Drinking water

Drinking water is water that is not harmful to health, which, even when continuously consumed, does not cause disease or health disorders due to the presence of microorganisms or substances affecting the health of natural persons and their offspring by acute, chronic or late effects, and whose sensory characteristics and quality do not prevent its consumption and use for the hygienic needs of natural persons. (According to the definition of drinking water, which is similarly enshrined in Act 258/2000 Coll. and Decree of the Ministry of Health of the Czech Republic 252/2004 Coll, which are directly related to drinking water.)[1]

Hygienic requirements for the safety and quality of drinking water (for which the law uses the term "quality of drinking water") are determined by the hygienic limits for the content of microbiological, biological, physical, chemical and organoleptic quality indicators, which are regulated by Decree No. 252/2004 Coll. (as amended) or are permitted or determined under the Act on the Protection of Public Health by the competent sanitary authority. Compliance with the above requirements is checked by laboratory analyses of drinking water, the frequency and extent of which are required by Act No 258/2000 Coll. on the protection of public health for water supply operators.[2]

Water treatment

🔎 *For more information see Bulk water supply.*

Drinking water indicators and their hygiene limits

Values for the determination of drinking water parameters:

- recommended value (DH);
- limit value (MH) - exceeding it does not pose an acute health risk. An adjustment is necessary;
- Maximum limit value (NMH) - must not be exceeded. If exceeded, it is not drinking water.

Microbiological and biological indicators of drinking water and their hygienic limits

'**Clostridium perfringens**'

- limit: 0 CTU (colony forming unit)/100 ml, limit type: MH;
- pathogen, affecting the quality of drinking water from surface water.

Enterococci'

- limit: 0 KTJ/100 ml, limit type: NMH;
- fecal pollution indicator.

'**Escherichia coli**'

- limit: 0 KTJ/100 ml, limit type: NMH;
- fresh fecal contamination indicator.

Coliform bacteria'

- limit: 0 KTJ/100 ml, limit type: MH;
- indicator of total fecal pollution.

Microscopic image - abioseston

- limit: 10%, limit type: MH;

Microscopic image - number of organisms'

- limit: 50 individuals/ml, type of limit: MH;

Microscopic image - living organisms'

- limit: 0 individuals/ml, limit type: MH;

Colony counts at 22 °C';

- limit: 200 KTJ/ml, type of limit: MH;
- the source is most often feces, but also soil, plants, dust, etc.

Colony counts at 36 °C';

- limit: 100 KTJ/ml, type of limit: MH;
- the source is most often feces, but also soil, plants, dust, etc.

Pseudomonas aerugnosa'

- limit: 0 KTJ/250 ml, limit type: NMH;

Selected physical, chemical and organoleptic parameters of drinking water and their hygienic limits =

pointer	limit	limit type
ammonium ions	0.5 mg/l	MH
benzene	0.001 mg/l	NMH
bromates	0.01 mg/l	NMH
nitrates	50 mg/l	NMH
nitrite	0.5 mg/l	NMH
fluoride	1.5 mg/l	NMH
free chlorine	0.30 mg/l	MH
epichlorohydrin	0.0001 mg/l	NMH
chlorides	100 mg/l	MH
chromium	0.05 mg/l	NMH
Total cyanide	0.05 mg/l	NMH
copper	1 mg/l	NMH
pH	6.5-9.5	MH
sodium	200 mg/l	MH
calcium	30 mg/l	MH
magnesium	10 mg/l	MH
iron	0.2 mg/l	MH

- **Nitrates and nitrites'** - react with haemoglobin in the blood to form methaemoglobin, causing a risk of internal suffocation, especially in infants under three months of age. They enter the water supply from human and animal faeces or from sewage produced in towns and villages. Leaching from agricultural land or contamination by fertilisers are also possible.
- **Epichlorohydrin'** - causes local irritation and changes in the central nervous system. It is thought to be carcinogenic. Epichlorohydrin enters water sources by leaching from epoxy coatings in pipelines and by release from some improper ion-exchange devices used in water treatment.
- **Fluoride** - until 1993 it was added artificially to water and served as a prevention of tooth decay. However, very strict concentration ranges had to be observed for fluoride to have a preventive effect. Higher concentrations cause tooth staining, so-called dental fluorosis, and bone damage, bone fluorosis. Today, fluoride is present in water due to the leaching of the geological bedrock.
- **Magnesium and calcium'** - acts to prevent deaths from cardiovascular disease and probably to prevent some other diseases. In concentrations above 100 mg/l, magnesium may have a laxative effect in the presence of sulphates.
- **Chlorine'** - added to drinking water as the most common disinfectant. At the permitted concentration (up to 0.3 mg/l), chlorine present in water is not harmful to health. Skin irritation may exceptionally occur in sensitive persons.
- **Copper'** - in elevated concentrations (above 1mg/l), causes vomiting, nausea and other gastrointestinal symptoms. Chronic use may cause liver and kidney damage.
- **Lead'** - damages developing nervous tissue in children. This can lead to impaired intelligence, learning and behaviour. Lead also interferes with calcium metabolism. In adults, it increases blood pressure, damages the kidneys and causes anaemia.

Drinking water control[3]

1. **Truncated analysis'** - used to obtain periodic information on the stability of the water source and the effectiveness of water treatment, especially disinfection (if carried out), microbiological quality and organoleptic properties of the water, in order to determine whether the limit values set by the decree or by the public health authority under the law are complied with.
2. **Full analysis'** - the purpose of full analyses is to obtain the information needed to determine whether the limit values of **all** indicators set by Decree 252/2004 Coll. are being met.

The minimum annual frequency of sampling and analysis of drinking water samples for the purpose of checking whether the water is of drinking water quality shall be determined according to the number of inhabitants of the area supplied or the volume of water distributed or produced in the area supplied (m^3/day). In addition, sampling and analysis (abbreviated) of drinking water samples shall be carried out:

- from the new part of the water pipeline to be put into operation;
- in case of water supply interruption for more than 24 hrs;

- prior to the commencement of seasonal use of a portion of a water supply or individual drinking water source;
- after repairing a water main break that could affect the quality of the water in the water main.

A full analysis of the treated drinking water must be carried out before the new drinking water source is put into operation. The results of the analysis shall not be older than 6 months. Drinking water samples shall be taken for control purposes in such a way as to be representative of the quality of drinking water consumed throughout the year and of the entire water supply network. The sampling points shall be chosen so that more than 50 % of the sampling points are not permanent but change each year.

Hardness of water[4]

In general, water hardness is characterized as the concentration of calcium and magnesium in the water. Other definitions state that it is the content of divalent cations of calcium, magnesium, strontium and barium, or all polyvalent cations of alkaline earth metals. Calcium is usually considered to be the main component of water hardness. A five-point scale is used to assess water hardness. It divides water into very soft, soft, medium hard, fairly hard and very hard. At the same time, hard water is distinguished between permanent and transient water. Permanent hard water contains dissolved chlorides, sulphides, nitrates, and silicates. The essential compound in transient hard water is calcium bicarbonate, the precipitation of which produces scale (calcium carbonate). While permanent hard water can only be removed chemically (calcium hydroxide and sodium carbonate remove it), transient hard water can be removed by boiling. The hardness value of water is usually measured in mmol/l. However, older units such as German degrees (°N or °dH) or French degrees (°F) are still used. These units are mainly used by detergent manufacturers to indicate the hardness of water. The units can be converted using the following formulae. German degrees: 1 mmol/l = 5,6°. French degrees: 1 mmol/l = 10°.

Water hardness scale

type of water	concentration of dissolved substances
very soft	0-0.7 mmol/l
soft	0.7-1.3 mmol/l
medium-hard	1.3- 2.1 mmol/l
quite hard	2,1-3,2 mmol/l
hard	3,2-5,3 mmol/l
very hard	> 5.3 mmol/l

Calcium, the main component of water hardness, is beneficial from a health perspective. It helps healthy growth and prevents calcification. It is therefore recommended to consume harder water, although the hardness should not exceed certain limits in the long term. There are no strict water hardness values to be observed in legislation. However, the Drinking Water Ordinance sets a recommended range of 2,0-3,5 mmol/l. These values correspond to the usual composition of tap water in Czech households, which thus represents the most accessible source of calcium for the human body.

Links

Related articles

- Bulk water supply
- Individual drinking water source

External links

- Vodárenský portál http://www.vodovod.info

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