

ON IMPROVEMENT OF SOCIAL AND HYGIENIC MONITORING IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION

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During the period of work of the social and hygienic monitoring system, the main formation stages of the indicators showing the sanitary and epidemiological situation were completed, as well as information on the population health condition and the environment state was collected. At the moment, there is a need for an upgrade and development of social and hygienic monitoring, change of methodological approaches to the information collection and assessment of the environment and public health quality. When conducting social and hygienic monitoring in the AZRF, there are certain difficulties: the search for indicators that are adequate to the purposes and objectives of monitoring and showing the impact of environmental factors on public health. Methodological approaches to selection of control points and creation of programs for laboratory studies of environmental samples have not been sufficiently developed. There are limited opportunities to exchange information on natural and climatic factors as well as on environmental and health factors due to the difficulties of interdepartmental interaction. The article suggests possible ways to improve efficiency of the social and hygienic monitoring in the AZRF.

Keywords: social and hygienic monitoring; sanitary and epidemiological welfare; geoinformation systems; population health; habitat factors; Arctic Zone of the Russian Federation.

Since 1994, the Federal Service for Supervision of Consumer Rights Protection and Human Well-Being has been carrying out social and hygienic monitoring, which is based on the principles of constancy, continuity, adequacy of tasks of protection and promotion of health, automation of accounting, mathematical processing and observational analysis, unification of collection methodology, information processing and analysis, etc.

Information collected within the social and hygienic monitoring:

- is unique (lack of similar information in other monitoring systems);
- is diverse: public health and habitat factors: biological, chemical, physical, social, natural-and-climatic;
- is in demand for use in territorial automated information systems, in implementation of investment projects, etc.

Over the period of work of the social and hygienic monitoring system, the main formation stages of indicators, objects and factors characterizing the sanitary and epidemiological situation were completed, as well as information on the state of the population health and human environment was collected, formed in the federal, regional and local information files of the social and hygienic monitoring data. Regulatory legal acts and reference materials in analysis, forecasting and determination of cause-and-effect relations between the state of the population health and the impact of environmental factors have been developed [1].

The results of the social and hygienic monitoring are used to inform about the sanitary and epidemiological state of the regions of the Russian Federation, for preparation and implementation of management decisions aimed at improvement of the habitat, prevention

of mass noncommunicable diseases due to the impact of habitat factors by Rospotrebnadzor, public authorities and local governments.

Further development of the social and hygienic monitoring system is constrained by a number of legislative, organizational, technological and financial and economic problems: mainly the territorial principle of social and hygienic monitoring management without regard to inter-regional aspects; insufficient development of the methodology for social and economic efficiency assessment of social and hygienic monitoring; insufficient human resourcing level of social and hygienic monitoring; outdated information platforms for collection and storage of social and hygienic monitoring data, which do not meet modern requirements and ensure interdepartment cooperation [2, 3].

Currently, there is an urgent need for update and development of social and hygienic monitoring, changes in methodological approaches to information collection and assessment of the environment and public health quality [4]. First of all, these are the requirements of today:

1. social utility, adequacy of information to the set purposes and objectives.
2. prompt delivery of the collected information, timeliness of obtaining information on the state of habitat factors and population health, necessary for the quickest adoption of measures to improve the sanitary and epidemiological situation.
3. sufficiency is a balance between the necessary information to assess the impact of habitat factors on the population health and redundant information, which overloads databases and makes it difficult to carry out the analysis, as well as requires considerable effort.
4. the information collected on habitat

factors should allow assessing the impact on population health.

5. possibility of automated information collection, data conversion (import) into already developed programs or programs under development should be fulfilled.

6. availability of specialists able to collect, evaluate and analyse the collected information.

For an objective analysis of the sanitary and epidemiological situation, assessment of the public health risk in the Arctic zone of the Russian Federation (AZRF) and development of measures to prevent morbidity it is necessary to have complete, reliable and qualitative information in environment and human health.

However, despite the set state objectives and the efforts made to implement social and investment programs, the key features and problems of the Arctic are taken into account and solved insufficiently effectively, which is related to:

- extreme natural and climatic conditions;
- local character of industrial and economic development of the territories and low population density;
- significant reduction of population in the macro-region;
- outflow of skilled personnel and inflow of low-skilled, socially unadapted manpower;
- high resource intensity and dependence of economic activities and life support of the population on the supply of fuel, food and essential goods from other regions of Russia;
- underdeveloped infrastructure, especially energy and transport infrastructure;

- environmental tension in the Arctic territories, low sustainability of environmental systems and their dependence on even minor anthropogenic impacts;
- low social and economic protection of the indigenous population [5].
- For Rospotrebnadzor, this means the need to form scientifically based management decisions to ensure the sanitary and epidemiological welfare of both indigenous and newly arrived population, not adapted to the Northern conditions [6].
- When conducting social and hygienic monitoring in the AZRF, there are certain difficulties: the search for indicators that are adequate to the purposes and objectives of the monitoring system, and indicating the impact of habitat factors on the population health. Methodological approaches to selection of control points and formation of programs for laboratory studies of environmental samples have not been sufficiently developed. There are limited opportunities to exchange information on natural and climatic as well as on environmental and health factors due to the difficulties of interdepartmental interaction.

In 2018, the habitat factors in the AZRF were monitored in 643 points (Table 1).

The Nenets Autonomous Okrug, the Arctic territories of the Republic of Sakha (Yakutia) and the Republic of Karelia do not have ambient air monitoring. The list of the controlled indicators differs upon the AZRF constituent territories. When selecting the indicators controlled in the air, one should keep in mind the temperature limitations during the research. For example, the minimum temperature of ambient air at which samples of dioxide nitrogen and dioxide sulphur are taken is 0°C, samples of suspended solids and oxide carbon are taken at minus 10°C.

Within the framework of the social and hygienic monitoring, soil is studied at 243 monitoring points in the Arctic settlements. In the Arctic territories of the Republic of Sakha (Yakutia), the Norilsk city district and the Taimyr district of the Krasnoyarsk Krai the soil is not studied (Table 1). In order to assess the impact of the soil quality on health in the populated areas, each monitoring point should have at least 6 studies per year on chemical, bacteriological, parasitological indicators and cover all seasons of the year, which is difficult to achieve in the Arctic conditions. Despite the significant number of monitoring points in the Chukotka Autonomous Okrug the soil is studied only for parasitological indicators, in the Nenets Autonomous Okrug - for bacteriological and parasitological indicators.

While assessing availability of public centralized water supply, it should be noted that, considering the vast areas of the Chukotka, Nenets Autonomous Okrug and the Republic of Sakha (Yakutia), arrangement of a properly centralized water supply is a complex technical and technological task, including in permafrost [7].

Table 1

Number of social and hygienic monitoring points by the AZRF constituent territories

Constituent territory	Number of the monitoring points		
	ambient air	soil	drinking water
Arkhangelsk	7	52	18
the Republic of Karelia	-	3	8
the Republic of Komi	2	3	7
Krasnoyarsk Krai	24	2	18
The Murmansk region	14	41	154
The Nenets Autonomous Okrug	-	6	11
The Chukotka Autonomous Okrug	2	82	81
the Republic of Sakha (Yakutia)	-	-	2
The Yamalo-Nenets Autonomous Okrug	9	54	45
Totally	58	243	342

In 2018, the quality of drinking water of the centralized utility and drinking water supply systems was controlled in 46 Arctic districts in 342 control points (tab. 1). Neither social nor social and hygienic monitoring research was conducted in the Shuryshkarsky District of the Yamal-Nenets Autonomous Okrug and 12 uluses (districts) of the

Republic of Sakha (Yakutia): Abyiskiy, Allaikhovskiy, Anabarskiy, Verkhnekolymskiy, Verkhoyanskiy, Zhiganskiy, Momskiy, Nizhnekolymskiy, Olenekskiy, Srednekolymskiy, Ust-Yanskiy, Eveno-Bytantaiskiy. In the Arctic zone, the lists of the controlled indicators differ significantly (Table 2).

List of the drinking water indicators under control upon the Arctic constituent territories

Table 2

Constituent territory	List of the controlled indicators
Arkhangelsk	alkyl benzene sulphonates, aluminium, hydroxybenzene, iron, cadmium, manganese, copper, arsenic, oil, nickel, nitrates, mercury, lead, strontium, sulphates, formaldehyde, fluorine, chlorides, chloroform, chromium, zinc
the Republic of Karelia	Ammonia and ammonium ion, iron, cadmium, copper, nitrates, nitrites, lead, chlorides, zinc
the Republic of Komi	Ammonia and ammonium ion, iron, manganese, nitrates, nitrites, sulphates, chlorides
Krasnoyarsk Krai	DDT, 1,2,3,3,4,5,6-hexachlorocyclohexane, aluminum, ammonia and ammonium-ion, barium, beryllium, boron, iron, cadmium, cobalt, manganese, copper, molybdenum, arsenic, nickel, nitrates, nitrites, mercury, lead, selenium, strontium, sulfates, tetrachloromethane, tetrachloroethylene, trichloroethylene, fluorine, chlorides, chloroform, chromium, cyanides, zinc
The Murmansk region	aluminium, ammonia and ammonium ion, bromodichloromethane, hydroxybenzene, dibromchloromethane, iron, manganese, copper, nickel, nitrates, nitrites, lead, tetrachloromethane, chlorides, chloroform, zinc
The Nenets Autonomous Okrug	ammonia and ammonium ion, iron, manganese, copper, nitrates, nitrites, sulphates, chlorides
the Republic of Sakha (Yakutia)	ammonia and ammonium ion, iron, magnesium, sodium, nitrites, sulphates, chlorides
The Chukotka Autonomous Okrug	aluminium, ammonia and ammonium-ion, iron, cadmium, calcium phosphate, magnesium, manganese, copper, molybdenum, arsenic, nitrates, nitrites, mercury, lead, sulphates, fluorine, chlorides, zinc
The Yamalo-Nenets Autonomous Okrug	ammonia and ammonium ion, iron, silicon, manganese, nitrates, nitrites, sulphates, chlorides

One of the possible ways to solve the problems of data collection on the state of the population health and habitat factors under current conditions is the use of geoinformation systems.

In order to collect and analyse information about the state of sanitary and epidemiological welfare, the North-Western Scientific Centre of Hygiene and Public Health conducts research work on creation of the geoportal “Sanitary and Epidemiological Welfare of the AZRF Population”.

Within the framework of the “Pure Water” federal project within “Ecology” national project, the Rospotrebnadzor project office is creating an interactive map of drinking water quality control of centralized water supply systems, the purpose of which is to inform the population, state and executive authorities of the Russian Federation, local governments and water supply organizations on the quality and safety of water of centralized drinking water supply systems. Qualitative drinking water supply to the population will be assessed, in 2024 it should be 90.8%, and for the urban population it should be 99.0%.

In-depth analysis shows that the favourable

situation with quality drinking water in the AZRF is due to the cities and urban-type settlements, where a significant part of the AZRF population lives. At the same time, the situation in rural settlements is not so favourable.

The specific gravity of water samples from the centralized drinking water supply distribution network exceeding hygienic standards of the sanitary and chemical indicators in the AZRF is almost twice as high as the Russian average, and in the settlements of the Chukotka Autonomous Okrug and the Arctic regions of Krasnoyarsk Krai and the Republic of Sakha (Yakutia) more than 30.0% of drinking water samples did not meet the hygienic standards.

The specific gravity of water samples from the centralized drinking water supply distribution network exceeding the hygienic standards of the microbiological indicators in the AZRF is at the level of the average Russian indicator. However, in the Arctic regions of the Republic of Sakha (Yakutia), the proportion of samples exceeding the hygienic standards in 2017 was 22.4%.

Except for keeping the population informed, the performance capabilities of the Interactive Map will also include:

1. prompt hygienic assessment of the areas according to the quality of drinking water supplied to the population;
2. prompt assessment of the number of population supplied with quality water, in case of emergencies as well;
3. development of targeted programs to improve the quality of drinking water;
4. identification of cause-and-effect relations between water quality and population morbidity at runtime;
5. proposals on improvement of water quality control system.

One of the methods of timely identification of deviations of quality indicators from standard values is to control water quality of centralized water supply systems with the use of devices that allow carrying out automated quality control throughout the water supply system. The most universal is the on-line analysis, which imply creation of a continuous sampling line with installation of a permanently functioning analyser or a system of analysers.

Conclusion.

1. To increase the social and hygienic monitoring efficiency in the AZRF it would make sense:
2. To develop normative and legal documents on arrangement of social and hygienic monitoring.
3. To develop a regulatory and methodology framework for arrangement and conduct of inter-regional social and hygienic monitoring, the purpose of which will be to improve the quality of expert and analytical processing of data having an interregional features, with regard to the factors affecting the population health.
4. To include health risk assessment indicators (the risk of mandatory requirements violation) as target indicators of implementation of state (regional) target programs and municipal development programs.
5. To create a modern online resource in order to generate an information file of the social and hygienic monitoring data with access to other departments for the purpose of a joint management of the information file and analytical processing.

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