

# Interdisciplinary character of ecological studies and balance of their scientific and methodical bases

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The results obtained using the method of structural epidemiological analysis in combination with the methods of selective statistics, comparative analysis of population morbidity, and development of personified medical databases for solving ecological problems are presented. It is shown that the interdisciplinary principle of organization of ecological studies implies the search for solution of the problem on discrepancy between the scientific and methodical level of ecological epidemiology and the level of development of the corresponding applied fields of mathematics, chemistry, and physics. The comparison of the results of ecological studies carried out in Novosibirsk within the framework of the currently accepted methods and those obtained with the use of the above-mentioned combination of methods showed that in the latter case the results are far more informative.

The current ecology, especially, the nature protection practice has many problems connected with analysis of the variety of chemical, physical, and biological environmental factors. Medical-biological research has even less success in ecology. At the same time, the degree of variability of an epidemic situation depends on the level of urbanization of a territory, what, as a rule, means intensification of the distress component in the "human – environment" system.

The efficiency of diagnostic research in medicine is estimated as 12–16% (Ref. 1), but etiology of even well established human diseases very often remains unproved. Turning our attention to the problem of revealing the forms of ecopatology at the level of a representative group of people, we can prove that some classes and sometimes nosologic forms belong to the category of ecologically dependent diseases. Thus, in principle, a wide variety of ecological problems can be solved. At present, the high-accuracy quantitative and qualitative studies of the environmental factors are accompanied only by the data on how many people visited specialized ecological medical institutions. In only few cases ecologists have epidemiological information prepared for solution of ecological problems.

Examples of complex analysis of ecological information are few in the scientific literature. Let us consider one of typical publications,<sup>2</sup> whose authors Akulov and Mingazov undertook an attempt to find, in particular, the principal etiologic factors causing some already known ecological diseases. The correlation analysis of the dynamics of these diseases for several years and the annual mean concentration of some chemical compounds in the atmosphere over Novosibirsk gave the dependence characterized by the correlation coefficient from 0.1 to 0.5. The authors failed to establish and statistically justify that some diseases are ecologically dependent.

The question arises on can it be stated for sure or not that such correlation indicates that a disease is caused by one or other chemical compound? Maybe, these diseases are the consequence of the combined effect of unfavorable ecological factors on human health, or they are caused by social and hygienic or psychogenic factors. They also may result from distant consequences of some environmental or industrial factors. We could answer many such questions, if the accuracy of epidemiological information was at least comparable with the accuracy of determining the content of chemical compounds and other environmental factors.

## Technique

As an object for our study, we took Novosibirsk population, who worked at an institution having affiliates in different regions of the city and lived nearby their workplaces. In accordance with the method of selective statistics, we determined five groups, each of 900 people aged from 30 to 40 (with the equal number of men and women in a group). The work of these people was not harmful to the health. The level of medical help was almost the same for all the selected people.

The data on visits to local polyclinics for a three-year period were collected in a personified databank. For each patient, the following data were stored: name, sex, age, address and the place of work, disease code, form of disease (sharp or chronic), date of visit to a doctor, date of recovery, duration of service. The following epidemiological characteristics were calculated for each group separately: the part of ill people, number of cases of temporarily disabled people, number of days of temporary disablement, mean duration of a single case in the total number of cases, mean duration per one patient, complex indicator of

morbidity,<sup>3</sup> the part of cases with the chronic form of diseases in the total number of cases, the part of people with different duration of disablement of the total number of patients, and the part of cases with different duration of disablement in the total number of cases.

The content of chemical compounds in the near-ground atmospheric layer in each of five municipal districts far spaced from each other was measured by the standard techniques. We did not find significant differences in the content of sulfur and nitrogen dioxides, carbon and nitrogen oxides, and suspended particles. It should be noted that in this study, as in Ref. 2, the information on chemical pollution of the urban atmosphere was taken from the same sources (State Ecological Committee and Western-Siberian Hydrology and Meteorology Center). Thus, these researches differ only in the medical information used.

The reliability of correlations was determined at the 95% probability by the Spirman pair method. The reliability of differences in the level of morbidity in all the population groups studied was estimated by the Student's *t*-criterion. The data were statistically processed on a computer with the use of Statgraphics and Statistica codes.

## Results

The correlation analysis revealed diseases caused by the above-mentioned chemical factors of the environment, as is indicated by the value of the correlation coefficient from 0.8 to 0.9 ( $p < 0.05$ ). The class of ecologically dependent diseases includes infectious diseases, diseases of nervous system, sensory organs, respiratory organs, digestive organs, urogenital system, and skin. The detailed analysis of the morbidity structure revealed nosological forms, because of which the diseases from the above-listed classes were separated out. They include diseases of conjunctiva, middle otitis with suppuration, acute pharyngitis, laryngitis, tracheitis, infections of respiratory tract of various localization, bronchitis, angina, chronic bronchitis, pneumonia, diseases of soft tissue in the mouth cavity.

The level of morbidity estimated as a whole based on the epidemiological indices was not significantly

different for the groups of people. However, it turned out that the results of analysis of the morbidity structure with the use of the same indices differentiate markedly one of the groups. The number of the prevailing forms of pathology in this group was by 40% larger than in other groups, and all nosological forms also belonged to the classes of diseases that were determined as ecologically dependent. This result is one of the examples of polymorphism of the clinical manifestations of diseases, which are connected with unfavorable industrial conditions or, as in our case, with the action of ecological factors on the human health. The certainty of the differences in the morbidity structure in the studied groups of adults of Novosibirsk is indicative of the presence of such biologically significant natural factors in at least one of the five districts under study, which are now beyond the control of the corresponding services.

## Conclusion

The obtained results are indicative of the need to take into account the environmental factors (within the framework of chemical-analytical studies, mathematical calculation of pollutant concentrations in the near-ground atmospheric layer and regularities in the formation of industrial pollution zones) simultaneously with the determination of the structure and level of morbidity. In the second task, it is worth using the method of structure epidemiological analysis in combination with the methods of selective statistics, comparative analysis of people morbidity, and development of personified medical databases. It should be noted that the use of complex indicator of morbidity was of particular importance in this study.

## References

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3. A.Ya. Leshchenko, *Zdravookhranenie RF*, No. 3, 8–10 (1992).