Hemoglobin different derivatives concentration enhancement after usage of Magnetic Treated Water (MTW) as drinking water

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ABSTRACT

Water properties are found to be strongly affected by the surrounding magnetic and electric fields. The aim of this work was to study to what extend magnetic treated water can enhance the hemoglobin different derivatives concentration. forty two New Zealand albino rabbits weighing between 2.5 and 3 kg were conducted to the study. Study was approved from the NRC, Ethical Committee. Animals were subdivided into two groups. Control group : animals used the normal drinking water. Groups II : animals used the magnetic treated water instead of the normal one. Hemoglobin derivatives were evaluated in both groups. Results revealed a statistical improve in oxygenated hemoglobin derivative-oxyhemoglobin, and also showed a dramatic decrease in oxidized form of hemoglobin that is called methemoglobin after usage of magnetic treated water instead of normal drinking one.

Keywords : Magnetic Treated Water – hemoglobin – derivatives - linear equations

Introduction

Water covers 71% of the Earth's surface (The World Fact book, 2008), and is vital for all known forms of life On Earth [1], 96.5% of the planet's water is found in oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds (formed of solid and liquid water particles suspended in air), and precipitation). Only 2.5% of the Earth's water is freshwater, and 98.8% of that water is in ice and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products [2].

Safe drinking water is essential to humans and other life forms. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation. There is a clear correlation between access to safe water and GDP per capita [3]. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability [4]. A recent report suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50% [5]. Water plays an important role in the world economy, as it functions as a solvent for a wide variety of chemical substances and facilitates industrial cooling and transportation. Approximately 70% of the fresh water used by humans goes to agriculture [6].

Water fit for human consumption is called drinking water or potable water. Water that is not potable may be made potable by filtration or distillation, or by a range of other methods. Water that is not fit for drinking but is not harmful for humans when used for swimming or bathing is called by various names other than potable or drinking water [4], and is sometimes called safe water, or "safe for bathing". Chlorine is a skin and mucous membrane irritant that is used to make water safe for bathing or drinking. Its use is highly technical and is usually monitored by government regulations (typically 1 part per million (ppm) for drinking water, and 1–2 ppm of chlorine not yet reacted with impurities for bathing water). Water for bathing may be maintained in satisfactory microbiological condition using chemical disinfectants such as chlorine or ozone or by the use of ultraviolet light [7].

Water is the blood of life, it is needed to transport compounds via the blood, maintain cellular structural integrity, regular temperature, etc[8]. Water is a very simple molecule, consisting of two hydrogen atoms attached to an oxygen atom. Although the water molecule as a whole has no charge, the parts of it, the hydrogen wings and the oxygen body, so exhibit individual opposite charges. Since opposite electrical charges attract, water molecules tend to attract each other [9]. Water in living systems naturally gathers into structures of 14, 17, 21, 196, 280 or more molecules [10].

There is a long history of the promotion of magnets to improve the quality and health benefits of water. Researchers found when a permanent magnet is kept in contact with water for a considerable period of time; the water gets magnetically charged and acquires magnetic properties. Such magnetically treated water has its effect even on the human body when taken internally and regularly for a considerable period of time [11]. Physics shows that water change weight under the influence of magnetic fields. More hydroxyl (OH-) ions are created to form alkaline molecules, and reduce acidity. Normal water has a pH level of about 7, whereas magnetized water can reach pH of 9.2 following the exposure to a 7000 gauss strength magnet for a long period of time [11].

According to many researchers that the equilibrium of living cell can be restored-with the help of magnets. A wide variety of magnetic water devices is available [12]. These devices consist of one or more permanent magnets affixed either inside or to the exterior surface of the incoming water pipe. The water is exposed to the magnetic field as it flows through the pipe between the magnets to structure water. However, less seems to be known about the effects of magnetic field on the physical and chemical properties of water [11].

Magnetic water treatment (also known as anti-scale magnetic treatment or AMT) is a controversial method of supposedly reducing the effects of hard water by passing it through a magnetic field, as a non-chemical alternative to water softening. Scientific studies into the efficacy the treatment have had mixed results, though several studies have produced significant effects and proposed possible mechanisms for the observed decrease in water scale [13,14,15,16,17]. Some commentators regard the treatment as unproven and unscientific [17].

Vendors of magnetic water treatment devices frequently use pictures and testimonials to support their claims, but omit quantitative detail and well-controlled studies[17]. Advertisements and promotions generally omit such system variables as corrosion coupon results or system mass balance analyticals, as well as measurements of post-treatment water such as concentration of hardness ions or the distribution, structure, and morphology of suspended particles [18,19,20].

Duration of exposure and field strength, gradient, rate of change, and orientation along or perpendicular to flow are variously cited as important to the results [16]. Magnetic water treatment proponent Klaus Kronenberg proposed that the shapes of solute lime molecules are modified by strong magnetic fields, leading them to precipitate as spherical or round crystals rather than deposit as sheets or platelets of hard crystals [21]. John Donaldson, professor of chemistry at Brunel University, proposed that the crucial step is the interruption of agglomeration of particles carrying a surface charge after dissolved contaminants have nucleated as a colloidal suspension. Simon Parsons of the School of Water Sciences at Cranfield University proposed that the magnetic field reduces the surface charge on small particles, increasing the tendency to coagulate as large particles that stay with the flow rather than depositing as scale. Some proponents propose that formation of the polymorph aragonite over the more common calcite is favored in the presence of a magnetic field. However, an internal study in 1996 at Lawrence Livermore National Laboratory found no difference in preferred crystal structure of scale deposited in magnetic water treatment systems [22].

Liu et al. and Coey and Cass published research in 2010 and 2000 demonstrating that magnetic treatment causes water containing minerals to favor formation of a more soluble form of calcium carbonate (aragonite rather than calcite), and the resulting removal of calcium carbonate deposits from a steel substrate [5]. Furthermore, in their 2010 publication, Liu et al. conclude that "The magnetic treatment of scaling waters was proved to be efficient. The efficiency obtained with this very simple magnetic device can be very much improved if the geometry is better devised. Kozic and Lipus concluded in their 2003 paper that the effects of magnetic treatment on water indeed results in reduced formation of lime scale and that this effect lasts approximately 200 hours [23].

The free-radical theory of aging (FRTA) states that organisms age because cells accumulate free radical damage over time. A free radical is any atom or molecule that has a single unpaired electron in an outer shell. While a few free radicals such as melanin are not chemically reactive, most biologically-relevant free radicals are highly reactive. For most biological structures, free radical damage is closely associated with oxidative damage. Antioxidants are reducing agents, and limit oxidative damage to biological structures by passivating free radicals [24].

In some model organisms, such as yeast and Drosophila, there is evidence that reducing oxidative damage can extend lifespan. In mice, interventions that enhance oxidative damage generally shorten lifespan. However, in roundworms (Caenorhabditis elegans), blocking the production of the naturally occurring antioxidant superoxide dismutase has recently been shown to increase lifespan. Whether reducing oxidative damage below normal levels is sufficient to extend lifespan remains an open and controversial question [25].

Lead poisoning is a medical condition caused by increased levels of the heavy metal lead in the body. Lead interferes with a variety of body processes and is toxic to many organs and tissues including the heart, bones, intestines, kidneys, and reproductive and nervous systems. It interferes with the development of the nervous system and is therefore particularly toxic to children, causing potentially permanent learning and behavior disorders. Symptoms include abdominal pain, confusion, headache, anemia, irritability, and in severe cases seizures, coma, and death [26].

Elevated lead in the body can be detected by the presence of changes in blood cells visible with a microscope and dense lines in the bones of children seen on X-ray. However, the main tool for diagnosis is measurement of the blood lead level or a urine test. When blood lead levels are recorded, the results indicate how much lead is circulating within the blood stream, not the amount being stored in the body [27]. There are two units for reporting blood lead level, either micrograms per deciliter (µg/dl), or micrograms per 100 grams (µg/100 g) of whole blood, which are both numerically equivalent. The Centers for Disease Control has set the standard elevated blood lead level for adults to be 25 (µg/dl) of the whole blood. For children however, the number is set much lower at 5 (µg/dl) of blood as of 2012 down from a previous 10 (µg/dl) Children are especially prone to the health effects of lead and as a result, blood lead levels must be set lower and closely monitored if contamination is possible. The major treatments are removal of the source of lead and chelation therapy [28].

Chelation therapy is the administration of chelating agents to remove heavy metals from the body. Chelation therapy has a long history of use in clinical toxicology. Poison centers around the world are using this form of metal detoxification. For the most common forms of heavy metal intoxication—those involving lead, arsenic or mercury—the standard of care a number of chelating agents are available. DMSA dimercaptosuccinic acid has been recommended for the treatment of lead poisoning in children by Poison Centers around the world. Other chelating agents, such as 2,3-dimercapto-1-propanesulfonic acid (DMPS) and alpha lipoic acid (ALA), are used in conventional and alternative medicine [29].

Reactive oxygen species (ROS) and reactive nitrogen species (RNS) are well-established molecules responsible for the deleterious effects of oxidative stress. Accumulation of free radicals coupled with an increase in oxidative stress has been implicated in the pathogenesis of several disease states. The role of oxidative stress in vascular diseases, diabetes, renal ischemia, atherosclerosis, pulmonary pathological states, inflammatory diseases, cancer, as well as ageing has been well established. Free radicals and other reactive species are constantly generated *in vivo* and cause oxidative damage to biomolecules, a process held in check by the existence of multiple antioxidant and repair systems as well as the replacement of damaged nucleic acids, proteins and lipids. Measuring the effect of antioxidant therapies and ROS/RNS activity is crucial to suppressing or treating oxidative stress inducers [29].

The aim of this work was testing the role of magnetically treated water as a helping tool in chelation therapy of lead poisoning to enhance getting out of lead ions from the body, as well as, controlling the free radical side effect resulted from elevated lead levels.

Materials and Methods

forty two New Zealand albino rabbits weighing between 2.5 and 3 kg, aged two months, of both sexes were used for this study. All animals were subjected to distilled water as drinking water for 30 days before starting the experimental design. All through the experiment duration, rabbits were housed in separate cages, fed standard laboratory food and allowed free access to water in room lightening with a 12 hour light-dark cycle in animal house of National Research Center (NRC). Experimental animals design was priory approved from the National Research Center ethical committee

Animals were subdivided into two groups. Control group : animals used the normal drinking water. Groups II : animals used the magnetic treated water instead of the normal one. Hemoglobin derivatives were evaluated in both groups

Magnetic treated water was prepared by passing water through a magnetic funnel [12] at relatively low speed. According to the product specification, water will keep its magnetic properties for the next 12 hour of exposure to the funnel. So, water was supplied to the animals cages each 10 hours to ensure using magnetic treated drinking water. Funnel's magnetic field consists of seven pairs of successive magnets. Each magnet had a circle shape with a diameter and thickness of 7.22 and 4.96 mm, respectively. The strength of the magnet was between 450 to 500 Gauss as measured by a gauss meter (Mega Dev, Inc).

Sample preparation attention was paid to avoid contamination, therefore every item from the moment of sampling until analysis was regarded as potential source of contamination and was checked not to contain or leach detectable amount of any contaminant.

Multi-component spectrophotometric method for the simultaneous determination of four hemoglobin derivatives

The millimolar extinction coefficients were put into four linear equations with the four unknown concentrations of hemoglobin pigments (C_{HbO_2}, C_{HbCO}, C_{MetHb} and C_{SHb}) .

$$A^{500} = 5.05\, C_{HbO_2} + 5.35\, C_{HbCO} + 9.04\, C_{Met.Hb} + 7.2\, C_{SHb} \quad (1)$$

$$A^{569} = 11.27\, C_{HbO_2} + 14.27\, C_{HbCO} + 4.1\, C_{Met.Hb} + 8.1\, C_{SHb} \quad (2)$$

$$A^{577} = 15.37\, C_{HbO_2} + 10.0\, C_{HbCO} + 4.1\, C_{Met.Hb} + 8.1\, C_{SHb} \quad (3)$$

$$A^{620} = 0.24\, C_{HbO_2} + 0.33\, C_{HbCO} + 3.35\, C_{Met.Hb} + 20.8\, C_{SHb} \quad (4)$$

Where the absorption bands at wavelengths 500, 569, 577 and 620 nm represent the absorption maxima of Met-Hb, HbCO, HbO_2 and SHb, respectively.

The above linear system of equations can be represented in the matrix form as :

$$\begin{bmatrix} 5.05 & 5.35 & 9.04 & 7.2 \\ 11.27 & 14.27 & 4.10 & 8.1 \\ 15.37 & 10.0 & 4.10 & 8.1 \\ 0.24 & 0.33 & 3.35 & 20.8 \end{bmatrix} \cdot \begin{bmatrix} C_{HbO_2} \\ C_{HbCO} \\ C_{Met.Hb} \\ C_{SHb} \end{bmatrix} = \begin{bmatrix} A^{500} \\ A^{569} \\ A^{577} \\ A_{620} \end{bmatrix} \quad (5)$$

This linear system of equations was solved by mathematical manipulation, using the Gaussian elimination method. For matrix calculation[19], to yield the following equations :

$$C_{SHb} = \frac{A^{620} - 0.442293A^{500} + 0.1065519A^{569} + 0.0515769\ A^{577}}{18.895404} \quad (6)$$

$$C_{Met.Hb} = \frac{9.0602343A^{500} - A^{577} - 2.6960235A^{569} - 35.295898\ C_{SHb}}{66.750821} \quad (7)$$

$$C_{HbCO} = \frac{A^{569} - 2.2316831A^{500} + 16.074415\ C_{Met.Hb} + 7.9681188\ C_{SHb}}{2.330495} \quad (8)$$

$$C_{HbO_2} = \frac{A^{500} - 5.35\ C_{HbCO} - 9.04\ C_{Met.Hb} - 7.2\ C_{SHb}}{5.05} \quad (9)$$

Where A^{500}, A^{569}, A^{577} and A^{620} are the absorbances of hemoglobin solution at the wavelengths 500, 569, 577 and 620 nm, respectively.

Statistical analysis

The data was expressed as mean + standard deviation. All analyses were made using the SPSS statistical software package. A one-way ANOVA test was applied to data to detect significant differences between different groups. Differences were considered significant at $p < 0.05$.

Results

Table 1:- Hemoglobin of different derivatives of animals received ionizing radiation with and without radio protector as compared to control (mean ± SD)

Group	SHb		Met Hb		HbCO		HbO_2		Total Hb gm/dl
Control	gm/dl	%	gm/dl	%	gm/dl	%	gm/dl	%	12.75± 1.36
	0.034± 0.0023	0.26	0.313± 0.044	2.4	0.306± 0.026	1.7 %	12.110± 1.65	94 %	
G_1	0.029± 0.006[c]	0.31	0.215± 0.022[c]	3.13	0.228± 0.013[a]	1.4 %	13.115 ± 0.62[c]	96 %	12.30± 1.75[c]

a Mean + SD.
b Significant difference compared to G1.
c Highly significant difference compared to G1.

Table 1 shows different hemoglobin concentrations in animals used magnetic treated water as compared to those used normal tap water as drinking water. Results showed a highly significant decrement in the oxidized form of hemoglobin (Methemoglobin) as compared to control. Also, there was a significant increase in the useful derivative of hemoglobin (oxyhemoglobin) as compared to control.

Discussion

Water and life are closely linked. This has been recognized throughout history by civilizations and religions and is still the case with scientists today [30]. Liquid water is required for life to continue. No enzymes work in the absence of water molecules. No other liquid can replace water. The development of life required this water. How exactly this was achieved, is a question that has interested many since well before the early experiments producing amino acids from simpler molecules by electric discharge in aqueous systems [31]. More recently, various theories have been propounded but without a consensus except for thr key involvement of liquid water [32]. Water possesses particular properties that cannot be found in other materials and that are required for life-giving processes. These properties are brought about by the hydrogen-bonded environment particular evident in liquid water [33].

The hydrogen bond in liquid water is highly affected by electrical and magnetic fields [34]. It is found that some physical and chemical properties changed when water pass through magnetic field. Therefore, the so called magnetic treated water (MTW) has different chemical and physical properties and action than ordinary water.

Magnetized water was first used in Russia by three specialists: Drs. G. Gerbenshchikow, I. Shetsov and K. Tovstoles, all three specialists in urology at the Kirov Military Medical Academy in Leningrad. They had their patients drink bi-polar magnetized water. This simple treatment was very effective in breaking up kidney and gall bladder stones into small enough particles to be passed through urine without any pain or danger to the patient. The water also prevented further formation of stones in the kidneys and gallbladder. Soviet physicians have been giving internally magnetized water to patients for over 30 years for digestive, urinary and nervous problems, ailments like mastitis, pains and swellings, painful urination and many other disorders [35].

Because magnetized water is wetter and therefore more penetrating, it furthers better assimilation of the various nutrients and vitamins in the cells. The Soviet biologist Kumarov had experimentally doubled the life span of flies by feeding them magnetized sugar. In his book "Magnets For Your Health" Dr. Louis Donnet, M.D., wrote, "magnetized water can be helpful in weight control, as an adjutant to a correct diet." He states (page 82) that he has seen over 100 successful cases. Because this water improves metabolic activity, it may be helpful in burning up excessive fatty tissue [36].

Similarly to the way magnetized water dissolves the settled salts on the wall of boilers and radiators, so it has been reported to help unclog the arteries and veins of deposits of cholesterol and salts and normalize the circulatory system. Magnetized water has been found

effective in alleviating colds, coughs, bronchitis, all types of fever and more. Dr. H. L. Bansal found it helpful in the regularization of women's menses [37].

Magnetized water has been reported helpful for tiredness in daily activities. Biophysicist Albert R. Davis, a pioneer in magnet therapy research, wrote in his book "The Magnetic Effect" that he and his co-workers found they could overcome the early afternoon letdown by drinking a glass of magnetized water while relaxing for a few minutes [38].

Independent research into magnetized water began in both Eastern and Western European countries. One grass roots researcher was a self-taught scientist by the name of Johann Grander. He claimed his knowledge came from studying nature in his native Austria [39]. "In normal conditions," Grander wrote, "water flows either on the surface of the earth or deep underground, always seeking a natural course. In our water supply system, however, the water is collected and forced through pipelines under pressure. At this stage, the water suffers a serious aggression for the first time. The high pressures are highly detrimental to the liquid [40]. The water is then further contaminated by the addition of powerful chemicals, such as chlorine. However, we use it, the water eventually finds its way back to nature through the drains. We collect clean water from nature and return it soiled and sick." Grander said water has a double function. It supplies life-giving energy. It also acts as a waste disposal agent for all living beings [41].

"Water picks up energy from the sun and collects the energies that are stored in the earth. In summer, with strong solar energy, the water pushes itself to the surface. In winter, with weaker solar energy, it burrows deep into the ground, collecting the stored and transformed energies. "It is an eternal circle in which water plays the main role [42]. The water is also a living organism and therefore capable of transforming energies and refuse through its own microorganisms. Live water seeks by itself its sources of energy. Healthy water can be distinguished from sick water even by its murmurs." [43].

Many success reports specify that magnetized water maintains its property of scale deposit prevention up to two days. Kronenberg says some critics make this fact look absurd by calling it "water's ability to remember its magnetizing experience.[44,45].

Our work can be considered as another prove of the healthy benefits of magnetic treated water. The study design was based on testing to what extend magnetic treated water may enhance the useful hemoglobin derivatives.

Hemoglobin molecule is formed from four globin parts surround a heme atom in the center of this structure. The magnetic properties of the hemoglobin that controls the binding process of hemoglobin with oxygen and carbon dioxide many depends on this magnetic field generated around the heme atom. By generating many of free radicals the unpaired electron molecules reach to the heme atom revealing oxidation process in which heme is highered from ferrohemoglobin to ferric hemoglobin. In ferric hemoglobin heme atom is in the higher electronic state which make the affinity of oxygen very low.

Treatment with magnetic treated water (MTW) improved the surrounding magnetic field of the water molecule and enhance the overall reaction carried out depending on this property. enhancement of the normal oxyhemoglobin in which heme atom is in the ferro state is an indication of the hemoglobin health.

In conclusion, we can state that magnetic treated water enhanced the normal hemoglobin derivatives and decrease the non-function hemoglobin form so it improve the overall hemoglobin health.

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Conflict of Interest:

Conflict of interest declared none.

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