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On the System of Social and Hygienic Monitoring in the Russian Federation

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ABSTRACT

INTRODUCTION: The review is devoted to social and hygienic monitoring (SHM), a system of monitoring the state of the environment and health of the population, allowing to establish cause-and-effect relationships between them. It is used for all stages of processing data on environmental parameters, socio-economic indicators and medical and demographic characteristics of the population. All regions of the Russian Federation have experience in SHM. Every year, hundreds of thousands of instrumental measurements of human environmental factors are performed as part of its implementation. A huge amount of data has been accumulated at the federal and regional levels, the analysis of which is the basis for making informed decisions in order to improve the sanitary and epidemiological situation and well-being of the population, as well as for the development and implementation of effective measures and activities to eliminate risk factors. Today, the SHM system is provided with modern tools and methods, it is constantly being improved, responding to emerging requests.

AIM: To analyze and summarize the regulatory framework and scientific literature on social and hygienic monitoring in order to identify promising areas for its further development.

The search for scientific articles was carried out in the eLibrary, Google Scholar, CyberLeninka databases, and regulatory documentation was searched in the TekhExpert system.

CONCLUSION: Based on the results of the study, several promising areas for further development of the SHM system can be identified. The urgent tasks include the development of a single document on social and hygienic monitoring, optimization of sampling programs and laboratory tests, and the introduction of molecular genetic monitoring, which will allow for individual multifactorial health risk assessment. In addition, it is necessary to expand interdepartmental interaction and information exchange in order to form a single database of SHM results to solve urgent problems of public health protection.

Keywords: social and hygienic monitoring; public health; habitat; sanitary and epidemiological well-being.

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О системе социально-гигиенического мониторинга в Российской Федерации

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АННОТАЦИЯ

Введение. Обзор посвящен социально-гигиеническому мониторингу (СГМ) — системе мониторинга за состоянием среды обитания и здоровья населения, позволяющей устанавливать причинно-следственные связи между ними. Он применяется для всех этапов обработки данных о параметрах окружающей среды, социально-экономических показателях и медико-демографических характеристиках населения. Опыт ведения СГМ существует во всех регионах Российской Федерации. Каждый год в ходе его проведения выполняются сотни тысяч инструментальных измерений факторов среды обитания человека. На федеральном и региональном уровнях накоплено огромное количество данных, анализ которых лежит в основе принятия обоснованных решений в целях улучшения санитарно-эпидемиологической обстановки и благополучия населения, а также для разработки и реализации эффективных мер и мероприятий по устранению факторов риска. На сегодняшний день система СГМ обеспечена современным инструментарием и методами, она постоянно совершенствуется, отвечая на появляющиеся запросы.

Цель. Проанализировать и обобщить нормативно-правовую базу и научную литературу, посвященную социально-гигиеническому мониторингу, для выявления перспективных направлений его дальнейшего развития.

Поиск научных статей осуществлялся по базам данных eLibrary, Google Scholar, CyberLeninka, нормативной документации — в системе «Техэксперт».

Заключение. По результатам исследования можно выделить несколько перспективных направлений дальнейшего развития системы СГМ. Среди актуальных задач — разработка единого документа по социально-гигиеническому мониторингу, оптимизация программ отбора проб и проведения лабораторных исследований, внедрение молекулярно-генетического мониторинга, который позволит проводить индивидуальную многофакторную оценку риска здоровью. Кроме того, необходимо расширение межведомственного взаимодействия и информационного обмена в целях формирования единой базы данных результатов СГМ для решения актуальных задач охраны здоровья населения.

Ключевые слова: социально-гигиенический мониторинг; здоровье населения; среда обитания; санитарно-эпидемиологическое благополучие.

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INTRODUCTION

Improving the demographic situation, reducing morbidity and mortality of the population, and minimizing chemical risks are strategic tasks in our country. Improving the existing procedure for monitoring the state of the environment and public health is a key element of a comprehensive approach to protecting the health and sanitary and epidemiological well-being of Russian citizens.

The **aim** of this study to analyzes and summarizes the regulatory framework and scientific literature on social and hygienic monitoring in order to identify promising areas for its further development.

The search for scientific articles was carried out in the eLibrary, Google Scholar, CyberLeninka databases, and regulatory documentation was searched in the TekhExpert system.

Social and hygienic monitoring (SHM) is a 'state system for monitoring, analyzing, assessing and forecasting the health status of the population and the human habitat, as well as determining the cause-and-effect relationships between the health status of the population and the impact of human environmental factors on it in order to take measures to eliminate the harmful effects of human environmental factors on the population'[1].

The principles of implementation and structure of social and hygienic monitoring were built in in the early 90s with the aim of solving the problems of studying the comprehensive impact of the environment on human health and well-being. The SHM system was introduced step-by-step in the course of its organizational and structural formation and was consistently developed by government documents and regulatory legal acts. At present, the regulatory legal framework of SHM is quite large and includes various documents, including guidelines and other information documents. The main document regulating monitoring is RF Government Resolution No. 60 of February 2, 2006 'On approval of the regulation on conducting social and hygienic monitoring'[2].

Collection of information for social and hygienic monitoring has a hierarchical structure corresponding to the administrative-territorial division of the Russian Federation. SHM is carried out by all levels of governmental authorities. The leading role in its implementation is assigned to the Federal Service for Surveillance on Consumer Rights Protection and Human Well-Being (Rospotrebnadzor) with the participation of other federal executive bodies. In particular, the powers of the Federal Medical and Biological Agency include conducting social and hygienic monitoring in the territories it serves, as well as exercising control and supervision in the sphere of ensuring the sanitary and epidemiological well-being of employees of organizations in certain industries with particularly hazardous working conditions.

The information base of the SHM is a long-term collection and analysis of data on medical and demographic indicators, socio-economic characteristics of the population and parameters of the state of the habitat [1]. The scope of environmental studies conducted as part of the SHM in 2022 amounted to more than 5 million analyzed samples [2]. The data characterizing the sanitary and epidemiological situation are collected in the process of state sanitary and epidemiological supervision (control)[3].

The nomenclature of indicators during the SHM is quite extensive and is regulated by the Order of Rospotrebnadzor No. 810 of December 30, 2005 'On the List of indicators and data for the formation of the federal information fund of social and hygienic monitoring'[4]. The programs for research, sampling and laboratory monitoring of environmental factors for SHM are established by the letters of Rospotrebnadzor No. 0100/10460-06-32 of October 2, 2006 'On the organization of laboratory control during social and hygienic monitoring'[5] и № 01/870-16-32 от 28.01.2016 and No. 01/870-16-32 of January 28, 2016 'Legislative and methodological support for laboratory monitoring of environmental factors during social and hygienic

[1] Federal Law of the Russian Federation No. 52-FZ dated March 30, 1999 "On sanitary and Epidemiological welfare of the population". Available from: https://docs.cntd.ru/document/901729631. Accessd: 24.02.2024.

[2] Decree of the Government of the Russian Federation No. 60 dated February 02, 2006 "On Approval of the Regulations on Social and hygienic Monitoring". Available from: https://docs.cntd.ru/document/901966842. Accessed: 24.02.2024.

[3] Order of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare No. 385 dated April 26, .2005 "On the organization of work on social and hygienic monitoring". Available from: https://www.rospotrebnadzor.ru/documents/details.php?ELEMENT_ID=826. Accessed: 24.02.2024.

[4] Order of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare No. 810 dated December 30, 2005 "On the List of Indicators and Data for the formation of the Federal Information Fund for Social and Hygienic Monitoring". Available from: https://www.rospotrebnadzor.ru/documents/details.php?ELEMENT_ID=824. Accessed: 24.02.2024.

[5] Letter from the Federal Service for Supervision of Consumer Rights Protection and Human Welfare No. 0100/10460-06-32 dated October 02, 2006 "On the organization of laboratory control during social and hygienic monitoring". Available from: https://docs.cntd.ru/document/902005811. Accessed: 24.02.2024.

monitoring'[6], as well as some methodological documents [7, 8, 9].

To note, there are some contradictions in terms of sampling. On the one hand, in practice, environmental quality monitoring that fully covers all aspects of environmental pollution (both natural and anthropogenic) is irrational in terms of economic costs and cannot be used in full [3]. Therefore, basic principles for selecting priority indicators have been developed, the lists of which are developed for each region separately. These lists should contain minimal, but sufficient for assessing the relationship between health and environmental pollution, sets of parameters taking into account the specifics of the territory under study the main industrial facilities and other sources of pollution, as well as the natural and climatic characteristics of the area [4, 5]. The location and number of monitoring points are established separately for each territory and can change in accordance with the specific sanitary and epidemiological situation in the region.

On the other hand, because of the reduction of sampling programs and laboratory studies, it is impossible to promptly assess changes in environmental parameters associated with anthropogenic intervention and being short-term. The characteristics of the water and air environment can change quickly under the influence of natural causes, such as dilution and air mass transfer. Therefore, an increase in the number of samples is necessary to study the dynamics of changes in parameters and promptly monitor their status. In addition, a revision of the timing and number of points for instrumental examinations can help in identifying violations of sanitary and epidemiological legislation, which can be of a short-term character (volley emissions or discharges).

Information for social and hygienic monitoring in each region is collected by the Centers of Hygiene and Epidemiology and their branches, as well as by territorial departments of the Rospotrebnadzor in the constituent entities of the Russian Federation. Based on this data, regional information funds of the SHM are formed[10]. At the federal level, there is the Federal Information Fund of Social and Hygienic Monitoring Data, which is a huge base of data recorded during continuous long-term observations and has serious analytical potential. Based on the study and forecast of this data, further decisions are made to improve the sanitary and epidemiological situation[11]. Filling, functioning and technical maintenance of the Federal Information Fund is the competence of the Federal Center of Hygiene and Epidemiology of Rospotrebnadzor.

To simplify the process of interdepartmental interaction and data transfer between organizations of different levels, the automated information system 'Social and Hygienic Monitoring' (AIS SHM) was created. It is part of the Unified information and analytical system of Rospotrebnadzor. The main principles of the system are the formation of a centralized data warehouse, its daily replenishment with data from the field, automated control of incoming information, the presence of unified reference books, forms, means of processing and visualizing data. This allows for systemic control, increasing the manageability, operability and effectiveness of the system. The AIS also includes information on other aspects of sanitary and epidemiological activities [6].

One of the important stages in the development of social and hygienic monitoring is increase in the attention to risk assessment issues[12]. This has become one of the key areas of work to improve the existing monitoring system and to increase the reliability of conclusions on the assessment of the impact of xenobiotics in the environment on public health. During risk assessment, the degree of influence

[6] Letter from the Federal Service for Supervision of Consumer Rights Protection and Human Welfare No. 01/870-16-32 dated January 28, 2016 "Legislative and methodological support of laboratory control environmental factors during social and hygienic monitoring". Available from: https://docs.cntd.ru/document/420369294. Accessed: 24.02.2024.

[7] MP 2.1.6.0157-19. 2.1.6. Atmospheric air and indoor air, sanitary air protection. Formation of programs for monitoring the quality of atmospheric air and quantitative assessment of exposure for the tasks of social and hygienic monitoring. Available from: https://legalacts.ru/doc/mr-2160157-19-216-atmosfernyi-vozdukh-i-vozdukh-zakrytykh-pomeshchenii/. Accessed: 24.02.2024.

[8] MP 2.1.4.0176-20. 2.1.4. Drinking water and water supply in populated areas. Organization of monitoring the provision of high-quality drinking water to the population from centralized water supply systems. Methodological recommendations. Available from: https://legalacts.ru/doc/mr-2140176-20-214-pitevaja-voda-i-vodosnabzhenie-naselennykh-mest/. Accessed: 24.02.2024.

[9] Order of the Federal State Statistics Service of the Ministry of Economic Development of the Russian Federation No. 654 dated September 27, 2022 "On Approval of the Federal Statistical Observation Form with Instructions for Completing it for the organization by the Federal Service for Supervision of Consumer Rights Protection and Human Welfare of Federal Statistical monitoring of the sanitary condition of the Subject of the Russian Federation". Available from: https://docs.cntd.ru/document/351928505. Accessed: 24.02.2024.

[10] Order of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare No. 367 dated November 17, 2006 "On the Procedure for conducting social and hygienic monitoring, data Presentation and Exchange". Available from: https://www.rospotrebnadzor.ru/documents/details.php?ELEMENT_ID=818. Accessed: 24.02.2024.

[11] Order of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare No. 368 dated November 17, 2006 "On Approval of Regulatory documents on social and hygienic monitoring". Available from: https://docs.cntd.ru/document/902017151. Accessed: 24.02.2024.

[12] Resolution of the Chief State Sanitary Doctor of the Russian Federation No. 25 dated November 10, 1997 and the Chief State Inspector of the Russian Federation for Nature Protection No. 03-19/24-3483 dated November 10, 1997 "On the use of risk Assessment Methodology for Environmental Quality Management and public Health in the Russian Federation". Available from: https://docs.cntd.ru/document/420276120. Accessed: 24.02.2024.

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of environmental factors on public health is assessed and ranked, priority factors, sources and routes of pollutants entering the human body are established, and territories with the highest and lowest levels of health risks are identified [7]. Analysis of negative forecasts for the development of environmentally dependent pathologies is important for the implementation of preventive measures to combat the influence of harmful factors. Thus, the risk assessment methodology provides an opportunity to use predictive and analytical methods instead of a formal assessment of the unsatisfactory hygienic state of the environment based on deviations from reference values [8]. Risk assessment also allows for scientific justification of the location of sampling points and the formation of research programs based on identifying the zone of influence of the risk source.

Geoinformation support plays a significant role in the development of a modern system of social and hygienic monitoring. To store and systematize the information obtained during the SHM, software products such as geographic information systems (GIS) are used, allowing for the collection, processing and visualization of data. GIS are an effective tool for social and hygienic monitoring. They can be used in ecological and hygienic studies for vivid presentation of the levels of harmful effects of pollutants and the health status of the population. Geoinformation systems allow one to create a picture of the current situation with reference to a cartographic basis, as well as to model and forecast many options for the development of the sanitary and epidemiological situation, to use materials from urban planning and environmental monitoring and other territorial GIS [9].

A comprehensive hygienic assessment of territories is also based on the data obtained during the SHM [7, 10, 11]. It implies a comprehensive study of the nature of water, soil and air pollution in a particular territory, a study of medical and demographic parameters, analysis and identification of risk factors, which can be used to develop comprehensive preventive programs aimed at 'sanitation' of the environment and reduction of the anthropogenic burden on the population. Thus, in 2019–2021, more than 9 thousand managerial decisions were prepared (including 3,313 managerial decisions in 2019, 2,865 in 2020, and 3,008 in 2021). On their basis, various programs aimed at improving the state of the environment have been developed [12, 13]. They can be used, among other things, to justify urban planning decisions, the implementation of which leads to a reduction of the negative impact of various factors on a human [14, 15].

At the present stage, the social and hygienic monitoring system is undergoing modernization through integration with the control and supervisory activities of Rospotrebnadzor. During this process, the results of control and supervisory activities provide precise instructions to the SHM system as to what industrial objects and in what parameters violate the requirements of the legislation (i.e. in what parameters hygienic standards are exceeded). Accordingly, these objects should be subjected to additional observations and inspections. The SHM system solves the problem of scientific justification of the selection of monitoring points and programs. The results of social and hygienic monitoring activities should be clear, prove the presence or absence of an unacceptable risk to health, identify threats to the population, and, most importantly, establish the specific source of this threat [16].

As a promising direction for improving the SHM system, one can consider the introduction of modern molecular genetic research methods to deepen and develop theoretical concepts in hygienic science. For example, by determining the polymorphisms of marker genes and early preclinical indicators of the expression level of predictive marker genes, it became possible to expand the assessment of individual characteristics of the body in order to develop various programs for the non-specific prevention of environment-dependent pathology. There are individual predispositions that have been shown in a number of studies [17–19]. Based on these studies, one can see that the use of molecular genetic methods allows one to determine the pathogenetic pathways of development and progression of diseases.

Inclusion of molecular genetic monitoring in the SHM system is an urgent task, since it can be considered one of the important components of a personalized approach to preventive measures that allow determining the individual risk to the health of a particular person.

Today, the social and hygienic monitoring system is provided with modern tools and methods. It is constantly evolving and being improved, responding to emerging requests. Nevertheless, during the analysis of literary sources, as well as regulatory and methodological documents governing the implementation of SHM, several critical points and opportunities for improving the process of establishing cause-and-effect relationships in the 'environment — human health' system were identified.

Thus, it should be noted that the existing package of documents was developed at different times (the spread is more than 20 years), some documents duplicate each other. Accordingly, the development of a single document regulating all processes included in SHM will allow identifying all disparities with the current legislation, as well as making changes and improvements in the future.

Since the SHM system is based on the administrative-territorial division of our country, data are obtained within the existing territorial entities, which complicates the analysis of measurement results at their borders. The influence of transboundary migration of various chemical pollutants not only from the territories of neighboring regions, but also from neighboring states cannot be ruled out. Optimization approaches to the organization of the SHM system should take into account the characteristics of the studied territories, the natural and climatic characteristics of the region, as well as the situation in the adjacent territories.

Instrumental studies of environmental factors conducted as part of the SHM do not allow for prompt assessment of changes in environmental parameters associated with anthropogenic intervention; the sampling regulation implies significant time intervals, while changes in water and air can be short-term due to natural causes such as dilution or air mass transfer. Obtaining initial data is accompanied by difficulties caused by the imperfection of existing physicochemical determination methods and not always sufficient sampling of studies. Thus, the frequency and nomenclature of sampling do not correspond to the requirements of a rapid response to assess the state of the human habitat. It is necessary to increase the number of samples taken to determine the dynamics of changes in parameters and promptly monitor their condition. Accordingly, revision of the timing and the number of points for instrumental studies will allow using SHM data as basic information for risk-oriented surveillance. It is also necessary to consider the issue of taking into account violations of mandatory requirements in the field of sanitary and epidemiological legislation, which can be short-term (volley emission or discharge).

Scientific substantiation of hygienic standards for chemical substances in environmental objects is the most important condition for the successful solution of issues related to public health protection and prevention of environment-dependent human pathologies. In general, about two hundred million organic and inorganic compounds are registered in the environment, including alloys of complex compounds, minerals, mixtures, polymers and salts, which significantly exceed the number of substances with the established MPCs. Considering that the SHM is conducted only for substances having hygienic standards, the assessment of the impact of harmful factors on public health remains incomplete.

The introduction of molecular genetic monitoring into the SHM system is an urgent task, since it can be one of the important components of a personalized approach to prophylactic measures that make it possible to determine the individual health risk of a particular person.

The results of social and hygienic monitoring are in demand by many departmental and research institutions. Therefore, the task of creating a unified SHM information system to provide broad access to information on anthropogenic, chemical and other burdens on human health is also urgent.

CONCLUSION

Thus, this review showed that social and hygienic monitoring is a dynamically developing multicomponent structure that collects, processes and analyzes data on the state of the environment and health of the population. These data can be used to determine and rank the potential harmful effects of the environment on human health, as well as other (socioeconomic and medical-demographic) parameters. The results of social and hygienic monitoring make it possible to scientifically substantiate measures to manage the sanitary and epidemiological situation in our country.

ADDITIONAL INFORMATION

Author contributions. Ya.I. Lebed–Sharlevich — collection of material, writing the text, editing; R.A. Mamonov — writing the text, editing; S.M. Yudin — editing. All authors approved the manuscript (the publication version), and also agreed to be responsible for all aspects of the work, ensuring proper consideration and resolution of issues related to the accuracy and integrity of any part of it.

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