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## DEBRECEN

Expert opinion on the water of well number Debrecen K-2510 OKK qualified as  
mineral water

Budapest, March 2011

## Expert opinion on the water of well number Debrecen K-2510 OKK qualified as mineral water

Essays on mineral waters generally start with rather boring banalities (water is the source of life, clean water means treasure or future wars will be started for drinking water etc.). For this reason this essay disregards all these trivialities and a conclusion is made only: you have an easy job if you have to issue a positive description about Kék Gyémánt (Blue Diamond) mineral water.

Hungary has an ambiguous situation concerning drinking water quality. Water providers provide customers with water of mineral water quality and cleanness from the wells with filtration system on the river bank along the Danube, from karst wells and karst shafts as well as in the region of Kisalföld (e.g. Tatabánya, Várpalota or Zirc). In Alföld (the landscape of the Hungarian Plain) tap water quality should be improved much, especially the high arsenic, boron, fluorine, nitrate and ammonia content and the low enjoyment value are a problem.

These water contaminants affect over 1,6 million inhabitants in 507 towns as you can see in the table below (the number of all towns and inhabitants is not the same as the total number of those affected by certain water contaminants because of the multiple contaminant presence).

Water contaminant	Number of towns affected	Number if inhabitants affected
Arsenic	475	1 548 614
Boron	53	113 154
Nitrate	7	26 625
Fluoride	5	2 980
Total	507	1 612 147

## Arsenic content (As) of tap waters in Hungary

### Arsenic (As)

- contested
- non-contested

EU/HU limit value: 10 µg/l

In Hungary in the towns listed in the Gov. Order 201/2001 (10.25.) temporary limit values different from those ones indicated herein are valid until 25 December 2009.

Made by the National Environmental Health Institute, Quarter 1 2007

## Boron (B), Fluoride (F) and Nitrate (NO<sub>3</sub>) content of tap waters in Hungary

boron, fluoride contested  
boron contested  
fluoride contested  
nitrate contested  
none of them contested

In Hungary in the towns listed in the Gov. Order 201/2001 (10.25.) temporary limit values different from those ones indicated herein are valid until 25 December 2009.

Made by the National Environmental Health Institute, Quarter 1 2007

EU/HU limit value:  
B: 1,0 mg/l  
F: 1,5 mg/l  
NO<sub>3</sub>: 50 mg/l

## Ammonia

over EU limit value  
county border  
population 2002  
1000  
1000-2500  
2500-5000  
5000

The above give explanation to the fact that contrary to other kinds of food the mineral water consumption increases in Hungary year by year. In 2010 it was 109 l per person. This value means that several Hungarians cover their whole biological water demand with mineral water only (appr. 2 l/day). It is recommended for them to drink mineral water of reasonable mineral content.

Daily mineral substance demand for an ordinary lifestyle:

Chrome: 100 µg

Selenium: 70 µg

Iodine: 0,15 mg

Fluorine: 2 mg

Copper: 2 mg 4 mg

Zinc: 15 mg

Iron: 18 mg

Magnesium: 0,4 g

Phosphorus: 1,2 g

Calcium: 1 g

Potassium: 2,5 g

Common salt: 8 g

Check the physiological effects of the components:

The importance of Potassium-Sodium

On the cell membrane there are several potassium channels ( its open state is called osmosis)

Potassium-Sodium pump: mechanism requiring energy for maintaining cell membrane potential

Energy provides by ATP

The process is catalyzed by an enzyme (Na-K-ATPáz) (the enzyme is activated by magnesium)

Another "pump" changes  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$

$\text{Na}^{+}$  and  $\text{K}^{+}$ : maintaining cell membrane potential

$\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ : control and directing part

The regulation is extremely complex and even in case of a (relatively) missing ion may cause serious function disturbances, in case of physical stress: cramps!

Magnesium

One of the eight main rock-forming components.

The water from limestone and dolomite hollows contains it in big quantities

In the human body in bones and cells,

there are 24-28 g in the human body

Protein and carbon-hydrate metabolism processes,

conduction of stimulus

component of 300 enzymes

it is required for muscle function

Daily amount: 300-350 mg

Lack of magnesium: decrease of diameter of K-Na pump,

decrease of activity of ATPáz enzyme

## Calcium

common element, 3,6 % of the earth's crust

it dissolves well in CO<sub>2</sub> water

in the human body there is 1000 g of calcium (99% in the bones)

Component of bones and teeth

Penetrability of cell membrane, enzyme activating,

conduction of stimulus: muscle relaxation, blood coagulation

Daily amount: 1000-1500 mg, 20-40 % absorbs,

utilization of D- vitamin and protein supply

little calcium intake may cause osteoporosis

Phosphates hinder Ca absorption (Coke)

## Chloride

the biggest quantity in sea water (ion)

in waters under surface indicates sea water origin

in the human body in extra cellular space in form bound to Na or K in food,

in the human body as chloride

regulation of fluid balance with hydrogen it forms

gastric acid, acid-base balance

Daily amount: 3 g

## Hydrogen-carbonate

it forms through dissolution of carbonate rocks

in the presence of carbonic acid

water getting through limestone layer is rich in hydrogen carbonate

in the human body it causes alkalizing effect

it is good against pyrosis

the human body can generate it so its lack does not cause a disorder

Let's see the favorable physiological effect of the composition of Kék Gyémánt (Blue Diamond) mineral water and let's compare it with other popular Hungarian and foreign mineral waters imported from abroad:

Sodium content: 23 mg/l

Today, the favorable physiological effect of the low sodium content is essential as your body is burdened with the excessive salt amount found in crisps, snacks or fast food.

The above also cause high blood pressure.

	Sodium content (mg/l)
Aqua Matthias	65
Ave	34
Balfi	196
Civis	38
Csokonai	35
Jászok Kincse	112
Pannon Aqua	43
Parádi	165
Pávai Vajna	230
Theodora Kékkúti	37
Visegrádi	67
Borsec	68,5
Hargita Gyöngye	66,3
Tusnád	82

Calcium content: 103 mg/l

As it was mentioned above, 20-40 % of Ca intake absorbs only so it is important to drink waters with rather high Ca content for healthy teeth and bones.

	Ca content (mg/l)
AVE	60
Civis	62
Csokonai	59
Jászok Kincse	36,6
Mizse	60
Pannon Aqua	65
Pávai Vajna	30,8
Primavera	60
Szentkirályi	63
Veritas Gold	64
Evian	78
Jana	63
San Benedetto	48,2

Magnesium content: 20, 7 mg/l

This value can be considered an average value among the Hungarian mineral waters.

Chloride content: 6 mg/l

In addition to the low sodium content the low chloride content is another positive fact so drinking this kind of mineral water common salt intake does not increase.

	Cl content (mg/l)
Balfi	69
Lillafüredi	17
Natur Aqua	24
Pávai Vajna	76
Theodora Kékkúti	17
Visegrádi	54
Perrier	23
San Pellegrino	59
Vöslauer	21

In addition to the above macro ions, it is important to point out to another water component: that is the relatively high (31 mg/l) meta silicic acid content.

Those people who do hard physical or mental work, athletes, pregnant women, growing children and people suffering of chronic diseases have to take meta silicic acid in a special big amount. Old people's meta silicic acid intake may be critical as the connective tissues of the human body can absorb less and less meta silicic acid with the years. This is one reason for the fact that the connective tissues lose their elasticity and flexibility. Also, young people suffer of lack of silicic acid quiet often due to their eating habits. If vegetarians eat a great amount of cereals that are rich in meta silicic acid they can get this trace element in a sufficient amount. However, if people eat not-whole-grain cereals, meat and food products of animal origin they risk not getting trace elements in a sufficient amount. There is another important fact to be considered: agricultural lands may lose their rich nutrient content and as a result whole-grain cereals can also lose their meta silicic acid content.

Finally some words about organic and inorganic micro contaminants.

Except for Ba, Zn and As, organic micro contaminants are under traceable limit value. The same concerns to organic micro contaminants. The volatile aromatic hydrocarbons (BTEX), the volatile chlorinated aliphatic hydrocarbons (VOCI), the polycyclic aromatic hydrocarbons (PAH) and pesticides were all under traceable limit value.

The tritium test result ( $<0,06$  Bq/l) proves that in the water there are not any elements older younger than 60 years. That confirms the protection test of the well according to which the protective zone connected with fifty-year access period does not have a surface section.

To sum it up, it can be stated that Kék Gyémánt (Blue Diamond) acknowledged mineral water is a water free from any contaminants, originally clean water of excellent quality and due to its composition it is the right water to cover biological water demand.

Through these features it can also be applied in food industry (beer production, soft drink production). It is slightly alkaline so it has an especially favorable physiological effect.

Budapest, 15.02.2011

(signature: illegible)

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