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Medical geographic modeling of spatiotemporal changes of naturally determined diseases under the changing climate and economic development of the Russian Arctic

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This research aims at the solution of environmental problems related to sustainable and economically efficient development of the North, which could enhance the quality of life and health of the population in the changing Russian Arctic. The medical geographic modeling of spatiotemporal patterns of naturally determined diseases is based on the detailed database covering the Arctic zone of Russia. The role of factors affecting the spread of diseases is unequal, with the climatic factor regarded as the most significant at all levels of territorial differentiation. At the highest (national) level, this factor determines the latitudinal zoning, which, in turn, determines the existence conditions of disease hosts and vectors and, ultimately, the foci of diseases. At regional level, the effect of climate is traced in monthly mean temperatures, temperature extremes, precipitation, snow depth, length of no-frost period, etc. Changes of these characteristics influence the poikilothermic (cold-blooded) arthropods, as well as the pathogens spending a part of their life cycles in the arthropods' organisms. Another important factor is related to water resources, particularly, water-table height and ecological state of water bodies. Comparative analysis of hydrological and hydrochemical data, and their total impact on morbidity rates in terms of pathogenicity eco-indices, can serve as an additional tool for detecting the critical infection areas and population early warning. The original methodology is applied to evaluate the actual medical environmental situation, to forecast possible spatiotemporal changes in morbidity, including due to the most virulent infections, and to elaborate recommendations to public health authorities on planning the preventive and health-improving activities in the Arctic.