WHAT WE KNOW ABOUT DRINKING WATER IN THE SLOVAK REPUBLIC

Drinking water supply for inhabitants is one of the most important measures for human health protection, moreover, it also characterises the living standard of particular country.

Drinking water sources in Slovak Republic

Groundwater is the drinking water source of the highest quality. Both, groundwater (82.2 %) as well as surface water (17.8 %) are exploited as drinking water sources in Slovakia. **Žitný ostrov is the biggest natural groundwater source in the Slovak Republic (SR) and in Central Europe** with app. 20 400 $l.s^{-1}$ capacity.
Solely groundwater sources are used abstraction for drinking water in the regions of **Bratislava, Trnava and Nitra. In the rest of regions** both, ground water as well as surface water is used as drinking water source for inhabitants.

Drinking water supplies for Slovak Republic in 2008

Public water supply systems feed app. **86 %** of SR inhabitants. The highest proportion of publicly supplied inhabitants is in region Bratislava (97 %), the lowest ratio in region Prešov (77.9 %).
Individual water supplies (private wells) **are used by app. 14%** of SR inhabitants. 80 – 85 % of private water sources for individual use do not comply with hygienic requirements, thus posing permanent risk of human health deterioration, or the water has unacceptable sensorial properties. Faecal pollution, nitrates and iron are the most frequent parameters exceeding the limits. The water quality of the individual sources is impacted by low technical status of the wells, their insufficient depth, but also spills of sewage waters in the vicinity of these wells. The risk of infectious disease is even higher during flood periods and sewage system failures.
Decrease of drinking water consumption from public water supply systems was recorded recently in SR. Private water wells and purchase of bottled water is preferred by increasing part of the population.

Drinking water quality control in Slovak Republic

Drinking water quality and health safety is checked by a set of 82 water quality parameters that are defined by **SR Government Regulation No. 354/2006 Coll. setting out the requirements for water intended for human consumption, and quality control of such water,** that transforms the **Council Directive 98/83/EC** on the quality of water intended for human consumption Limit values of drinking water quality parameters are distinguished according to their health impacts as follows: recommended value, indicative value and the highest acceptable limit value. **Exceeding of the highest acceptable limits can cause the most serious health impacts, which excludes the exploitation of such water for drinking.**
Raw water quality control in the sources and water quality in the distribution network is performed by the public water supply systems owners or operators. Water companies, municipalities or other legal bodies or individuals can serve as public water supply systems operators that have the respective license for operation of public water supply systems of corresponding category. **The regional authorities for public health check the water quality on the spot of the user.**
The results of 2007 Evaluation Report of the National Reference Centre for Drinking Water show that among the **microbiological parameters** the highest exceeding of the limit values was found for **coliform bacteria** (6.2 %), **enterococal organisms** (3.7 %) **and Escherichia coli** (3 %). Among the sensorial parameters the highest exceeding of the limit values was shown for **temperature** (23.5 %), **oxygen water saturation** (8 %) and **iron** (8 %). Insufficient water disinfection was found in 25.4 % of the total number of laboratory analyses - parameter **free chlorine.** The most frequently measured chemical parameters in the framework of drinking water quality monitoring comprise **nitrates** and nitrites. **Nitrate** concentration exceeded the limit value in 0.85 % of analyses, mainly in smaller municipal water supplies. Among the selected **heavy metals**, antimony and arsenic were found in the drinking water of certain Slovak regions having these two elements naturally in the geological ground. In the framework of evaluation of complete analysed parameters of drinking water quality, **limit values were exceeded in 3.2 % of results of year 2007.** When selecting only the parameters that are most important from human health point of view (those having defined the limit value as the highest acceptable limit value), only 0.3 % of analyses shown exceeding of limits.
The results show mostly shortcomings in the protection of water sources, shortcomings in drinking water disinfection, but also negative impact of distribution network to the drinking water quality in the spot of user - parameters causing sensorial changes.
More information on drinking water quality is available also on web site of the **Drinking Water Information System http://pitnavoda.enviroportal.sk**.

Water related health risks

Drinking water can act as infection disease vector in case of microbiological contamination, mainly **typhoid fever, bacterial dysentery, cholera, anthrax, leptospiroses, viral hepatitis A, enteroviroses, parasitic** and other diseases. The most frequent waterborn diseases in SR conditions are (mainly in persons living under lower hygienic standards) **bacilar dysentery, infectious hepatitis A**, certain animal-transmitted diseases and other diarrhoea disease. The risk of those diseases is higher during flood periods or in cases of sewage failures.

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„Information system on water intended for human consumption"

Project beneficiary
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CHARACTERISTICS OF SELECTED DRINKING WATER QUALITY PARAMETERS

<table>
<tr><td>Coliform bacteria</td><td>Indication: Faecal pollution from digestive system of homoiothermic animals and from humans.
Impacts: Risk of entrance of another potentially pathogenic microorganisms.
Limit: Absence in 100 ml (LV, PS). Absence in 10 ml (LV, IS).
Note: Indication of week water source protection and shortcomings in sanitary security of water distribution.</td></tr>
<tr><td>Escherichia coli (E.C.)</td><td>Indication: Recent faecal pollution exclusively of intestinal origin.
Impacts: Certain uncommon strains of E. coli are or can be under special conditions pathogenic. They can cause different inflammations, e.g. of urinary bladder.
Limit: Absence in 100 ml (LV, PS). Absence in 10 ml (LV, IS).
Note: Indication of serious shortcomings in water source protection, in drinking water treatment and in its sanitary security.</td></tr>
<tr><td>Enterococci</td><td>Indication: Recent faecal pollution (out of intestinal system they quickly die), general pollution.
Impacts: Cause of urinary tract infections, myocardium inflammations, and intestinal infections. Possible resistance to antibiotics.
Limit: Absence in 100 ml (LV, PS). Absence in 10 ml (LV, IS).
Note: Indication of week water source protection and shortcomings in treatment and sanitary security of water distribution.</td></tr>
<tr><td>Iron (Fe)</td><td>Indication: Insufficient water treatment and follow-up of certain reactions in the distribution system. Increased water aggressivity.
Impacts: No risk for human body. Impact to sensorial properties of water (yellow to rusty colour, or bitter taste).
Limit: 0.2 mg/l (LV), 0.5 mg/l (for iron of geological origin and when unfavourable impact to water sensorial properties do not appear)</td></tr>
<tr><td>Manganese (Mn)</td><td>Indication: Insufficient water treatment efficiency, follow-up of certain reactions in the distribution system. Increased water aggressivity.
Impacts: Parameter not important from human health point of view. Impacts sensorial water properties (brown-black colour, or bitter taste), unlimited growth of Mn bacteria (clogging of water pipe).
Limit: 0.05 mg/l (LV), 0.2 mg/l (for manganese of geological origin and when unfavourable impact to water sensorial properties do not appear)</td></tr>
<tr><td>Calcium (Ca)</td><td>Impacts: Presence in water is desirable.
Limit: More than 30 mg/l (recommended value - RV), 1.1 – 5.0 mmol/l (for pooled content of Ca and Mg).</td></tr>
<tr><td>Magnesium (Mg)</td><td>Impacts: Presence in water is desirable. Excess results in inappetence, diarrhoea to unconsciousness and death.
Limit: 10.0 - 30.0 mg/l (RV), 125 mg/l (LV), 1.1 - 5.0 mmol/l (for pooled content of Ca and Mg)
Note: Supports mineralisation of organic substances from lifeless organisms, contributing to self-purification processes in water.</td></tr>
<tr><td>Water hardness</td><td>Indication: Generally it represents sum of calcium and magnesium content in water. They appear in water by leaching from limestone and dolomites.
Impacts: High concentration of elements contributing to water hardness is desirable in drinking water. In contrary, in technological waters it causes creation of "water stone".
Limit: 1.1 to 5 mmol/l (RV) (i.e. water hardness 6.16 to 28 °dH)
Note: Recalculations of water hardness: 1 mmol/l = 5.6 °dH, 1 °dH = 0.1783 mmol/l.
<table>
<tr><td rowspan="6">Water hardness scale</td><th>Label</th><th>Hardness degree (mmol/l)</th><th>Hardness degree (°dH)</th></tr>
<tr><td>Very soft</td><td>< 0.69</td><td>< 3.89</td></tr>
<tr><td>Soft</td><td>0.7 – 1.25</td><td>3.9 – 7</td></tr>
<tr><td>Moderately hard</td><td>1.26 – 2.5</td><td>7.01 – 14</td></tr>
<tr><td>Hard</td><td>2.51 – 3.75</td><td>14.01 – 21</td></tr>
<tr><td>Very hard</td><td>> 3.76</td><td>> 21.01</td></tr>
</table></td></tr>
<tr><td>Nitrates (NO_3^-)

Nitrites (NO_2^-)</td><td>Indication: Excessive use of fertilisers and leakage of waste water from septic tanks and farms.
Impacts: Nitrates are reduced in intestinal system to more toxic nitrites. They cause transformation of haemoglobine to methaemoglobine, that is not able to transfer oxygen. Oxygen lack is manifested by cyanosis and blue lips, and it can lead to asphyxia, failure of brain functions and insufficiency of basic vital functions. Nitrates react in stomach with amines resulting in carcinogenic N-nitroso compounds.
Limit for nitrates (NO_3^-): 50 mg/l (HALV)
Limit for nitrites (NO_2^-): 0.5 mg/l (HALV)
Note: Risk of methaemoglobinemia is higher for suckling babies up to 3 months of age.</td></tr>
<tr><td>Free chlorine</td><td>Indication: Water disinfection.
Impacts: Health impact concerns are not reliable since the hygienic criteria, concentration limits and professional approach of drinking water supplier and operator are met.
Limit: 0.3 mg/l (LV) (after water treatment), 0.05 mg/l (requested minimal concentration in the distribution network)
Note: Chlorine application in the process of drinking water disinfection is considered world-wide as one of the most effective measure for water health safety and prevention of appearance and spread of diseases.</td></tr>
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Legend: PS - public supply, IS - individual supply, LV - limit value, HALV - highest acceptable limit value, RV - recommended value, °dH - German degree