Water Treated by Magnetic Field Increases Bone Mineral Density of Rats

Chapter · October 2014

9 authors, including:

Jair Rodini Engracia Filho
Pontifícia Universidade Católica do Paraná (…

Mário Jefferson Quirino Louzada

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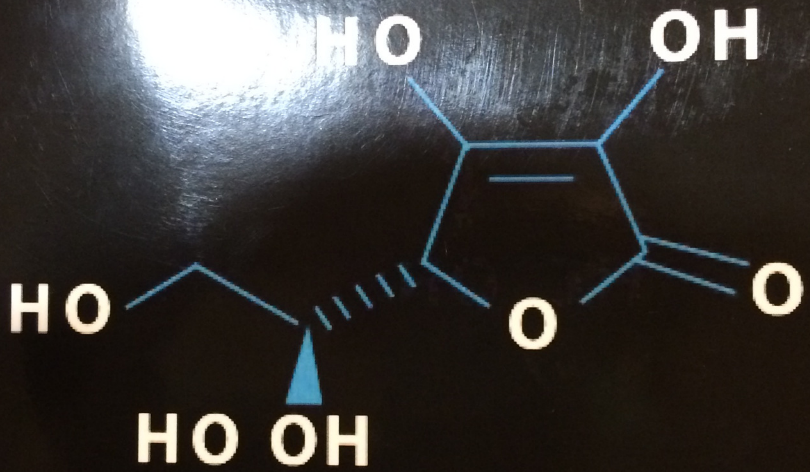

Edited by Danik M. Martirosyan, PhD and Sean Liu, PhD

Proceedings of the 17th International Conference

Discovery, Utilization, and Control of Bioactive Components and Functional Foods

Organized by United States Departement of Agriculture and Functional Food Center

Discovery, Utilization, and Control of Bioactive Components and Functional Foods

Volume 17

Functional Food Center Inc./Functional Food Institute
7575 Frankford Rd, Suite 3527, Dallas, Tx 75252, USA
http://www.functionalfoodscenter.net

Printed and Edited in the United States of America

ISBN-13: 9781503012462; ISBN-10: 1503012468
Library of Congress Control Number: 2014919221

For information regarding special discounts for bulk purchases, please contact Food Science Publisher Special Sales at 469-441-8272 or email ffc@functionalfoodcenter.com

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Food Science Publisher 2014
Edited by Danik M. Martirosyan, PhD, and Sean Liu, PhD

WATER TREATMENT BY MAGNETIC FIELD INCREASES BONE MINERAL DENSITY OF RATS

Geraldo Balieiro Neto[1], Bruna Rezende da Silva Martins de Oliveira[2], Jair Engracia Rodini[3], Cassia Maria Molinaro Coelho[3], Lilian Francisco Arantes de Souza[3], and Mario Jefferson Quirino Louzada[2]

[1]São Paulo State Agency Agribusiness Technology, APTA, 14030-670 Ribeirao Preto, São Paulo, Brazil, [2]Department of Basic Science, São Paulo State University, 16050-680 Araçatuba, SP, Brazil, [3]Department of Veterinary Pathology, São Paulo State University, 14884-900 Jaboticabal, SP, Brazil

Keywords: Bone density, bone resistance, bone content, magnetic field, drinking water

Background: Data suggests that the properties of magnetically treated water are different from those of untreated water. This fact is usually attributed to the weaknesses of intermolecular interactions (hydrogen bonds) and nucleation processes (effect of impurity, frequency and growth of nuclei). Water treatment by magnetic field is an attractive but still controversial issue in its application to human health. We found that there were increases in bone mineral density of rats consuming water conditioned by a magnetic field compared to a group consuming unconditioned water;this effect can reduce the risk of osteoporosis and bone fractures in humans.

Objective: The purpose of the present study is to investigate the effects of water treatment by magnetic field on Bone Mineral Density (BMD, g/cm^2), Bone Mineral Content (BMC, g), Bone Area (BA, cm^2), Bone Resistance (BR, kN/m) and Blood Gas Analysis (Bicarbonate, mmol/L; Anion Gap, mOsm/kg) of rats.

Methods: The treatment of water was performed using some commercial magnetic conditioners (Sylocimol) designed to generate a strong magnetic monopole field. These devices were inserted into the water troughs of the metabolic cages. A completely randomized design distributed to a 2x3 factorial arrangement was used. Forty-eight Wistar rats were divided into two groups: control (n=24) and group consuming magnetic water (n=24). Then, these groups were subdivided into three groups to evaluate three consumption periods (15, 30 and 45 days). The animals were kept in metabolic cages throughout the entire experiment. The BMD, BMC and BA of the right femur were measured by the DPX-Alpha, Lunar® densitometer. BR of the mid shaft and head femoral were measured by the Universal Test Machine EMIC®, DL3000. Blood samples were collected from the femoral artery using a blood sampling kit for blood gas analysis (3 ml ventilated syringes with 23 G 1 in needle, containing freeze-dried lithium heparin). All the samples were immediately analyzed in a calibrated blood gas analyzer set at the body temperature of rats.

Results: No significant difference was found on water intake (35.14 vs 32.51, $p>0.05$), dry matter intake (25.66 vs 24.35, $p>0.05$), BA (1.29 vs 1.29 cm^2) or head femoral resistance (95.56 vs 102.48 kN/m). However, higher Anion Gap (14.70 vs 16.95 mOsm/kg, $p<0.05$) and lower $CHCO_3$ (28.66 vs 25.04 mmol/L, $p<0.05$) were found in the arterial blood of the group drinking treated water. There was a significant interaction between water and consumption period to BR, BMD and BMC ($p<0.05$). In the first analysis (after fifty days), there was no difference ($p<0.05$) in BMC and BR between the two groups. In the second evaluation (after thirty days), there were increases in BR (mid shaft) BMD and BMC ($p<0.05$). After forty-five days, there were increases in BR, BMD and BMC ($p<0.05$) and the differences between the groups were higher (Table 1).

Table 1. Magnetic treatment of water on Bone Mineral Density (BMD, g/cm^2), Bone Mineral Content (BMC, g), Bone Area (BA, cm^2) and Bone Resistance (BR, kN/m) of rats.

Days of consumption	Control	Test	CV	MSE	*P*-value
	Bone Mineral Content				
15	0.123	0.134	26.48	0.034	0.511
30	0.169 ^{b}	0.215 ^{a}	10.19	0.019	0.0003
45	0.201 ^{b}	0.296 ^{a}	12.01	0.030	<0.0001
	Bone Mineral Density				
15	0.096	0.114	17.82	0.018	0.075
30	0.137 ^{b}	0.173 ^{a}	6.92	0.010	<0.0001
45	0.141 ^{b}	0.200 ^{a}	6.09	0.010	<0.0001
	Mid shaft Femoral Resistance				
15	317,94	349,89	19,51	65,17	0,377
30	438,33 ^{b}	531,22 ^{a}	15,66	75,47	0,033
45	436,06 ^{b}	567,61 ^{a}	14,37	72,15	0,005

Within rows, means with different letters are significantly different ($P < 0.05$).

Conclusion: The hydrogen ion is not accounted for on the cation side, but the decrease in the bicarbonate buffer compensation would appear as a Bicarbonate deficit, and the Anion Gap would increase. Thus, the effects were attributed to reduced hydrogen ions' competition for calcium binding sites. We concluded that there were increases in BMD, BMC and BR in group consuming water conditioned by the magnetic field technology compared to group consuming unconditioned water. Furthermore, the highest consumption period of the water conditioned by the magnetic field increased BMD, BMC and BR in rats. The treated water intake for more than 45 days can reduce the risk of osteoporosis and fractures by reducing hydrogen competition for calcium binding sites and increased bone mass.

These scientific papers are written by leading authorities from different parts of the world, including the participants in the 17th International Conference "Discovery, Utilization, and Control of Bioactive Components and Functional Foods". This event was held on November 18 – 19, 2012, at the University of San Diego, San Diego, California, USA.

Main Conference topics include:

- Functional food ingredients and bioactive compounds: sources and potential benefits in public health
- Functional food upgrade: Delivery of bioactive compounds in every day's foods and beverages
- Turning agricultural and food byproducts into functional food ingredients
- Dairy functional foods
- Diet, heart and brain health
- The effects of bioactive compounds and functional foods on biomarkers of chronic disorders
- Functional and medical foods with bioactive compounds for the management of chronic diseases
- Legislation on health claims: healthy, functional and medical foods.
- Research and development of new functional food products

This book presents not only innovative ideas for the Discovery, Utilization, and Control of Bioactive Components and Functional Foods, but also the cutting edge techniques and scientific research which led to these inventive and modern treatment methods.

Scientists, medical doctors, registered dieticians, and other professionals in the food and medical industry will benefit from the data discussed within this publication.

Danik M. Martirosyan, PhD
President of Functional Food Center/ Functional Food Institute, Dallas, TX, USA

Sean Liu, PhD
Functional Foods Research Unit, United States Department of Agriculture, ARS, USA

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ISBN 9781503012462
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