

Using ecological risks assessment with a view to improve drinking water-supply in Odessa

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The most perspective choice of principal ways of environmental policy aimed to reduce danger of unfavorable environmental factors for human health is based on the scientific analysis of bonds between state of environment and health in the specific conditions of a region or a city. One of the most effective present-day approaches to determination of such bonds is a methodology of risk assessment.

US EPA (United States Environmental Protection Agency) has determined the risk assessment as an assessment of toxicity of a substance and of conditions of exposure for determining the rate and characteristics of its harmful effect for human health. Risk is a probability of a harmful effect. Exposure of toxic chemical pollutants may cause a wide range of changes in human organism. Such changes may vary from biochemical, physiological and pathological changes to fatal outcome.

It is possible to evaluate risk numerically (in a value from 0 to 1) or qualitatively (low, average or high risk level). When assessing significance of an ecological problem individual risk is multiplied by quantity of people who are exposed to the specific pollutant.

When determining the method of risk assessment one usually choose a special methodic developed by United States Environmental Protection Agency or its modifications. Under this method four stages of risk assessment are determined:

1. *Determination (identification) of a danger.* This stage means assessing of available proof of presence and danger of pollutants that can cause harmful effects.

2. *Evaluation of "dose-response" dependence* which determines the rate of influence of various doses. This dependence varies for carcinogenic and toxic effects. It is supposed that carcinogenic effect can be caused by any dose of a hazardous substance, whereas toxic effect becomes evident only if dose exceeds some threshold level called the referent dose.

3. *Evaluation of exposure.* This stage supposes the definition of the value, duration and frequency of exposure of a human with the determined pollutant and the number of people who are exposed to the effect of hazardous substance in various ways.

4. *Risk characteristics.* This means connecting the information obtained from identification of danger, evaluation of "dose-response" dependence and evaluation of exposure for assessment of the risk related to each of scenarios of concerned effect and representation of information about uncertainties or assumptions during realization of analysis.

Effects of substances which are polluting the environment on human health can be realized in various ways. This causes serious difficulties for risk analysis. When researching risks caused by drinking of contaminated water one consider peroral way of inflow.

There are two widespread sources of drinking water in Odessa. They are the system of centralized supply (aqueduct) and the network of city well-rooms. Water supplied into the city aqueduct is taken from the Dniestr River. The water intake is situated on a distance of forty kilometers away from Odessa in Belyaevka.

The existing system of water supply from Dniestr was built 133 years ago (in 1873). Nowadays the spread of aqueduct network is 1600 kilometers. Some parts of this network especially in the central part of the city are in critical situation. This is caused with the fact that some parts of the conduit haven't been repaired since they were built in the 19th century.

To neutralize substances which can contaminate water on its way from water intake to consumer method of chlorination is used for city aqueduct water. Particularly this method is used for water disinfection and for preventing reproduction of pathogenic bacteria in drinking water. Residual quantities of chlorine cause the most negative effect, thus it is the primary pollutant of the aqueduct water. Besides water supplied from the Dniestr River has rather high level of mineralization, particularly hardness.

The main alternative for city aqueduct water is water that citizens can take from the network of city well-rooms. This is deep-well water pumped out from the depth of 130 meters. It is possible to get 15-20 tons of water per day from each well-room. In each of 14 functioning well-rooms water treatment and purification are provided. In such sources water is disinfected using ozone as alternative for chlorine. In that way the same effect as if using chlorination is achieved with much less contamination or even without contaminating water with reagent. Besides deep-well water is much better comparing with water from Dniestr in nearly all sanitary-hygienic characteristics. Research has shown that water pumped out from 130 meter depth has some medicinal properties.

In addition to foregoing chlorine the most essential pollutants of drinking water are suspended matters, mineral salts and pathogenic bacteria, particularly colibacillus. They are taken as primary pollutants in ecological risk assessment.

Using EPA methodic of risk assessment is congenial for selecting substances which cause more negative effects. This methodic gives an opportunity to range all the components of drinking water depending on the level of risk to experience negative effects caused with inflow of hazardous substances into organism by means of drinking contaminated water. Such list of priority substances shows which of them should be removed from water before

usage and which can not cause any harmful effects. This conclusion about danger of each water component can be a base for working out, planning and adoption of water purification and protection measures.

If saying about Odessa city aqueduct the primary measure should be taken is its major repair for preventing contamination.