың түрлі жүйелеріндегі өзгерістер алады. Осыған байланысты адам экологиясы және қоршаған ортаны гигиена саласындағы зерттеулердің ең маңызды бағыты — зиянды факторлардан туындайтын адам денсаулығының ерте өзгерістерін диагностикалаудың ақпараттық инвазивті емес әдістеріне негізделген жоғары технологияларды пайдалану.

Кілт сөздер: донозология, қоршаған орта, гигиена, диагностика, тұрғындар денсаулығы, денсаулықты бағалау, адам экологиясы, инвазивті емес әдіс, жағымсыз факторлар, химиялық ластану.

М.А. Мукашева, Г.Ж. Мукашева, Р.М. Курбаналиев

Донозологическая диагностика в проблеме «окружающая среда – здоровье населения» (обзор)

В статье отмечено, что патогенетическую основу заболеваний, связанных с воздействием химических загрязнений различных объектов окружающей среды, составляют нарушения процесса адаптации организма, т.е. изменения тех или иных систем организма, которые получили название преморбидных (предпатологических) состояний, отличающихся от заболеваний преобладанием неспецифических изменений

над специфическими. Подчеркнуто, что в связи с этим важнейшим направлением исследований в области экологии человека и гигиены окружающей среды является использование высоких технологий на основе информативных неинвазивных методов диагностики ранних изменений в состоянии здоровья человека, возникающих под воздействием неблагоприятных факторов.

Ключевые слова: донозология, окружающая среда, гигиена, диагностика, здоровье населения, оценка здоровья, экология человека, неинвазивный метод, неблагоприятные факторы, химическое загрязнение.

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