

Preface

*The intellect of any nation
is determined by the quality of its drinking water
and the progress of a civilization depends
on the level of water supply and sewage systems.*

Recent attention to water and water supplies has generated tremendous interest in its properties and inspired many new myths connected with water. A great many modern publications in mass media and scientific journals have entertained readers with stories of fantastic properties and capabilities of water that are not proved by science. Nevertheless, newly funded research results on water properties has afforded an opportunity to explain some earlier incomprehensible and extraordinary water characteristics.

Among numerous riddles which are still not completely understood there are two global issues: *How did life emerge on the Earth?*; and, *Why is water, one of the tiniest and lightest molecules, which consists of two widely common elements: hydrogen and oxygen (occupying first and third place in abundance in the Universe respectively) a “matrix” of life?*

The most enigmatic riddle is the presence of a vast amount of water on the Earth—not just water molecules containing hydrogen and oxygen atoms but with a particular ratio of hydrogen isotopes. How could it be explained that millions years ago such a particular ratio of protium to deuterium appeared to be: ~150 ppm of deuterium in a protium water? This concentration of deuterium determines the maximum biological activity in water.

Life on Earth became possible only because of such a ratio of hydrogen isotopes. This ratio also determines physicochemical properties of water: from the temperatures of boiling and freezing of water to its light refraction factor, viscosity, density, velocity of sound and other properties such as reaction rate constant, biological processes which take place in living organisms.

Water is described as one of the most explored substances on Earth but it seems to receive little study in contemporary fundamental science. Almost 100 years ago water was known to be a complex substance. Excepting its light component—hydrogen atoms—there are some heavy isotopes; but nobody understood their function. We didn't just made a suggestion but also proved that all physicochemical

parameters of water determined by the presence of heavy hydrogen—deuterium. It was clarified that altering the concentration of deuterium in water would annihilate all known notions about this substance. The boiling temperature (if a pure isotopes composition is considered), freezing point and other properties of water can be greatly modified depending on the hydrogen isotopes ratio. Water can't exist in a liquid phase if deuterium is removed from its molecules. Thus, the structure and physicochemical parameters of water are defined by the presence of deuterium. The results we received about the influence of deuterium on the properties of water form the basis for discovery of a new method of controlling water quality. I want to emphasize a special relevance of this discovery for validating the quality of potable water.

For thousands of years people consumed only natural water. The earliest water pipelines were made of wood and granite, which was satisfactory because these materials are natural. After replacement of such natural materials by anthropogenic ones, some victims of progress appeared. For example, ancient Romans used lead pipes and lead tableware. Some archaeologists, biologists and toxicologists point to this fact as a reason for a quick degradation of the Roman nation and attribute the high rate of death-to lead poisoning. This is one of many examples of the consequences of an anthropogenic approach to the water-supply system, and the utilization of toxic water. However, broad awareness of the severity of the problem came only in the twentieth century. More than 150 years ago, global industrialization began; megalopolises emerged and this caused ecological problems including environmental pollution. This in turn induced people to apply chemical reagents to surface water in order to produce drinking water. The first standards for drinking water were established in 1853. The pollution of surface water sources was such that the quality of drinking water was determined by nine components. Over recent decades chemical the composition of water has changed. A vast amount of anthropogenic components have emerged; these substances were made by people and never existed in nature. In reviewed publications more than 35 million of such anthropogenic components were found. In addition in 1 year nearly one and a half million new compounds are synthesized and all it could be found in the aqueous medium. The majority of surface water which forms our centralized water supply is characterized by chemical and bacteriological pollution. Antibiotics are the most dangerous, as they sterilize the water and change the surroundings. It is impossible for a higher biological form of life to exist in an antibiotic medium. It's not the way nature works.

The centralized water supply of Ukraine is drawn mostly (70%) from surface water sources. According to data of 1994–1997 most sources of surface water had third level of quality and according to international classification, fourth and fifth quality level. What does the fourth level of water quality mean? This corresponds to waste water, and the third level of quality corresponds to diluted sewage. There are no clean rivers or other sources of water where drinking water could be taken from. The same situation is true in the USA, France and other countries.

Many years ago I expressed a negative attitude towards state drinking water standards in effect at that time. Nowadays the standards which define the quality of

drinking water have been adjusted by widening the enumeration of parameters subjected to control and toughening reliability-and-quality baselines. I am convinced that under present-day conditions this approach cannot solve the problem of the quality of drinking water; it is a dead-end. Why? The World Health Organization today recommends monitoring 95 components in drinking water, while 150 years ago there were only 9 parameters! USA standards list 102 indicators. In Ukraine there are only 29 components! How could we speak about the quality of the water by controlling only a scant fraction of indicators? WHO data supports this point. Every year 5 million people die because of poor water quality; this is 10 times more than in war time. Around 40 countries have an ultimate deficiency of water (Middle Eastern countries, Africa, India, China, etc.). Nearly 20% of European population have no ecologically clean water. Approximately 20% of Americans (~50 million people) drink polluted water.

What we have found in a water supply system: (1) instead of natural microflora, micromycetes emerged. These are fungi that could cause numerous human diseases. Specialists in the area of micromycosis assert that more than 90% of people have such an illness. Drugs currently produced do not heal mycosis. Fungi live peacefully in a niche created by people as a result of utilization of chemical reagents for water purification: chlorination kills microflora which are natural and safe for people. Even if we find a protection against parasitic fungi some other unconquerable hazards could appear. This will surely happen as our world is build on a balance of forces.

An elementary question arises: What is a solution is to this emerging situation? My answer: implementation of a completely new concept of water supply system. This concept is based on three fundamental elements: new state standards for sources of drinking water, completely new standards for drinking water, and a unique method of control of drinking water quality.

One of the basic steps to ensuring a high quality of drinking water is a new standard of qualification.

It will take a good deal of time to assess, adopt and implement a fundamentally new approach to drinking water quality which will have a positive physiological influence on people. Exploration of a solution of a problem is not easy as comes to drinking water. What basic principles apply to quality assessment of drinking water? The answer to this question was found in a classic definition of life: "Life" is a cellular albumen form of existing of matter. The work of the famous Russian physiologists I. I. Mechnikov, I. M. Sechenov, I. P. Pavlov, biochemists A. I. Oparin, geneticist N. V. Timofeev-Resovski, A. A. Zavarzin emphasizes that the health of human beings starts with the health of cells. If everything starts with the health of cells, the quality of water in cells should be estimated. More complex living organisms have very strong immune systems. The biological object without immune system would react drastically to the quality of drinking water: it either lives or dies. When I apprehended this, I realized I had found the method of estimation of water quality. A principally new method of water quality monitoring was developed by us: the behavior of a cell is controlled on a cytogenic level and its abnormal behavior is detected. If the water is good cell division follows classical biology laws. If the

water is toxic, cells exhibit anomalous division—instead of one nucleus they have two or more. This is a characteristic feature of genetic changes. Moreover, medicine registers the beginning of oncological disease when a cell division is very fast, and we know which pesticides and antibiotics provoke what processes.

As a method of assessment of a drinking water quality, biotesting allows new standards for the quality of packaged drinking water.

Bad quality of drinking water caused an abrupt increase in demand for packaged drinking water and correspondingly the appearance of numerous producers of packaged drinking water. Every manufacturer has its own technology of production but the inevitable stage is water conservation. Water can't be stored; it dissolves some quantity of everything it comes into contact with. The maximum safe period for storing water in polyethylene containers is 1 month. In order to lengthen storage time, antibiotics are used as preservative agents and to prevent microflora reproduction. Our research of 31 different types of packaged drinking water showed that all of them, except "Morshynska" (not carbonated) are not safe. "Morshynska" is perfect from the point of view of physiological influence on humans.

To sum up I want to point out water prices are high today and will be even higher in future as water is essential for life processes. There are good reasons for making a prognosis that drinking water will be a problem of the twenty-first century.

All the aforementioned became a reason for writing this book. My profound belief that water is essential not just for human health but for forming a level of human intellectual development defines the main idea of the book: the quality and characteristics of drinking water from point of view of chemical physical and biological fundamental scientific states. I endeavored to present this information in a manner which is understandable for the general reader. Only in a few chapters are some details that could be a bit difficult for laymen to understand. This is dictated by the necessity to show scientific proofs of our new research results. How much I succeeded only the reader can judge.

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