

Research Article

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A Study on Drinking Water Quality as one of the Input Categories of Metabolism Model Using GH-Method: Math-Physical Medicine

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Received: May 14, 2020; Accepted: May 19, 2020; Published: May 23, 2020

Introduction

In this paper, the author presents his collected data on drinking water quality as a supplementary part of his mathematical metabolism model.

Methods

After self-studying four chronic diseases, i.e. obesity, diabetes, hypertension, and hyperlipidemia, and food nutrition from 2010 through 2013, the author decided to build a mathematical model of human metabolism with a focus on metabolic disorders induced chronic diseases. For the entire year in 2014, he stayed in Las Vegas to work on this research project.

Initially, he selected four simple biomedical measurements as his output categories, i.e. weight, glucose, blood pressure, and lipids. He then decided to select six important lifestyle input categories, i.e. food, drinking water, exercise, sleep, stress, and daily life routines. With a total of 500 elements associated with these 10 categories, he started to develop the governing equation to describe the interactions among those 10 categories. He utilized advanced mathematics, physics concepts, engineering modeling, and computer science tools to develop this customized metabolism model which can calculate each person's overall health status continuously and dynamically.

This paper addresses the quality of drinking water specifically. He established a personal target of 3,000 cc or 3,000 ml per day (about 6 normal size of 500 cc bottles). By drinking large amounts of water each day, it is extremely important to monitor the quality of water intake. Figure 1 shows that he drinks 2,769 cc per day (achieved 92.3% of his established daily target) during this 5.5-years period (from 4/11/2014 to 10/20/2019).

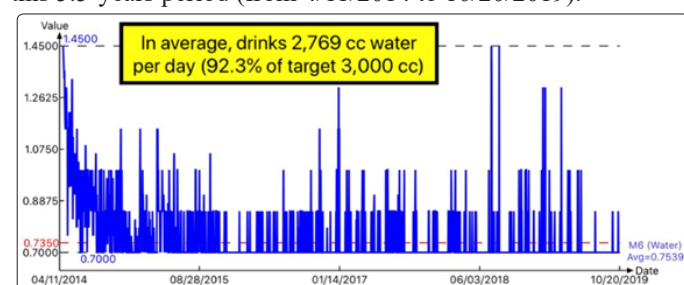


Figure 1: Author's daily drinking water record

On 9/1/2018, he purchased and started to use this convenient tool to test his drinking water quality, especially when he was traveling. Figure 2 displays this specific water quality measurement device.



Figure 2: Water TDS meter used for quality measurements

Product Description (quoted from Google):

A TDS meter (aka ppm pen, nutrient tester, TDS stick) is an inexpensive and convenient digital tool to instantly check your overall water quality. TDS = Total Dissolved Solids, which is any salt, metal or mineral in the water. With the push of a button, the TDS-EZ can tell you your overall water purity level, which will be displayed on the screen in ppm (parts per million). The lower the TDS level, the purer the water, with 0 ppm being pure H₂O. The TDS-EZ is a great tool for drinking water, water filtration and purification, hydroponics (test your nutrients), aquariums, RO/DI systems, pools and spas, and more.

Results

When traveling to a different city, he uses this meter to measure the quality readings (ppm level) of both tap water and locally purchased bottled water. Figure 3 shows the water sampling data measured in the hotel, at home, and some airports of each nation where he traveled during the period of 9/1/2018 - 10/20/2019. Among those 42 measurements, 31 tests (74% of total) were performed when he attended various medical conferences in different parts of the world. The results show not only the natural quality of the local water source, but also the work quality of the water treatment facility, quality and aging of infrastructure

(including water pipes, tanks, and reservoirs), as well as the facility where the bottled water is manufactured.

Area	Samples	Nation	Samples
Asia & Others	12	Japan	3
Europe	12	Taiwan	4
N. America	18	Myanmar	2
		UAE	1
		Turkey	2
		France	2
		Iceland	1
		Italy	1
		Netherland	1
		Portugal	1
		Switzerland	2
		UK	4
		Canada	2
		USA	16

Figure 3: Sampling size of water quality measurements

The worldwide averaged quality measurements of these 42 datasets are tap water = 177 ppm and bottled water = 92 ppm (52% level of tap water).

The final comparison of water quality by areas and nations are shown in Figure 4.

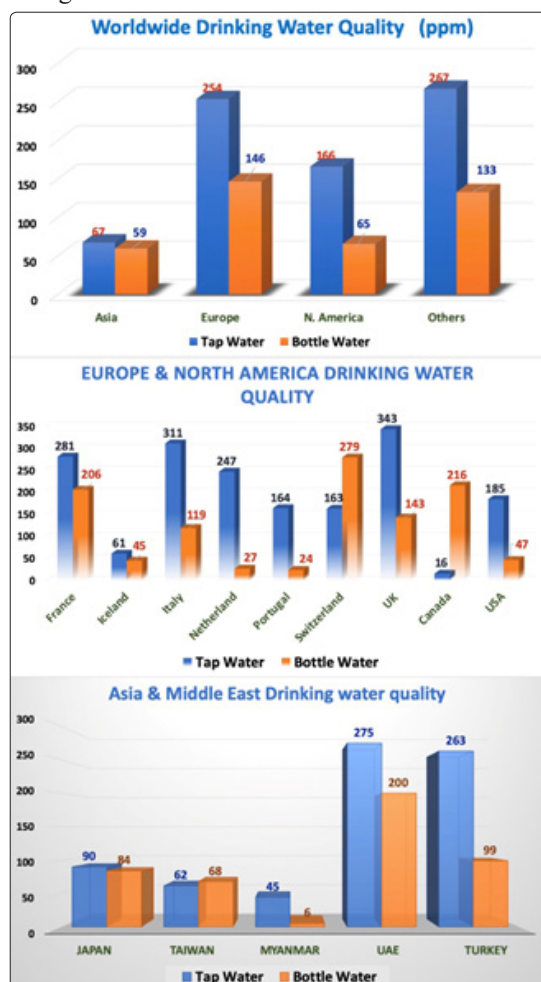


Figure 4: Summary of drinking water quality (purity, ppm)

The following paragraphs describes in more detail of the findings in this study:

1. Although the author's sample data size is limited and results could even be somewhat biased, nevertheless, it still offers some usefulness and can be served as a reference point.
2. He has heard that certain places have excellent water quality due to winter ice melting or volcano rock filtering, etc. However, from his limited analysis results, Vancouver, Canada, has shown the best tap water quality, even better than Iceland and Hawaii. Therefore, the natural source of water supply is important, but the human population and environmental pollution are also significant factors.
3. Tap water quality in Taiwan and Japan are actually good (<100 ppm) despite their overpopulation. The author believe that these good quality results come from better work quality of the local water treatment facilities and personnel.
4. For the overall ranking, European cities have the worst score due to their aged infrastructure and other reasons which doubled the US quality score.
5. Within the USA, there is a wide range of scores. For example, Las Vegas is >400, Silicon Valley is >200 (last year, dropped to below 100), Hawaii is >200, Mid-west is >100.
6. Many people think that bottled water has better purity than tap water. The reality is that bottled water has about half of the level (52%) of tap water quality, not more. Of course, bottled water quality depends on each brand, but some of them are even "dirtier" than locally supplied tap water.

Conclusions

Keeping hydrated by drinking plenty of water is important to maintain our health because all of the cells and organs need it. Therefore, the quality of drinkable water is also significant to what we put into our body. The author hopes this little experiment can increase the reader's awareness and provide some knowledge regarding the quality/purity of drinking water.

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