

What's up in your tap?

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Abstract

The main task of our project is to gather and analyse research materials on the suitability of tap water, coming from our water supply, to be consumed. Moreover, we will also try to question the widely-held belief that tap water is less healthy than bottled water.

The object of our interest will mainly be the bodies of water in Rybnik and its surrounding area, which we draw our water from. This water is subject to special chemical processes before finding its way to our taps.

We will compare the results of our research with the research results obtained by some institutions dealing with water and its suitability to be drunk, for example The Water and Sewage Company in Rybnik.

We have become interested in this topic because of the prevailing stereotype of tap water being unhealthy or even harmful that still exists among many Polish people.

If our hypothesis that cheaper, commonly available and not aggravating the environment tap water is just as good as bottled water is confirmed, we will conduct an information campaign among our students and local community.

We will also try to encourage the local inhabitants to drink tap water and thereby reduce the consumption of plastic bottles, contributing to the improvement of our local and national environment.

Keywords

tap water, waterworks, Rybnik

1. Introduction

Rybnik is a town situated in the southern part of Poland, in the region called Silesia. It has 27 districts in which there live about 137000 inhabitants. The town has got quite modern hydrological infrastructure which allows us to meet the European and national norms of water treatment.

In addition to the water and sewage infrastructure, the town has also got a lot of interesting water complexes like Rybnik Lake which is a very important area because it functions as a cooling system for the carbon power station in Rybnik. Because of the fact that the water is constantly heated up by the power station, the lake constitutes a very interesting ecosystem, owing to which a lot of organisms have favourable conditions to survive although the climate is not suitable for them. By the lake there is a dam which helps to keep water at the correct level. [1]

Two rivers flow through Rybnik: The Ruda and The Nacyna. The main function of The Nacyna, due to the bad condition of its water in the local ecosystem, is to constitute home for water fowl. The Ruda river is placed in a beautiful landscape park known as "Cistercian Land-

scape Compositions of Rudy Wielkie". It performs a lot of functions as an interesting ecological area which were shown at the previous conference -"Water Is Life 2014". The Ruda was chosen to be The River of The Year in 2015. [2]

Tap water in Rybnik is derived from three different sources – Dzieńkowice Reservoir, Goczałkowice Reservoir and the underground water intake in Tęczowa Street. [Fig. 1]

The share of Goczałkowice Reservoir in the total production of drinking water provided by the Upper Silesian Waterworks in Katowice amounts to about 30%. About 1 million people have access to that water. It is a loam intake so the water is not rich in minerals. [3]

The water from Dzieńkowice intake goes to the Upper Silesian Waterworks (the annual absorption of the water is about 21 million cubic meters). It was built as the main source of water for the Silesians and as a water tank for Katowice Steelworks. [4]

The town has also got its own intake, a deep well, in Tęczowa Street. This intake was used as a source for the old brewery. The water from this well has higher hardness and a lot of minerals. It is obtained from the depth of 50 m. Rybnik's daily need of water is about 1600 cubic meters and this well gives us about 7,5 % of it, which is about 1200 cubic meters. [5]



Fig. 1: Water intake in Tęczowa Street.

The Silesian region, including Rybnik, is characterized by a high level of industrialization which quite significantly affects the local environment. As far as the local hydrological conditions are concerned, smaller rivers and surrounding local reservoirs suffer the most. However, there are also advantages of the high level of industrialization in our region. Thanks to the access to three different sources, modern hydrological infrastructure and many water controls (in the local and Silesian water control stations) we can say that our tap water is as good as bottled mineral water.

Another essential issue concerning, indirectly, water is the consumption of PET bottles to their distribution. Poland does not have any system of collecting and reusing bottles (a common idea in Germany or the Netherlands).

In 2012 about 4,5 billion plastic bottles were distributed in our country and only 1.1 billion of them were recycled while the rest were dropped in woods and rubbish dumps or burnt in stoves. 0,5 kg of carbon dioxide is emitted to the atmosphere while producing 1 plastic bottle and its decomposition takes 500 years.

Since 2013 there has been an obligation to recycle bottles in Poland. The more people decide to drink tap water, the fewer plastic bottles will be produced and our environment will be in better condition. [6]

2. The purpose of the investigation

1. Why is a large part of our society afraid of drinking tap water straight from the tap?
2. Is the fear of tap water only a stereotype or are our fears justified?
3. Is tap water healthy for us?
4. How can we give our society reliable and objective

information about tap water to let people make conscious decisions about drinking it straight from the tap?

5. What can be done to reduce the amount of plastic waste?

The questions mentioned above became the starting point of our research.

3. Method of the investigation

To achieve our goals we covered the following aspects:

- a) We gathered information about tap water from different sources;
- b) We analyzed different Polish and European norms which set standards for tap water;
- c) We got to know the methods of testing the content of water;
- d) We carried out physicochemical research (conductivity, pH, turbidity and colour of water, the concentration of chlorides, iron, manganese, ammonia, nitrates, nitrites, alumina, the concen-

tration of ions of calcium (Ca^{2+}) and magnesium (Mg^{2+}) and bacteriological research (the whole amount of bacteria, Escherichia Coli, Clostridium perfringens, Enterococcus) of water in our school and compared the data with other water intakes and norms;

- e) We visited two waterworks laboratories in Rybnik and Katowice which deal with testing tap water;
- f) We carried out interviews with a nutritionist and a doctor;
- g) We conducted questionnaires about tap water among our local and school society (403 people);

- h) We conducted organoleptic tests in order to obtain information about characteristics and taste expectations concerning tap water [Fig. 2];
- i) We prepared a multimedia presentation and leaflets that we presented to the local society;



Fig. 3: Presentation at a local school

- j) We contacted local schools and community centers, where we presented our research on tap water [Fig. 3];
- k) The conclusions of our research were published on social networking sites.



Fig. 2: Organoleptic test

4. Results of the experiment

Gathering information about tap water, we traced water from its source to our taps. We visited all the institutions which deal with transport, research, treatment and distribution of water in our region. We used the collected information to prepare materials showing objective results concerning tap water.

Basing on the collected materials everyone could verify their opinion about tap water and decide whether or not to drink it straight from the tap.

We compared the results of testing tap water in our school with the results in other parts of Rybnik, with norms being in force in Poland [7] and the European norms. The research has shown that tap water meets all stringent requirements [Table 1].

The questionnaire was conducted among 403 citizens of Rybnik.

- a) More than 60% of the respondents declare that they drink water straight from the tap; most of them if they do not have another choice at a given moment (Fig. 3);
- b) The people who do not drink tap water dread the contamination caused by installations or bacteria (Fig. 4);
- c) 90% of the people could be persuaded to drink straight from the tap if they had access to reliable

information on the topic of the quality of tap water or if water tests were directly performed in their houses (Fig. 5);

- d) Foreigners staying in Poland are more willing to drink tap water than Polish residents (Fig. 6).

We compared the cost of water and we found out that despite having the highest price of water in Poland and one of the highest prices in Europe, the price of tap water is lower than that of bottled water (the difference equals 50gr/l or 12cents/l).

The organoleptic survey conducted in our school shows that more than 90% of the 93 students do not distinguish between tap water and bottled water.

Having prepared informative materials we began a campaign promoting the consumption of tap water.

- a) We conducted lectures for about 620 students from different schools in Rybnik;
- b) We handed out 1000 leaflets;
- c) We spread the information concerning our research in the local media and on social networking sites. We aroused interest in tap water as well as a social discussion about that topic.

We also joined two other competitions. One of them was organized by The Waterworks in Rybnik. We were appreciated by them - we won the first place with the prize of a drinking fountain for our school.

Parameter	Results of samples from IV LO	Norms being in force in Poland [7]
Conductivity $\mu\text{S}/\text{cm}$	255	2500
pH	7,20	6,5-9,5
Colour Hz	5,8	15
Turbidity NTU	0,388	1,0
Iron mgFe/dm^3	0,12	0,20
Mangan mgMn/dm^3	0,011	0,05
Chlorids mgCl/dm^3	21,37	250,00
Water hardness $\text{mmolCa}+\text{Mg}/\text{l}$	1	0,6-5,0
Available chlorine mgCl_2/l	0,022	0,30
Ammonia $\text{mgNH}_4/\text{dm}^3$	0,04	0,50
Nitrates (V) $\text{mgNO}_3/\text{dm}^3$	2,2	50
Nitrates (III) $\text{mgNO}_2/\text{dm}^3$	0,03	0,50
Aluminium mgAl/dm^3	0,05	0,20

Table 1: Results of the research in IV LO

Why are you afraid of tap water?

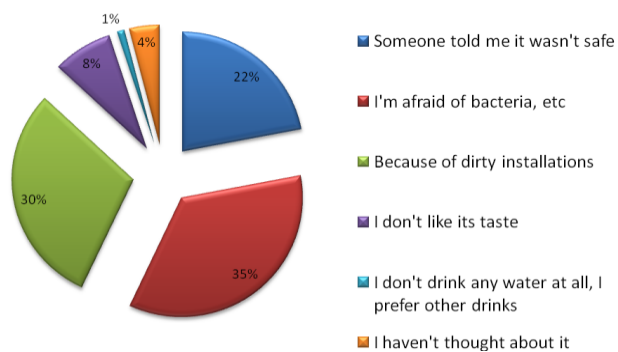


Fig. 4

What would convince you to drink tap water?

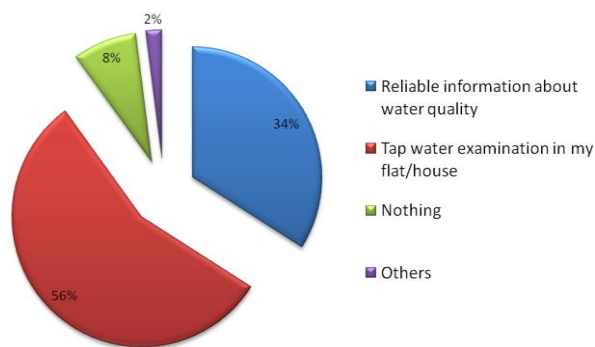


Fig. 5

Do you drink water straight from the tap?

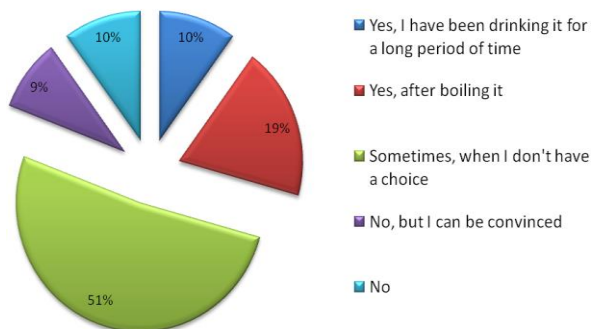


Fig. 3

Do you drink tap water in Poland?

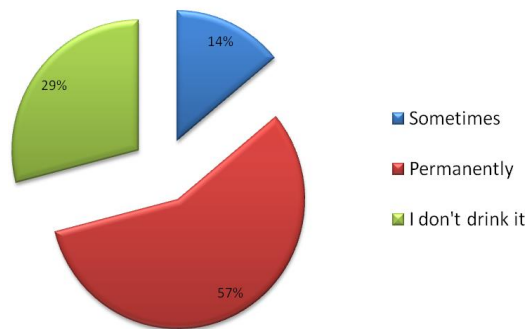


Fig. 6

5. Conclusion

Thanks to a thorough control of compatibility of domestic and European norms as well as advanced technological infrastructure, tap water is competitive with drinking water.

The stereotype that tap water is not good for drinking was mainly passed on by the older generation who was exposed to polluted water from taps.

The water from our taps now is much better than the water 30 years ago [8]. The process of preparing it for drinking is very time-consuming and painstaking as we could see it in the laboratories we visited. The condition of water is constantly checked. It is also controlled in the receiver's place as it is in our school.

Most of the respondents are not convinced to drink tap water. Despite the fact that there is no possibility of the presence of foreign bodies in the water supply networks, 30% of the respondents are afraid of dirty installations, which is indirectly related to the fact that some buildings were built in the communist era and some of them may not meet modern standards. As a result of oxidation, metal deposits may precipitate but we must keep in mind that these are extremely rare cases, however deeply rooted in

the public consciousness. 35% of the respondents are sure that there are a lot of dangerous microbes in water, which is impossible because of the controls and norms that we need to comply. Most foreigners, who have lived in Poland for a couple of years, drink tap water as they used to do in their mother countries (Great Britain, Australia, South Africa, the USA, Ireland, Scotland, Canada). It means that they do not believe in our stereotypes.

The organoleptic testing showed that the taste of tap water is almost the same as the taste of water from the bottle. The difference of taste is mainly connected with minerals in water, which has a crucial role in the concentration of ions Ca^{2+} , Mg^{2+} and Na^+ [9].

The issue of drinking water straight from the tap is still controversial in Poland and it arouses many emotions.

However, Polish people are rather open-minded to reliable information and if information campaigns like ours are continued, they may result in spending less money on water bought by consumers and most importantly, it will lower the usage of plastic bottles, which will have a positive influence on the condition of the local environment.

References

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