

Water-borne diseases in the Voronezh River Basin

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Water-borne diseases are a topical modern problem. These are “dirty-water” diseases, i.e. caused by water that has been contaminated by human, animal, or chemical wastes. Millions of people have little access to sanitary waste disposal or to clean water for personal hygiene. An estimated 3 billion people lack a sanitary toilet, for example. Over 1.2 billion people are at risk because they lack access to fresh water. Where proper sanitation facilities are lacking, water-borne diseases can spread rapidly. The above-mentioned diseases take the lives of 5 to 7 million people around the world each year, including 1 child every 8 seconds.

Untreated excreta carrying disease organisms wash or leach into fresh water sources, contaminating drinking water and food. The extent to which disease organisms occur in specific fresh water sources depends on the amount of human and animal excreta that they contain. Water-borne diseases include typhoid, shigellosis, salmonellosis, amebiasis, schistosomiasis, campylobacteriosis, hepatitis A, and others. Human beings and animals can act as hosts to bacterial, viral or protozoal organisms that cause these diseases.

Diarrheal disease, the major water-borne disease, is prevalent in many countries where sewage treatment is inadequate. Instead, human wastes are disposed of in open latrines, ditches, canals, and watercourses, or they are spread on cropland. An estimated 4 billion cases of diarrheal disease occur every year, causing 3 million to 4 million deaths, mostly among children.

Using contaminated sewage as a fertilizer can result in epidemics of such diseases as cholera. Water supplies are lacking. In the early 1990s, for example, raw sewage water that was used to fertilize vegetable fields caused outbreaks of cholera in Chile and Peru.

The most typical water-borne infectious disease in the Voronezh River Basin is water fever, or leptospirosis. The natural centre of this infection is the Voronezh River Basin. The symptoms of leptospirosis include fever, calf pain, slight jaundice, increased liver and spleen sizes, abdominal discomfort, diarrhoea. One type of the leptospirosis agents (*Leptospira Zemskovy*) was discovered in Voronezh State Medical Academy.

Also such kind of water-borne diseases as shigellosis often occurs within the Voronezh River Basin. And one type of the shigellosis agents (*Shigella Schmitz - Schutzer*) was described for the first time in Voronezh City by Russian scientist Michael Schutzer.

Toxic substances that find their way into fresh water are another cause of water-borne diseases. Increasingly, agricultural chemicals, fertilizers, pesticides, and industrial wastes are being found in freshwater supplies. Such chemicals, even in low concentrations, can build up over time and eventually, can cause chronic diseases among people who use the water.

Control of water-borne diseases caused by chemicals is a painful problem in Russia. This is a particular in the Voronezh River Basin due to pollution created by such large-scale industrial enterprises as Voronezhskaya sintezkautchuk, Novolipetsk Metallurgical Works, Rossosh Mineral Fertilizers Plant, Voronezh Tyre Plant, and others.

A few words about the Voronezh River. Voronezh is a river in the Central Chernozem Region of Russia, a left tributary of the Don River. The Voronezh River is 342 kilometres in length. The area of its basin is 21,600 square kilometres. It freezes

up in the first half of December and stays under the ice until late March. The lower reaches of the river are navigable. The cities of Voronezh and Lipetsk are located on the Voronezh River. There are 28 tributaries of the Voronezh River in its basin (Ilovay, Stanovaya Rjasa, Matyra, Usman are the most significant). There are 488 surface water bodies in the Voronezh River Basin with the general length of the river system of 4,645 kilometers.

Within the Voronezh River Basin there are 29 chemical and petrochemical companies. In 2005, water pollution caused by these companies was observed in the city of Voronezh and in 14 districts of the Voronezh Region. In the Voronezh Region, 252 thousand people live in conditions of polluted water. Within the Voronezh River Basin human diseases are no longer only secondary to microbial or parasitic pollution, but first and foremost, to chemical pollution induced by industrial activities. The priority pollutants include lead and compounds thereof, chromium, nickel, nitrogen oxide and dioxide, sulphur dioxide, carbon dioxide, 1,3-butadiene, benzene, styrene, trichloroethane, phenol, formaldehyde, acrylonitrile. Because many of these toxic substances are carcinogenic, mutagenic, reprotoxic and allergenic, they must be monitored in water. The Centre for the Ecologic Adversity Counteraction (CEAC) established the independent water quality research laboratory. This allows monitoring the official data on the level of chemical compounds in the water bodies of the Voronezh River Basin. Also the data of independent water quality research laboratory help to solve the conflicts between region authorities and local community.

Many diseases with a growing incidence originate from industrial pollution. They include cancers, congenital malformations, infertility, allergies, blood diseases, digestive organs diseases, degenerative diseases of the central nervous system. CEAC implemented the effective system of medical monitoring of population in the districts with polluted water.

The efficiency of the prevention and treatment of diseases is directly dependent on the quality and timeliness of diagnosing those diseases. In terms of diagnostics, a systemic approach is important, which first of all takes into account all the factors directly or indirectly influencing the formation of pathologic changes or evidencing their presence.

In Russia at the present stage, diagnostic examination of those who live in the area with polluted water is restricted by certain economic and organizational reasons. Therefore, it is quite important to use an analytical approach in assessing the necessity and optimum order of patients examination.

In the course of the examination organization, it is suggested that the groups are defined, which require immediate, scheduled, or preventive diagnostic procedures. In this case, the use of expert assessment has allowed identifying the basic factors involved and provided quantitative estimation of their indicators for each of the groups mentioned above. These factors include years of residing in the territories with the polluted water, age, complaints of pains or unpleasant sensations in various parts of the body, taking pills with potential toxic effects, excessive or insufficient weight, and others. This allowed making special questionnaires for population of the area with polluted water. The inhabitants living in the territories with the most polluted water were asked necessary questions in ready form to determine the risk groups. The number of interrogated people was enough to get the trustworthy statistic data.

When the computer database was created the number of points characterizing the patients' state of health (taking into account the revealed priorities of certain factors in the development of diseases) was automatically calculated. Those who took a certain number of points form the groups requiring immediate, scheduled or preventive diagnostic procedures.

Screening medical examination included objective inspection, laboratory research (full-scale general blood test, biochemical testing complex), endoscopic investigations and ultrasound testing of the internal organs.

The analysis of the data obtained showed that there were much more patients with various diseases among people from the highest risk group than in other groups. Early identification of different diseases enabled to conduct successful treatment in time.

All these prove the practical significance of proper structuring of medical examination, the necessity of competent management of diagnostic screening, grounded detection of priorities in clinical and anamnestic data assessment, efficient methods for early and complete revealing of water-borne diseases. I hope the results of this work are of interest to the state institutions of healthcare in industrial regions of Russia and other countries.

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