

## THE EFFECT OF DRINKING MAGNETIC WATER IN COMPARISON TO WATER TREATED BY MICROWAVE OVEN ON BONE MINERALS CHANGES

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### ABSTRACT

This study examined the effect of magnetized water in comparison with water put in microwave on bone minerals. The 21 total number of albino rats was separated to three groups formed of 7 rats each. The first group is a control group, the rats drank a normal tap water. The second group is a magnetized water group, the rats drank a magnetic water. The third group is a microwave water group, the rats drank a tap water treated by a microwave oven. The rats in three groups drank water for two months. The result of this study revealed to high significant differences between magnetic water group and both other groups in calcium and phosphorus mineral content in mandible bone by SEM/EDX. Also magnetic water group had a significant difference with microwave water group when measure the intensity of Von Kossa special stain. In conclusion the magnetic water had a good effect on bone mineral and density.

**KEYWORDS** Magnetic water, microwave oven, bone minerals.

### INTRODUCTION

Biologically, water is most substantial substance which is important to dissolvable and modify the properties of biomolecules as proteins, nucleic acid and carbohydrate. Water has ability for keeping the magnetic charge which is mean para-magnetism. The para-magnetism happen mostly in any substance has part or all of individual atoms, ions,

or molecules possess a permanent magnetic dipole moment which is water one of these substances<sup>(1,2,3)</sup>.

Magnetic water is happen by let water move through magnetic tube and that done by place a magnet in water to change its properties. The properties of water change to active and fertile and that lead to high oxygen ratio and increase percentage of dissolved salts and amino acid in water<sup>(4)</sup>.

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The properties of water will be changed to better. The modification will be in PH, dissolved solids, dissolved oxygen and total count of bacteria. However, the PH level of magnetic water reach to 9.2 instead of 7 in normal water<sup>(3,5)</sup>.

Gerbenshchikow et. al., who first use the magnetic water. They use a magnetic water to treat their patients who suffer from kidney and gall bladder stones and can break the stones into small enough particles and allow it to pass through urin. The magnetic water also not allow to formed more stones inside gallbladder and kidney<sup>(6)</sup>.

The water minerals will be changed when exposed to magnetic field but its changing related to strength and exposure time to the magnet. So, using of magnet is one of interested and cheap methods to improve the quality of water in compare with chemical and physical treatment<sup>(5)</sup>.

The surface tension in magnetic water is decreased by 10 to 12.5 while its velocity increased in compare to normal water. So, its penetration to cell wall will be easier and that can accelerate diffusion of water to vital organs. However, the blood flow in human body will change with continuous magnetic water intake. As it be more light, pure and smooth than normal water<sup>(7,8,9)</sup>.

The microwave consider as a current technology that form a heat energy by the speedy polar molecules movement by stroke against each other. Nowadays, microwaves are popular to be used in homes, industry, communicate and medical field. Microwaves are electromagnetic waves with frequencies ranging from 300 MHz to 300 GHz. However, microwave ovens which found in houses or restaurant operate at frequencies of about 2.45 GHz<sup>(10,11,12)</sup>.

In the other hand, the minerals as Ca, P and Mg are necessary for bone validity, mineralization and growth. The sufficient amount of calcium intake at childhood and adolescent period is important to reach to adequate peak bone mass which its

decrease lead to risk of bone fracture in childhood and osteoporosis in adulthood<sup>(13,14,15)</sup>.

The importance of bone not only for protection of connective tissue and soft tissue, but it also cooperate in regulation of PH and calcium levels in blood<sup>(16)</sup>. However, magnetic water can increase level of bone mineral density, bone mineral content and bone resistance<sup>(17)</sup>.

This study is aimed to investigate the efficacy of magnetic water on calcium and other mineral levels in mandibular bone in compared to water treated by non-ionized electromagnetic field (microwave oven) and normal nonmagnetic water.

## MATERIALS AND METHODS

### Animal and diet preparation

This experiment done in animal house of Delta University of science and technology. It was approved Delta University ethical committee. Eighteen Sprague Dawley rat's male albino rats weighing 150±10g which were 10 to 12 weeks old, were purchased from the Vaccine and Immunity Organization, Ministry of Health, Egypt. Under standard conditions, the animals were housed in well-aerated cages (12/12 light/dark cycle, 23 ± 2°C temperature and 60% humidity). The rats were fed pelleted balanced diet consisting of the following ingredients purchased from Agricultural Development Company, 6-October, Giza, Egypt: sunflower oil (15%), concentrate mixture 45% (10%), yellow corn (49%), soybean meal 44% (11%), wheat bran (10%), molasses (3%), common salt (0.5%), ground limestone (0.2%), dicalcium phosphate (0.1%), lysine (0.2%), dl-methionine (0.7%) and mineral-vitamin premix (0.3%). Water and feed were offered ad libitum.

### Study design

The rats take a week for adaptation, then rats were distributed randomly into three groups of seven rats each. Rats of group 1(control group) drank untreated tap water for two months. Group 2 (magnetic water

group) drank magnetic water. The magnetized water used in the experiment was produced by passing water through the magnetic field of 14500 gauss and it was provided to the magnetized water group for drinking water. The magnetized water was changed every day, as the shelf life of the magnetized water was 1 day according to the instruction of the producer. The magnetized water was obtained with a magnetizer device from Delta Water Company (14500 gauss; Alexandria, Egypt). Group 3 (microwave water group) drank tap water treated by microwave oven (Sharp Microwave 34 Liters, Stainless steel, 60 Hz - R-77AS ST) for 10 minutes in 1 lit beaker until formation of bulbs, and then cooled at room temperature.

#### **Rats Euthanasia and tissue preparation**

Rats were euthanized with over dose of Phenobarbital sodium salt at day 60, then we cut the mandible. The right side prepared for quantitative energy dispersive X- ray (EDX) to assess calcium and phosphorus minerals (Equipment: Jeol- 6510 lv Oxford X- max 20) at faculty of Agriculture Mansoura University. The left side immersed in EDTA 10% solution for two months till be softened then the specimens gland were fixed in 10% neutral-buffered formalin for one day then dehydrated in ascending grades of alcohol, cleared in xylene and embedded in soft paraffin. Non-serial sections of right mandible specimen were prepared for the von Kossa method for detection of calcium salt in a black and brown colors. After dewaxing, the slides were immersed for one hour in 5% silver nitrate solution and washed by distilled water. Then the sections were treated with 5% sodium thiosulfate for 5 min. The sections were washed in distilled water, stained with picosirius-red method and analysed under light microscope<sup>(18)</sup>.

Slides were photographed using (insert camera name) digital camera installed on (insert microscope name) microscope, using a (magnification lens) X objective. The resulting images were analyzed on

Intel® core I7® based computer using Fiji ImageJ (version 1.51r; NIH, Maryland, USA) software. For measuring staining intensity, the color deconvolution plugin was used. Five random fields from each slide were analyzed.

#### **Statistical analysis**

The gained results from quantitative EDX and Vin Kossa special stain were statistically analyzed using one-way ANOVA followed by Post Hoc Tukey's multiple comparisons test. Data are presented as mean  $\pm$  standard deviation of mean, significance was declared at  $p < 0.05$ .

## **RESULTS**

#### **Quantitative energy dispersive X-ray (EDX)**

Qualitative EDX measure the bone calcium and phosphorus in three groups of the experiment. In magnetic water group the calcium weight was significantly higher ( $36.092 \pm 1.541$ ) ( $p= 0.000$ ) in comparison to control group ( $32.524 \pm 1.834$ ). On the other hand calcium in microwave group was significantly lower ( $22.527 \pm 0.869$ ) ( $p= 0.000$ ) in its weight in comparison to control group. Regarding the phosphorus weight, the magnetic water group showed a significantly higher weight ( $11.0643 \pm 1.093$ ) ( $p= 0.003$ ) in comparison to control group ( $8.3900 \pm 0.89861$ ). However, phosphorus in microwave group was significantly lower ( $6.6943 \pm 0.78458$ ) ( $p= 0.000$ ) in comparison to control group (fig. 1).

#### **Von kossa special stain**

In control group showed positive reaction of bone tissue to Von kossa special stain (fig. 2). The magnetic water group showed that bone tissue had strong positive reaction when stained by Von kossa stain (fig. 3). In the other hand the microwave group showed weak bone tissue reaction to Von kossa stain (fig. 4).

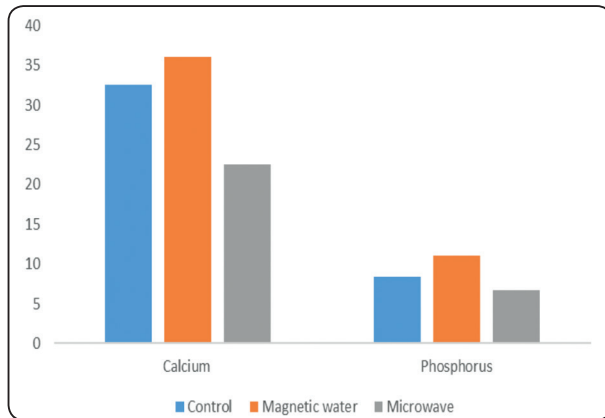


Fig. (1): Different mean value of calcium and phosphorus minerals measured by EDX in three groups.

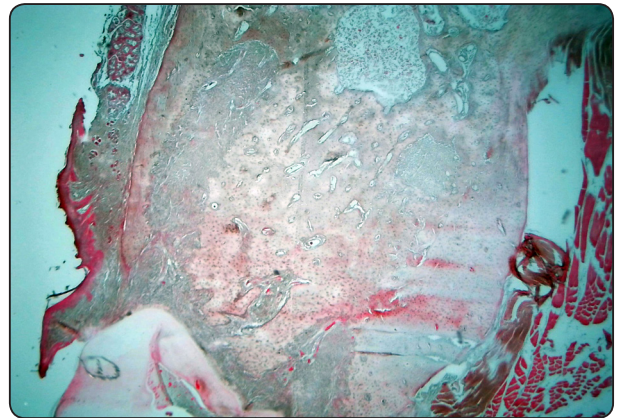


Fig. (4): Showed a microwave water group had a weak positive reaction of bone tissue stained by Von kossa stain. (x400)

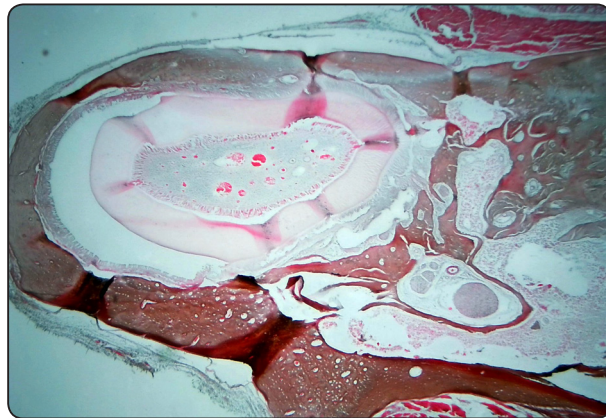


Fig. (2): Showed control group had a positive reaction of bone tissue stained by Von kossa stain.(x400)

### Statistical analysis

In this statistical analysis the darkest shade represented by lowest value and lightest shade represent the highest value. So, the magnetic water group was in-significant ( $85.74233 \pm 20.1213$ ) ( $p=0.3686$ ) with the control group ( $102.7265 \pm 27.551$ ). On the other hand, the microwave water group was higher significant ( $153.1734 \pm 22.533$ ) ( $P \text{ value} = <0.0001$ ) with the magnetic water group and also higher significant ( $P \text{ value} = 0.0002$ ) with the control group (fig. 5).

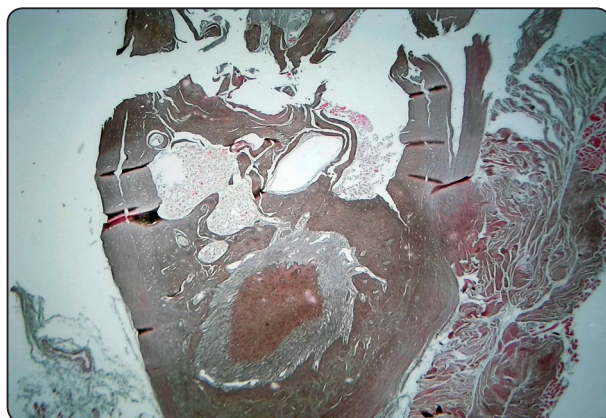


Fig. (3): Showed magnetic water group had strong positive reaction of bone tissue stained by Von kossa stain. (x400)

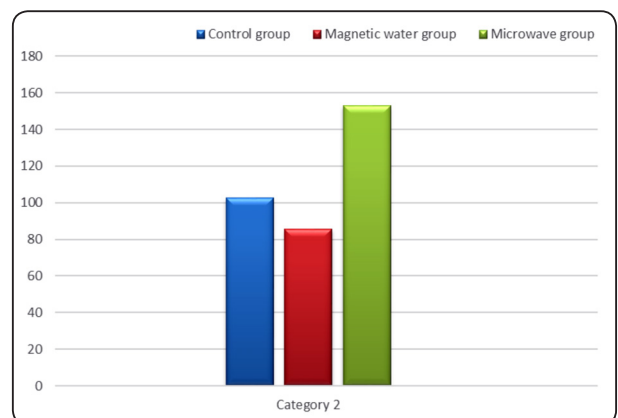


Fig. (5): Different measured mean value of Von Kossa stain intensity in all three groups staining.



## DISCUSSION

Some studies show that when a permanent magnet come in contact with a water in considerable time that will change in its properties due to change in its charges which will affect in internal body organs and tissue when water come internally<sup>(3)</sup>. However, exposure to non-ionized electromagnetic radiation such as microwave oven will alter the human body tissue<sup>(19)</sup>.

In our study we use three groups of seven male albino rats each. There were a control group which use normal tap water, magnetic water group which use magnetic water and microwave group which water after treated by microwave oven for two months. The aim of our study is to show the effect of magnetic water on bone of the rats in compared to effect of microwave oven on water.

In quantitative EDX result showed a significant increase in weight of calcium and phosphorus in magnetic water group when compared to control and microwave water group.

Our result was in agreement with Hanafy et. al. (2017) which compare the amount of calcium in tap water and magnetic water who show that calcium in magnetic water has a significant difference increase than that in normal tap water. Also they show the increase of percentage of calcium in blood of hens that used magnetic water as raoutin drinking water<sup>(20)</sup>.

Another paper used a magnetic water on hens and compare it with other group used a normal tap water and showed that the calcium an phosphorus were increased in yolk of eggs and also increase in hen's egg shell. However in this paper they measure a calcium and phosphorus percentage after 30 and 60 days<sup>(21)</sup>.

In our experiment we used a special stain Von Kossa for measure the mineralization bone of mandible of rats in relation to each other group. The magnetic water group had the most mineralized

bone tissue the control group and the last was the microwave group. However, magnetic water group had a significant differences between it and microwave water group. This result coincided with our result in EDX test.

Our result was in agreement with Neto et. al. (2017) who used a magnetic water on rats for 15, 30 and 45 days to show its effect on bone mineral density (BMD) and bone mineral content (BMC) in comparison to control group. They revealed that BMD and BMC after 45 days had significant increase on magnetic water use<sup>(17)</sup>.

Our result also was in agreement with Hassan et. al. (2019) who used a magnetic water only for 24 days and measured also BMC and BMD on pelvis bone and found a significant increase in magnetic water group when compared to control group<sup>(22)</sup>.

On our best knowledge is that no paper spoke about effect of non-ionized electromagnetic field on water and its effect on bone minerals. But will now the use of microwave technology is insufficient because increase the rate of heating induce destruction of the structure internally. Higher rate of water loss lead the reaction to stay in intermediate stage and finally there are many processes not easy controlled<sup>(23, 24)</sup>.

However there was a study show the effect long exposure of this field on human sperm had a significant effect on its motility and also effect on male rats' hormones. Also, another paper showed that exposed rats to electric magnetic field (ionized and non-ionized) will change the blood analysis but it related to time and field of exposure<sup>(25, 26)</sup>.

Finally, in this paper found that water which had a magnetic field had good effect on body tissue especially on a bone mineral. On the other hand, non-ionized electromagnetic field (microwave oven) had harmful effect on water which in turn to effect on bone calcium and bone density.

## CONCLUSION

This study demonstrate the effect of water treated by magnetic field or by microwave oven on bone minerals. The magnetized water has a beneficial effect on bone minerals which appeared be EDX and Von Kossa special stain. The microwave oven has unfavorable effect on bone minerals which lead to decrease minerals than control and magnetic water groups.

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