

## ORIGINAL PAPER

# Diverse biological effects of electromagnetic-treated water



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**The effects of water treated with an electromagnetic field (EMF) were investigated on two biological systems, humans and plants. Purified de-ionised water was treated by (1) boiling, (2) exposure to microwave radiation, and (3) low frequency electromagnetic oscillation molecular resonance effect technology (MRET), before being used to prepare media for culturing human peripheral blood mononuclear cells (PBMC) from three healthy females. Our results indicated that PBMC culture in MRET-activated medium showed significantly less oxidative metabolism when compared to media prepared from other types of water. As for the effects on soybean, our results indicated that both MRET- and microwave-treated water greatly enhanced the length of the root. These results suggested that electromagnetic-treated water can have diverse biological effects on both animal and plant cells. Since these effects are related to the ‘Memory of Water’, hypothesis which has been suggested as an explanation of the action of high homeopathic dilutions, our finding warrant a further investigation on the mechanisms of various types of physically conditioned water on specific cellular activities. *Homeopathy* (2013) 103, 186–192.**

**Keywords:** Molecular resonance effect technology; Water; Biological effect; PBMC; Soybean; Resazurin

## Introduction

Water is essential for life. Each day, humans are exposed to water that has gone through different processes such as boiling or heating with a microwave. Recent issues in the news have mentioned the possible harmful effect of microwaved water.<sup>1</sup> In addition, the beneficial effects of water that has gone through special treatment such as ionisation<sup>2</sup> or activation by low frequency electromagnetic oscillations i.e., molecular resonance effect technology (MRET) is quite popular, especially in Thailand and other countries

in Southeast Asia. Even though the claims about the various biological effects of this physically conditioned water are met with scepticism, stories about the health-promoting effects of MRET-treated water have been reported.<sup>3,4</sup> These studies suggested that water treated with low frequency electromagnetic fields (EMF) might have effects on biological systems by a mechanism that is based on a quantum physics model.<sup>5</sup>

Some reports on the effects of magnetic field and EMF on water molecules have been published.<sup>6</sup> These include changes in viscosity, surface tension, index of light refraction, electrical conductivity, and light absorption.<sup>7,8</sup> It has been suggested that long-term changes in water properties mediate the effect of EMFs on biological systems, such as the activation of ion channels.<sup>9</sup> This hypothesis is related to the ‘Memory of Water’, a hypothesis which has been suggested as an explanation of the action of high homeopathic dilutions.<sup>10</sup>

In this study, we seek to investigate the biological effects of water treated with two kinds of EMFs. The first one was a non-ionising microwave radiation at a frequency around 2.45 GHz, which is used in household microwave ovens. In

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this experiment, boiled water, using regular stovetop, was used as a control for water heated with a microwave. The second treatment was a low frequency, resonant EMF, obtained from a patented technology termed MRET (see [Methods](#) section). The experiments were conducted on two complex normal biological systems, human peripheral blood mononuclear cells (PBMC) and soybean seeds. The effects on PBMC bioactivity (indicated by mitochondrial oxidative phosphorylation) and on the growth of soybean (indicated by dry weight, height, and root length) were reported along with appropriate statistical analysis.

## Experimental methods

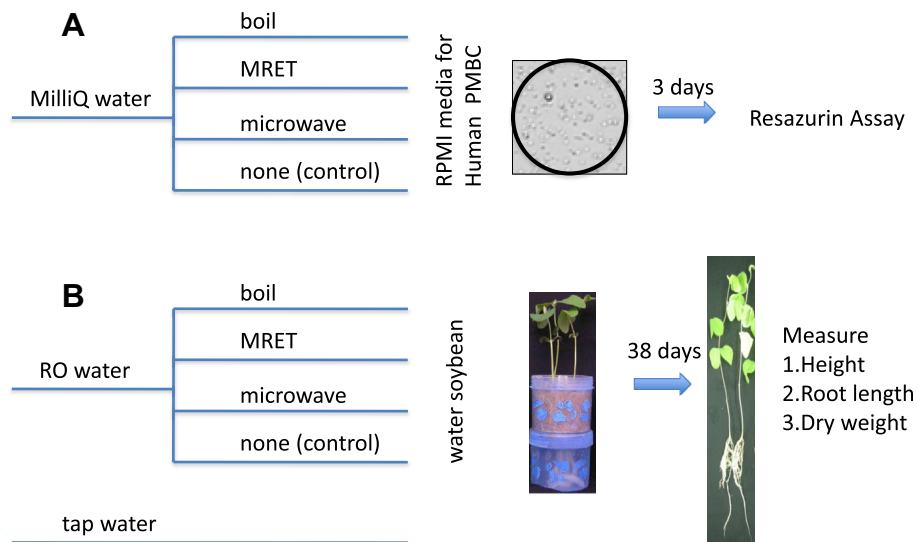
### Preparation of physically conditioned water

A diagram describing different treatments of water for the experiments on human cells (A) and soybean growth (B) is shown in [Figure 1](#). Purified and de-ionised water (Milli Q water) was obtained by passing triple distilled water through Millipore machine (model: simplicity, MA, USA). The Milli Q water contained total organic carbon (TOC) < 50 ppb, and resistivity > 1 MΩcm. RO water was a regular drinking water that was purified by reverse osmosis (RO), followed by UV radiation. Tap water was from a standard municipal water system at Suranaree University of Technology (SUT). Boiled water was obtained by boiling the MilliQ- ([Figure 1A](#)) or RO-UV treated- ([Figure 1B](#)) water on a hotplate for 5 min and cooled down to room temperature. Microwaved water was prepared by heating the water in a cooking microwave at

2.45 GHz (Sharp Thai, Co., Ltd.) for 5 min, and cooled down to room temperature. MRET-treated water was obtained by activating the water with a commercially available MRET activator machine (USA patent number 6022479) for 30 min as recommended by the manufacturer. The device includes a liquid reservoir; an activation body formed of a patented polymeric matrix with the body disposed in a strong (2500–25,000 Oersted) magnetic field and responsive to visible electromagnetic radiation having a frequency of 7.2–7.8 Hz and a wavelength of 400–800 nm, and with one end disposed proximate to the surface of the liquid; and an electrical circuit adjacent at the other end of the body, activating diodes to emit flashes of light having that wavelength and frequency, so that the materials and the polymeric body are energised and emit low frequency oscillations, which activate the liquid contained in the reservoir.<sup>11</sup> MRET is an acronym for molecular resonance effect technology which is claimed to reorganise the structure of water molecules such that it will be more compatible to biological systems, allowing proper function of cellular signalling and metabolism.<sup>5</sup>

### Preparation and culture of PBMC

Normal human PBMC were chosen as the representative of human cells in our study because they are abundant in the human body, have rapid turn over rate, and are crucial for the immune system. The biological effects were detected by measuring the overall oxidative activity at the molecular and cellular level that occurred in mitochondria



**Figure 1** Schematic diagram of the protocols used in this study. **Panel A: Experiments on human cells.** Four types of water were used to prepare media for culturing peripheral blood mononuclear cells (PBMCs). After culturing for three days, resazurin reagent was added to measure the overall oxidative activity of the cells. All three types of water treatments (boiled, MRET activation, and exposure to microwave radiation) were done on Milli Q water on the same day as described in the [Methods](#) section. Medium prepared from none-treated Milli Q water was used as a control; whereas boiled water using a regular stovetop was used as a control for water heated with a microwave. The experiments were done in triplicate wells of PBMC cells obtained from three adult (25–26 year old) females. **Panel B: Experiments on soybean growth.** Four types of water and tap water were used to water soybean seeds and soybean plants grown in Leonard jars under a strictly controlled room. After the soybean seeds germinated, they were grown for 38 days, before the plants were collected to measure dry weight, root length and height. All three types of water treatments (boiled, MRET activation, and exposure to microwave radiation) were prepared from reverse osmosis (RO) water every week. None-treated RO water was used as a control, and boiled water using a regular stovetop was used as a control for water heated with a microwave.

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