MONITORING DRINKING WATER QUALITY – AN IMPORTANT ROLE IN PUBLIC HEALTH SURVEILLANCE

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Abstract

The European Union defines essential quality standards that water intended for human consumption must meet through the Council Directive on the quality of water intended for human consumption, Directive aiming to protect human health. Romania has the obligation to monitor drinking water quality and report the results (Act no drinking water quality no.458/july 2002). During the triennial reporting period 2008-2010, by monitoring the physical-chemical and microbiological parameters, the most frequent inconsistent analyzes were identified in the case of chlorides (7.6%), manganese (1.81%), nitrate (0.39%) and in the determination of E. coli, Enterococci, Clostridium perfringens, Coliform. In 2011 the number of inadequate physical, chemical and microbiological tests increased in Bihor county. After identifying the factors incriminated, remedial measures necessary to restore water quality should be undertaken as soon as possible.

Key words: water, quality, monitoring, public health surveillance

INTRODUCTION

Human health and welfare are strictly dependent on a clean environment. Interactions between the environment and human health are very complex and therefore difficult to assess (Manescu S., 1984). Main environmental factors impacting on health are ambient air pollution, low water quality and insufficient hygiene (Zamfir Gh., 1975). Water is the most common substance on earth, representing the factor on which plant and animal productivity depends. It ensures the exchanges between bodies and the environment, being present into the constitution of all animal and vegetable organisms (Meirosu E., et al, 2003). In the human body it performs an essential role in biological processes, which are not possible in its absence. In order to be safely consumed water should have specific and admissible organoleptic, physical, chemical, bacteriological, biological and radioactive properties (Teusdea V., 2007). If it does not meet the conditions established for drinking water, in situations of environmental pollution, water used by the population may be an important factor in disease: infectious diseases (bacterial, viral, parasitic), noninfectious diseases, various poisoning) (Bowling A., 1995).

In 2008, the European Council issued a Directive (98/83/EC) on the quality of water intended for human consumption, in which a number of
obligations, supervision standards, and aspects relating to sanitary inspection and water quality monitoring are drawn (European Environment, 2010). In Romania, the number of monitored parameters varied from one county to another (in 2010 there were 10 parameters in Suceava county and 60 parameters in Cluj county). Bihor county monitored a total of 22 parameters in 2008, 21 in 2009 and 22 in 2010.

Monitoring over time certain health indicators that can be influenced by environmental changes one can observe a directly proportional relationship between these indicators and the environmental parameters taken into consideration (Penescu A., 2001, Bulletin epidemiologique hebdomadaire, 2012). Thus, while monitoring these indicators we can also monitor our life quality; adopting appropriate measures will lead in the future to a state of optimal health and increased life quality of the population.

Aim: Monitoring drinking water quality and identifying inappropriate parameters, so as to adopt appropriate measures.

MATERIAL AND METHOD

In the observational, retrospective and descriptive study performed in statistical reporting, population-type data were collected.

Primary data sources were represented by the periodical reports and statistical bulletins issued according to legislative requirements concerning monitoring (National Institute of Public Health - National Center for Monitoring Risks in Community Environments, Activity reports of Public Health Administration Bihor). Including data in the central database and their processing were performed according to the Guide for Reporting. The methods used were the measurement, description and analysis of parameters.

RESULTS AND DISCUSSIONS


Drinking water quality surveillance is done by monitoring chemical and microbiological parameters.

In Romania, in 2010, a series of tests were performed in order to monitor microbiological parameters, the most common being represented by determining E. coli, Enterococci, Cl.perfringens, Coliform (fig. 1).
The chemical parameters observed were aimed to indicate water oxidability, turbidity, chlorides, nitrates, iron, manganese, lead. Inappropriate analyzes were identified in chlorides (7.6%), manganese (1.81%), nitrate (0.39%) (fig. 2).

In different counties the largest number of inappropriate parameters were obtained in Calarasi - 15 in 2010, Ialomita - 12 and Ilfov – 11 (fig. 3).
In Bihor County in 2008-2011, a total of 341 producers / distributors of drinking water were evaluated, representing 90.72% of the producers / distributors existing in Bihor county, with whom service contracts were signed for the procurement, transport and physical-chemical and microbiological analyzes of water samples in the laboratories of Public Health Administration in Bihor. Water samples were taken from the central water supply systems, water fountains and public fountains (fig. 4).

The activity of monitoring drinking water in 2011 was different by comparison with the previous years, a decrease being observed both in the number of producers and distributors monitored, and in the ratio concerning the number of producers / distributors monitored and the total number of producers/distributors existing in Bihor county.

In 2011 a total of 1369 water samples were taken, of which 794 samples (58.2%) were inadequate. Water pollution observed in the case of water from the central water supply systems is superior to that collected from public wells and fountains (fig. 5.).
Of the total number of samples taken from central supply systems 51.8% samples were inadequate from the physical-chemical point of view, 13.2% in terms of microbiological aspects and 57.3% presented mixed pollution. The study on water quality in the public artesian fountains and wells, conducted in 2011, indicates that 76.5% of the samples taken were inadequate from the physical-chemical point of view, 30.8% were microbiologically improper and 72.8 showed mixed pollution (fig. 6).

![Fig. 6. Evolution of inadequate water sample frequency](source: Activity reports of Public Health Administration Bihar)

To analyze the quality of water supplied by central water supply systems in 2011 18,958 laboratory tests were performed, of which 1968 tests proved inadequate results: 1653 (11.8%) were related to physical-chemical aspects and 315 (6.4%) to microbiological aspects. The analysis of water quality provided in public fountains and wells in 2011 was conducted by 1717 laboratory tests, results being inadequate in 186 situations: 150 (80.6%) referred to physical-chemical aspects and 36 (19.3%) microbiological aspects (fig. 7).

Of the physical-chemical and microbiological indicators monitored in the case of drinking water from central systems, non-compliance with legal regulations on drinking water were present in the case of: ammonia, arsenic, nitrites, nitrates, conductivity, taste, odor, turbidity, sodium, total hardness, color, pH, oxidability, iron, manganese, aluminum. From artesian fountains and public wells, the key indicators that do not meet the standards for drinking water are: nitrates, nitrites, ammonia, taste, odor, turbidity, total hardness, color, arsenic, pH, fluoride, conductivity, oxidability, sodium, iron, number of colonies at 22°C, coliforms, E. coli and fecal enterococci (fig. 8 and fig. 9).
Local authorities on whose jurisdiction these water sources (wells) are present were notified of the inadequacy of water quality in relation to the drinking water norm, in the view of informing and warning people about the risks to their health.
CONCLUSIONS

Water potability increased in 2011, compared to the previous year, in the case of central supply systems (by 8.4%) and in public fountains and wells (by 19.6%).

The drinking water monitoring performed in 2011 indicated an increase in inadequate physical/chemical water samples, of the identified the factors one being able to mention: the taking-over of drinking water stations without final acceptance by the beneficiary; inadequate water supply; producers / distributors did not act in the direction of remedying deficiencies in drinking water stations; the physical and moral wear of some water treatment plants and distribution networks; the absence of rehabilitation and technological improvement of some stations for ensuring water potability; inappropriate disinfection technology; poor service.

Monitoring the quality of drinking water supplied for the population is one of the main objectives aimed at protecting human health. If value parameters are not ensured, necessary remedial measures necessary should be adopted as soon as possible in order to restore water quality.
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