# 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 ao 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 2011the 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 DISSCUSIONS**

In Romania, water quality is regulated by Law No.458/2002, republished in the Official Gazette Part no. 875/2011 on drinking water quality, Government Decision no. 974/2004 - Rules for the surveillance, sanitary inspection and monitoring of drinking water quality and the Sanitary authorization procedure for the production and distribution of drinking water.

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).

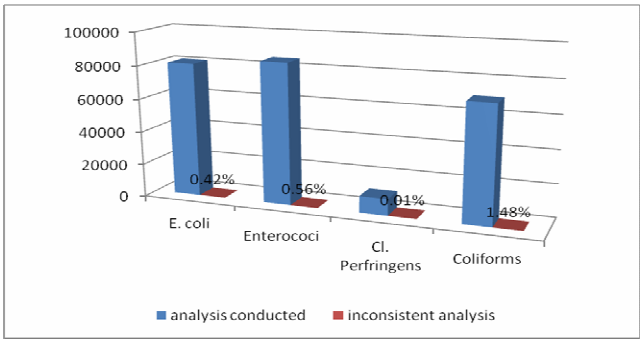


Fig.1. Microbiological parameters - Romania, 2010 *(source: Healt and Environment Report 2008-2010, National Center for Monitoring Risks in Community Environments)*

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).

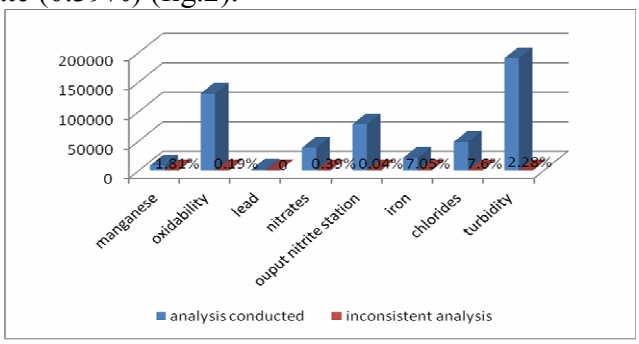


Fig. 2. Chemical parameters - Romania, 2010 *(source: Healt and Environment Report 2008-2010, National Center for Monitoring Risks in Community Environments)*

In different counties the largest number of inappropriate parameters were obtained in Calarasi - 15 in 2010, Ialomita - 12 and Ilfov – 11 (fig. 3).

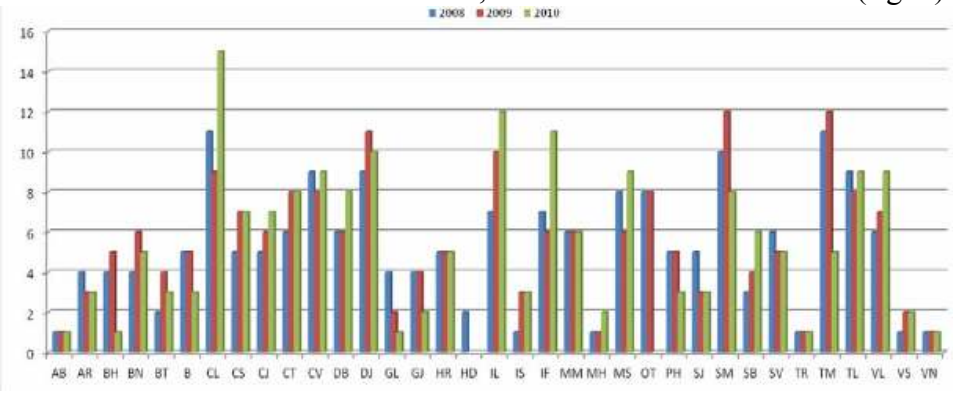


Fig. 3. Number of inappropriate parameters - Romania 2008-2010*(source: Healt and Environment Report 2008-2010, National Center for Monitoring Risks in Community Environments)*

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).

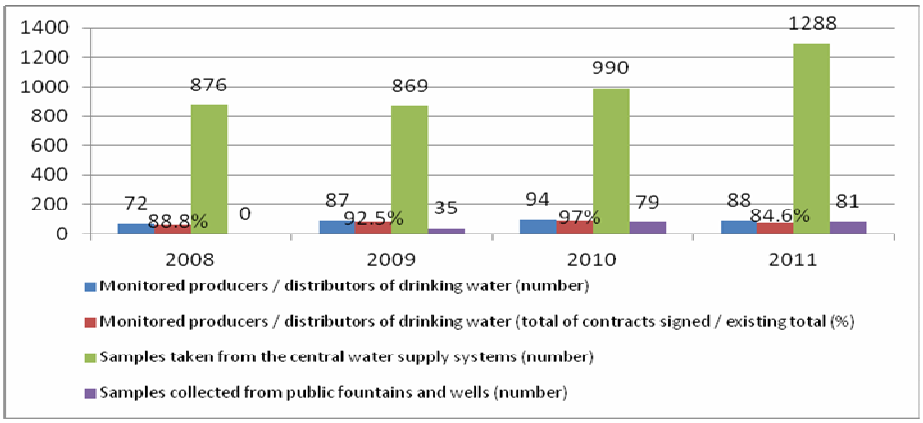


Fig. 4. Analysis of drinking water monitoring activities in the period 2008-2011 *(source: Activity reports of Public Health Administration Bihor)*

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.).

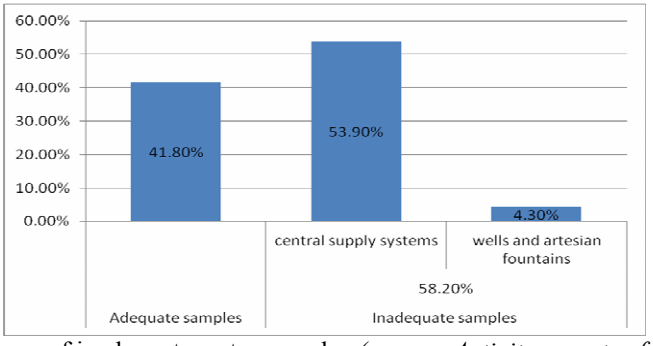


Fig. 5. Frequency of inadequate water samples *(source: Activity reports of Public Health Administration Bihor)*

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).

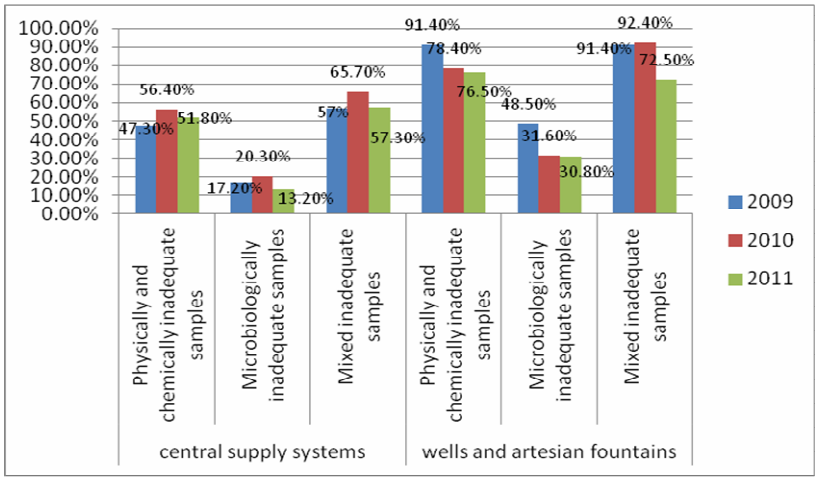


Fig. 6. Evolution of inadequate water sample frequency *(source: Activity reports of Public Health Administration Bihor)*

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 $22^0$C, coliforms, E. coli and fecal enterococci (fig. 8 and fig. 9).

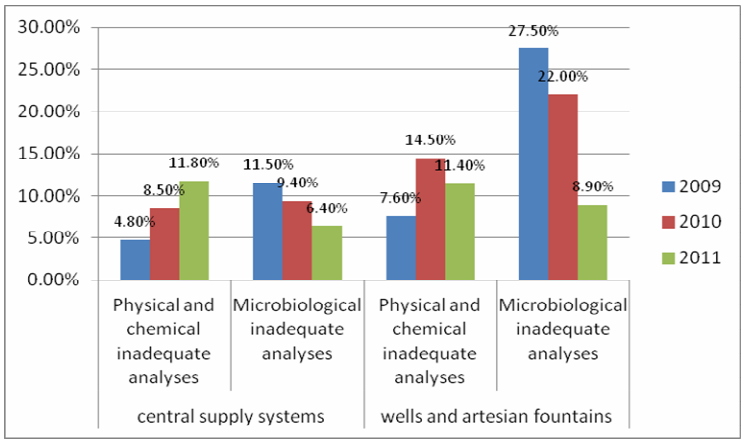


Fig. 7 Evolution of inadequate tests frequency *(source: Activity reports of Public Health Administration Bihor)*

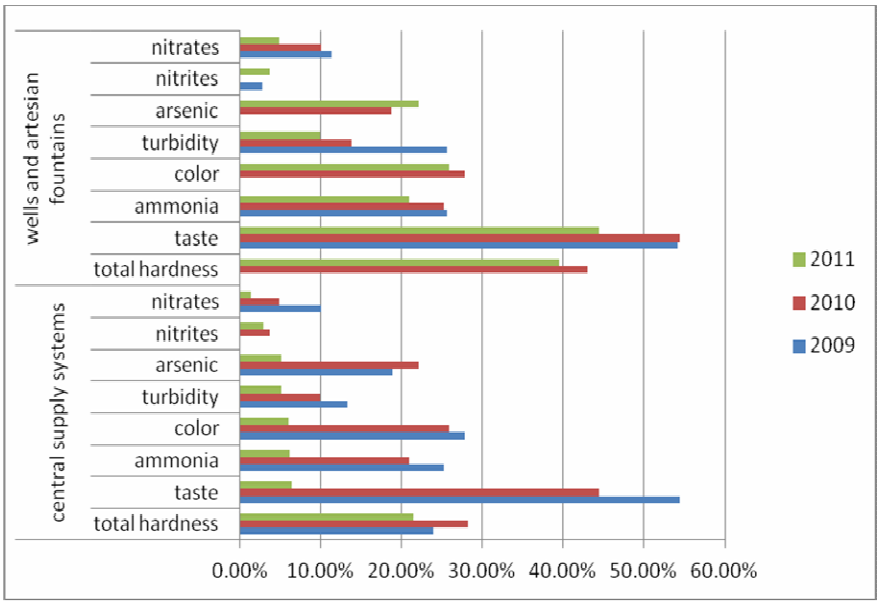


Fig. 8. Evolution of inadequate physical-chemical parameters frequency – central supply systems and public fountains and wells *(source: Activity reports of Public Health Administration Bihor)*

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.

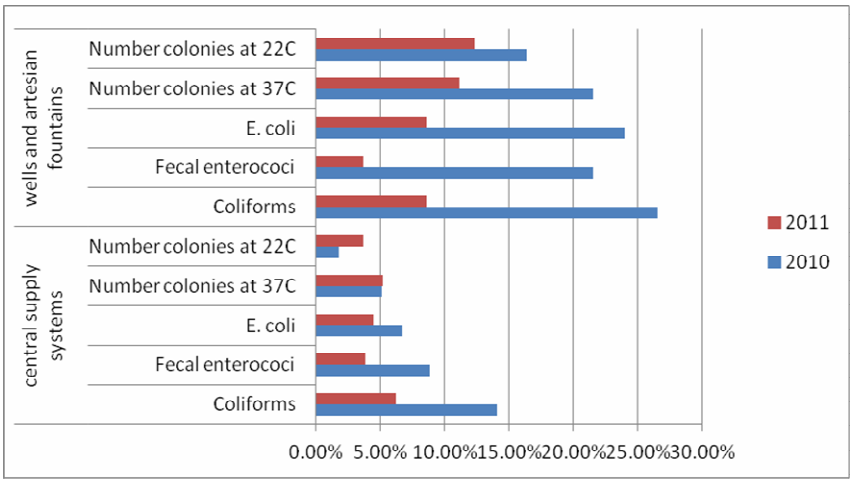


Fig. 9. Evolution of microbiologically inadequate parameters – central supply systems and public fountains and wells *(source: Activity reports of Public Health Administration Bihor)*

**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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