

Correction

Correction: Hunt, R.W. *et al.* Electromagnetic Biostimulation of Living Cultures for Biotechnology, Biofuel and Bioenergy Applications. *Int. J. Mol. Sci.* 2009, 10, 4515–4558

Ryan W. Hunt ^{1,*}, Andrey Zavalin ², Ashish Bhatnagar ¹, Senthil Chinnasamy ¹ and Keshav C. Das ¹

¹ Department of Biological and Agricultural Engineering, The University of Georgia, Athens, GA 30602, USA; E-Mails: bhatnagarashis@gmail.com (A.B.); csenthil@engr.uga.edu (S.C.); kdas@engr.uga.edu (K.C.D.)

² Mass Spectrometry Research Center, Vanderbilt University Medical Center, Nashville, TN 37232, USA; E-Mail: andrey.zavalin@vanderbilt.edu (A.Z.)

* Author to whom correspondence should be addressed; E-Mail: rwhhunt@gmail.com (R.W.H.); Tel.: +1-706-227-7147; Fax: +1-706-542-8806.

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We found some errors in the paper published in International Journal of Molecular Sciences [1]. The table 1 had some typographical errors, information regarding field intensity missing, and the nomenclature did not match the legend. The corrected version is given below.

Table 1. Summary of electromagnetic treatments of some microorganisms.

Organism Class	* EM	Intensity	Biological effect	Reference
<u>Archaea</u>				
<i>Methanosarcina barkeri</i>	MW	13.5–36.5 GHz	Increase in growth, cell count, size and methane production	[5]
<u>Eubacteria</u>				
<i>E. coli</i>	SMF	0.05–1 mT	Stimulated transposition activity and reduced cell viability	[6]
	OMF	16, 60 Hz	Stimulation and suppression of enolase activity	[7]
	OMF	0.05–1 mT	Reduced transposition activity and enhanced cell viability	[6]

Table 1. Cont.

	OMF	100 mT	Exposure time dependent stimulation or inhibition of cell viability	[8]
	OMF	30 μ T	Cell density dependent changes in AVTD	[9]
	DC EF	NA	Increase in growth and removal of inhibitory compounds in medium	[10]
	OMF	0.1–1 mT @ 50 Hz	Significant morphotype changes and alteration during cell division	[11]
	ACEF	2.5–50 V/cm @ 0.05–100 kHz	Stimulation of membrane bound ATP synthesis, optimum at 100 Hz	[12]
	6-polar ACEF	0.35–2.1 kHz for test tubes 60 Hz for Petri dishes	Increase in growth in test tubes ($147 \pm 24\%$) and colonies ($42\text{--}179\%$)	[13,14]
<i>Bacillus cereus</i>	6-polar ACEF	1 kHz	Increase in growth ($196 \pm 29\%$)	[13,14]
<i>B. mucilaginosus</i>	SMF	~ 0.39 T	Increase in growth	[15]
<i>B. subtilis</i>	OMF	0.8, 2.5 mT, 0.8 and 1 kHz	Increase in growth and a loss of intercellular cohesion	[16]
<i>Bacteria & Yeast</i>	OMF	0–0.3 Hz @ 5–90 mT	Elevated or even diminished growth rates for <i>Bacillus subtilis</i> , <i>Candida albicans</i> , <i>Halobacterium</i> , <i>Salmonella typhimurium</i> , and <i>Staphylococci</i>	[17]
<i>Pseudomonas stutzeri</i>	SMF	0.6–1.3 mT	Increase in growth	[18]
<i>Trichoderma reesei</i>	SMF	1.5 mV cm ⁻¹	Increase in growth and cellulase activity and secretion	[19]
<i>Streptomyces noursei</i>	SMF	1.5 mV cm ⁻¹	Increased antibiotic production, O ₂ evolution and glucose uptake	[20]
<i>Salmonella typhimurium</i>	OMF	15 mT@ 0.3Hz	Growth stimulation; Mutation reversion rate unaffected	[17]
<i>Micrococcus denitrificans</i>	SMF	500–800 mT	Growth inhibition followed by stimulation after 6 h	[21]
<i>Corynebacterium glutamicum</i>	OMF	4.9 mT, 50 Hz	Increase in ATP levels by about 30%	[22]
Natural Flora	SMF	22 mT	Enhanced degradation of phenolic waste liquors	[23]
Natural Flora	PEF	1.25 - 3.25 kVcm ⁻¹	Enhanced biosorption of uranium	[24]
Bacteria & yeast	OMF	15 mT@ 0.3 Hz	30% increase in growth in gram –ve bacteria (<i>Pseudomonas aeruginosa</i> , <i>Halobacterium halobium</i>) than gram +ve (<i>Bacillus subtilis</i> , <i>Staphylococcus epidermidis</i>) and yeast (<i>Candida albicans</i>).	[17]
<i>Rhodobacter sphaeroides</i>	OMF/ SMF	0.13–0.3 T	Increase in porphyrin synthesis; Enhanced expression of 5-aminolevulinic acid dehydratase	[25]

Table 1. Cont.

<u>Cyanobacteria</u>				
<i>Spirulina platensis</i>	SMF	10 mT	Increase in growth (50%), O ₂ evolution and sugar and phycocyanin production	[26]
		250 mT	Increase in growth (22%), CNP and minerals uptake and chlorophyll content	[27]
	MW	7.1 mm @	Increased growth (50%)	[28]
		2.2mWcm ⁻²		
<i>Anabaena doliolum</i>	SMF	300 mT	Increase in growth, pigments, carbohydrate and protein	[29]
<u>Algae</u>				
<i>Chlorella vulgaris</i>	SMF	10–35 mT	Increase in growth (100%); Stimulated antioxidant defense	[30]
<i>Chlorella</i> sp.	SMF	6–58 mT	Increase in growth (NA)	[31]
<i>Dunaliella salina</i>	SMF	10–23 mT	Increase in growth (90%), and β -carotene content	[32]
<i>Scenedesmus</i> sp.	PEF	NA	Enhanced oil extraction	[33]
<u>Yeast</u>				
<i>Saccharomyces cerevisiae</i>	PMF	~ 4.7 μ T	Increased activity of alcohol dehydrogenase	[34]
	OMF+SMF	20 mT + 8 mT	Increase in ethanol and sugar utilization	[35]
<i>S. cerevisiae</i>	OMF	0.28–12 mT	Increase in growth	[36]
	OMF	0.2–12 mT	Increase in growth (25 +/- 5%)	[37]
		@ 50 Hz		
	AC/DC EF	100/10 mA	Increase in growth, organic acid production and cell budding	[38]
	MW	42GHz@ < 3 mWcm ⁻²	Frequency dependent increase or decrease in growth	[39]
	6-polar ACEF	1 kHz	Increase in gas production (195 $\pm$ 20%)	[13,14]
	OMF	0.5 μ T, 100–200 Hz	30% reduction in respiration	[40]
	SMF	7.28 T	Better UV survival; Stimulation of respiration	[41]
				[42]
	SMF	~0.26 T	Increase in growth (27–36%)	[15]
<i>Kluyveromyces marxianus</i>	PEF	0.25 kV	Increased ethanol production and cellobiose utilization	[43]
<i>Physarum polycephalum</i>	OMF	45,60,75 Hz	Delayed mitosis by 0.5 to 2 h	[44]
	OMF	0.1 mT, 60 Hz	Lower ATP levels but no decreased respiration	[45,46]
		0.2 mT and 60 and 75 Hz	Reduced respiration	
<u>Protozoa</u>				
<i>Trichomonas vaginalis</i>	SMF		Field strength dependent growth stimulation/inhibition	[47]

Table 1. Cont.

Ciliophora				
<i>Paramecium tetraurelia</i>	OMF	1.8 mT, 72 Hz	Increase in cell division rates; Alterations in membrane fluidity	[48]
<i>Tetrahymena pyriformis</i>	OMF	10 mT, 60 Hz	Delayed cell division and increased oxygen uptake	[49]

* AC-EF: alternating current electric field; DC-EF: direct current electric field; MW: microwave; OMF: oscillating magnetic field; SMF: static magnetic field; PEF: pulsed electric field; PMF: pulsed magnetic field.

We apologize for any inconvenience caused to the readers.

References

1. Hunt, R.W.; Zavalin, A.; Bhatnagar, A.; Chinnasamy, S.; Das, K.C. Electromagnetic Biostimulation of Living Cultures for Biotechnology, Biofuel and Bioenergy Applications. *Int. J. Mol. Sci.* **2009**, *10*, 4515-4558.

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