

(translation of reference letter)



ARMY Independent Voluntary Health Insurance Fund

1392 Budapest, Pf.:295 web:www.honvedep.hu E-Mail: honvedep@honvedep.hu
Tel:(+36 1) 412-3320,412-3321; HM 277-95 Fax:239-6749 HM fax: 278-94
1135 Budapest Aba utca 4.

Additional ARMY Independent Voluntary Health Insurance Fund was launched in March 1996 as a sector insurance and it has been opened as publicly found since 2005.

The number of institutional employers are over 100, who are paying their employer contribution. The fund's largest employer is the Ministry of Defence. The membership of health fund exceeds 30,000 people.

We have had a health service contract between our Health Service and Your Company for around three years, to provide the preventive care, screening, and health needs of our members.

During the last period of the staff took health services, which included medical tests after developing Personal Health Plans and treatments.

The treatments aimed at health prevention and rehabilitation, mainly:

- to improve physical well-being
- improving vital capacity
- treating post-traumatic stress
- other e.g. wound healing, digestion, allergies, pain relief

Recently many of our members took advantage of the advanced services of your Health Service. Our members consider the service appropriate, effective and they are still being used.

Your professional commitment is demonstrated by being on demand at our events free of charge and by giving free presentation of your services. Hereby I would like to thank you for your work at our recent common successful introduction in Veszprém village (at Military Day).

I wish you good luck to your work, and I hope for further successful cooperation,
18.06.2012. Budapest, Hungary, EU

Dr. Miklós Rékai

managing director,

ARMY Independent Voluntary Health Insurance Fund





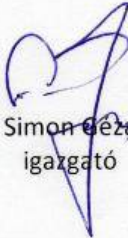
ORFK

Rendészeti Szervek Kiképző Központ

Lőkiképzés- és Intézkedéstaktikai Alosztály

Levélcím: 1097 Budapest, Vágóhid u. 11-13.; 1903 Budapest, Pf. 314
BM ☎:28-012 Városi ☎:476-3445 BM fax:28-062 Városi fax:476-3446

Egyetértek:


Simon Géza
igazgató

translation of reference letter

Hungarian National Police and Provost Duties, Armed Marshalls Training Center (ORFK-KK) Marksman- and Tactical Units Training Department

approved by Simon Géza

director

Referring to your report of 15 November 2011 concerning the efficiency of EMOST treatments on the staff taking part in the training program for special units during the period of 4-7 October 2011, I congratulate you on the achieved results.

While consulted the staff about the treatment I got positive feedback on the treatment only. You managed to achieve development and measurable decrease of stress load in training circumstances.

Special congratulations on the proven results which exceeded your estimated rate.

I am delighted that the technology has been tested first in the world in the (Hungarian) National Police and Provost Duties, Armed Marshalls Training Center Marksman- and Tactical Units Training Department in lifelike mission environment, in real situations.

I wish you good luck to your work and to effective adaptation of your method.

28.11.2011, Budapest,

Zoltan Laszlo SZABÓ, Ret. Police Lieutenant-Colonel,
Marksman- and Tactical Units Training Department Chief


Szabó Zoltan László t. alezredes
alosztályvezető



NATO CENTRE OF EXCELLENCE FOR MILITARY MEDICINE
H-1885 Budapest, P.o.B. 25
Phone: +36 (1) 883-0100 • Fax: +36 (1) 883-0120



TO: Dr. Erdőfi-Szabó Attila Ph.D.,
BioLabor Biofizikai- és Laboratóriumi Szolgáltató Kft
H-1122 Budapest Városmajor u. 20. 1/20


SUBJECT: **LETTER OF APPRECIATION**

DATE: 18 JUNE 2012

Dear Professor, dear Attila,

Congratulation to your scientific results, which were recently published in Electromagnetic Biology and Medicine (2012.VI, DOI: 10.3109/ 15368378.2012.681823). I see it as a great prospective in future not-yet-conventional training and rehabilitation processes.

With the hope of further successful cooperation I wish you all the best!


Lieutenant Colonel Robert BALAZS MD
Lessons Learned Branch
Acting Chief

Dr Beatrix SKURDENKA

Specialist physician, factory doctor, ambulance doctor, general practitioner, gastroenterologist and practice in the field of cardiology
BUDAPEST – HUNGARY – EUROPEAN UNION

Subject: Medical opinion

I have been working within the frame of service of BioLabor since 2009, mainly in the field of medical visits and factory medical audit. During inspections I often experience accumulated complaints of patients, in such cases I suggest comprehensive change of life-style and also solutions helping self-regeneration in view of the results of treatment.

As I have the chance to examine the changes of condition, the visible efficiency of treatments and statement of subjects aroused my interest, and I got to know the biological-biophysical impact mechanism of the treatment, the EMOST treatment method of Biolabor from Attila Dr. Erdőfi-Szabó managing director, developer, and I have carried out treatments since January 2010.

Summary of my experience

1. Psychological overload, stress, lethargy (37 subjects)

During inspections I experienced significant distress status, significant underregulation of dopamine, increased level of cortisol, typically high value of blood pressure and insufficient activity of the heart, typically respiratory disorders, hypoventilation, and also hypercapnia. On the first occasion of the series of treatments so-called Happy-Cocktail (#1) directed at the central nervous system. I gave a 45-minute treatment, after a short time at rest subjects typically reach the deep sleep phase, their breathing gets balanced, they are calm during the treatment. Their behaviour after treatment is typical of awakening, the second treatment occurs after a week.

During the second treatment there are two types of experience with subjects. Less change can be experienced in case of those whose body is presumably dehydrated due to low water intake. Those subject whose water intake is proportional to the body weight, typically mention increased tranquillity, meanwhile higher vitality and increased vital performance. The second treatment, Happy Cocktail (#2) is mainly directed at the neurotransmitters and the limbic system, length of treatment 45 ins in both cases. During the treatment subjects are at rest, they require less conversation, I draw their attention to the importance of water intake.

Experience at arrival to the third treatment is typically decrease of mood swings and increasing comfort, so the third, fourth and fifth treatment is carried out in the previously standardized way, in weekly rhythm, and then I check the changes of status. After the series of treatments subjects are usually in a more favourable steady state compared to that before the treatment, their stress level has

considerably improved, the level of dopamine and cortisol is typically better, symptoms of dispnea has considerably decreased, their mood and vitality has gotten better which they usually attribute to the treatments. In my opinion this method of treatment proves to be really effective in the treatment of stress which has remarkable guarding and preventive effect in point of stress risks and their adverse effects.

2. Accumulated complaints (56 subjects)

I experience in a lot of cases that the regulation of the body is unstable, under- and overfunctioning, compensation often occur just like hormonal and circulatory processes. In case of experiencing morbidity and distress appearing among risk factors I carry out a comprehensive treatment named Maxi-Vital that improves well-being.

Behaviour of subjects during treatment is typically the same as introduced above so I would rather not repeat myself.

This series of treatments is central nervous system/anti-stress indicated for the first two times, then directed at metabolism, circulation, immunity; on the whole it is comprehensive, health improving purpose, requiring altogether five treatments. According to my experience improvement of homeostasis can be well demonstrated in the changes of status, significantly occurring improving measured values (circular efficiency, improvement of heart function, decrease of metabolic disorders) and improving well-being of subjects. In my opinion this series of treatments can greatly improve the chance of healing, regenerational ability, decreasing risks and adverse effects so in case of accumulated complaints this method can greatly improve the results of other therapies.

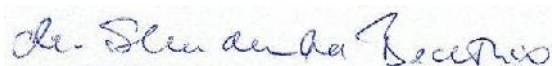
3. Own experience

Occasionally I also avail myself of the treatments, its stable stress reducing effect is really favourable for me, I also experience improvement of concentration and my vital capacity has considerably increased. It seems that the achieved results are overall capable of improving the subsystems and the overall body, so I started a series of treatments based on each other.

Summary

Based on the significant favourable changes of status I suggest this method for reducing stress risks and improving the chance of healing morbidity, presumably improving therapeutical efficiency, preserving and improving health, targeted treatments after researches controlled among clinical circumstances.

Date: Budapest, 14.03.2011



Dr Beáta SKURDENKA, (speaks in english)

Tel.: +36 20 594 5050



IBS - Irritable Bowel Syndrome

Dr Magdolna TÓKEY

Recovery from irritable bowel syndrome after seven years. Anamnesis: Man of 28 years, with IBS diagnosed seven years ago, psychological disturbances, progressive complaints of psychosomatic origin. Subject has been suffering from discomfort due to his illness, he can bear his transportation while travelling to the family owned venture only with parental help, by car. Due to his incontinence he has solved other journeys by parental toilet exploration and "toilet map" for years. This psychological load intensifies his complaints, complaints intensify his psychological load as a cycle, he has difficulties in building relationships due to his illness, furthermore he is not able to keep his partners. Parent comes across the method of Biolabor in the family-owned venture, in a photocopy shop. Afterwards they come for consultation and to take part in a free of charge trial. Indication: the first area is psychological unloading, the second target area is release of erosion in the bowel wall, regeneration of intestinal mucous membrane and regulation of its pH value, then the third target area is the improvement of the digestional process, hereby improvement, reactivation of the alimentary tract and absorption of alimentary substances.

Treatments take place in turns, on a weekly basis. During the first treatment he falls asleep, his parents receive it with curiosity. During the second treatment subject and parents tell that he feels and sleeps more comfortable. Right after the second treatment no stimulus of defecation occur any more. Before the third treatment the experience of the last two weeks indicate favourable changes, the frequency of defecation, faecal retention disorders falls nearly by half. After the third treatment he goes home alone by public transport. Before the fourth treatment an account is given about the experience of the last three weeks according to which his well-being has greatly improved, his inhibitions has decreased, respectively they do not occur, his taste and salivary excretion has become more intensive, his elimination is free of complaints. He arrives alone at the fifth treatment, talking about remarkable improvement, he is calmer and feels better, his faecal retention has become more controlled, controllable. Before the sixth treatment he talks about his experience in the last five weeks according to which his fears and worries have improved a lot due to the improvement of elimination, faecal retention; he reckons only one or two further treatments as reasonable "just to be on the safe side". Today, on 15th September 2010, on the day of the seventh treatment subject is completely calm, being in a psychologically unloaded state during the treatment, giving a healthy impression. Based on his account he "feels completely well", his previous experience of discomfort appear rather as memorials, however he can naturally get by them. The subject and his parents express that his load seems to end after several years of discomfort, secludedness, bad quality of life, and the method of BioLabor meant a solution for the subject (Zoltán) in his recovery from irritable bowel syndrome.



Dr Magdolna TÓKEY, physician, retired GP

MEDICAL OPINION

I got acquainted with the proprietary development method of BioLabor in 2007, and I have been a devotee of it since then. Based on my experience of several hundreds of patients I can say this self-regeneration stimulating method (EMOST) can be really useful for both the science of medicine and patients. I am convinced that human beings can heal themselves just as they can make themselves ill. This method works as a mirror. It seems it can confront the body with the ongoing biological processes, so it can facilitate re-checking of processes being behind the regeneration pace, self-regulation, self-recovery, homeostasis, and this is a great success.

Dr. Tókey Magdolna
Dr. Tókey Magdolna

Dr Magdolna TÓKEY, physician, retired GP

+36 70 342 9968

Mrs Csűrös Dr Veronika Hajda

Parmaceutist, Naturopath-fitotherapist, Homeopathic consultant
Budapest - Hungary – European Union

Subject: Medical opinion

Dear enquirer,

I have used the equipment developed by BioLabor since 2007, the reason of my purchase was my receptiveness of modern equipments and supplementing allopathic therapies to increase their efficiency.

I can regard the efficiency of the method successful until today, mainly in case of chronic diseases where the conventional protocol could not reach sufficient recovery results. According to my experience the equipment provides outstanding results mainly in the improvement of the regulation system of the body, both in chronic and acute, stagnant stages.

Summary of my experience:

1. In case of sleeping disturbance, insomnia (267 subjects)
4-5 treatments, carried out with a weekly frequency, are typically enough to reduce chronic problems remarkably, or to cease them. After the first, second treatment subjects experience improvement of their mood, a favourable change in their psychological state, improved metabolic process, and balanced circadian rhythm. After the completion of treatments their complaints are significantly reduced, typically ceased, their social and interpersonal relations get normal. According to my experience subjects preserve the state they reached also in the long run after the series of treatments, or rather their state often even improves after the series of treatments.
2. In case of allergy, irritation (158 subjects)
Subjects typically suffer from several symptoms of irritation, allergy with more complaints at the same time. I start the treatments with stress relieving treatment which means 2-3 treatments, followed by natural and unknown antigen treatments every week, altogether 4-6 times. During the treatment moderate diet and increased water intake is suggested. (25 body kilogram/1 litre of water) According to my experience the stress relieving treatments already reduce complaints which refers to the psycho-neuro-immunological connections, psychosomatic effect. After finishing the series of treatments a significant part of subjects is free of complaints, the remaining small fraction needs nutritional immune intolerance test presuming enzyme disorders. I find the method outstanding in case of children with asthma bronchilae, atypic dermatitis. This is the point where I have to remark that I appreciate the Social Responsibility program of Biolabor, the caritative, free of charge treatment of children under ten years old is exemplary and unfortunately necessary.
3. I case of persistent mood disorder, lethargy (307 subjects)
During my experience subjects get to the status of persistent mood disorder and lethargy in conjunction with metabolic and regulational disorders. Complaints are accompanied by sleeping disorders and also characterized by digestive, elimination disorders. I always start the treatments with stress relieving treatment, then I carry out both the sleeping disorder and digestive program once.

Based on the experience gained during these treatments I follow the treatments with mood disorder and Happy Cocktail program, typically 4-5 times on a weekly basis. Based on the last years the method is exceptionally indicated in such cases, subjects usually give an account of stable favourable changes, their drug addiction is considerably reduced, their social relations improve, their psychological status gets normal. It belongs to my opinion while the equipment helps to get over the "dead point" , it is also necessary to settle the root causes, but then this method gives an appropriate psychological method.

4. Incontinence, elimination disorders (156 subjects)

The service of Biolabor's equipment provided in this field reaches success in such an area where there is no real alternative. Subjects usually arrive with several parallel symptoms, psychological/mood disorders, sleeping disorders, neurological overload and in many cases drug overload that have an effect on the sensitivity to stimuli, steroidal regulation, resistance. I always start the treatments with stress relieving treatment, then I carry out the series of incontinence treatment which means altogether 4 occasions on a weekly basis. In case the expected result is late during the treatment then I supplement it with stress relieving treatment and sleeping disorder program, so typically the expected favourable result can be achieved by 2-3 further treatments. In case of elimination disorders (chronic constipation) after 2-3 targeted treatments the equipment usually helps the regulation, correction of peristalsis, intestinal mucosa, hydration, reducing complaints by self-regulation.

5. Other experience:

- Conception program: In case of conception difficulties I suggest an allergy test for the mother in the first place. In case it exists then first I give a stress relieving (central nervous system, limbic balance, amygdala, hypophysis) treatment, followed by 4-5 targeted antiallergic program and I suggest the increase of fluid intake. After the treatments in the week of ovulation I start the Conception program which means 5 treatments, including estradiol, FSH, neurotransmitter balance, after which we usually reach the goal within two or three months in 70-80% of the cases.
- Children: According to my experience the treatments of children are really effective. 2-3 shorter targeted treatments are typically enough for a considerable improvement. The immune system strengthening programs are given with great efficiency to children getting into community, their healing time gets considerably shorter and they become comparatively more resistant. After 1-2 treatments hyperactive children generally calm down, become well-socialized, their emotions get more stable. In case of inhibited, fearsome children 3-4 mood improving treatments are enough for the change, and an accompanying results is that their vitality, appetite and activity improves, and their resistance also increases.

As a summary, I find the equipment and the method appropriate to reach the above mentioned goals, to help the self-healing mechanism of the body, to reduce chronic disorders.

Budapest, 6th May 2011

Mrs Csűrös Dr Veronika Hajda

Tel.: +36 30 999 99 47 *(speaks in english)*



Iringó Ingrid Tankó 14th Nov 2009 brain damage at birth, (birth stroke), birth hypoxia, muscle, Pier Robin syndrome diagnosed at the age of 2 months.

➔ Breathing, muscular spasm, visual and audial reflex, lack of pharyngeal reflex, pulmonary atrophy, faint, hardly viable status.

No. of EMOST™ treatments:

1. treatment on 19.06., XXXX, pneumonia, 339, digestion, oxygen intake.
2. 340, 366, 403, 339
3. 340, 366, 403, 339
4. 340, 341, 366, 403, 339

Experience until now:

Parents: "Her breathing is calmer, her eye-sight is better, better reaction to stimuli. The hearing reflex improved, she reacts even from 2 meter far. There is no change in pharyngeal reflex. Her parents reckon the apperance of visual-audial reflex as a really favourable change. Her mood is better, the need of creating relationships appeared. Her mother is reading and after her song she seems to express pleasure, her grasp became stronger. According to the child's physician, Dr Julcsi Seres, the symptoms of muscle atrophy is not detectable, no change can be perceived in the coordination of the limbs. Holding of the head and neck appeared for a short time, 5 minutes continuously, she can hold it again after a short rest. Her defecation improved, its consistence improved, being attributed to tasting on the tongue as well. The result of moving the child on the ground is that she can roll around alone for almost an hour which she likes. It can be declared that her fitness, concentration, mood and abilities have greatly improved since the treatments carried out by EMOST, 'it can be regarded as GREAT result compared to the beginning'. The parents stated that the family got a chance to step over the dead point of shock and hopelessness.

Dated: Sepsiszentgyörgy 05.08.2011."

Romania, EU

Kelt, Sepsiszentgyörgy 2011.08.05.
Kovács

Kovács
Hollóczy Ilona
075 211 8190

Tankó
Tanka Urszula
074 114 7680

Kovács Károly
Urszula



Recovery from stigmatic double consciousness

“Recovery from stigmatic double consciousness after nine years. Anamnesis: Twenty-four year old man (resident of Siófok), double consciousness diagnosed nine years ago, subdepression, superficial injuries of stigmatic characteristic on the skin below the shoulder blades, furthermore signs of other injuries not caused by himself (medical evidence), constant nightmares, asocialization, ochlophobia, living alone with his mother, declared to be unemployable due to psychological causes. During personal consultation he has a distant look, he is under the effects of antidepressants, avital, of weak concentration, his manifestations indicate increased sensitivity to stimuli while evoking his experiences. He was directed to Prof. Dr Ágnes Valló psychotherapist, behaviour therapist, university teacher, based on his personality disorder and psychological status, where searching a different treatment became necessary after two psychotherapeutic treatments.



of inhibition, the other targeted the neurovegetative system, mainly the parasympathetic (perception of stimuli) and sympathetic (reactions to stimuli) regulation and the controllability of neurotransmitters. The targeted treatments were carried out on alternating areas on a weekly basis. After the second treatment subject and parent gave an account of improving mood, reduced frequency of lethargic and depressive periods experienced during the first week. During the second week his mood improves even further, he leaves the house for the first time after nine years and takes a walk in the garden. After the third treatment he has the first undisturbed sleep, on the fourth week he pays attention to his clothing. He takes a short walk in the centre of Siófok, on the promenade (at the end of August, in peak season) accompanied by his parents. After the fifth treatment he feels calm and confident enough to travel ALONE by train from Siófok to Budapest for his sixth treatment and then back home. This imbues both his parents and the treating staff with delight and excitement. Before the treatment he talks about the overall favourable changes, settling of his emotions and giving up taking certain antidepressants, appearance of enthusiasm. His manifestations are controlled, reflexes can be evaluated, are adequate, his behaviour is stable. After omitting one week he arrives to the seventh treatment alone by train again, giving and showing the impression of a young man with a healthy psyche. Answering a question he claims that he feels to be cured, he has desires, longing for relationship, fellowship, he think with love of his relationship with his parents and wants to be active, useful. Today, on 15th September 2010 we could present the story of a cured person, his release of stigmatic double consciousness and bipolar depression, ochlophobia, with the application of electromagnetic own signal therapy (EMOST) of BioLabor (Dr.Erdőfi-Szabo), with contribution of subject and parents, with common success and delight.”

Prof. Dr Ágnes Valló
+36 30 981 6332

Declaration of subject:

Paranoid schizophrenia

“My illness is paranoid schizophrenia. One of its characteristics is that the patient is not aware of the illness. I was told by several people (before the treatment of biolabor) that my speech was incoherent. For me it did not seem incoherent at all, indeed I spoke very logically, but there were things I did not dare to talk about openly so I tried to circumscribe them with other words, and if people had taken trouble over concentrating on my message and followed my speech from the very beginning, then the hidden content of my speech would have been made up. My speech was slow and discontinuous because I continuously rephrased my real message into a version that can be hardly understood by criminals. At least at the time I had on my brain that by making the comprehensibility of my sentences more difficult I can avoid ill-intentioned people hurting me.

I have an idea about the cause of development of my illness. According to others this coherent logic is nothing else but the irrational thinking arising from my illness. According to my idea the symptoms of schizophrenia appeared within me when I was buried under the ground. I have not known about it for years but there is an explanation for this as well. According to me psychiatrists oppressed this memory in me, so it was easier to bear it. I was very colloquial with people before my illness, everybody knew and liked me in the hostel, I laughed and made others laugh a lot. Then I suddenly sank in myself. One of my classmates even made a remark that in the summer the UFOs had taken me with themselves and brought me back ruined. I could not explain to him why I had become so speechless, because these memories had been oppressed in me by then.

I started to get used to the situation when in a summer the thing that only happens in movies according to other people, happened again, I was buried again and cut very badly. From that time I dove into myself so much that I don't even remember what I did, what I spoke with whom and how I lived my life after the healing of my injuries. I took my school leaving exam nearly unconsciously and I went through a technical institute.

Later I began to take part in the treatments of Biolabor. The psychologist with whom I am in contact, told me that my speech was more complex and it was not as incoherent as it used to be. What I feel myself is that I am less often in depressive ascetic state. Before the treatment I was continuously depressed. After the treatment only in such cases when something important was a failure. I think I talk more and more to my friends. I used to be like a brainless vegetable. I am not a popular sanguine character even today but I have taken a road towards improvement due to the biolabor treatments.

Dated: 25.11.2010 17:26, Musztafa A.M.”



Thanks giving graphic by Musztafa

PRELIMINARY EXPERIMENTS:

Single EMOST treatment effect on electrocardiogram and the serum concentration of urea, albumin, cortisol, chloride, CPK, TSH, and CRP



UNDER REVIEW

We performed some preliminary experiments on twelve members of our BioLabor regarding the effectiveness of single EMOST treatment on some serum parameters and electrocardiogram (ECG). ECG results did not show statistic significant improvement after single EMOST treatment. In contrast, some serum factor such as uric acid, albumin, cortisol, chloride, Creatine phosphokinase (CPK), Thyroid stimulating hormone (TSH), C-reactive protein (CRP) indicated some remarkable changes following one treatment.

Cortisol, TSH, CRP, and CPK serum concentrations were reduced in the most of us. The albumin concentration usually showed a slight decrease and the uric acid concentration increased in almost all cases. Chloride level of serum showed a slight increase in almost every case. Of course, these few preface experiments have no great importance, but indicate EMOST treatment may reduce stress factors and affect on the redox/free radical processes as numerous studies reported regarding to the effect of low-frequency and intensity electromagnetic fields.

For example, cortisol levels were decreased in most of the members of our BioLabor after one EMOST treatment. Cortisol is a (glucocorticoid) steroid hormone that produced by the adrenal cortex in response to stress (Inslicht et al., 2011). Its major functions are, among them, to increase blood sugar through gluconeogenesis and suppress the immune system, but recent studies revealed that glucocorticoids (cortisol) have both stimulatory and suppressive effects on immune responses that are dependent on the GC concentration (Yeager et al., 2008).

Uric acid concentration increased in almost all cases after single EMOST treatment. However, uric acid is strong reducing agents (electron donors) and potent antioxidants (Warning, 2002). In humans, about the half the antioxidant ability of blood plasma comes from uric acid (Maxwell et al., 1997).

Chloride level also showed a slight increase in almost every case. Chloride is a prominent negatively charged ion in the blood, where it represents about 70% of the body's total negative ion content. However, chloride level has essential role of blood pH value that can influence pH-dependent redox/free radical processes. It seems that EMOST treatments may transiently potentiate functional redox processes.

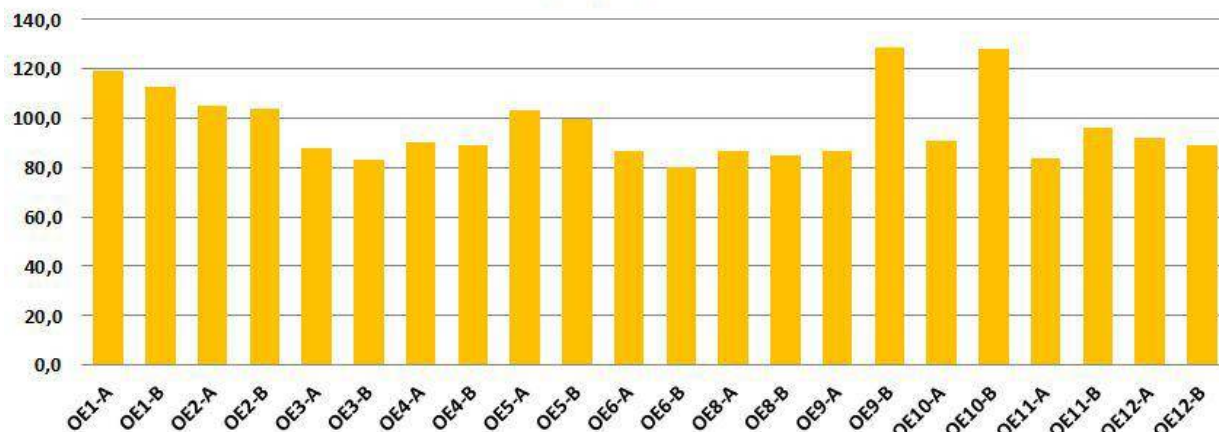
However, we have started a large-scale, controlled testing of EMOST treatments (with forty subjects and with sham exposed controls) regarding its effectiveness on serum parameters and electrocardiogram. We hope that we can report the results in the near future.

Results:

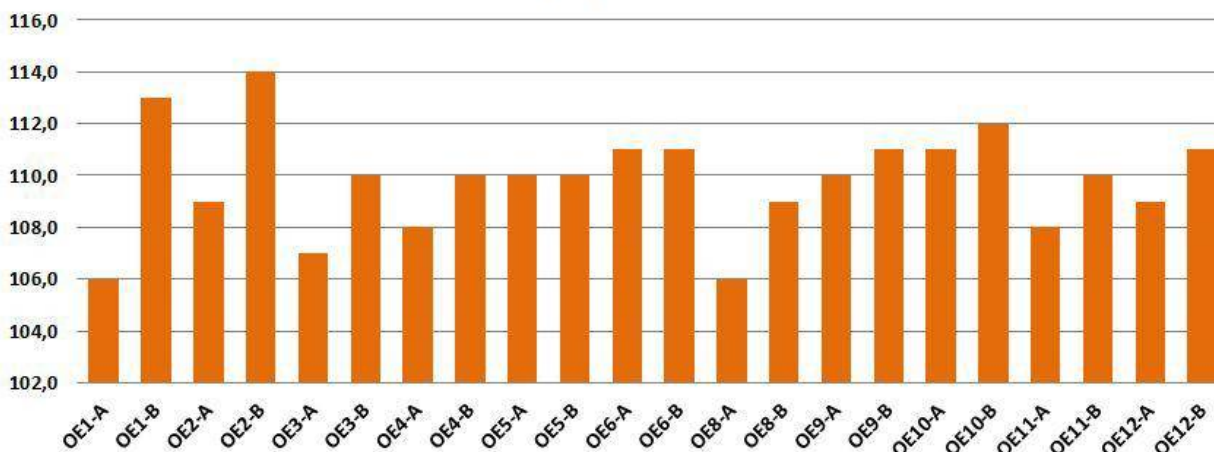
		OE1-A	OE1-B	OE2-A	OE2-B	OE3-A	OE3-B	OE4-A	OE4-B	OE5-A	OE5-B	OE6-A	OE6-B	OE8-A	OE8-B	OE9-A	OE9-B	OE10-A	OE10-B	OE11-A	OE11-B	OE12-A	OE12-B
mmol/l	Chlor	105,0	113,0	109,0	114,0	107,0	110,0	108,0	110,0	110,0	110,0	111,0	111,0	105,0	109,0	110,0	110,0	112,0	112,0	108,0	110,0	109,0	111,0
g/l	Albumin	43,5	41,0	42,0	37,0	40,0	38,0	43,0	44,0	42,0	36,0	46,0	44,0	35,0	42,0	36,0	43,0	43,0	40,0	45,0	44,0	46,0	45,0
U/L	CK	163,0	158,0	149,0	133,0	71,0	77,0	170,0	148,0	216,0	185,0	197,0	186,0	114,0	207,0	127,0	197,0	219,0	169,0	270,0	153,0	230,0	180,0
mg/l	CRP	3,8	2,7	3,3	3,0	7,0	7,0	2,8	2,6	3,4	3,3	1,2	1,2	4,6	2,3	3,0	2,4	2,3	2,3	2,3	2,3	2,3	2,6
mmol/l	Uric acid	434,0	446,0	298,0	285,0	239,0	238,0	156,0	164,0	246,0	246,0	253,0	216,0	309,0	303,0	305,0	364,0	310,0	323,0	228,0	350,0	439,0	357,0
mIU/l	TSH	3,6	2,6	1,7	1,1	2,0	1,6	2,2	1,9	2,2	1,9	1,9	2,0	6,3	6,1	8,6	8,1	1,3	0,9	1,0	1,2	2,1	2,2
nmol/l	Cortisol	381,0	276,0	221,0	141,0	121,0	123,0	215,0	159,0	164,0	120,0	170,0	182,0	333,0	261,0	293,0	208,0	626,0	271,0	215,0	319,0	295,0	316,0



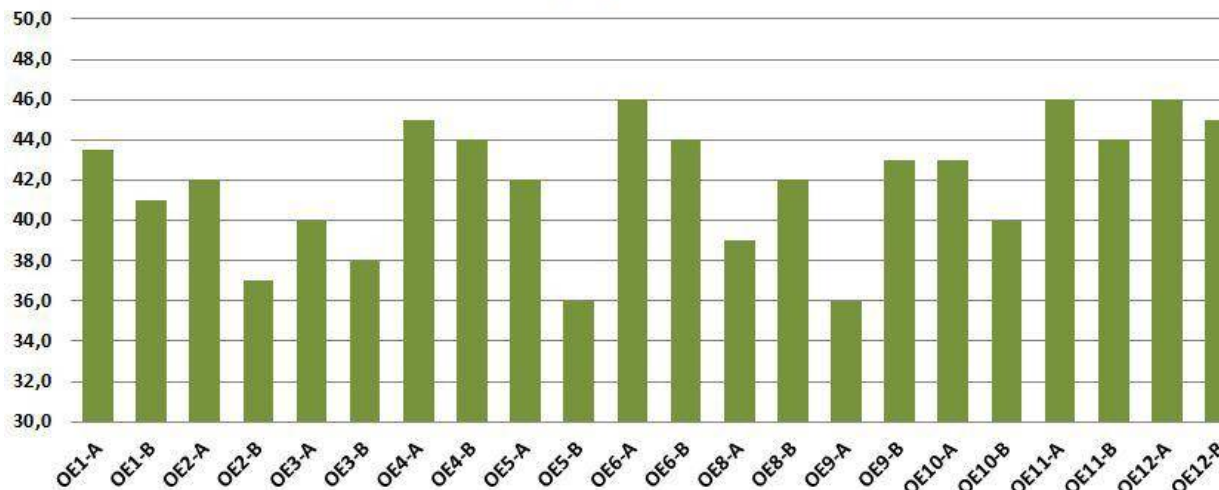
Changing in Creatinin



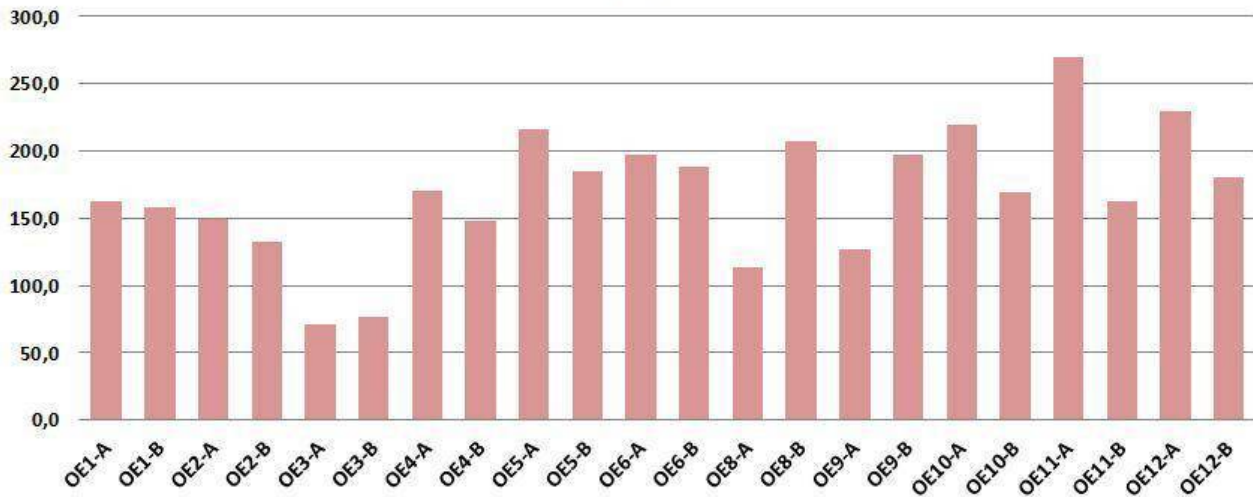
Changing in Chloride



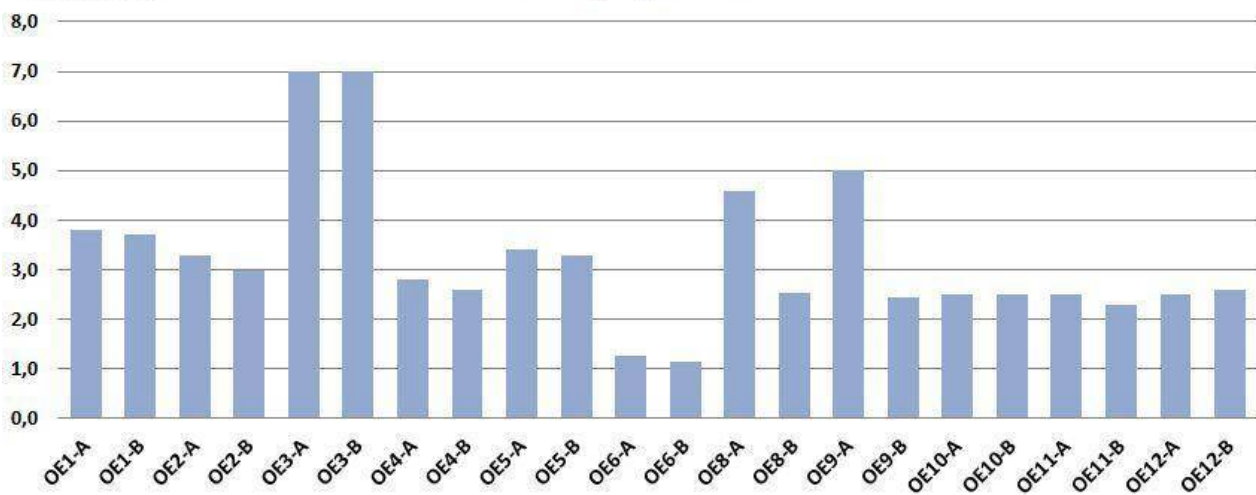
Changing in Albumin



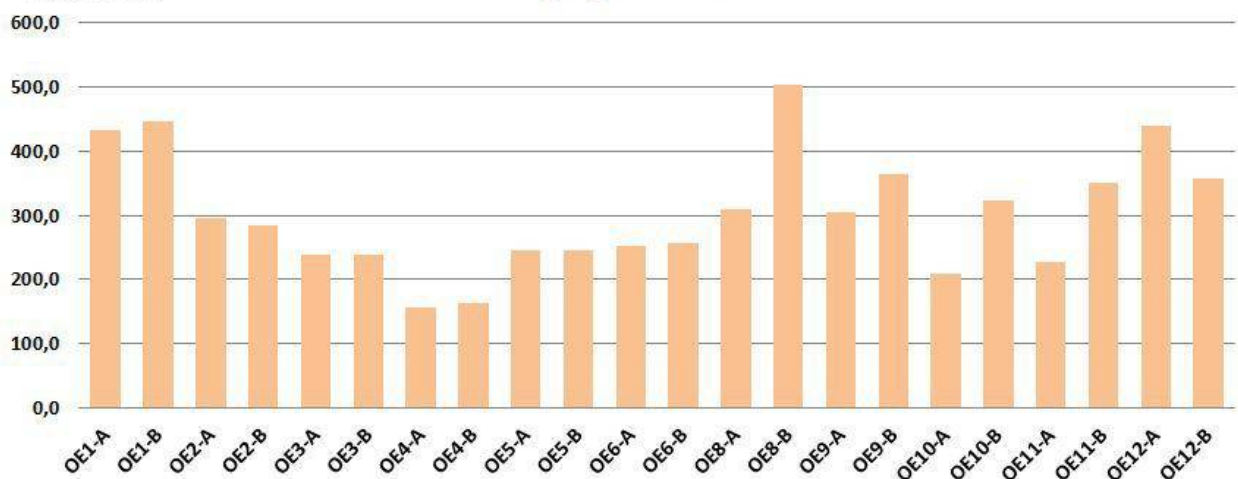
Changing in CK



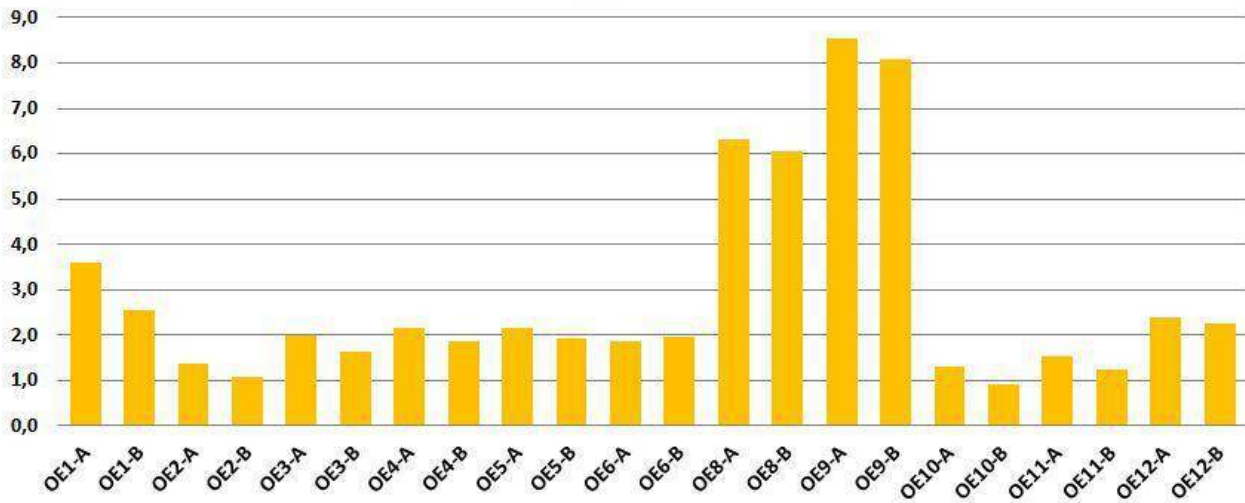
Changing in CRP



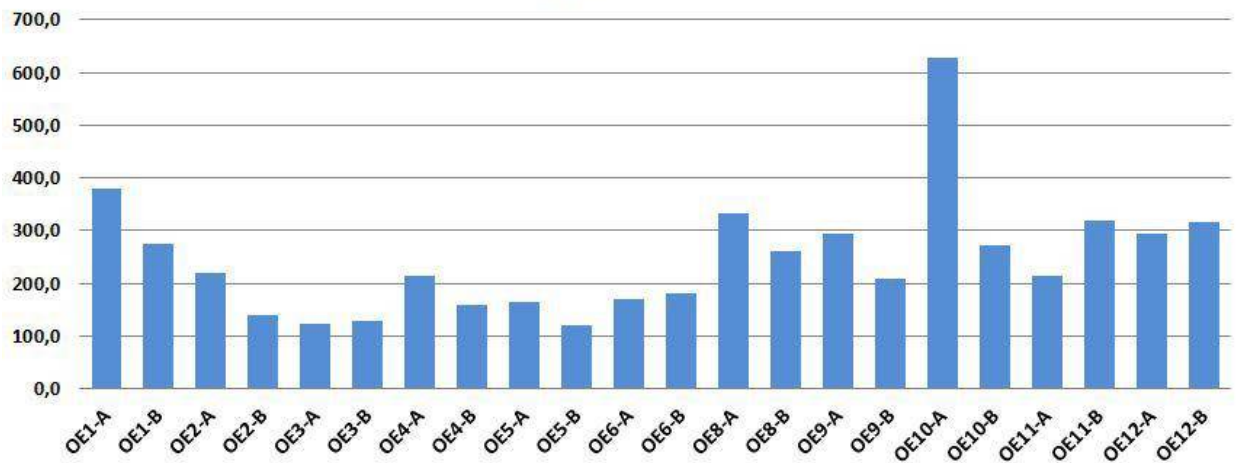
Changing in Uric Acid



Changing in TSH

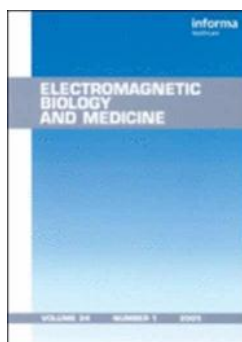


Changing in Cortisol



István Bókkon Ph.D.
Attila Erdőfi-Szabó Ph.D
Dr., Sci-Med. Attila Till MD.

EMOST™
biolabor-med.com



EMOST: Elimination of chronic constipation and diarrhoea by low-frequency and intensity electromagnetic fields

Journal:	<i>Electromagnetic Biology and Medicine</i>
Manuscript ID:	Draft
Manuscript Type:	Original Article
Date Submitted by the Author:	n/a
Complete List of Authors:	Bókkon, István; Semmelweis University, Doctoral School of Pharmaceutical and Pharmacological Sciences Erdőfi Szabó, Attila; BioLabor, Till, Attila; National Institute for Medical Rehabilitation, Budapest, Hungary, Erdőfi-Nagy, Éva; BioLabor Biophysical- and Laboratories Services Ltd, Lukács, Tünde; BioLabor Biophysical- and Laboratories Services Ltd,
Keywords:	Chronic diarrhoea, Chronic constipation, Low-frequency and intensity electromagnetic fields

SCHOLARONE™
Manuscripts

1
2
3 **EMOST: Elimination of chronic constipation and diarrhoea by low-**
4 **frequency and intensity electromagnetic fields**
5

6 ¹Bókkon I, ²Erdőfi-Szabó A, ³Till A, ⁴Lukács T, ⁵Erdőfi-Nagy É,
7

8 **2012**
9

10 *1 Chief Scientific Consulting of BioLabor Biophysical- and Laboratories Services Ltd, Budapest,*
11 *Hungary*

12
13 *2 Pro Deo State University, Chairman of BioLabor Biophysical- and Laboratories Services Ltd,*
14 *Budapest, Hungary*

15 *3 National Institute for Medical Rehabilitation, Budapest, Hungary*

16
17
18 *4 Accredited Biophysical Therapist, BioLabor Biophysical- and Laboratories Services Ltd, Budapest,*
19 *Hungary*

20
21 *5 Accredited Biophysical Therapist, BioLabor Biophysical- and Laboratories Services Ltd, Budapest,*
22 *Hungary*
23

24
25
26 ***Corresponding author: István Bókkon**

27 **Corresponding author's Email: bokkoni@yahoo.com**

28
29 **Corresponding author's Address: H-1238 Budapest, Láng E. 68. Hungary**

30
31 **Corresponding author's Phone: +36 30 9769699**

32
33 **Corresponding author's Fax: + 36 1 217-091**
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Previously, we reported about the effectiveness of the EMOST (Electro-Magnetic-Own-Signal-Treatment) treatments in reduction of phantom limb pain as well as improvement of the quality of sleep and mood in subjects under clinical circumstances. We also presented the successful application of EMOST for mental stress management of humans under catastrophic conditions. Our some years experience indicated that the efficiency of EMOST is much greater in children than in adult subjects. In addition, in children much less treatment is needed for recovery compared to adult subjects, as well as the duration of the treatment is shorter. It is possible that this particular success is due to the large plasticity of the central and the autonomic nervous system in young patients. Thus, our research pays special attention regarding the EMOST effectiveness in the field of chronic childhood diseases. Here we report about results of routine alternative treatments carried out at Biolabor Biophysics and Laboratory Services Ltd by EMOST device regarding to the elimination of chronic constipation and persistent diarrhoea in the case of two children. We also briefly present two important possible biological mechanisms such as redox processes and the bidirectional communication between skin cells and the nervous system regarding the efficiency of low-frequency and intensity electromagnetic fields (LFI-EMF) treatments.

Keywords: Chronic diarrhoea, Chronic constipation, Low-frequency and intensity electromagnetic fields (LFI-EMFs)

Introduction

Living cells produce a particularly weak non-linear electromagnetic activity in a wide spectrum of frequencies - from Hz to THz (Fraser and Frey, 1968; Isojima et al., 1995; Cohen and Popp, 1997; Kobayashi et al., 1999; Pokorný et al., 2001; Lipkova and Cechak, 2005; Cifra et al., 2011; Albrecht-Buehler, 2005; Wang, Bókkon et al., 2011) that is due to the various cellular mechanisms associated with biochemical/ bioelectric processes.

Although modern pharmacology has made considerable progress in the treatments of diverse diseases, we should also recognize that in many cases pharmacology treatments can be ineffective. In these cases, the application of biophysical low-frequency and intensity electromagnetic fields (LFI-EMFs) could offer new opportunities, because during various diseases, cells not only display altered biochemical processes but also generate altered non-linear bioelectric and bioelectromagnetic complex patterns.

1
2
3 To date, most investigations about electromagnetic exposition focus for the harmful
4 effects that are due to the increased environmental artificial electromagnetic pollutions
5 (especially microwaves and radiofrequencies, among others) (Viel et al., 2009; Abdus-salam
6 et al., 2008; Hardell and Sage, 2008). However, several increasing evidences revealed that
7 non-ionizing LFI-EMFs influence cell functions and can facilitate or initiating various healing
8 processes, such as the delay of fractures, induction of analgesia, acceleration of wound re-
9 epithelialization, inhibition of inflammatory processes, reduction of fatigue, improvement of
10 multiple sclerosis and chronic pulmonary disease, among others (Orgel et al., 1984; Sandyk,
11 1996; Selvam, et al., 2007; Satter Syed et al., 1999; Lappin et al., 2003; Kumar et al., 2005;
12 Alfieri et al., 2006; Zhang et al., 2007; Markov, 2007a; Tsang et al., 2009; Mach and
13 Persinger, 2009; Mancuso et al., 2007; Patruno et al., 2010).

14
15 We should make difference between the harmful effects of environmental
16 electromagnetic pollutions from the possible application LFI-EMFs for therapies. The former
17 is an uncontrolled harmful process but later is controlled procedure with specific
18 electromagnetic frequencies, durations and wave forms.

19
20 In addition, the role of exposure time during LFI-EMF therapies is extremely critical
21 (Di Carlo et al., 2002; Regoli et al., 2005). LFI-EMF radiations with a short-term exposition
22 (about less than 45 min) can facilitate the immune system and cellular processes, but a long-
23 term or continuous exposure to LFI-EMFs results in a decline in cytoprotection (Regoli et al.
24 2005; Di Carlo et al. 2002). Long-term electromagnetic exposition can shift the redox and
25 calcium balance, which could cause additional cellular malfunctions. For example, NMDA
26 receptors can be redox modulated by hydroxyl radicals (Aizenman, 1995; Bókkon and Antal,
27 2011), but long-term or continuous exposure to LFI-EMFs provoke aberrant NMDA receptor
28 activities (Manikonda et al., 2007).

1
2
3 Here we report about the elimination of chronic constipation and persistent diarrhoea
4 by LFI-EMF treatments by EMOST medical device (Figure 1) in the case of two children. We
5 also briefly propose two important possible mechanisms such as redox processes and the
6 bidirectional communication between skin cells and the nervous system regarding the
7 efficiency of LFI-EMF treatments.
8
9
10
11
12

13 14 15 16 **Chronic diarrhoea**

17
18 Chronic diarrhoea (duration > 14 days or longer) is very complex symptom that is due
19 to a wide range of aetiologies. Usually, there is more than one mechanism can be occurring
20 simultaneously. Acute diarrhoea disorders usually due to the: I. Infections (bacterial as
21 Salmonella, Shigella, Clostridium, and Yersinia or viral as Rotavirus, Adenovirus,
22 Cytomegalovirus, and Human immunodeficiency virus (HIV)); II. Drugs (like antibiotics) or
23 poisons; III. Immediate hypersensitivity reactions (Thapar and Sanderson, 2004).
24
25
26
27
28
29
30
31

32 Chronic diarrhoea can be produced by: I. Parasite infections (Giardia, Entamoeba,
33 Cryptosporidia, etc.); II. Congenital disorders of digestion or absorption (cystic fibrosis,
34 autoimmune disorders, enzyme defects, food allergies, among others). Irritable bowel
35 syndrome (IBS) is one of the most common causes of chronic diarrhoea. Diabetes can also
36 induce chronic diarrhoea when the nerves that supply the digestive tract are injured (Thapar
37 and Sanderson, 2004).
38
39
40
41
42
43
44

45 Chronic diarrhea can make severe complications such as malnutrition, dehydration or
46 weight loss. In addition, persistent diarrhoea is related to undernutrition, growth faltering,
47 micronutrient deficiency, impeded neurodevelopment, increased morbidity and mortality in
48 childhood, among others (Moore et al., 2010; Black et al., 2008; McAuliffe et al., 1986). The
49 goal of chronic diarrhoea management is to eliminate the underlying cause. For example,
50 diarrhea produced by infections can be treated with antibiotics (Schorling et al., 1991). In
51
52
53
54
55
56
57
58
59
60

1
2
3 other cases, management is simple eliminating a food (like in the case of lactose intolerance)
4
5 or drug. However, in several cases, the cause of chronic diarrhoea is unknown.
6
7
8

9 10 **Chronic Constipation**

11
12 Constipation is a frequent gastrointestinal disorder in the pediatric (Borowitz et al.,
13
14 2003; Youssef and Di Lorenzo, 2001) as well as in adult population (Drossman et al., 1993;
15
16 Higgins and Johanson, 2004) that affects mostly women. Mild constipation can be defined as
17
18 fewer than three stools per week and severe constipation as less than one stool per week.
19
20 Constipation usually is caused by the slow movement of stool through the colon. In most
21
22 cases chronic constipation has not any dietary or structural causes that can be revealed.
23
24 Chronic constipation negatively affects the quality of life and produce high costs (Spinzi et
25
26 al., 2009; Martin et al., 2006). Constipation requires an urgent assessment if it is accompanied
27
28 by symptoms such as rectal bleeding, abdominal pain and cramps, nausea and vomiting, and
29
30 involuntary loss of weight. Causes of functional constipation include, for example,
31
32 dehydration, inflammatory bowel disease, psychosocial stress, parental disharmony, etc.
33
34
35

36
37 Regarding to nonpharmacologic strategies there is not any evidence, for example, that
38
39 increased exercise and fluid intake could provide relief the symptoms of chronic constipation
40
41 (Müller-Lissner et al., 2005). Nonpharmacologic biofeedback retraining of the pelvic floor for
42
43 treatment of defecation provided effectiveness (Koh et al., 2008) but additional studies are
44
45 needed in the future. Other managements of constipation can include dietary fiber, non-
46
47 stimulant laxatives (osmotic laxatives such as saline laxatives, nonabsorbed sugars or
48
49 polyethylene glycol that can increase intestinal water secretion) or stimulant laxatives
50
51 (diphenylmethane or anthraquinone derivates), enemas, surgery, among others (Coremans,
52
53 2008). Stimulant laxatives should not be used more than a few days because they can
54
55 permanently damage the colon and worsen constipation.
56
57
58
59
60

EMOST method and natural-based electromagnetic signal forms

EMOST medical device (Figure 1) can detect non-linear bioelectric and bioelectromagnetic signals from subjects' skin by special input/output electrodes. The collected signals are processed by computer of EMOST device. The subjects are treated by processed signals originated from device (frequency range between 1 Hz - 1 MHz; intensity range between 0.1-10 micro Tesla). A particular feature of EMOST method - compared to most of electromagnetic equipments - is that the subjects' own bioelectromagnetic signals that are detected from skin can be processed in analogue mode (non-digitalized). Then, analogue signals are radiated back using a flat electrode radiator through various band/signal combinations, with some amplification (-20dB- +60dB), to the skin's surface on the opposite side and extended by the higher range sounds of the signal. The special analogous process makes it possible that the biophysical information content of detected and back-transmitted electromagnetic signal is much larger than in digitized methods (Figure 1).



Fig. 1. EMOST Redox 1.1. Medical Device (Certificate: HU11/6192) controlled by a personal computer.

Stimuli by artificial electric and electromagnetic signal forms do not contain natural information originated from our body (Figure 2). In contrast, detected own signals include information, for example, from the nervous system, muscle activity or from any element of coordination. The electroencephalogram (EEG) or the electrocardiogram (ECG) of cardiac function include information-rich, nonlinear and natural signals, so, these are typically own

1
2
3 signals, which are originated from the subject, and they are not only continuous variable, but
4
5 also are individual. It is reasonable to propose that the special efficiency of EMOST is due to
6
7 the application of information-rich, nonlinear and natural-based signals from our body.
8
9



10
11
12
13
14
15 Fig. 2. Illustration about information-rich, natural (nonlinear) electroencephalogram signal, and artificial sinus
16 and square signal forms.
17
18
19

20
21 Regarding to EMOST method, recently, we reported about the effectiveness of the
22
23 EMOST treatments in reduction of phantom limb pain as well as improvement of the quality
24
25 of sleep and mood in patients under clinical circumstances (Bókkon et al., 2010, 2011a,
26
27 2011b). We also presented the successful application of EMOST for stress management of
28
29 humans under catastrophic conditions (Bókkon et al., 2012). Some preliminary experiments
30
31 on twelve members of our BioLabor Ltd. regarding the effectiveness of single EMOST
32
33 treatment on some serum parameters were also shown (Bókkon et al., 2012).
34
35

36
37 Our some years experience with EMOST revealed that in children much less
38
39 management was needed for recovery compared to adult subjects, as well as the duration of
40
41 the treatments were shorter (about with an average of 25 minutes compared to adult subjects
42
43 with an average of 45 minutes). It is probable that this special effectiveness of EMOST
44
45 treatments is due to the large plasticity of the central and the autonomic nervous system in
46
47 young patients. Thus, our research pays special attention to study EMOST effectiveness in the
48
49 field of (chronic) childhood diseases.
50
51
52
53
54
55
56
57
58
59
60

Possible mechanisms for spreading low frequency and low intensity electromagnetic signals in the body

Numerous hypotheses have been suggested to elucidate the influence of LFI-EMFs in living systems. For example, Eddy electric currents, resonance models, biomagnetites, the interference of quantum states of bound ions and electrons, coherent quantum excitations, stochastic and parametric resonance, and magnetosensitive free-radical processes, among others (Binhi, 1999; Bókkon and Salari, 2010). Despite these notions, the major effect of LFI-EMFs on cell functions remains unclear. It is reasonable to propose that more mechanisms act simultaneously on cellular systems under LFI-EMF expositions. However, here we emphasize and briefly present two important possible biological mechanisms such as redox processes and the bidirectional communication between skin cells and the nervous system regarding the efficiency of LFI-EMF treatments.

Redox regulation and LFI-EMF signals

Latest experiments have provided evidence that free radicals and their derivatives (redox regulation) act as essential signals (secondary messengers) during physiological (and pathophysiological) processes in intra- and intercellular signaling processes (Hidalgo et al., 2000; Hancock et al., 2001; Dröge, 2002; Turpaev, 2002; Fang et al., 2004; Ushio-Fukai and Alexander, 2004; Zhang and Gutterman, 2007; Kamsler and Segal, 2007; Valko et al., 2007; Kishida and Klann, 2007; Bókkon and Antal, 2011). Because several effects of LFI-EMFs can be explained by redox regulation and membrane processes, LFI-EMFs may have an important effect on redox mechanisms. According to the latest results of Morabito et al. (2010), LFI-EMFs modify the cellular redox state. Thus, it is possible that one of the important effects of the LFI-EMFs is to influence redox processes in cells and tissues via the circulating blood. In addition, according to Simkó (2007), the cell type-specific redox status is responsible for the effects of diverse electromagnetic expositions. It seems that some possible effects of diverse

1
2
3 electromagnetic fields are dependent on the cell type and the temporary spatiotemporal redox
4 (and free radicals) patterns of cells. LFI-EMFs exposition could strengthen the cellular redox
5 communication between cells and can influence the redox balance of the entire body via the
6 circulating blood.
7
8
9
10

11 12 13 14 *The skin as a neuroimmunoendocrine organ and LFI-EMF signals*

15
16 The innervated skin is an extreme complex system and the largest organ of the body
17 with numerous very important functions that is associated with the peripheral sensory nervous
18 system (PNS), the autonomous nervous system (ANS), as well as the central nervous system
19 (CNS) (Roosterman et al., 2006). The skin is not just a simple barrier protecting the body
20 from dangers from the external environment. The skin bears densest and most complex
21 innervation of all mammalian organs. There is growing evidence that the cutaneous peripheral
22 nervous system has essential roles in skin homeostasis as well as in diseases. Cutaneous
23 nerves can react to stimuli from the circulation and to emotions. Moreover, the central
24 nervous system is directly (through efferent nerves or CNS-derived mediators) or indirectly
25 (through the adrenal glands or immune cells) linked to skin functions (Figure 4) (Roosterman
26 et al., 2006).
27
28
29
30
31
32
33
34
35
36
37
38
39

40 There is evidence that (Kreibig, 2010) autonomic nervous system serves as a major
41 component in the emotion response. Recent studies support the notion that basic emotions
42 have emotion-specific ANS activity/signature (Kreibig, 2010; Stephens et al., 2010). In Collet
43 et al. (1997) experiments, basic emotion (happiness, surprise, anger, fear, sadness and disgust)
44 induced specificity autonomic patterns in the skin regarding recorded parameters such as skin
45 conductance, skin potential, skin resistance, skin blood flow, skin temperature and
46 instantaneous respiratory frequency. It suggests that skin, as our largest organ, can represent
47 stress related conscious and unconscious emotions directly by efferent nerves and mediators
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 from CNS or indirectly by the adrenal glands or immune cells. The represented stress related
4
5 conscious and unconscious emotions can affect on biochemical, bioelectrical and
6
7 bioelectromagnetic patterns.
8

9
10 There is bidirectional communication between skin cells and the nervous system that
11
12 has essential roles in homeostatic regulation during physiological and pathophysiological
13
14 states (Roosterman et al., 2006). Under LFI-EMF expositions, first the skin meets
15
16 electromagnetic fields that can exert a complex effect on skin mechanisms. These complex
17
18 effects can spread by different mechanisms by modulation of specific neuropeptides released
19
20 from cutaneous nerves that act on target cells by paracrine or endocrine pathway. It is now
21
22 well appreciated that complex interactions exist linking sensory and autonomic nerves to the
23
24 immune and endocrine systems. Moreover, the skin itself generates neuromediators and
25
26 neurotrophic factors that target nerve fibers, thereby modulating inflammation, immune
27
28 responses during host defense, pain, and pruritus. Recently, Arck et al. (2010) proposed a
29
30 unifying model about the gut-brain-skin communication axis.
31
32

33
34 Acupuncture therapy has been applied to various psychiatric diseases and chronic pain
35
36 since acupuncture stimulation could affect brain activity (Hori et al., 2010). Recently, Yu H et
37
38 al., (2009) reported that magnetic stimulation on HeGu acupoint can modulate ongoing EEG
39
40 and affect specific brain regions compared with the mock point. Chen et al. (2006) revealed
41
42 by 3D (124-ch) EEG power spectrum mapping and source imaging that HeGu acupuncture
43
44 stimulation modulates limbic cingulum by frequency modulation manner. Acupuncture
45
46 studies indicate that induced signals from skin could affect brain activity.
47
48

49
50 According to Vianale (2008) experiments, ELF-EMF can modulate chemokine
51
52 production and keratinocyte growth by inhibition of the NF-kappaB signalling pathway and
53
54 thus may inhibit inflammatory processes. In addition, Patrino et al. (2010) reported that ELF-
55
56 EMF modulate expression of inducible nitric oxide synthase, endothelial nitric oxide synthase
57
58
59
60

1
2
3 as well as cyclooxygenase-2 in the human keratinocyte cells. Recent experiments support that
4
5 pulsed electromagnetic or low energy and frequency magnetic fields influence the autonomic
6
7 nervous system (Grote et al., 2007; Kraiukhina et al., 2010).
8

9
10 Nordlind et al. (2008) in their recent paper, titled, *The skin as a mirror of the soul:
11 exploring the possible roles of serotonin*, state that, “.. alterations in the levels of 5-HT in
12
13 extracellular fluids can alter the maturation, metabolism, migration and mitosis of its target
14
15 cells, including those in both the brain and the skin. Serotonin (5-HT) is a significant
16
17 bidirectional mediator between the neuroendocrine system and the skin. Recently, Irmak
18
19 (2010) proposed that excitable Merkel cells in the skin (Merkel cells’ function is still unclear),
20
21 which are in close contact with sensory nerve endings, may take part in mammalian
22
23 magnetoreception. The movement of melanosome with the changing electromagnetic field
24
25 may open ion channels producing a receptor potential that can be transmitted to brain by
26
27 sensory neurons.
28
29
30

31
32 All together, the above mentioned support that the LFI-EMF exposition can modulate
33
34 biochemical, bioelectrical, and bioelectromagnetic processes in the skin and the modulated
35
36 skin signals can affect the neuroendocrine system and modulate brain activity via ANS. Thus,
37
38 the skin system may guarantee the spreading of low frequency and low intensity
39
40 electromagnetic signals in the whole body in which LFI-EMF modulated cellular redox
41
42 communication can also take significant roles.
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

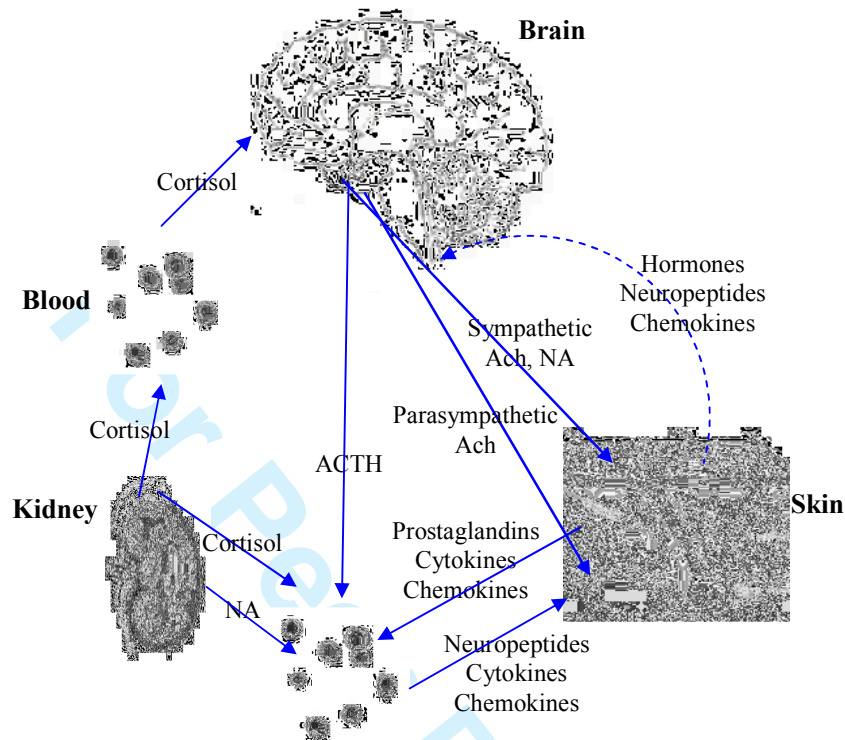


Fig. 3. Schematic illustration about complex communication between skin cells and the nervous system. Ach =acetylcholine, NA=noradrenaline, ACTH= Adrenocorticotrophic hormone.

Case reports

In the next sections we report about results of routine alternative treatments carried out at Biolabor Biophysics and Laboratory Services Ltd by EMOST device. EMOST alternative routine treatments comply with the Declaration of Helsinki. Children's parents were informed about the EMOST method and they contribute to the treatments that were confirmed by their signatures. Parents also confirmed with their signatures that they contribute to report about results in scientific journal.

Case report 1

On April 2011 a 4-year-old girl was suffering from chronic constipation of unknown etiology had proved unresponsive to conventional treatments. According to her mother report, the girl had history of chronic constipation of 1 year. The girl was also hospitalized by history

1
2
3 of constipation treated with enemas and laxatives and provided with food recommendations.
4
5 The girl has not any learning or mental disabilities and physical examination revealed a good
6
7 general condition.
8

9
10 **Family anamnesis:** The mother is raising her child alone under difficult financial and life
11
12 circumstances since the child was born.

13
14 **EMOST treatments:** The collected bioelectromagnetic input signals of 4-year-old girl were
15
16 processed by preprogrammed EMOST device. She was treated by output preprogrammed
17
18 electromagnetic signals of EMOST device via a flat electrode for 6 sessions. Each session was
19
20 approximately 30 min, between all treatments with a weak pause. During and after the girl
21
22 had completed the six treatments, she did not receive any additional treatments related to the
23
24 elimination of persistent constipation.
25
26

27
28 **Results:** After the girl had completed the six treatments she and her mother reported the
29
30 elimination of chronic constipation. We should mention that, on February 2012, about one
31
32 year after EMOST treatments, we have established contact with girl. However, there was no
33
34 any further constipation during this year, and girl reported a better general healthy state.
35
36
37

38 **Case report 2**

39
40 On March 2012, a foster mother reported about persistent diarrhoea for the over one
41
42 year in her 7-year-old girl. This twin girl in question has somatic and cognitive lag compared
43
44 with children of similar age. Her weight and height were significantly lag compared with her
45
46 twin girl. The twin girl in question had severe physical and mental load, before she was
47
48 placed with her foster mother. The girl is wearing glasses. She has no known allergies or
49
50 medications. Since this girl was placed with her foster mother (about on January 2011), girl
51
52 has always stinking, mucoid, undigested and watery stools 1-2 times per day with abdominal
53
54 complaints. The application of various probiotics and lactose-free diet were ineffective
55
56
57
58
59
60

1
2
3 regarding the persistent diarrhoea. Coeliac test and abdominal ultrasound examination were
4
5 also negative. Her laboratory workup was acceptable.
6

7 ***Perinatal anamnesis:*** Neglected geminate gravidity on 28th week with placenta abruption.
8
9 Birth weight was 800 gram. The neonate girl was breathed for a week. In the 5th day she was
10
11 suffered cerebral haemorrhage. In 1 month age she has necrotizing enterocolitis with ileum
12
13 perforation. The perforated ileum segment was resected. She had received seven transfusions.
14
15 In 7th month of age the ileostoma was closed. She was hospitalized for 7 months old. Due to
16
17 the cholelithiasis she was treated by Ursofalk (ursodeoxycholic acid) to dissolve gallstones. In
18
19 2006, girl was examined via regular gastroenterology procedure because of the slow somatic
20
21 progress, but there was not any chronic aberration.
22
23

24 ***Family anamnesis:*** The mother has totally neglected her twin daughters. What is known
25
26 about the twin girl in question originated from the hospital reports. The twin girl in question
27
28 had severe physical and mental load, before she was placed with a foster mother.
29
30

31 ***EMOST treatments:*** The collected bioelectromagnetic input signals of 7-year-old girl were
32
33 processed by preprogrammed EMOST device. The patient was treated by output
34
35 preprogrammed electromagnetic signals of device via a flat electrode for 14 sessions. Each
36
37 session was approximately 30 min, between all treatments with a weak pause. During the girl
38
39 had completed the 14 treatments, she did not receive any additional treatments related to the
40
41 elimination of chronic diarrhoea.
42
43
44
45
46

47 ***Results:*** On June 2012, after 14 treatments, the foster mother reported that her girl has almost
48
49 always normal stool and the incidence of slightly loose feaces is extreme rare (without
50
51 mucoid stool). Girl has about one normal bowel movement per day, increased its power, and
52
53 reported amount moderate abdominal discomfort. In addition, girl's appetite has been
54
55
56
57
58
59
60

1
2
3 increased. We continue the EMOST treatment of this twin girl in question for improving her
4
5 somatic and cognitive lag. We hope we can report its results in the close future.
6
7

8 9 **Discussion and conclusions**

10
11 The elimination of persistent intestinal catarrh and chronic constipation by LFI-EMFs
12
13 by EMOST method in the described cases of two children well demonstrated the opportunity
14
15 of the application of biophysical low-frequency and intensity electromagnetic fields. These
16
17 young girls, for about one year, were suffering from persistent diarrhoea or chronic
18
19 constipation (with unknown etiology) but the biophysical treatment could put an end to their
20
21 sufferings. The 4-year-old girl was suffered essentially psychological load. But the 7-year-old
22
23 twin girl had both severe physical and mental load, before she was placed with a foster
24
25 mother. Later, 7-year-old twin girl needed much more treatment for elimination of her
26
27 intestinal disease compared to former. It is promising that durability of the achieved results in
28
29 the case of girl with chronic constipation, because about one year after EMOST treatments
30
31 there was not any further constipation during this year, and girl reported a better general
32
33 healthy state. We should emphasize that not only these two children with gastrointestinal
34
35 disorders were successfully treated by EMOST method but numbers of young patients were
36
37 recovered with various diseases by this method in the last years.
38
39
40
41
42

43 The particular effectiveness of EMOST method is possible due to the analogous
44
45 process of own non-linear signals detected from skin that makes it possible that the
46
47 biophysical information content of detected and back-transmitted electromagnetic signal is
48
49 much larger than in digitized methods. In addition, the application of patient's own signals
50
51 also makes it possible that all treatment can be individualized.
52

53
54 We briefly described two potential biological mechanisms such as redox processes and
55
56 the bidirectional communication between skin cells and the nervous system regarding the
57
58
59
60

effectiveness of LFI-EMF treatments. We also pointed out that skin system may guarantee the spreading of LFI-EMF signals in the whole body in which LFI-EMF modulated cellular redox communication also can have important roles.

However, in addition to the modern pharmacologic and psychological methods, LFI-EMF treatments and developments should get more possibility and attention in the application of biophysical treatment of diseases in the future, because during diverse diseases, cells and living systems not only display altered biochemical processes but also produce altered non-linear bioelectric and bioelectromagnetic complex patterns.

CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content.

References

- Abdus-salam, A., Elumelu, T., Adenipekun, A. (2008). Mobile phone radiation and the risk of cancer; a review. *Afr. J. Med. Med. Sci.* 37:107–118.
- Aizenman, E. (1995). Modulation of N-methyl-D-aspartate receptors by hydroxyl radicals in rat cortical neurons in vitro. *Neurosci.Lett.* 189:57–59.
- Albrecht-Buehler, G. (2005). A long-range attraction between aggregating 3T3 cells mediated by near-infrared light scattering. *PNAS USA* 102:5050–5055.
- Alfieri, R. R., Bonelli, M. A., Pedrazzi, G., et al. (2006). Increased levels of inducible HSP70 in cells exposed to electromagnetic fields. *Radiat. Res.* 165:95–104.
- Arck, P., Handjiski, B., Hagen, E., et al. (2010). Is there a 'gut-brain-skin axis'? *Exp. Dermatol.* 19:401–405.
- Binhi, V. N. (1999). An analytical survey of theoretical studies in the area of magnetoreception. In: Repacholi, M. H., Rubtsova, N. B., Muc, A. M. eds. *Electromagnetic Fields: Biological Effects and Hygienic Standardization.* (pp. 155–170). World Health Organization. Switzerland, Geneva.

- 1
2
3 Black, R. E., Allen, L. H., Bhutta, Z. A., et al. (2008). Maternal and Child Undernutrition
4 Study Group. Maternal and child undernutrition: global and regional exposures and
5 health consequences. *Lancet* 371:243–260.
6
7
8 Bókkon, I., Antal, I. (2011). Schizophrenia: redox regulation and volume transmission. *Curr.*
9 *Neuropharm.* 9:289 – 300.
10
11 Bókkon, I., Salari, V. (2010). Information storing by biomagnetites. *J. Biol. Phys.* 36:109–
12 120.
13
14 Bókkon, I., Till, A., Erdőfi-Szabó, A. (2010). Phantom pain reduction by non-ionizing
15 electromagnetic treatment. *Hungarian Epidem.* 7:(Suppl 4)15.
16
17 Bókkon, I., Till, A., Erdőfi-Szabó, A. (2011a). Non-ionizing electro-magnetic-own-signal-
18 treatment. *Eur. Biophys. J.* 40(Suppl. 1):S191.
19
20 Bókkon, I., Till, A., Erdőfi-Szabó, A. (2011b). Phantom pain reduction by electromagnetic
21 treatment. *Electromagn. Biol. Med.* 30:115–127.
22
23 Bókkon, I., Till, A., Erdőfi-Szabó, A. et al., (2012). EMOST: Report about the application of
24 low-frequency and intensity electromagnetic fields in disaster situation and commando
25 training. *Electromagn. Biol. Med.* DOI: 10.3109/15368378.2012.681823.
26
27
28
29 Borowitz, S. M., Cox, D. J., Tam, A., et al. (2003). Precipitants of constipation in early
30 childhood. *J. Am. Board. Fam. Pract.* 16:213–218.
31
32
33 Chen, A. C., Liu, F. J., Wang, L., Arendt-Nielsen, L. (2006). Mode and site of acupuncture
34 modulation in the human brain: 3D (124-ch) EEG power spectrum mapping and source
35 imaging. *Neuroimage* 29:1080–1091.
36
37
38 Cifra, M., Fields, J. Z., Farhadi, A. (2011). Electromagnetic cellular interactions. *Prog.*
39 *Biophys. Mol. Biol.* 105:223–246.
40
41 Cohen, S., Popp, F. A. (1997). Biophoton emission of the human body. *J. Photochem.*
42 *Photobiol. B.* 40:187–189.
43
44 Collet, C., Vernet-Maury, E., Delhomme, G., Dittmar, A. (1997). Autonomic nervous system
45 response patterns specificity to basic emotions. *J. Auton. Nerv. Syst.* 62:45–57.
46
47
48 Coremans, G. (2008). Prucalopride: the evidence for its use in the treatment of chronic
49 constipation. *Core Evid.* 3:45–54.
50
51 Di Carlo, A., White, N., Guo, F., et al. (2002). Chronic electromagnetic field exposure
52 decreases HSP70 levels and lowers cytoprotection. *J. Cell. Biochem.* 84:447–454.
53
54 Dröge, W. (2002). Free Radicals in the Physiological Control of Cell Function. *Physiol. Rev.*
55 82:47–95.
56
57
58
59
60

- 1
2
3 Drossman, D. A., Li, Z., Andruzzi, E., et al. (1993). U.S. householder survey of functional
4 gastrointestinal disorders. Prevalence, sociodemography and health impact. *Dig. Dis.*
5 *Sci.* 38:1569–1580.
6
7
8 Fang YZ, Yang S, Wu G: 2004, Free radical homeostasis. *Sheng Li Ke Xue Jin Zhan* 35: 199–
9 204.
10
11 Fraser, A., Frey, A. H. (1968). Electromagnetic emission at micron wavelengths from active
12 nerves. *Biophys. J.* 8:731–734.
13
14 Grote, V., Lackner, H., Kelz, C., et al. (2007). Short-term effects of pulsed electromagnetic
15 fields after physical exercise are dependent on autonomic tone before exposure. *Eur. J.*
16 *Appl. Physiol.* 101:495–502.
17
18 Hancock, J. T., Desikan, R., Neill, S. J. (2001). Role of reactive oxygen species in cell
19 signalling pathways. *Biochem. Soc. Trans.* 29:345–350.
20
21 Hardell, L., Sage, C. (2008). Biological effects from electromagnetic field exposure and
22 public exposure standards. *Biomed. Pharmacother.* 62:104–109.
23
24 Hidalgo, C., Carrasco, M. A., Muñoz, P., Núñez, M. T. (2000). A role for reactive
25 oxygen/nitrogen species and iron on neuronal synaptic plasticity. *Antioxid. Redox*
26 *Signal.* 9:245–255.
27
28 Higgins, P. D., Johanson, J. F. (2004) Epidemiology of constipation in North America: a
29 systematic review. *Am. J. Gastroenterol.* 99:750–759.
30
31 Hori, E., Takamoto, K., Urakawa, S., et al. (2010). Effects of acupuncture on the brain
32 hemodynamics. *Auton Neurosci* 157:74–80.
33
34 Irmak, M. K. (2010). Multifunctional Merkel cells: their roles in electromagnetic reception,
35 finger-print formation, Reiki, epigenetic inheritance and hair form. *Med. Hypotheses*
36 75:162–168.
37
38 Isojima Y, Isoshima T, Nagai K., et al. (1995). Ultraweak biochemiluminescence detected
39 from rat hippocampal slices. *NeuroReport* 6:658–660.
40
41 Kamsler, A., Segal, M. (2007). *Control of neuronal plasticity by reactive oxygen species.*
42 *Antioxid. Redox Signal*, 9:165–167.
43
44 Kishida, K. T., Klann, E. (2007). Sources and targets of reactive oxygen species in synaptic
45 plasticity and memory. *Antioxid. Redox Signal.* 9:233–244.
46
47 Kobayashi, M., Takeda, M., Sato, T., et al. (1999). In vivo imaging of spontaneous ultraweak
48 photon emission from a rat's brain correlated with cerebral energy metabolism and
49 oxidative stress. *Neurosci. Res.* 34:103–113.
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 Koh, C. E., Young, C. J., Young, J. M., Solomon, M. J., Koh, C. E., Young, C. J., Young, J.
4 M., Solomon, M. J. (2008). Systematic review of randomized controlled trials of the
5 effectiveness of biofeedback for pelvic floor dysfunction. *Br. J. Surg.* 95:1079–1087.
6
7 Kraiukhina, K. Iu., Lobkaeva, E. P., Deviatkova, N. S. (2010) Effect of the low-frequency
8 impulse magnetic field on the autonomic nervous system in animals. *Biofizika* 55:720–
9 726
10
11 Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: A review. *Biol.*
12 *Psychol.* 84:394–421.
13
14 Kumar, V. S., Kumar, D. A., Kalaivani, K., et al. (2005). Optimization of pulsed
15 electromagnetic field therapy for management of arthritis in rats. *Bioelectromagnetics*
16 26:431–439.
17
18 Lappin, M. S., Lawrie, F. W., Richards, T. L., Kramer, E. D. (2003) Effects of a pulsed
19 electromagnetic therapy on multiple sclerosis fatigue and quality of life: a double-blind,
20 placebo controlled trial. *Altern. Ther. Health. Med.* 9:38–48.
21
22 Lipkova, J., Cechak, J. (2005). Existence of Electromagnetic Radiation in Humans in. ELF
23 Band. *Prog. Electromagnetics. Res. Sym.* 1:227–230.
24
25 Mach, Q. H., Persinger, M. A. (2009). Behavioral changes with brief exposures to weak
26 magnetic fields patterned to stimulate long-term potentiation. *Brain Res.* 1261:45–53.
27
28 Mancuso, M., Ghezzi, V., Di Fede, G. (2007). Utilization of extremely low frequency (ELF)
29 magnetic fields in chronic disease; five years experience: three case reports.
30 *Electromagn. Biol. Med.* 26:311–313.
31
32 Manikonda, P. K., Rajendra, P., Devendranath, D., et al. (2007). Influence of extremely low
33 frequency magnetic fields on Ca²⁺ signaling and NMDA receptor functions in rat
34 hippocampus. *Neurosci. Lett.* 413:145–149.
35
36 Markov, M. S. (2007). Expanding use of pulsed electromagnetic field therapies. *Electromagn.*
37 *Biol. Med.* 26:257–274.
38
39 Martin, B. C., Barghout, V., Cerulli, A. (2006). Direct medical costs of constipation in the
40 United States. *Manag. Care Interface* 16:43–39.
41
42 McAuliffe, J. F., Shields, D. S., Auxiliadora de Sousa M., et al. (1986). Prolonged and
43 recurring diarrhea in the northeast of Brazil: examination of cases from a community-
44 based study. *J. Pediatr. Gastroenterol. Nutr.* 5:902–906.
45
46 Moore, S. R., Lima, N. L., Soares, A. M., et al. (2010). Prolonged episodes of acute diarrhea
47 reduce growth and increase risk of persistent diarrhea in children. *Gastroenterology*
48 139:1156–1164.
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 Morabito, C., Rovetta, F., Bizzarri, M., et al. (2010). Modulation of redox status and calcium
4 handling by extremely low frequency electromagnetic fields in C2C12 muscle cells: A
5 real-time, single-cell approach. *Free Radic. Biol. Med.* 48:579–589.
6
7 Müller-Lissner, S. A., Kamm, M., Scarpignato, C., Wald, A. (2005). Myths and
8 misconceptions about chronic constipation. *J. Gastroenterol.* 100:232–242.
9
10 Nordlind, K., Azmitia, E. C., Slominski, A. (2008). The skin as a mirror of the soul: exploring
11 the possible roles of serotonin. *Exp. Dermatol.* 17:301–311.
12
13 Orgel, M. G., O'Brien, W. J., Murray, H. M. (1984). Pulsing electromagnetic field therapy in
14 nerve regeneration: an experimental study in the cat. *Plast. Reconstr. Surg.* 73:173–183.
15
16 Patruno, A., Amerio, P., Pesce, M., et al. (2010). Extremely low frequency electromagnetic
17 fields modulate expression of inducible nitric oxide synthase, endothelial nitric oxide
18 synthase and cyclooxygenase-2 in the human keratinocyte cell line HaCat: potential
19 therapeutic effects in wound healing. *Br. J. Dermatol.* 62:258–266.
20
21 Pokorný, J., Hašek, J., Jelínek, F., et al. (2001). Electromagnetic activity of yeast cells in the
22 M phase. *Electro- and Magnetobiol.* 20:371–396.
23
24 Regoli, F., Gorbi, S., Machella, N., et al. (2005). Pro-oxidant effects of extremely low
25 frequency electromagnetic fields in the land snail *Helix aspersa*. *Free. Radic. Biol. Med.*
26 39:1620–1628.
27
28 Roosterman, D., Goerge, T., Schneider, S. W., et al. (2006). Neuronal control of skin
29 function: the skin as a neuroimmunoendocrine organ. *Physiol. Rev.* 86:1309–1379.
30
31 Sandyk, R. (1996). Electromagnetic fields for treatment of multiple sclerosis. *Int. J. Neurosci.*
32 87:1–4.
33
34 Satter Syed, A., Islam, M. S., Rabbani, K. S., Talukder, M. S. (1999). Pulsed electromagnetic
35 fields for the treatment of bone fractures. *Bangladesh. Med. Res. Counc. Bull.* 25:6–10.
36
37 Schorling, J. B., De Souza, M. A., Guerrant, R. L. (1991). Antibiotic use among children in an
38 urban Brazilian slum: a risk factor for diarrhea? *Am.J. Public. Health.* 81: 99–100.
39
40 Selvam, R., Ganesan, K., Narayana Raju K. V., et al. (2007). Low frequency and low
41 intensity pulsed electromagnetic field exerts its antiinflammatory effect through
42 restoration of plasma membrane calcium ATPase activity. *Life Sciences* 80:2403–2410.
43
44 Simkó, M. (2007). Cell type specific redox status is responsible for diverse electromagnetic
45 field effects. *Curr. Med. Chem.* 14:1141–1152.
46
47 Spinzi, G., Amato, A., Imperiali, G., et al. (2009). Constipation in the elderly: management
48 strategies. *Drugs Aging* 26:469–474.
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 Stephens, C. L., Christie, I. C., Friedman, B. H. (2010). Autonomic specificity of basic
4 emotions: evidence from pattern classification and cluster analysis. *Bioll. Psychol.*
5 84:463–473.
6
7
8 Thapar, N., Sanderson, I. R. (2004). Diarrhoea in children: an interface between developing
9 and developed countries. *Lancet* 363:641–653.
10
11 Tsang, E. W., Koren, S. A., Persinger, M. A. (2009). Specific patterns of weak (1 microTesla)
12 transcerebral complex magnetic fields differentially affect depression, fatigue, and
13 confusion in normal volunteers. *Electromagn. Biol. Med.* 28:365–373.
14
15
16 Turpaev, K. T. (2002). Reactive oxygen species and regulation of gene expression.
17 *Biochemistry (Mosc)* 67:281–292.
18
19
20 Ushio-Fukai, M., Alexander, R. W. (2004). Reactive oxygen species as mediators of
21 angiogenesis signaling: role of NAD(P)H oxidase. *Mol. Cell. Biochem.* 264:85–97.
22
23 Valko, M., Leibfritz, D., Moncol, J., et al. (2007). Free radicals and antioxidants in normal
24 physiological functions and human disease. *Int. J. Biochem. Cell. Biol.* 39:44–84.
25
26
27 Vianale, G., Reale, M., Amerio, P., et al. (2008). Extremely low frequency electromagnetic
28 field enhances human keratinocyte cell growth and decreases proinflammatory
29 chemokine production. *Br. J. Dermatol.* 158:1189–1196.
30
31
32 Viel, J. F., Cardis, E., Moissonnier, M., et al. (2009). Radiofrequency exposure in the French
33 general population: band, time, location and activity variability. *Environ. Int.* 35:1150–
34 1154.
35
36
37 Wang, C., Bókkon, I., Dai, J., Antal, I. (2011). First experimental demonstration of
38 spontaneous and visible light-induced photon emission from rat eyes. *Brain Res.*
39 1369:1–9.
40
41
42 Youssef, N. N., Di Lorenzo, C. (2001). Childhood constipation: evaluation and treatment. *J.*
43 *Clin. Gastroentol.* 33:199–205.
44
45
46 Yu, H., Xu, G., Yang, R. (2009). Somatosensory-evoked potentials and cortical activities
47 evoked by magnetic stimulation on acupoint in human. *Conf. Proc. IEEE. Eng. Med.*
48 *Biol. Soc.* 2009:3445–3448.
49
50
51 Zhang, D. X., Gutterman, D. D. (2007). Mitochondrial reactive oxygen species-mediated
52 signaling in endothelial cells. *Am. J. Physiol. Heart. Circ. Physiol.* 292:H2023–H2031.
53
54
55 Zhang, X., Zhang, J., Qu, X., Wen, J. (2007). Effects of different extremely low-frequency
56 electromagnetic fields on osteoblasts. *Electromagn. Biol. Med.* 26:167–177.
57
58
59
60

Figure legends

Figure 1. EMOST Redox 1.1. Medical Device (Certificate: HU11/6192) controlled by a personal computer.

Figure 2. Illustration about information-rich, natural (nonlinear) electroencephalogram signal, and artificial sinus and square signal forms.

Figure 3. Schematic illustration about complex communication between skin cells and the nervous system. Ach =acetylcholine, NA=noradrenaline, ACTH= Adrenocorticotropic hormone.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



Fig. 1. EMOST Redox 1.1. Medical Device (Certificate: HU11/6192) controlled by a personal computer.



Fig. 2. Illustration about information-rich, natural (nonlinear) electroencephalogram signal, and artificial sinus and square signal forms.

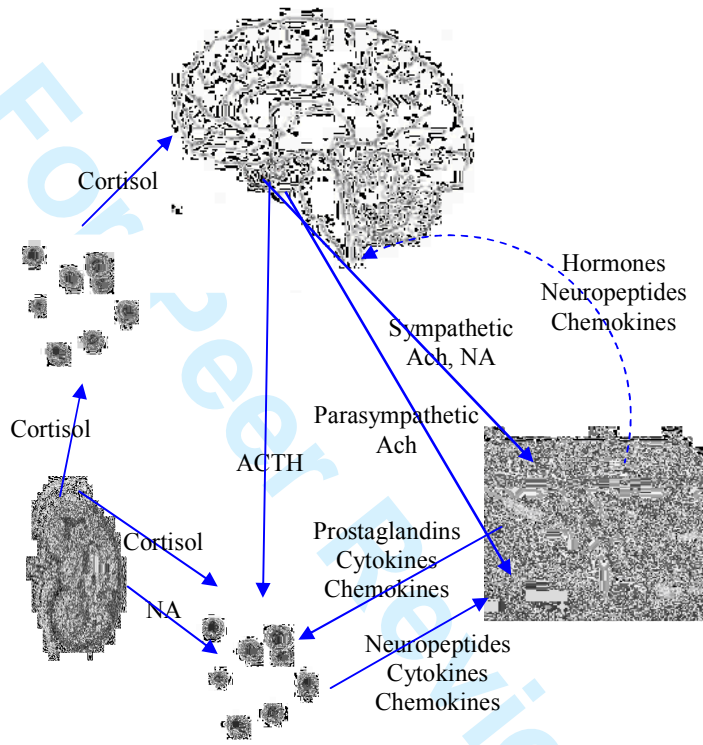
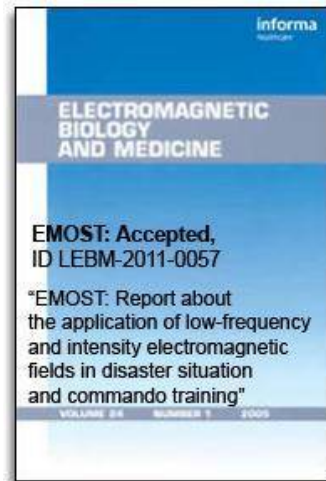


Fig. 3. Schematic illustration about complex communication between skin cells and the nervous system. Ach =acetylcholine, NA=noradrenaline, ACTH=Adrenocorticotrophic hormone.



**EMOST: Report about the application of low-frequency and intensity
electromagnetic fields in disaster situation and commando training**
2012 In press DOI: 10.3109/15368378.2012.681823

^{1*} István Bókkon, ² Attila Erdöfi-Szabó, ³ Attila Till, ⁴ Róbert Balázs, ⁵ Zoltán Sárosi,
⁶ Zoltán László Szabó, ⁷ Gábor Kolonics, ⁸ George Popper

1 Chief Scientific Consulting of BioLabor Biophysical- and Laboratories Services Ltd,
Budapest, Hungary

2 Pro Deo State University, Chairman of BioLabor Biophysical- and Laboratories Services
Ltd, Budapest, Hungary

3 National Institute for Medical Rehabilitation, Budapest, Hungary

4 NATO Centre of Excellence for Military Medicine, Lessons Learned Branch Acting Branch
Chief, Budapest, Hungary

5 Ret. Police Lieutenant-Colonel, Founder member of Hungarian Police Antiterror Unit,
Branch Chief of Training Master Trainer of Special Units, Budapest, Hungary

6 Ret. Police Lieutenant-Colonel, Hungarian National Police and Provost Duties, Armed
Marshalls Training Center (ORFK-KK) Marksman- and Tactical Units Training Department
Chief, Budapest, Hungary

7 Hungarian Military Hospital, Assistant-head of Ambulance Department, Budapest,
Hungary; Multinational Forces and Observers Sinai Mission-surgeon (from 2000 to 2001);
NATO Skopje HQ surgeon (2003)
kolonicsg@yahoo.com

8 President of International Bodyguard and Security Services Association, Executive
President and Professor of International Budo Academy, Budapest, Hungary

Running title: **Electromagnetic treatment in disaster and commando training**

***Corresponding author: István Bókkon**

Corresponding author's Email: bokkoni@yahoo.com

Corresponding author's Address: H-1238 Budapest, Lang E. 68. Hungary

Corresponding author's Phone: +36 20 570 6296

Corresponding author's Fax: + 36 1 217-091

Abstract

Recently, we published our results (Bókkon et al. 2011 Electromagn Biol Med.) regarding the effectiveness of the EMOST (Electro-Magnetic-Own-Signal-Treatment) method for the reduction of phantom limb pain under clinical circumstances. However, EMOST treatments not only significantly reduced phantom pain, but that most of the patients also reported about additional benefits such as improvement of their sleep and mood quality after treatments. Here we report some unusual applications of EMOST method under special situations. That is, we report about our effective EMOST treatments of humans under catastrophic conditions and commando training course. This article points out that it is reasonable to apply biophysical electromagnetic management under unique circumstances. We also report some preliminary experiments on twelve members of our BioLabor regarding the effectiveness of single EMOST treatment on some serum parameters and electrocardiogram.

Keywords: EMOST treatments, Catastrophic conditions, Commando training

Introduction

To the best of our knowledge, the treatment of humans by low-frequency and intensity electromagnetic fields under special situations has never been reported before. In this article, we report on the application of our EMOST method (Electro-Magnetic-Own-Signal-Treatment) in disaster situation and commando training. The goal of this paper is to demonstrate the non ionizing biophysical electromagnetic management under real-life and unique conditions and not the presentation of clinical or controlled trials.

Health-promoting effects of low-frequency and intensity electromagnetic fields

While the health-promoting outcomes of low-frequency and intensity electromagnetic fields (LFI-EMFs) can be divisive, numerous experiments suggested that LFI-EMFs are able to initiate different healing processes, such as induction of analgesia, acceleration of bone fracture processes and wound healing (re-epithelialization), antiinflammatory effects, decrease of fatigue and depression symptoms, improvement of multiple sclerosis, fibromyalgia, and chronic pulmonary disease, improvement of cardiovascular parameters, improvement of sleep and psychiatric disorders, etc. (Baldi et al., 2007; Barzelai et al., 2009; Mach and Persinger, 2009; Mancuso et al., 2007; Nishimura et al., 2011; Sandyk, 1997; Ghione et al., 2005; Kumar et al., 2005; Lappin et al., 2003; Satter Syed et al., 1999; Selvam et al., 2007; Patruno et al., 2010; Sutbeyaz et al., 2009; Zhang et al., 2007; Tsang et al., 2009; Cvetkovic and Cosic, 2009).

The contradictions of LFI-EMFs on health-promoting effects are due to several factors, among them: the lack of standardized experimental circumstances; the unsystematic application of artificial LFI-EMF signals; and furthermore the cell type-specific redox status can also be responsible for the effects of electromagnetic expositions (Simkó, 2007).

Too long expositions of LFI-EMF treatments are also extremely problematic. During LFI-EMF experiments and treatments, LFI-EMF radiations with a short-term exposition (less than 45 min) can facilitate the immune system and cellular processes* (for example, through redox activation processes), but a long-term or continuous exposition to LFI-EMFs causes a decline in cytoprotection and can shift the redox and calcium homeostasis of cells (Di Carlo et al., 2002; Regoli et al., 2005).

***LFI-EMF exposition → stimulation of cellular membrane NADPH oxidase activity → superoxide redical generation O_2^- → increased activity of calcium channels Ca^{2+} and lipoxygenases → start of arachidonsav cascade and lipid peroxidation processes → expansion of signaling pathways in cells.**

EMOST system

Our EMOST medical device can detect and scene non-linear, bioelectric and bioelectromagnetic signals of the patient (Bókkon et al., 2010, 2011a, 2011b). The collected signals from patients' skin are processed by preprogrammed EMOST device (Fig. 1). The patients are treated by preprogrammed signals of EMOST device (frequencies are in the range of 1 Hz - 1 MHz; intensity range between 0.1-10 micro Teslas, via very special input/output flat electrodes). A particular feature of our EMOST method - compared to many

electromagnetic equipments - is that the patient's own bioelectromagnetic signals, which are detected from skin are processed via analogue manner (non-digitalized) inside the EMOST device. This signals are transmitted back via a flat electrode radiator through different band/signal combinations, with some amplification (-20dB- +60dB), to the skin's surface on the opposite side and extended by the higher range sounds of the signal. The special analogous signal process of EMOST device makes it possible that the biophysical information content of detected and back-transmitted electromagnetic signal is much larger than in digitized methods.

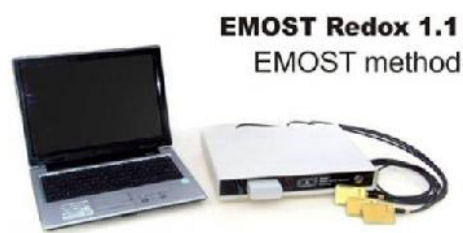


FIGURE 1 EMOST Redox 1.1 Medical Device (Certificate: HU11/6192) controlled by a personal computer.

Some possible effects of LFI-EMFs

Many possible mechanisms of various classical and quantum models have been suggested to elucidate the influence of LFI-EMFs in living systems (Binhi, 1999; Bókkon and Salari, 2010). A growing body of evidence suggested that several effects of LFI-EMFs therapies can be elucidated (or connected) by redox regulation and membrane-bound receptor mechanisms (Bauréus et al., 2003; Foster, 2003; Mathie et al., 2003). In addition, many experiments have revealed that reactive oxygen and nitrogen species as well as their derivatives act as essential signals in intracellular and intercellular communication (Dröge, 2002; Bókkon and Antal, 2011; Feissner et al., 2009; Kishida and Klann, 2007; Massaad and Klann, 2011; Powers et al., 2011; Valko et al., 2007; Zhang and Gutterman, 2007). The effect of LFI-EMFs on cell membranes and membrane-bound receptors can stimulate Ca²⁺-related pathways and free radical and redox-regulated processes. Thus, some of the fundamental effects of the EMOST treatment may be achieved via the redox balance of the body. It is likely that EMOST method can convey the detected and changed electromagnetic patterns of defective cells for surrounding and other cells, which facilitates intercellular communication via redox sensitive biochemical processes, and help restoration of homeostasis.

Biophysical therapeutic opportunities by LFI-EMF

Although modern pharmacology has made considerable progress in the medication of various diseases, we should also recognize that in many cases pharmacology treatments could be ineffective. In these cases, the biophysical LFI-EMF methods may offer some additional opportunities, because in various diseases, living cells do not only show altered biochemical processes but also generate altered non-linear bioelectric and bioelectromagnetic signals. Since each patient has a unique description of his/her own particular diseases, application of bioelectromagnetic own signals (EMOST) of patients for therapeutic applications may be effective especially compared to the diverse, artificial electromagnetic signals.

EMOST: phantom pain, sleep and mood quality

Recently, we presented our results regarding the effectiveness of the EMOST treatment (for six sessions) and the reduction of phantom limb pain under clinical circumstances (Bókkon et al., 2010, 2011a, 2011b). The EMOST method not only significantly reduced phantom pain, but also revealed additional benefits at most of the patients after expositions, such as improvement of their sleep and mood quality (Fig. 2).

We briefly mention here that we have established contact one year after our clinical EMOST experiments with those who took part in our research. However, there was no any further amputation in the EMOST treated patients during this year, and exposed patients reported a better general healthy states compared to sham exposed (control group). Pain is a key issue among veterans and members of the military due to increased survival rates from devastating injuries, including phantom limb pain after amputations (Ebrahimzadeh and Hariri, 2009; Wartan et a., 1997).

Since in many cases, various phantom pains can be disabling and can lead to a lifelong struggle with chronic pain, our EMOST method may offer a new possibility for the reduction of individual phantom pains.



FIGURE 2 Treatment of amputees by EMOST in the clinic.

Stress responses

Task stressors are a common problem in police officers, soldiers, veterans, as well as in special commandos (Carlier et al., 2000; Renck et al., 2002; Miller, 2011). The exposure to diverse violent situations, witnessing distressing events and seeing victims are some of the task related stressors. These task stress induced symptoms can range from mild to severe.

Traumatic stress experiences often produce peritraumatic stress responses during and immediately after effects of trauma and in subsequent acute and posttraumatic stress responses in stress exposed subjects. However, the perception of stress is individual dependent. What is stressful to **X** person may not cause stress in **Y** person, because it depends on the person's previous experiences, emotional and mental states.

Sleep disturbances and interpersonal problems are highly prevalent in military and police subjects with various scales of stress disorders that are associated with substantial comorbidities and increased healthcare risks (Capaldi et al., 2011). PTSD symptoms may include nightmares, disturbing thoughts, re-experiencing phenomena, being socially detached from family and friends, hyper-arousal (such as feeling angry, irritable), etc.

Several evidences indicated that traumatic stress exposures and PTSD are common anxiety disorders in military and police subjects as well as in normal populations and can be associated with cardiovascular diseases, chronic fatigue syndrome, musculoskeletal disorders, etc. (Boscarino, 2004). People with PTSD are more likely to have hypertension, obesity, hyperlipidemia, and cardiovascular disease.

The biological processes that account for the observed associations between PTSD and cardiovascular disease may relate to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and for continual over-stimulation of the autonomic nervous system that can promote the increases in blood pressure and lipid levels (Bedi and Arora, 2007).

Immune function changes in PTSD subjects may also influence circulating levels of interleukin-6 (IL-6), IL-1, tumor necrosis factor (TNF), and C-reactive protein (CRP) (Rohleder and Karl, 2006). However, inflammatory mediators such as TNF, CRP, and IL-6, can stimulate atherosclerosis. Interactions among the immune and neuroendocrine systems may partly account for associations between PTSD and chronic disease outcomes.

Psychological and medical treatments for PTSD include group or individual psychotherapy (for example, cognitive-behavioral therapy) and pharmacotherapy such as the use of selective serotonin reuptake inhibitors (Spoont et al., 2010).

EMOST treatment of police commandos during training exercise

In 2011, we performed some EMOST treatments of twelve Hungarian police commandos (elite forces) during their hard training exercise. During commando trainings, police officers had been exposed to very difficult physical and psychological conditions for three weeks. We provided our treatments (with official permission) on three consecutive days in the last week of exercising. The commandos came and went for shooting practice, physical training etc., and when they have a little pause, we performed EMOST treatments. As the Figure 3 shows, commandos were lying on the hard tables (sometimes with weapons) during EMOST treatments. So, the situation was very realistic.

The commandos were asked to rate their physical and psychological conditions on the 0–10 verbal numerical rating scale prior to the treatment and after the treatment during each three days. We also measured their cardiovascular risks prior to the treatments and after the treatments, and studied the speed of their reflexes via a simple task. Following the trend of the three treatments, after the third treatment, the studied parameters clearly showed a downward trend in cardiovascular risks, an improved physical and psychological conditions as well as a slightly increased reflex.

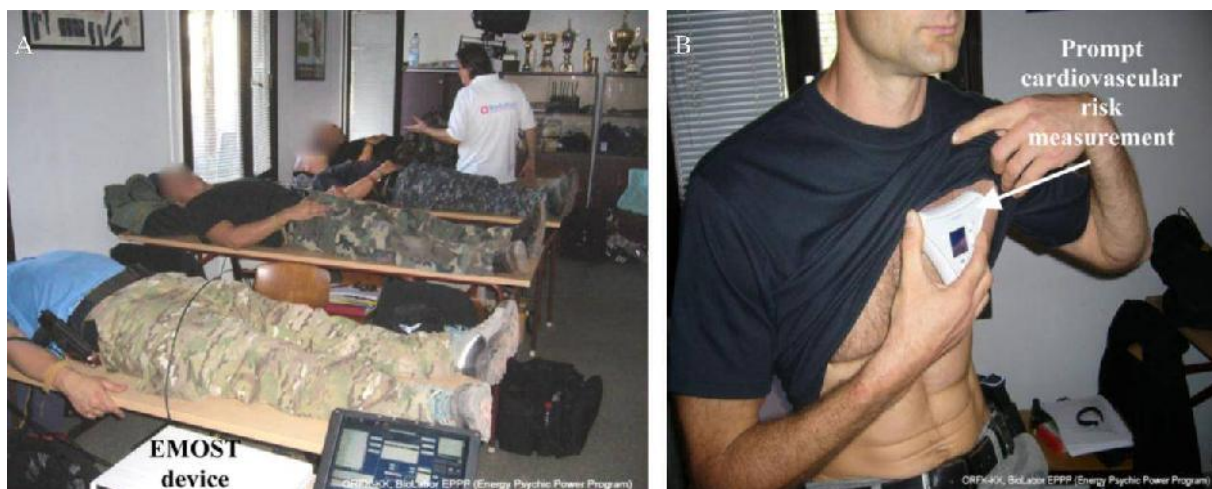


FIGURE 3 (A) Commandos were lying on the hard tables during EMOST treatments. (B) Prompt measure of cardiovascular risk.

EMOST treatments during flood disaster in Felsőzsolca, Hungary

Felsőzsolca is a small town in North-East of Hungary. In June, 2010 the biggest flood hit Felsőzsolca. Out of a total of 2200, about 1800 houses were damaged, and over 200 houses collapsed by the river Sajó. In addition to local residents, hundreds of soldiers, firefighters and

volunteers helped to save lives. The local government leaders as well as military and firefighter commanders continuously managed the rescue processes. Many managers had no sleep in 48 hours, and several residents suffered PTSD. Some voluntary psychologists also tried to reduce the extreme psychological stress caused by the flood.

Since our several years of EMOST application and our experiments indicated that EMOST can produce prompt effect to reduce stress and fatigue levels and to improve sleep and mood quality in patients, our BioLabor group also took part as volunteers in Felsőzsolca rescue-actions by EMOST treatments of several commanders and local residents that were exhausted at the border (see Figure 4 with our photos). We have treated about 80 managers and residents by some of special EMOST regeneration program. Most of the treated subjects rendered benefit improvements after 40 min treatment reported their reduced stress and fatigue levels and improved mood quality and concentration ability.

After traumatic stress (that frequently result in peri-traumatic stress), the sooner we use a variety of therapies, the smaller the chance to develop acute or posttraumatic stress state. However, biophysical LFI-EMF treatments may offer a special and prompt help in many particular situations.



FIGURE 4 Our photos have been taken in Felsőzsolca. (A) EMOST treatments of exhausted and stressed local residents, soldiers, firefighters. (B) Our car and local residents in a flooded street in Felsőzsolca, on June, 2010. (C) Residents used a boat to cross a flooded street in Felsőzsolca.

Preliminary experiments: Single EMOST treatment effect on electrocardiogram and the serum concentration of urea, albumin, cortisol, chloride, CPK, TSH, and CRP

We performed some preliminary experiments on twelve members of our BioLabor regarding the effectiveness of single EMOST treatment on some serum parameters and electrocardiogram (ECG). ECG results did not show statistically significant improvement after single EMOST treatment. In contrast, some serum factors such as uric acid, albumin, cortisol, chloride, Creatine phosphokinase (CPK), Thyroid stimulating hormone (TSH), C-reactive protein (CRP) indicated some remarkable changes following one treatment.

Cortisol, TSH, CRP, and CPK serum concentrations were reduced in the most of us. The albumin concentration usually showed a slight decrease and the uric acid concentration increased in almost all cases. Chloride level of serum showed a slight increase in almost every case. Of course, these few preface experiments have no great importance, but indicate EMOST treatment may reduce stress factors and affect on the redox/free radical processes as numerous studies reported regarding to the effect of low-frequency and intensity electromagnetic fields.

For example, cortisol levels were decreased in most of the members of our BioLabor after one EMOST treatment. Cortisol is a (glucocorticoid) steroid hormone that produced by the adrenal cortex in response to stress (Inslicht et al., 2011). Its major functions are, among them, to increase blood sugar through gluconeogenesis and suppress the immune system, but recent studies revealed that glucocorticoids (cortisol) have both stimulatory and suppressive effects on immune responses that are dependent on the GC concentration (Yeager et al., 2008).

Uric acid concentration increased in almost all cases after single EMOST treatment. However, uric acid is strong reducing agents (electron donors) and potent antioxidants (Warning, 2002). In humans, about the half the antioxidant ability of blood plasma comes from uric acid (Maxwell et al., 1997).

Chloride level also showed a slight increase in almost every case. Chloride is a prominent negatively charged ion in the blood, where it represents about 70% of the body's total negative ion content. However, chloride level has essential role of blood pH value that can influence pH-dependent redox/free radical processes. It seems that EMOST treatments may transiently potentiate functional redox processes.

However, we have started a large-scale, controlled testing of EMOST treatments (with forty subjects and with sham exposed controls) regarding its effectiveness on serum parameters and electrocardiogram. We hope that we can report the results in the near future.

Discussion and Conclusions

We have to stress again that our goal was not the presentation of clinical or controlled trials, but show the non ionizing electromagnetic management under real-life and also in unique conditions.

One may argue that the presented beneficial effects of our EMOST treatments were due to the placebo effect. However, it is unlikely that EMOST treatments could produce placebo effect on eighty subjects under flood disaster. In addition, during many years of EMOST application, we also effectively treated hundreds of children and babies with diverse health problems. It is also hardly possible that EMOST treatments could make placebo effects on babies. Furthermore, our recently published results on the effectiveness of the EMOST in reduction of phantom limb pain as well as improvement of the quality of sleep and mood in subjects under clinical circumstances also support the real effectiveness of EMOST.

Because the EMOST method based on non-linear, bioelectric and bioelectromagnetic signals of patients, it offers tailor-made opportunities. In addition, it is not realistic to apply a large number of psychologists under unexpected events and disaster conditions.

The presented EMOST application (Electro-Magnetic-Own-Signal-Treatment) under disaster conditions and commando training, may point out a further possible way of healing therapies in addition to the modern pharmacologic and psychological methods. We should also consider that the sooner we use a variety of therapies, the smaller the chance to develop acute or posttraumatic stress status after unexpected and disaster situations.

The aforementioned few preliminary experiments on members of our BioLabor regarding the efficiency of single EMOST treatment on serum parameters and electrocardiogram indicated that it is worthy to perform a large-scale, controlled testing that we have started.

Besides, not only for stress management should be considered, but also improve mental and physical states, concentration, cognitive and situation analysis abilities of exhausted troops and policemen after unexpected and catastrophic events.

In summary, we should consider biophysical electromagnetic managements as a further possible way of healing therapies in addition to the pharmacologic and psychological methods, especially under unique, unexpected and disaster situations.

CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content.

ACKNOWLEDGEMENTS

Authors gratefully thank the police contribution to perform our experiments for Géza Simon, Colonel, Director of Hungarian National Police and Provost Duties, Armed Marshalls Training Center (ORFK-KK). Authors also gratefully thank for commandos their participation in our survey related to EMOST treatments. Bókkon's URL: www.bokkon-brain-imagery.5mp.eu; BioLabor's URL: www.biolabor.org

References

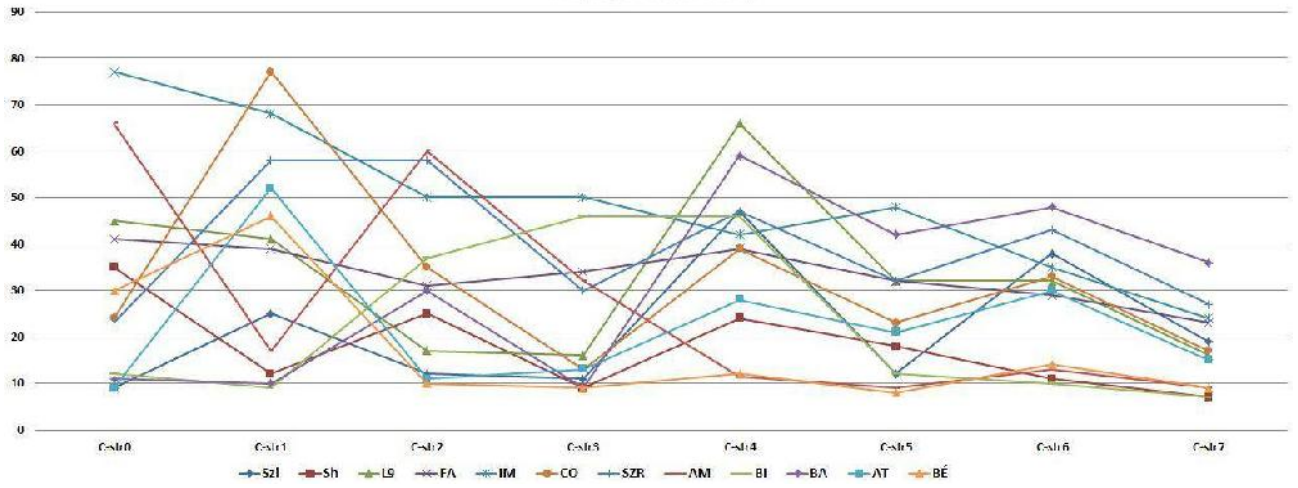
- Baldi, E., Baldi, C., Lithgow, B. J. (2007). A pilot investigation of the effect of Extremely low frequency pulsed electromagnetic fields on humans' heart rate variability. *Bioelectromagnetics* 28:64–68.
- Barzelai, S., Dayan, A., Feinberg, M. S., et al. (2009). Electromagnetic field at 15.95-16 Hz is cardio protective following acute myocardial infarction. *Ann. Biomed. Eng.* 37:2093–2104.
- Bauréus, K. C. L., Sommarin, M., Persson, B. R., et al. (2003). Interaction between weak low frequency magnetic fields and cell membranes. *Bioelectromagnetics* 24:395–402.
- Bedi, U. S., Arora, R. (2007). Cardiovascular manifestations of posttraumatic stress disorder. *J. National Med. Assoc.* 99:642–649.
- Binhi, V. N. (1999). An analytical survey of theoretical studies in the area of magnetoreception. In: Repacholi, M. H., Rubtsova, N. B., Muc, A. M. eds. *Electromagnetic Fields: Biological Effects and Hygienic Standardization*. (pp. 155–170). World Health Organization. Switzerland, Geneva.
- Bókkon, I., Antal, I. (2011). Schizophrenia: redox regulation and volume transmission. *Curr. Neuropharm.* 9:289–300.
- Bókkon, I., Salari, V. (2010). Information storing by biomagnetites. *J. Biol. Phys.* 36:109–120.
- Bókkon, I., Till, A., Erdöfi-Szabó, A. (2010). Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment. *Hungarian Epidemiology* 7/4/Suppl.:15.
- Bókkon, I., Till, A., Erdöfi-Szabó, A. (2011a). Non-ionizing Electro-Magnetic-Own-Signal-Treatment. *Eur. Biophys. J.* 40 (Suppl. 1): S191.
- Bókkon, I., Till, A., Grass, F., Erdöfi-Szabó, A. (2011b). Phantom pain reduction by electromagnetic treatment. *Electromagn. Biol. Med.* 30:115–127.
- Boscarino, J. A. (2004). Posttraumatic stress disorder and physical illness: results from clinical and epidemiologic studies. *Ann. N. Y. Acad. Sci.* 1032:141–153.

- Capaldi, V. F., 2nd, Guerrero, M. L., Killgore, W. D. (2011). Sleep disruptions among returning combat veterans from Iraq and Afghanistan. *Mil. Med.* 176:879–888.
- Carlier, I. V., Voerman, A. E., Gersons, B. P. (2000). The influence of occupational debriefing on post-traumatic stress symptomatology in traumatized police officers. *Br. J. Med. Psychol.* 73:87–98.
- Cvetkovic, D., Cosic, I. (2009). Alterations of human electroencephalographic activity caused by multiple extremely low frequency magnetic field exposures. *Med. Biol. Eng. Comput.* 47:1063–1073.
- Di Carlo, A., White, N., Guo, F., et al. (2002). Chronic electromagnetic field exposure decreases HSP70 levels and lowers cytoprotection. *J. Cell. Biochem.* 84: 447–454.
- Dröge, W. (2002). Free Radicals in the Physiological Control of Cell Function. *Physiol. Rev.* 82: 47–95.
- Ebrahimzadeh, M. H., Hariri, S. (2009). Long-term outcomes of unilateral transtibial amputations. *Mil. Med.* 174:593–597.
- Feissner, R. F., Skalska, J., Gaum, W. E., Sheu, S. S. (2009). Crosstalk signaling between mitochondrial Ca²⁺ and ROS. *Front. Biosci.* 14:1197–1218.
- Foster, K. R. (2003). Mechanisms of interaction of extremely low frequency electric fields and biological systems. *Rad. Prot. Dosim.* 106:301–310.
- Ghione, S., Seppia, C. D., Mezzasalma, L., Bonfiglio, L. (2005). Effects of 50 Hz electromagnetic fields on electroencephalographic alpha activity, dental pain threshold and cardiovascular parameters in humans. *Neurosci. Lett.* 382:112–117.
- Inslicht, S. S., Otte, C., McCaslin, S. E., et al. (2011). Cortisol Awakening Response Prospectively Predicts Peritraumatic and Acute Stress Reactions in Police Officers. *Biol. Psychiatry* Epub ahead of print.
- Kishida, K. T., Klann, E. (2007). Sources and targets of reactive oxygen species in synaptic plasticity and memory. *Antioxid. Redox Signal.* 9:233–244.
- Kumar, V. S., Kumar, D. A., Kalavani, K., et al. (2005). Optimization of pulsed electromagnetic field therapy for management of arthritis in rats. *Bioelectromagnetics* 26:431–439.
- Lappin, M. S., Lawrie, F. W., Richards, T. L., Kramer, E. D. (2003). Effects of a pulsed electromagnetic therapy on multiple sclerosis fatigue and quality of life: a double-blind, placebo controlled trial. *Altern. Ther. Health Med.* 9:38–48.
- Mach, Q. H., Persinger, M. A. (2009). Behavioral changes with brief exposures to weak magnetic fields patterned to stimulate long-term potentiation. *Brain Res.* 1261:45–53.

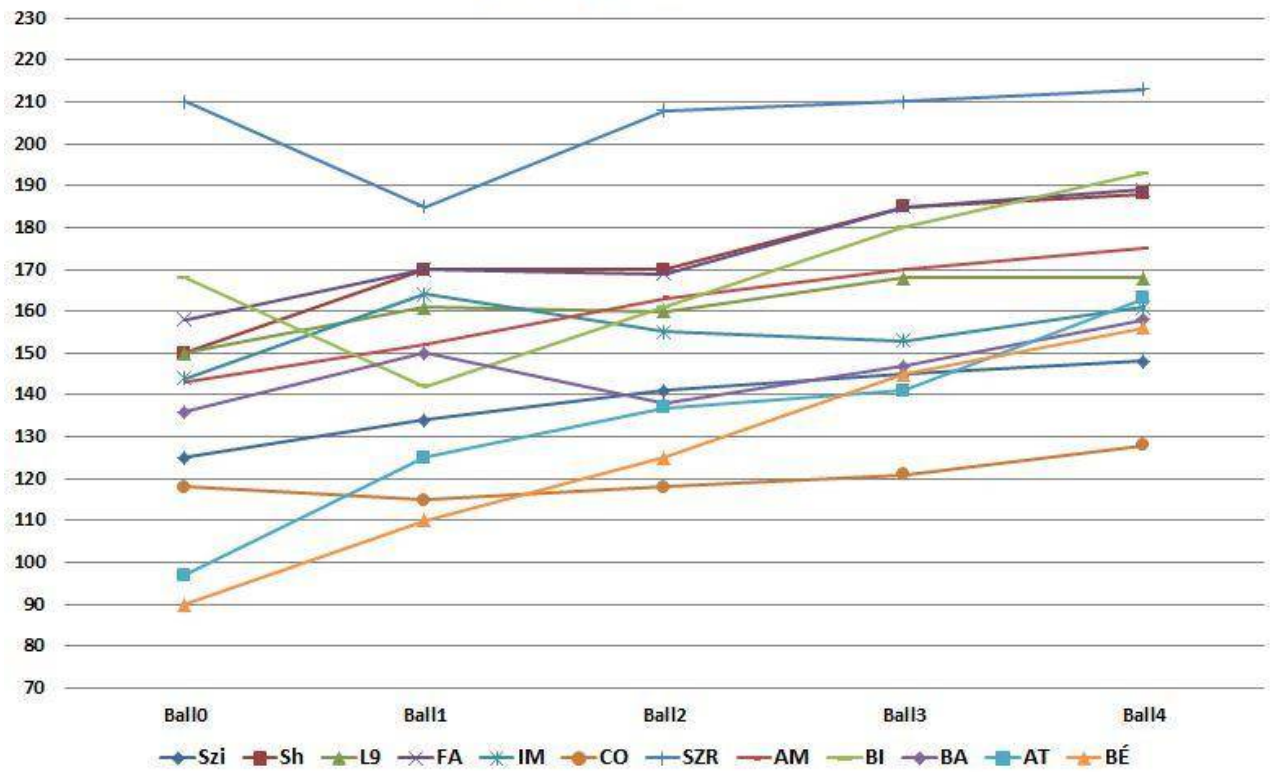
- Mancuso, M., Ghezzi, V., Di Fede, G. (2007). Utilization of extremely low frequency (ELF) magnetic fields in chronic disease; five years experience: three case reports. *Electromagn. Biol. Med.* 26:311–313.
- Massaad, C. A., Klann, E. (2011). Reactive oxygen species in the regulation of synaptic plasticity and memory. *Antioxid. Redox Signal.* 14:2013–2054.
- Mathie, A., Kennard, L. E., Veale, E. L. (2003). Neuronal ion channels and their sensitivity to extremely low frequency weak electric field effects. *Rad. Prot. Dosim.* 106:311–316.
- Maxwell, S. R., Thomason, J. H., Sandler, D., et al. (1997). Antioxidant status in patients with uncomplicated insulin-dependent and non-insulin-dependent diabetes mellitus. *Eur. J. Clin. Invest.* 27:484–490.
- Miller, G. (2011). The invisible wounds of war. Healing the brain, healing the mind. *Science* 333:514–517.
- Nishimura, T., Tada, H., Guo, X., et al. (2011). A 1- μ T extremely low-frequency electromagnetic field vs. sham control for mild-to-moderate hypertension: a double-blind, randomized study. *Hypertens. Res.* 34:372–377.
- Patrino, A., Amerio, P., Pesce, M., et al. (2010). Extremely low frequency electromagnetic fields modulate expression of inducible nitric oxide synthase, endothelial nitric oxide synthase and cyclooxygenase-2 in the human keratinocyte cell line HaCat: potential therapeutic effects in wound healing. *Br. J. Dermatol.* 162:258–266.
- Powers, S. K., Talbert, E. E., Adhietty, P. J. (2011). Reactive oxygen and nitrogen species as intracellular signals in skeletal muscle. *J. Physiol.* 589:2129–2138.
- Regoli, F., Gorbi, S., Machella, N., et al. (2005). Pro-oxidant effects of extremely low frequency electromagnetic fields in the land snail *Helix aspersa*. *Free Radic. Biol. Med.* 39:1620–1628.
- Renck, B., Weisaeth, L., Skarbö, S. (2002). Stress reactions in police officers after a disaster rescue operation. *Nord. J. Psychiatry* 56: 7–14.
- Rohleder, N., Karl, A. (2006). Role of endocrine and inflammatory alterations in comorbid somatic diseases of post-traumatic stress disorder. *Minerva Endocrinol.* 31:273–288.
- Sandyk, R. (1997). Treatment with electromagnetic fields reverses the long-term clinical course of a patient with chronic progressive multiple sclerosis. *Int. J. Neurosci.* 90:177–185.
- Satter Syed, A., Islam, M. S., Rabbani, K. S., Talukder, M. S. (1999). Pulsed electromagnetic fields for the treatment of bone fractures. *Bangladesh. Med. Res. Counc. Bull.* 25:6–10.

- Selvam, R., Ganesan, K., Narayana Raju, K. V., et al. (2007). Low frequency and low intensity pulsed electromagnetic field exerts its antiinflammatory effect through restoration of plasma membrane calcium ATPase activity. *Life Sciences* 80:2403–2410.
- Simkó, M. (2007). Cell type specific redox status is responsible for diverse electromagnetic field effects. *Curr. Med. Chem.* 14:1141–1152.
- Spoont, M. R., Murdoch, M., Hodges, J., Nugent, S. (2010). Treatment receipt by Veterans after a PTSD diagnosis in PTSD, mental health, or general medical clinics. *Psychiatric Services* 61:58–63.
- Sutbeyaz, S. T., Sezer, N., Koseoglu, F., Kibar, S. (2009). Low-frequency pulsed electromagnetic field therapy in fibromyalgia: a randomized, double-blind, sham-controlled clinical study. *Clin. J. Pain.* 25:722–728.
- Tsang, E. W., Koren, S. A., Persinger, M. A. (2009). Specific patterns of weak (1 microTesla) transcranial complex magnetic fields differentially affect depression, fatigue, and confusion in normal volunteers. *Electromagn. Biol. Med.* 28:365–373.
- Valko, M., Leibfritz, D., Moncol, J., et al. (2007). Free radicals and antioxidants in normal physiological functions and human disease. *Int. J. Biochem. Cell. Biol.* 39:44–84.
- Waring, W. S. (2002). Uric acid: an important antioxidant in acute ischaemic stroke. *QJM.* 95: 691–693.
- Wartan, S. W., Hamann, W., Wedley, J. R., McColl, I. (1997). Phantom pain and sensation among British veteran amputees. *Br. J. Anaesth.* 78:652–659.
- Yeager, M. P., Pioli, P. A., Wardwell, K., et al. (2008). In vivo exposure to high or low cortisol has biphasic effects on inflammatory response pathways of human monocytes. *Anesth. Analg.* 107:1726–1734.
- Zhang, D. X., Gutterman, D. D. (2007). Mitochondrial reactive oxygen species-mediated signaling in endothelial cells. *Am. J. Physiol. Heart Circ. Physiol.* 292:H2023–H2031.
- Zhang, X., Zhang, J., Qu, X., Wen, J. (2007). Effects of different extremely low-frequency electromagnetic fields on osteoblasts. *Electromagn. Biol. Med.* 26:167–177.

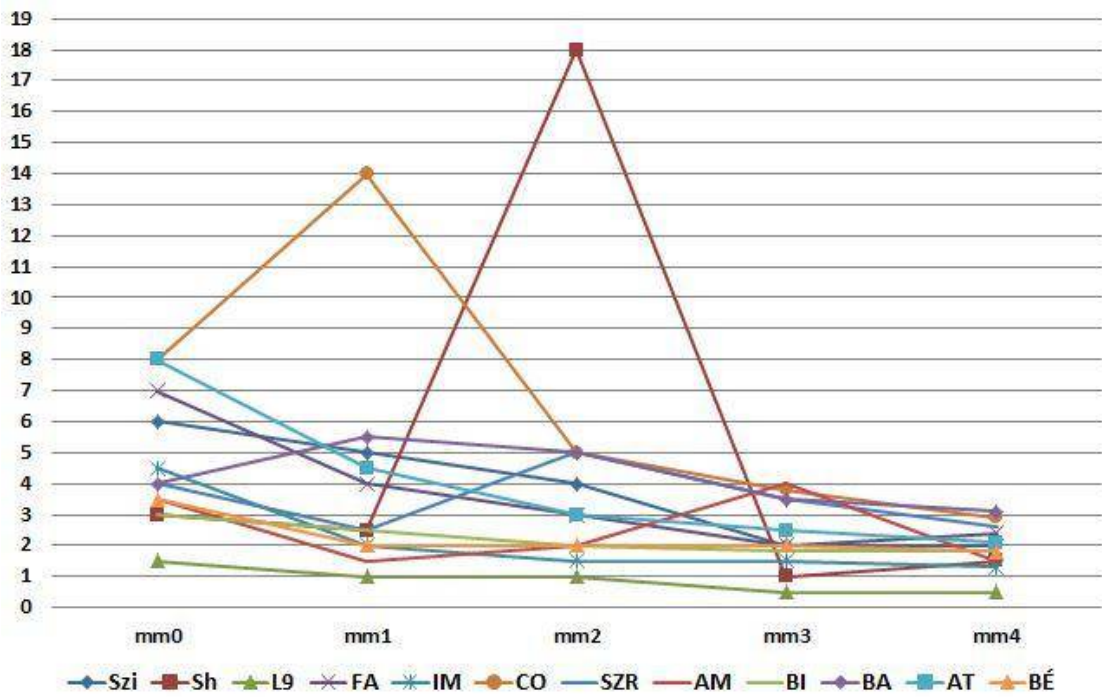
Changing in Cardio-stress



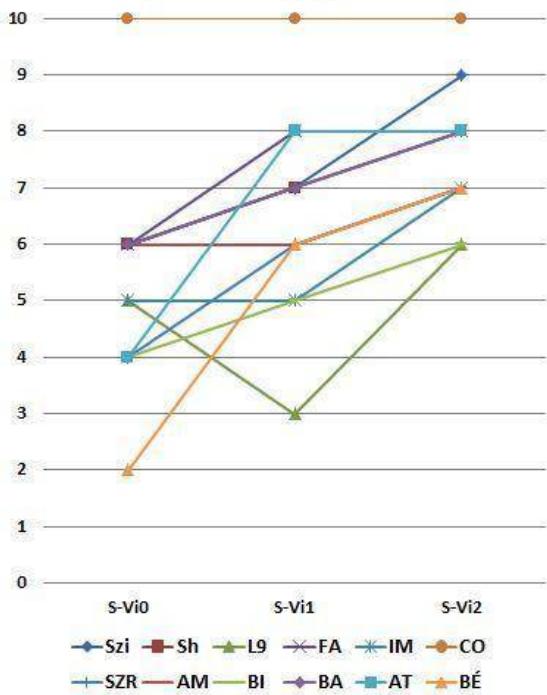
Changing in capacity, squeezes/min



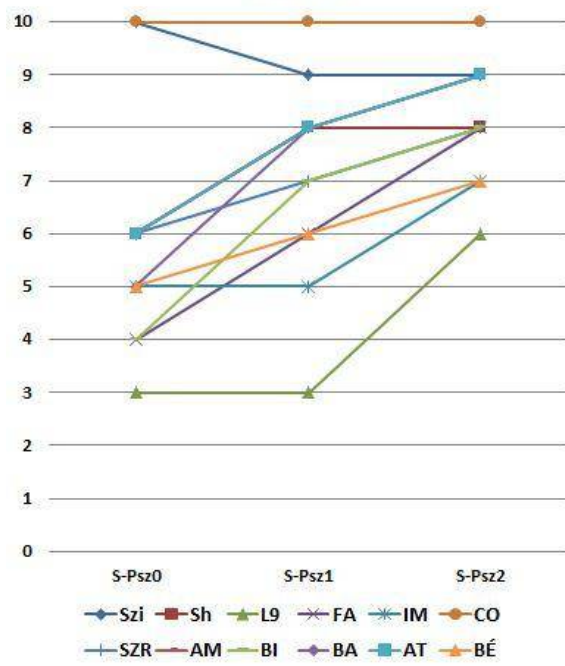
Changing in Reflex speed/mm

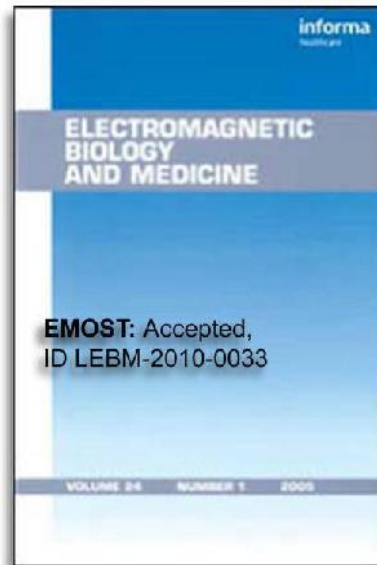


Subjective: changing in Vitality



Subjective: changing in Psychical balance





Phantom pain reduction by low-frequency and low-intensity electromagnetic fields

^{1*}Bókkon István, ²Till Attila, ³Grass Friedrich, ⁴Erdöfi-Szabó Attila
Revised version 2011

¹ Doctoral School of Pharmaceutical and Pharmacological Sciences, Semmelweis University, Budapest, Hungary

² National Institute for Medical Rehabilitation, Budapest, Hungary

³ Department for Biological Psychiatry, Medical University of Vienna

⁴ Director of BioLabor, Budapest, Hungary

Running title: **Phantom pain reduction by electromagnetic fields**

*Corresponding author: Bókkon István

Corresponding author's Email: bokkoni@yahoo.com

Corresponding author's Address: H-1238 Budapest, Lang E. 68. Hungary

Corresponding author's Phone: +36 20 570 6296

Corresponding author's Fax: + 36 1 217-0914

Abstract

Although various treatments have been presented for phantom pain, there is little proof supporting the benefits of pharmacological treatments, surgery or interventional techniques, electroconvulsive therapy, electrical nerve stimulation, far infrared ray therapy, psychological therapies, etc. Here, we report the preliminary results for phantom pain reduction by low-frequency and intensity electromagnetic fields under clinical circumstances. Our method is called as Electromagnetic-Own-Signal-Treatment (EMOST). Fifteen people with phantom limb pain participated. The patients were treated using a pre-programmed, six sessions. Pain intensity was quantified upon admission using a 0-10 verbal numerical rating scale. Most of the patients (n=10) reported a marked reduction in the intensity of phantom limb pain. Several patients also reported about improvement in their sleep and mood quality, or a reduction in the frequency of phantom pain after the treatments. No improvements in the reduction of phantom limb pain or sleep and mood improvement were reported in the control group (n=5). Our non-linear electromagnetic EMOST method may be a possible therapeutic application in the reduction of phantom limb pain. Here, we also suggest that some of the possible effects of the EMOST may be achieved via the redox balance of the body and redox-related neural plasticity.

Keywords: Phantom pain, Low-frequency and intensity electromagnetic fields, EMOST method, Redox-related neural plasticity

Introduction

The amputation of a limb is generally followed by a sensation that the deafferented body part is still present. Phantom limb sensations can be generally perceived by amputees following amputation (Ramachandran and Hirstein, 1998). However, phantom limb sensations can also occur following spinal cord injury, nerve avulsion and in children with congenital limb aplasia (Moore et al., 2000; Melzack, 1992; Melzack et al., 1997). The phantom sensations usually resolve without treatment, except in cases in which phantom pain develops.

When amputees sense an intense pain in their missing body part, the phenomenon is known as phantom pain. Phantom pain is more frequent in patients with preamputation pain and is less likely in cases in which the amputation was performed when the patient was very young. While phantom pain is most common after the amputation of a leg or an arm, it can also occur after the surgical removal of a breast, rectum, testicle, penis, or eye, among others (Flor, 2002). The phantom pain aftereffect occurs in 50-80% of the patients who have undergone this type of surgery, and the most frequently reported types of pain include burning, tingling, and cramping (Sherman, 1994). Various other pains and types of sensation such as shocking, itching, shooting, squeezing, and throbbing, among others, can also occur. Although a high percentage of amputees experience phantom pain, every patient has a unique description concerning his/her particular sensations and the pain experienced, as well as the intensity and frequency of the sensations. Phantom pain generally resolves without treatment, except in cases in which chronic phantom pain develops.

There is increasing evidence that both peripheral and central neural mechanisms are involved in phantom pain, but the pathophysiological mechanisms of phantom pain remain unknown (Devor and Seltzer, 1999; Dhillon et al., 2005; Davis et al., 1998; Mackert et al., 2003; Mercier et al., 2006; Karl et al., 2001). One possible peripheral mechanism is that neuromas (a growth of the nerve tissue) form injured nerve endings at the stump site after the amputation of a limb and fire abnormal action potentials. In addition to peripheral processes, spinal mechanisms have also been considered to influence phantom pain (Bittar et al., 2005). Phantom limb pain is also strongly correlated with changes in the representational plasticity (cortical reorganization) in the somatosensory and motor cortices. According to the neuromatrix theory, there is an extensive, genetically predetermined, network that interconnects the thalamus-cortex-limbic system, and phantom pain could arise from an atypical reorganization of this neuromatrix (Melzack, 1993; Bittar et al., 2005). Psychological factors have also been investigated. Whereas psychological factors do not appear to cause the phantom pain, these factors might affect the severity and the progression of the pain (Sherman et al., 1987).

Although various treatments have been presented, there is little clinical proof supporting the benefits of pharmacological treatments, surgery or interventional techniques, electroconvulsive therapy, electrical nerve stimulation, far infrared ray therapy, pulsed radiofrequency ablation, or psychological therapies (for instance, mirror box therapy), among other treatments (Gnezdilov et al., 1995; Rasmussen and Rummans, 2000; Wiech et al., 2004; Irlbacher et al., 2006; Wilkes et al., 2008; Huang et al., 2009; Seidel et al., 2009; de Roos et al., 2010).

Here, we report the preliminary results for phantom pain reduction by Electromagnetic-Own-Signal-Treatment (EMOST) under clinical circumstances. Our EMOST method does not perform any electromagnetic wave modulation or wave inversion (phase shift) of recorded output bioelectric and bioelectromagnetic signals of subjects. EMOST method solely employs filtered, various low-frequency and intensity electromagnetic fields (between 1 Hz - 1 MHz) that is controlled via preprogrammed computer. The EMOST device is based on our new concept, i.e., very fast electromagnetic feedback of recorded bioelectromagnetic signals of subjects without any changes could promote and reinforce intra- and intercellular redox communication. We also discuss that low-frequency and intensity electromagnetic fields (LFI-EMFs) may influence the cortical reorganization and the neurogenesis.

Materials and Methods

Patients

Limb amputees (*with vascular and arterial disease, diabetes and accidents*) were recruited at the National Institute for Medical Rehabilitation in Budapest, Hungary. The limb amputees (experimental amputees (n=10) and control amputees (n=5)) were randomized to receive either an active EMOST treatment or a sham treatment. Our EMOST experiments were performed by permission of the Ethics Committee of the National Institute for Medical Rehabilitation, Budapest, Hungary.

Apparatus

The EMOST device (BioLabor-MCC HI 2.5.2) was used in the experiments. It contains three basic elements: (1) an input electrode, (2) signal-processing circuits and (3) an output electrode. The input and output flat electrodes were placed on the joints of patients. The input signals were originated from bioelectric and bioelectromagnetic signals of patients who were placed in direct contact with the specially designed flat electrodes. The input signals were recorded similarly to extracting information from electromagnetic brain function via electroencephalogram (EEG). Namely, the EMOST device (which is controlled by a personal computer) operates with the non-linear, bioelectromagnetic signals of the patient within preprogrammed frequency ranges (between 1 Hz - 1 MHz). The parameters (input filtered frequency ranges and output intensity) and exposure time can be preprogrammed. The collected input signals of patients can be filtered using pre-programmed, low-frequency ranges (between 1 Hz - 1 MHz) by device circuits. Output, low-frequency electromagnetic signals were emitted by an identical flat electrode. The output electromagnetic intensity range of the device is 0.1-10 microteslas. A photograph of the EMOST apparatus is shown Figure 1.



Figure. 1. The EMOST device (BioLabor-MCC HI 2.5.2) is controlled by a personal computer.

Treatments

The present research conformed to the Helsinki Declaration outlining the principles for medical research involving human subjects. All of the subjects completed an informed consent form prior to participation in the study. The collected bioelectromagnetic input signals of patients were processed by preprogrammed EMOST device. The patients were treated by output preprogrammed signals of EMOST device (frequencies in the range of 1 Hz - 1 MHz; intensity range between 0.1-10 micro Teslas) via a flat electrode (Fig. 2) for six sessions. Each session was approximately 45 min, between all treatments with a one-day pause. Sham exposed patients (control group) were placed in the same conditions as the exposure groups but EMOST device was turned off. Subjects could not notice anything different from active and sham treatments. Pain intensity was quantified upon admission using a 0-10 verbal numerical rating scale (NRS) (Fig. 3). The patients were asked to rate their pain on the verbal NRS prior to the therapy and after they had completed the six treatments. During and after the patients had completed the six treatments, they did not receive any additional treatments related to the reduction or elimination of phantom limb pain.

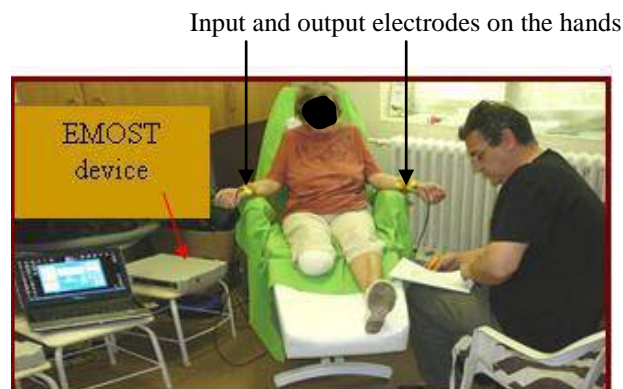


Figure. 2. Photograph of an amputee undergoing an EMOST treatment. While the operator was collecting patients' reports he was blind to the type of treatment (i.e., active or sham treatments).

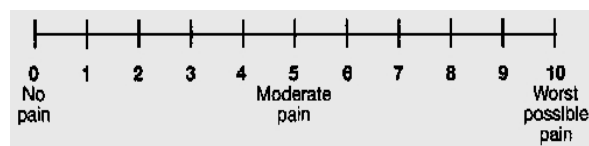


Figure. 3. Verbal numerical rating scale.

Results

The Student's t-test was used to analyze the data. The reduction of phantom limb pain by EMOST was statistically significant (*P < 0.05) as compared to the controls. Although our goal was to reduce phantom limb pain (or reduction in the frequency of phantom pain (PP↓)) via EMOST treatments, most of the patients also reported a marked improvement in their sleep and mood quality after the treatments. No improvements in the reduction of phantom limb pain or sleep and mood improvement were reported in the control group. The results obtained after six EMOST treatments are summarized in Table 1. All patients were followed for 2 weeks following their completed six treatments and there were no major differences in terms of phantom pain relief during this time.

	Patients	Phantom pain intensity before the treatments	Phantom pain intensity after six completed EMOST treatments	Interval between the amputation date and the EMOST treatments	Additional improvements reported by patients after six EMOST treatments	Disease or Accident
Patients with EMOST treatments	I.	6	0	1 month	Sleep	Diabetes
	II.	7	3	1/2 year	Sleep	Arterial
	III.	8	4	2 years	Mood	Diabetes
	IV.	6	2	1 month	Sleep, Mood	Arterial
	V.	1	0	8 years	Sleep, Mood	Arterial
	VI.	3	2	1 month	Sleep, Mood PP frequency↓	Arterial
	VII.	7	2	1 month	Sleep, Mood	Diabetes
	VIII.	7	4	1 month	Mood	Accident
	IX.	7	0	3 years	Sleep PP frequency↓	Diabetes
	X.	7	6	5 years	Mood	Diabetes and arterial

Table 1. This table summarizes the phantom pain intensity observed after completion of six EMOST treatments and additional improvements reported by the patients (The control group is not shown).

Discussion

Some possible effects of LFI-EMFs on cellular processes

Living cells display a particularly weak non-linear electromagnetic activity in a wide spectrum of frequencies - from Hz to THz, in cells (Fraser and Frey, 1968; Levin and Korenstein, 1991; Isojima et al., 1995; Cohen and Popp, 1997; Kobayashi et al., 1999; Pokorný et al., 2001; Lipkova and Cechak, 2005; Pelling et al., 2005) - that can be generated by diverse cellular mechanisms that are associated with biochemical processes.

Although the health effects of low-frequency and intensity electromagnetic fields (LFI-EMFs) are controversial, increasing evidence suggests that non-ionizing LFI-EMFs can influence numerous cell functions and are capable of initiating various healing processes, such as the delay of fractures, induction of analgesia, acceleration of wound re-epithelialization, inhibition of inflammatory processes, reduction of fatigue, improvement of multiple sclerosis and chronic pulmonary disease, among others (Orgel et al., 1984; Selvam et al., 2007; Reiter 1993; Satter Syed et al., 1999; Lappin et al., 2003; Kumar et al., 2005; Alfieri et al., 2006; Zhang et al., 2007; Markov 2007a; Tsang et al., 2009; Huo et al., 2009; Sutbeyaz et al., 2009; Mach and Persinger, 2009; Mancuso et al., 2007; Jing et al., 2010; Patruno et al., 2010).

Many potential causes have been suggested to explain the influence of LFI-EMFs in living systems, for example, Eddy electric currents, classical and quantum oscillator models, by the help of biomagnetites, cyclotron resonance, the interference of quantum states of bound ions and electrons, coherent quantum excitations, stochastic resonance, parametric resonance, bifurcation, and magnetosensitive free-radical and redox processes, among others (Binhi, 1999; Bókkon and Salari, 2010). Despite these explanations, the primary effect of LFI-EMFs on cell functions remains unclear. However, several effects of extremely low-frequency electromagnetic therapies may be explained (or connected) by redox regulations and membrane processes (Patruno et al., 2010; De Nicola et al., 2006; Di Loreto et al., 2009; Morabito et al., 2010).

Numerous experiments have provided evidence that reactive oxygen species (ROS) and reactive nitrogen species (RNS) and their derivatives act as fundamental signals (secondary messengers) during physiological (and pathophysiological) processes in intracellular signaling and intercellular communication processes (Hidalgo et al., 2000; Hancock et al., 2001; Dröge, 2002; Kamsler and Segal, 2007; Valko et al., 2007; Kishida and Klann, 2007; Forman et al., 2008; Bókkon and Antal, 2010). Because several effects of LFI-

EMFs can be explained by redox regulation and membrane processes, LFI-EMFs may have an important effect on redox mechanisms.

A growing body of evidence indicates that cell membranes play a key role in the transduction and amplification of LFI-EMF field signals (Bauréus et al., 2003; Foster, 2003; Mathie et al., 2003). Specifically, LFI-EMFs can affect the length of cell membranes and the number and variety of membrane-bound receptors. However, the activation of many cell surface receptors (for example, G protein-coupled receptors and receptor tyrosine kinases, among others) induces an influx of Ca^{2+} into the cells and the release of Ca^{2+} from the endoplasmic reticulum. Because ROS and calcium signals are intimately interconnected and calcium and ROS constitute the most significant intracellular signaling molecules in the regulation of various cellular functions (Gordeeva et al., 2003; Yan et al., 2006; Feissner et al., 2009), the effect of LFI-EMFs on cell membranes and membrane-bound receptors may cause these radiations to stimulate Ca^{2+} -related pathways and free radical and redox-regulated processes. Several cell surface receptors are regulated by redox processes (Dröge, 2002; Bókkon and Antal, 2010; Choi and Lipton, 2000; Nakashima et al., 2002; Kishida et al., 2005; Yang et al., 2006; Monteiro et al., 2008; Shi et al., 2010). Figure 4 shows some possible effects of LFI-EMFs on cellular processes.

In addition, LFI-EMF can have effects on the molecular transition states and can affect the kinetic processes of enzymes without thermodynamic kT energy. Importantly, magnetic fields are more effective when the tissue is out of equilibrium (Markov, 2007b). Consequently, LFI-EMFs experiments in healthy individuals do not reflect the potential response of patients who have endured an injury or disease. Because the cell type-specific redox status is responsible for the effects of diverse electromagnetic exposures (Simkó, 2007), it is possible that the effects of diverse electromagnetic fields are dependent on the cell type and the temporary spatiotemporal redox (and free radicals) patterns of cells.

It is important to note the role of exposure time during LFI-EMF therapies is especially critical. Radiations with a short-term exposure (according to our experience, less than 45 min) can facilitate (for example, through redox activation processes) the immune system and cellular processes, but a long-term or continuous exposure to LFI-EMFs results in a decline in cytoprotection (Regoli et al., 2005; Di Carlo et al., 2002). Long-term electromagnetic radiations may shift the redox and calcium balance, which could cause additional cellular malfunctions. For example, NMDA receptors can be redox modulated by

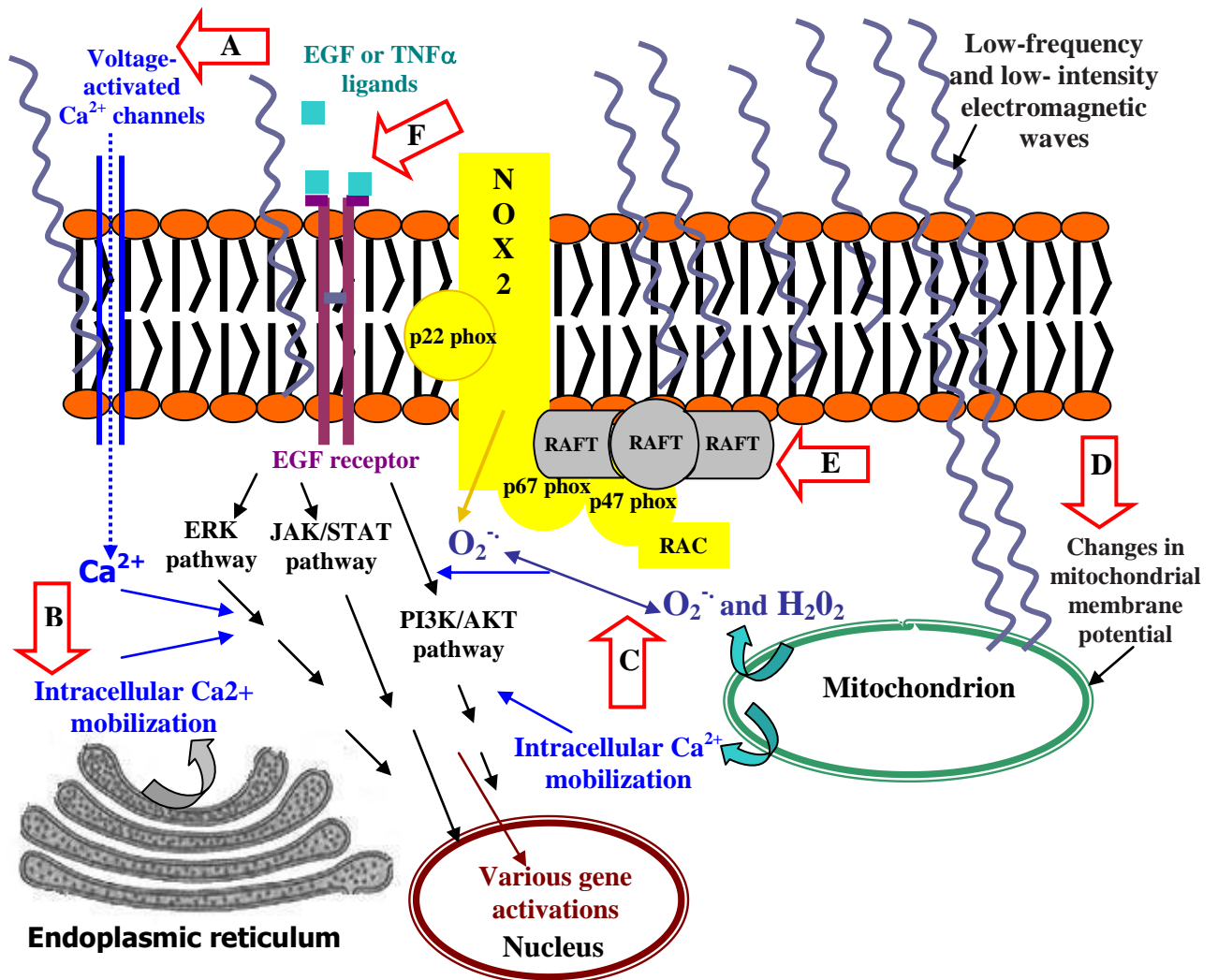


Figure 4. Some possible effects of LFI-EMF fields on cellular processes. A growing body of evidence indicates that cell membranes, mitochondria, Ca²⁺ and ROS play key roles in the transduction and amplification of LFI-EMF field signals. ELF-EMFs may be capable of inducing a shift in cell status to an “activated” state. Lipid rafts (RAFT, membrane microdomains) can play essential roles during the activation of membrane-bound receptors and enzymes by ELF-EMFs. **A.** Increases the open-channel probability. **B.** Intracellular Ca²⁺ mobilization. **C.** Increased intracellular O₂⁻ and H₂O₂ levels. **D.** Changes in mitochondrial membrane potential. **E.** Facilitation of NADPH oxidase (NOX) aggregation by membrane lipid drafts. **F.** Facilitate assembly and activation of membrane-bound receptors.

hydroxyl radicals (Aizenman, 1995), but long-term or continuous exposure to LFI-EMFs provoke aberrant NMDA receptor activities (Manikonda et al., 2007).

In most LFI-EMF experiments or treatments, various devices employ diverse artificial frequencies, which are waveforms that are modulated with respect to the frequency or the amplitude. LFI-EMFs with different characteristics, including different waveforms, frequencies and modulations, can have diverse (*or even opposing*) effects on biochemical signal processes during experiments. In other words, the effects of electromagnetic fields are associated with the type of electromagnetic field that is applied (Walther et al., 2007).

During various diseases, cells not only demonstrate altered biochemical processes but also produce altered non-linear electromagnetic complex patterns. Because it is impossible to investigate the whole range of artificial LFI-EMFs for potential therapeutic applications, it seems reasonable to use non-linear bioelectric and bioelectromagnetic signals from cells of the body for potential therapeutic applications that may be more effective than the diverse, artificial types of LFI-EMFs signals. However, the EMOST method is based on the utilization of the non-linear, bioelectric and bioelectromagnetic signals of the patients without any electromagnetic wave modulation or wave inversion of recorded output signals of subjects.

Since each patient with phantom pain has a unique description concerning his/her particular sensations and the pain experienced, and the effects of external electromagnetic fields are related to the type of electromagnetic field applied, it is possible that the treatment of particular phantom pain sensations will require specific method. Our EMOST device may guarantee this specific method, because it is based on the bioelectromagnetic fields of the patients' own living systems.

Phantom pain, neuromatrix theory, representation of body image, visual dreams, redox processes, EMOST treatment

The precise cause of phantom pain is incompletely understood, but most researchers agree that phantom pain and phantom sensations could originate from the central nervous system. LFI-EMFs can affect the length of cell membranes and various membrane-bound receptors as well as free radical and redox processes. During several years of EMOST application, we have found that our method generally affects the quality of sleep and mood in subjects. However, EMOST treatments not only significantly reduced phantom pain, but that most of the patients also reported these additional benefits (mainly about improvement of their sleep and mood quality) after six treatments (Table 1).

Recently, Ikeda et al. (2005) suggested that brain oxidation could be an initial process in sleep induction. They proposed that a mild enhancement of reactive species during wakefulness in the neuronal network that regulates sleep might trigger sleep induction. In other words, reactive species-related redox homeostasis plays an essential role in sleep/wake regulation.

Phantom limb pain can also occur in individuals who are born without limbs. Neurologists have hypothesized that the perception of our limbs can be hard-wired into our brain. According to the neuromatrix theory (Melzack, 1990), the representation of body image is genetically determined and can be modified by sensory input to generate a neurosignature. The regular neurosignature may be responsible for painless phantom limb sensations, whereas phantom pain could be due to an anomalous reorganization of the neuromatrix.

Michael Jouvet (1998) suggested that during sleep, an iteration process occurs at the DNA level that maintains and programs hereditary behavior. His notion may be related to the neuromatrix theory. Namely, during sleep, a neurocomputational process can maintain and reinforce the neurosignature and complex neuro-DNA patterns.

Mulder et al. (2008) reported that a large number of amputees continue to experience a body with all of the limbs intact during in their dreams. The visual perception from the eyes or the imagination generated internally employs the same (or a very similar) neural substrate in the visual cortex (Ganis et al., 2004; Slotnick et al., 2005; Borst and Kosslyn, 2008). In addition, in dream images, deficits occur that correlate with the damaged visual areas of the cortical brain. These phenomena indicate that the same (or a very similar) neural substrate of the visual cortex is used for the visual content of the dream image (Llinas and Pare, 1991). Such findings suggest that during sleep, visual dreams continue and/or reinforce the representation of a missing limb. After a limb has been amputated, the visual system from the eyes recognizes the lack of the limb, but the subconscious proprioceptive system and visual dreams (which are also produced by the subconscious) do not, because the subconscious brain mechanisms (proprioceptive system, neurosignature) have not yet changed.

According to the latest results of Morabito et al. (2010), low frequency and low intensity electromagnetic fields modify the cellular redox state. Thus, it is possible that one of the important effects of the EMOST method (that is based on the non-linear, bioelectromagnetic fields of the subject) is to influence redox processes in cells and tissues. However, reactive species and their derivatives act as fundamental signals (secondary messengers) in physiological (and pathophysiological) processes and are particularly important in redox signal systems. During EMOST treatments, the feedback of non-linear,

extra weak electromagnetic could strengthen the cellular redox communication between cells and can influence the redox balance of the entire body via the circulating blood. One outcome of these processes is that EMOST affects sleep and mood processes.

There are converging lines of evidence to support the hypothesis that sleep promotes brain plasticity. Glutamate is one of the main excitatory neurotransmitters in the visual cortex (Baughman and Gilbert, 1980), and the NMDA glutamate receptor is the most important molecular structure in controlling synaptic plasticity and memory functions. However, redox modulation has been recognized as a fundamental system in the regulation of the NMDA receptor (Bókkon and Antal, 2010; Choi and Lipton, 2000; Aizenman, 1995). In addition, glutamate receptors are reactivated during sleep-associated consolidation processes (Gais et al., 2008). It is possible that some of the important effects of the EMOST method are achieved via the redox balance of the body and redox-related plasticity during sleep.

In addition, weak magnetic fields with an optimal frequency and intensity have ameliorating effects on melatonin-related diseases (Persinger, 2006). However, melatonin is involved in the regulation of sleep, and can modulate hippocampus NMDA receptors, as well as brain and blood oxidative stress levels in ovariectomized rats. Furthermore, melatonin improves the antioxidant status (balance of the oxidant-antioxidant status) in the brain and liver (Subramanian et al., 2007; Dilek et al., 2010). According to Huse et al. (2001), opioids are effective in the treatment of phantom limb pain and may influence the cortical reorganization. Del Seppia et al. (2007) reported that non-ionizing electromagnetic fields could affect the nociceptive sensitivity and analgesia via opioid-mediated responses. Recently, Cuccurazzu et al. (2010) showed that extremely low-frequency electromagnetic fields can enhance the hippocampal neurogenesis in C57BL/6 mice.

Summary

We presented our preliminary results regarding the effectiveness of the EMOST method (which utilizes the non-linear, electromagnetic fields of the subjects) for the reduction of phantom limb pain under clinical circumstances. Because LFI-EMFs may affect cell membranes, membrane-bound receptors and free radical and redox processes, the cell type-specific redox status is likely responsible for the effects of various LFI-EMFs. Therefore, the EMOST method potentially can affect redox processes. For the reasons that redox homeostasis plays a fundamental role in physiological/ pathophysiological processes and sleep/wake regulation, and the brain oxidation can be an initial process in sleep induction, and

also because sleep promotes the brain plasticity, we hypothesize that some possible effects of EMOST improve redox and redox-related plasticity (*reorganization*).

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Acknowledgments

All of the authors gratefully acknowledge the assistance of the National Institute for Medical Rehabilitation, Budapest, Hungary.

References

- Aizenman, E. (1995). Modulation of N-methyl-D-aspartate receptors by hydroxyl radicals in rat cortical neurons in vitro. *Neurosci. Lett.* 189:57–59.
- Alfieri, R.R., Bonelli, M.A., Pedrazzi, G., Desenzani, S., Ghillani, M., Fumarola, C., Ghibelli, L., Borghetti, A.F., Petronini, P.G. (2006). Increased levels of inducible HSP70 in cells exposed to electromagnetic fields. *Radiat. Res.* 165:95–104.
- Baughman, R.W., Gilbert, C.D. (1980). Aspartate and glutamate as possible neurotransmitters of cells in layer 6 of the visual cortex. *Nature* 287:848–850.
- Bauréus, K.C.L., Sommarin, M., Persson, B.R., Salford, L.G., Eberhardt, J.L. (2003). Interaction between weak low frequency magnetic fields and cell membranes. *Bioelectromagnetics* 24:395–402.
- Binhi, V.N. (1999). An analytical survey of theoretical studies in the area of magnetoreception. In: *Electromagnetic Fields: Biological Effects and Hygienic Standardization*. Repacholi, M.H, Rubtsova, N.B., Muc, A.M. eds. (pp:155–170) Switzerland, Geneva: World Health Organization.
- Bittar, R.G., Otero, S., Carter, H., Aziz, T.Z. (2005). Deep brain stimulation for phantom limb pain. *J. Clin. Neurosci.* 12:399–404.
- Bókkon, I., Antal, I. (2010). Schizophrenia: redox regulation and volume transmission. *Curr. Neuropharmacol.* In press.
- Bókkon, I., Salari, V. (2010). Information storing by biomagnetites. *J. Biol. Phys.* 36:109–120.
- Borst, G., Kosslyn, S.M. (2008). Visual mental imagery and visual perception: structural equivalence revealed by scanning processes. *Mem. Cognit.* 36:849–862.
- Choi, Y.B., Lipton, S.A. (2000). Redox modulation of the NMDA receptor. *Cell. Mol. Life Sci.* 57:1535–1541.
- Cohen, S., Popp, F.A. (1997). Biophoton emission of the human body. *J. Photochem. Photobiol. B* 40:187–189.
- Cuccurazzu, B., Leone, L., Podda, M.V., Piacentini, R., Riccardi, E., Ripoli, C., Azzena, G.B., Grassi, C. (2010). Exposure to extremely low-frequency (50 Hz) electromagnetic fields enhances adult hippocampal neurogenesis in C57BL/6 mice. *Exp. Neurol.* 226:173–182.
- Davis, K.D., Kiss, Z.H., Luo, L. (1998). Phantom sensations generated by thalamic microstimulation. *Nature* 391:385–387.

- De Nicola, M., Cordisco, S., Cerella, C., Albertini, M.C., D'Alessio, M., Accorsi, A., Bergamaschi, A., Magrini, A., Ghibelli, L. (2006). Magnetic fields protect from apoptosis via redox alteration. *Ann. N. Y. Acad. Sci.* 1090:59–68.
- de Roos, C., Veenstra, A.C., de Jongh, A., den Hollander-Gijsman, M., van der Wee, N.J., Zitman, F.G., van Rood, Y.R. (2010). Treatment of chronic phantom limb pain using a trauma-focused psychological approach. *Pain Res. Manag.* 15:65–71.
- Del Seppia, C., Ghione, S., Luschi, P., Ossenkopp, K.P., Choleris, E., Kavaliers, M. (2007). Pain perception and electromagnetic fields. *Neurosci. Biobeh. Rev.* 31:619–642.
- Devor, M., Seltzer, Z. (1999). Pathophysiology of damaged nerves in relation to chronic pain.
- Dhillon, G.S., Kruger, T.B., Sandhu, J.S., Horch, K.W. (2005). Effects of short-term training on sensory and motor function in severed nerves of long-term human amputees. *J. Neurophysiol.* 93:2625–2633.
- Di Carlo, A., White, N., Guo, F., Garrett, P., Litovitz, T. (2002). Chronic electromagnetic field exposure decreases HSP70 levels and lowers cytoprotection. *J. Cell. Biochem.* 84:447–454.
- Di Loreto, S., Falone, S., Caracciolo, V., Sebastiani, P., D'Alessandro, A., Mirabilio, A., Zimmitti, V., Amicarelli, F. (2009). Fifty hertz extremely low-frequency magnetic field exposure elicits redox and trophic response in rat-cortical neurons. *J. Cell. Physiol.* 219:334–343.
- Dilek, M., Naziroğlu, M., Baha Oral, H., Suat Ovey, I., Küçükayaz, M., Mungan, M.T., Kara, H.Y., Sütçü, R. (2010). Melatonin modulates hippocampus NMDA receptors, blood and brain oxidative stress levels in ovariectomized rats. *J. Membrane Biol.* 233:135–142.
- Dröge, W. (2002). Free Radicals in the Physiological Control of Cell Function. *Physiol. Rev.* 82: 47–95.
- Feissner, R.F., Skalska, J., Gaum, W.E., Sheu, S.S. (2009). Crosstalk signaling between mitochondrial Ca²⁺ and ROS. *Front. Biosci.* 14:1197–1218.
- Flor, H. 2002. Phantom-limb pain: characteristics, causes, and treatment. *Lancet Neurol.* 1: 182–189.
- Forman, H.J., Fukuto, J.M., Miller, T., Zhang, H., Rinna, A, Levy, S. (2008). The chemistry of cell signaling by reactive oxygen and nitrogen species and 4-hydroxynonenal. *Arch. Biochem. Biophys.* 477:183–195.
- Foster, K.R. (2003). Mechanisms of interaction of extremely low frequency electric fields and biological systems. *Rad. Protec. Dosimet.* 106:301–310.
- Fraser, A., Frey, A.H. (1968). Electromagnetic emission at micron wavelengths from active nerves. *Biophys. J.* 8:731–734.
- Gais, S., Rasch, B., Wagner, U., Born, J. (2008). Visual-procedural memory consolidation during sleep blocked by glutamatergic receptor antagonists. *J. Neurosci.* 28:5513–5518.
- Ganis, G., Thompson, W.L., Kosslyn, S.M. (2004). Brain areas underlying visual mental imagery and visual perception: an fMRI study. *Brain Res. Cogn. Brain Res.* 20:226–241.
- Gnezdilov, A.V., Syrovegin, A.V., Plaksin, S.E., Ovechkin, A.M., Ivanov, A.M., Sul'timov, S.A. (1995). Evaluation of the effectiveness of transcutaneous electroneuroanalgesia in phantom pain syndrome. *Anesteziol. Reanimatol.* 2:97–102.
- Gordeeva, A.V., Zvyagil'skaya, R.A., Labas, Y.A. (2003). Cross-talk between reactive oxygen species and calcium in living cells. *Biochemistry (Mosc.)* 68:1077–1080.
- Hancock, J.T., Desikan, R., Neill, S.J. (2001). Role of reactive oxygen species in cell signalling pathways. *Biochem. Soc. Trans.* 29:345–350.
- Hidalgo, C., Carrasco, M.A., Muñoz, P., Núñez, M.T. (2000). A role for reactive oxygen/nitrogen species and iron on neuronal synaptic plasticity. *Antioxid. Redox Signal.* 9:245–255.

- Huang, C.Y., Yang, R.S., Kuo, T.S., Hsu, K.H. (2009). Phantom limb pain treated by far infrared ray. *Con. Proc. IEEE Eng. Med. Biol. Soci.* 2009:1589–1591.
- Huo, R., Ma, Q., Wu, J.J., Chin-Nuke, K., Jing, Y., Chen, J., Miyar, M.E., Davis, S.C., Li, J. (2010). Noninvasive Electromagnetic Fields on Keratinocyte Growth and Migration. *J. Surg. Res.* 162:299–307.
- Huse, E., Larbig, W., Flor, H., Birbaumer, N. (2001). The effect of opioids on phantom limb pain and cortical reorganization. *Pain* 90:47–55.
- Ikeda, M., Ikeda-Sagara, M., Okada, T., Clement, P., Urade, Y., Nagai, T., Sugiyama, T., Yoshioka, T., Honda, K., Inoué, S. (2005). Brain oxidation is an initial process in sleep induction. *Neuroscience* 130:1029–1040.
In: Wall, P.D., Melzack, R. eds. *Textbook of pain* (pp. 129–164). Edinburgh: Churchill Livingstone.
- Irlbacher, K., Kuhnert, J., Rörich, S., Meyer, B.U., Brandt, S.A. (2006). Central and peripheral deafferent pain: therapy with repetitive transcranial magnetic stimulation. *Der Nervenarzt* 77:1196,1198–1203.
- Isojima, Y., Isoshima, T., Nagai, K., Kikuchi, K., Nakagawa, H. (1995). Ultraweak biochemiluminescence detected from rat hippocampal slices. *NeuroReport* 6:658–660.
- Jing, D., Shen, G., Huang, J., Xie, K., Cai, J., Xu, Q., Wu, X., Luo, E. (2010). Circadian rhythm affects the preventive role of pulsed electromagnetic fields on ovariectomy-induced osteoporosis in rats. *Bone* 46:487–495.
- Jouvet, M. (1998). Paradoxical sleep as a programming system. *J. Sleep Res.* 7:1–5.
- Kamsler, A., Segal, M. (2007). Control of neuronal plasticity by reactive oxygen species. *Antioxid. Redox Signal.* 9:165–167.
- Karl, A., Birbaumer, N., Lutzenberger, W., Cohen, L.G., Flor, H. (2001). Reorganization of motor and somatosensory cortex in upper extremity amputees with phantom limb pain. *J. Neurosci.* 21:3609–3618.
- Kishida, K.T., Klann, E. (2007). Sources and targets of reactive oxygen species in synaptic plasticity and memory. *Antioxid. Redox Signal.* 9:233–244.
- Kishida, K.T., Pao, M., Holland, S.M., Klann, E. (2005). NADPH oxidase is required for NMDA receptor-dependent activation of ERK in hippocampal area CA1. *J. Neurochem.* 94:299–306.
- Kobayashi, M., Takeda, M., Sato, T., Yamazaki, Y., Kaneko, K., Ito, K., Kato, H., Inaba, H. (1999). In vivo imaging of spontaneous ultraweak photon emission from a rat's brain correlated with cerebral energy metabolism and oxidative stress. *Neurosci. Res.* 34:103–113.
- Kumar, V.S., Kumar, D.A., Kalaivani, K., Gangadharan, A.C., Raju, K.V., Thejomoorthy, P., Manohar, B.M., Puvanakrishnan, R. (2005). Optimization of pulsed electromagnetic field therapy for management of arthritis in rats. *Bioelectromagnetics* 26:431–439.
- Lappin, M.S., Lawrie, F.W., Richards, T.L., Kramer, E.D. (2003). Effects of a pulsed electromagnetic therapy on multiple sclerosis fatigue and quality of life: a double-blind, placebo controlled trial. *Altern. Ther. Health Med.* 9:38–48.
- Levin, A., Korenstein, R. (1991). Membrane fluctuations in erythrocytes are linked to MgATP-dependent dynamic assembly of the membrane skeleton. *Biophys. J.* 60:733–737.
- Lipkova, J., Cechak, J. (2005). Existence of Electromagnetic Radiation in Humans in. ELF Band. *Prog. Electromagnetics. Res. Sym.* 1:227–230.
- Llinas, R.R., Pare, D. (1991). Of dreaming and wakefulness. *Neuroscience* 44:521–535.
- Mach, Q.H., Persinger, M.A. (2009). Behavioral changes with brief exposures to weak magnetic fields patterned to stimulate long-term potentiation. *Brain Res.* 1261:45–53.

- Mackert, B.M., Sappok, T., Grüsser, S., Flor, H., Curio, G. (2003). The eloquence of silent cortex: analysis of afferent input to deafferented cortex in arm amputees. *NeuroReport* 14:409–412.
- Mancuso, M., Ghezzi, V., Di Fede, G. (2007). Utilization of extremely low frequency (ELF) magnetic fields in chronic disease; five years experience: three case reports. *Electromagn. Biol. Med.* 26:311–313.
- Manikonda, P.K., Rajendra, P., Devendranath, D., Gunasekaran, B., Channakeshava., Aradhya, R.S., Sashidhar, R.B., Subramanyam, C. (2007). Influence of extremely low frequency magnetic fields on Ca²⁺ signaling and NMDA receptor functions in rat hippocampus. *Neurosci. Lett.* 413:145–149.
- Markov, M.S. (2007a). Expanding use of pulsed electromagnetic field therapies. *Electromagn. Biol. Med.* 26:257–274.
- Markov, M.S. (2007b). Pulsed electromagnetic field therapy history, state of the art and future. *Environmentalist* 27:465–475.
- Mathie, A., Kennard, L.E., Veale, E.L. (2003). Neuronal ion channels and their sensitivity to extremely low frequency weak electric field effects. *Rad. Prot. Dosimet.* 106:311–316.
- Melzack, R. (1990). Phantom limbs and the concept of a neuromatrix. *Trends Neurosci.* 13:88–92.
- Melzack, R. (1992). Phantom limbs. *Scientific American* 266:120–126.
- Melzack, R., Isreal, R., Lacroix, R., Schultz, G. (1997). Phantom limbs in people with congenital limb deficiency or amputation in early childhood. *Brain* 120:1603–1620.
- Mercier, C., Reilly, K.T., Vargas, C.D., Aballea, A., Sirigu, A. (2006). Mapping phantom movement representations in the motor cortex of amputees. *Brain* 129:2202–2210.
- Monteiro, H.P., Arai, R.J., Travassos, L.R. (2008). Protein tyrosine phosphorylation and protein tyrosine nitration in redox signaling. *Antioxid. Redox Signal.* 10:843–889.
- Moore, C.I., Stern, C.E., Dunbar, C., Kostyk, S.K., Gehi, A., Corkin, S. (2000). Referred phantom sensations and cortical reorganization after spinal injury in humans. *Proc. Natl. Acad. Sci. USA* 97:14703–14708.
- Morabito, C., Rovetta, F., Bizzarri, M., Mazzoleni, G., Fanò, G., Marigliò, M.A. (2010). Modulation of redox status and calcium handling by extremely low frequency electromagnetic fields in C2C12 muscle cells: A real-time, single-cell approach. *Free Radic. Biol. Med.* 48:579–589.
- Mulder, T., Hochstenbach, J., Dijkstra, P.U., Geertzen, J.H. (2008). Born to adapt, but not in your dreams. *Conscious. Cogn.* 17:1266–1271.
- Nakashima, I., Kato, M., Akhand, A.A. (2002). Redox-linked signal transduction pathways for protein tyrosine kinase activation. Redox-linked signal transduction pathways for protein tyrosine kinase activation. *Antioxid. Redox Signal.* 4:517–531.
- Orgel, M.G., O'Brien, W.J., Murray, H.M. (1984). Pulsing electromagnetic field therapy in nerve regeneration: an experimental study in the cat. *Plast. Reconstr. Surg.* 73:173–183.
- Patruno, A., Amerio, P., Pesce, M., Vianale, G., Di Luzio, S., Tulli, A., Franceschelli, S., Grilli, A., Muraro, R., Reale, M. (2010). Extremely low frequency electromagnetic fields modulate expression of inducible nitric oxide synthase, endothelial nitric oxide synthase and cyclooxygenase-2 in the human keratinocyte cell line HaCat: potential therapeutic effects in wound healing. *Br. J. Dermatol.* 162:258–266.
- Pelling, A.E., Sehati, S., Gralla, E.B., Gimzewski, J.K. (2005). Time dependence of the frequency and amplitude of the local nanomechanical motion of yeast. *Nanomedicine* 1:178–183.
- Persinger, M.A. (2006). A potential multiple resonance mechanism by which weak magnetic fields affect molecules and medical problems: the example of melatonin and experimental "multiple sclerosis". *Med. Hypotheses* 66:811–815.

- Pokorný, J., Hašek, J., Jelínek, F., Saroch, J., Palan, B. (2001). Electromagnetic activity of yeast cells in the M phase. *Electro- and Magnetobiol.* 20:371–396.
- Ramachandran, V.S., Hirstein, W. (1998). The perception of phantom limbs. The D. O. Hebb Lecture. *Brain* 121:1603–1630.
- Rasmussen, K.G., Rummans, T.A. (2000). Electroconvulsive therapy for phantom limb pain. *Pain* 85:297–299.
- Regoli, F., Gorbi, S., Machella, N., Tedesco, S., Benedetti, M., Bocchetti, R., Notti, A., Fattorini, D., Piva, F., Principato, G. (2005). Pro-oxidant effects of extremely low frequency electromagnetic fields in the land snail *Helix aspersa*. *Free Radic. Biol. Med.* 39:1620–1628.
- Reiter, R.J. (1993). Static and extremely low frequency electromagnetic field exposure: reported effects on the circadian production of melatonin. *J. Cell. Biochem.* 51:394–403.
- Satter Syed, A., Islam, M.S., Rabbani, K.S., Talukder, M.S. (1999). Pulsed electromagnetic fields for the treatment of bone fractures. *Bangladesh Med. Res. Counc. Bull.* 25:6–10.
- Seidel, S., Kasprian, G., Sycha, T., Auff, E. (2009). Mirror therapy for phantom limb pain—a systematic review. *Wien Klin. Wochenschr.* 121:440–444.
- Selvam, R., Ganesan, K., Narayana Raju, K.V., Gangadharan, A.C., Manohar, B.M., Puvanakrishnan, R. (2007). Low frequency and low intensity pulsed electromagnetic field exerts its antiinflammatory effect through restoration of plasma membrane calcium ATPase activity. *Life Sciences* 80:2403–2410.
- Sherman, R.A. (1994). What do we really know about phantom limb pain? *Pain Rev.* 1:261–274.
- Sherman, R.A., Sherman, C.J., Bruno, G.M. (1987). Psychological factors influencing chronic phantom limb pain: an analysis of the literature. *Pain* 28:285–295.
- Shi, Y., Yu, J., Jia, Y., Pan, L., Shen, C., Xia, J., Zhang, M. (2010). Redox-regulated lipid membrane binding of the PICK1 PDZ domain. *Biochemistry* 49:4432–4439.
- Simkó, M. (2007). Cell type specific redox status is responsible for diverse electromagnetic field effects. *Curr. Med. Chem.* 14:1141–1152.
- Slotnick, S.D., Thompson, W.L., Kosslyn, S.M. (2005). Visual mental imagery induces retinotopically organized activation of early visual areas. *Cereb. Cortex* 15:1570–1583.
- Subramanian, P., Mirunalini, S., Pandi-Perumal, S.R., Trakht, I., Cardinali, D.P. (2007). Melatonin treatment improves the antioxidant status and decreases lipid content in brain and liver of rats. *Eur. J. Pharmacol.* 571:116–119.
- Sutbeyaz, S.T., Sezer, N., Koseoglu, F., Kibar, S. (2009). Low-frequency pulsed electromagnetic field therapy in fibromyalgia: a randomized, double-blind, sham-controlled clinical study. *Clin. J. Pain* 25:722–728.
- Tsang, E.W., Koren, S.A., Persinger, M.A. (2009). Specific patterns of weak (1 microTesla) transcerebral complex magnetic fields differentially affect depression, fatigue, and confusion in normal volunteers. *Electromagn. Biol. Med.* 28:365–373.
- Valko, M., Leibfritz, D., Moncol, J., Cronin, M.T., Mazur, M., Telser, J. (2007). Free radicals and antioxidants in normal physiological functions and human disease. *Int. J. Biochem. Cell. Biol.* 39:44–84.
- Walther, M., Mayer, F., Kafka, W., Schütze, N. (2007). Effects of weak, low-frequency pulsed electromagnetic fields (BEMER type) on gene expression of human mesenchymal stem cells and chondrocytes: an in vitro study. *Electromagn. Biol. Med.* 26:179–190.
- Wiech, K., Kiefer, R.T., Töpfer, S., Preissl, H., Braun, C., Unertl, K., Flor, H., Birbaumer, N. (2004). A placebo-controlled randomized crossover trial of the N-methyl-D-aspartic acid receptor antagonist, memantine, in patients with chronic phantom limb pain. *Anesth. Analg.* 98:408–413.

- Wilkes, D., Ganceres, N., Solanki, D., Hayes, M. (2008). Pulsed radiofrequency treatment of lower extremity phantom limb pain. *Clin. J. Pain* 24:736–739.
- Yan, Y., Wei, C.L., Zhang, W.R., Cheng, H.P., Liu, J. (2006). Cross-talk between calcium and reactive oxygen species signaling. *Acta Pharmacol. Sin.* 27:821–826.
- Yang, Z., Asico, L.D., Yu, P., Wang, Z., Jones, J.E., Escano, C.S., Wang, X., Quinn, M.T., Sibley, D.R., Romero, G.G., Felder, R.A., Jose, P.A. (2006). D5 dopamine receptor regulation of reactive oxygen species production, NADPH oxidase, and blood pressure. *Am. J. Physiol. Regul. Integr. Comp. Physiol.* 290:R96–R104.
- Zhang, X., Zhang, J., Qu, X., Wen, J. (2007). Effects of different extremely low-frequency electromagnetic fields on osteoblasts. *Electromagn. Biol. Med.* 26:167–177.

FIGURE 5 Treatments of amputees by EMOST in the clinic. (A.Erdöfi-Szabó and I.Bókkon)



translation of clinical reference letter



ORSZÁGOS
ORVOSI
REHABILITÁCIÓS
INTÉZET

National Institute for Medical Rehabilitation, Budapest, Hungary
Budapest, Szanatórium utca 19. <http://rehabint.hu/welcome.htm>

Dear Mr. Dr. Attila Erdőfi-Szabó,

Since 2010 we have been using EMOST method at our department in the process of rehabilitation following limb amputation together with the procedures stated in the rehabilitation protocol. We have been using this technology aiming mainly at reducing and stopping phantom pain and reducing the post operation post traumatic stress of the patients having been operated on. After the medical attendance aiming at the above mentioned goals we experienced the following results:

- a) there is less formation of phantom pain after the operation
- b) higher number of decrease and stopping of phantom pain
- c) post traumatic stress of limb absence is significantly less in the treated patients
- d) healing of the wound is significantly faster, the stump can be strained much earlier
- e) sleep quality in treated patients is significantly better than in the non-treated ones
- f) psychological status of the patients treated is significantly more propitious than in non-treated ones

In our department we used this method with patients having defecation and urination problems which made the rehabilitation process more difficult and thus making their quality of life worse.

According to our experiences we can state that using the equipment for these purposes, defecation and urination malfunction of treated patients decreased significantly, including stool retention and urinary retention and the decrease and stop of incontinence caused by stress.

It is a particularly good result because of the limitation of motion and the high risk of motion deficits, because the imbalance of "freshly" Amputees and the the number of injuries caused by falling due to perceiving the not yet accepted altered body image can be significantly reduced.

Our experience also suggests that the central nervous system and autonomic nervous system treatments resulted in the patients body detection is better than in non treated patients.

This way getting used to artificial limb is quicker, and more efficient thus reducing the risk of falls and the consequential formation of necrosis of the stump, while the rehabilitation time improves.

As we have reported in the magazine *Electromagnetic Biology and Medicine*, we found that patients treated with our method are needed smaller proportion of reamputation so the positive results exist, thus long-term effects can be assumed.

According to our experience we have gained so far, the EMOST method and equipment is considered a promising method because of its beneficial and spectacular impact on the nervous system, the conductivity and the post traumatic stress.

On behalf of my colleagues and myself I claim to continue the collaboration in the research team's work, so that the procedure based on the further results can be included in the protocol of amputee rehabilitation.

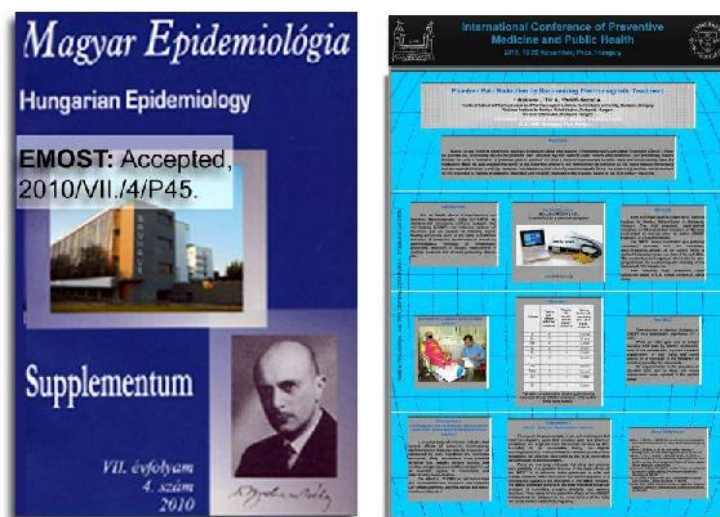
I wish you success in your work,

18.06.2012, Budapest

Dr. Attila TILL, Chief Medical Head of Department, Amputation Surgical Dep.,
National Institute for Medical Rehabilitation

Országos Orvosi Rehabilitációs Intézet
1528 Budapest XII., Szanatórium u. 19.
Telefon: 391-1944, Fax: 391-1977
ÁNTSZ-016010201
Amputációs Sebészeti osztály
osztályvezető főorvos: dr. Till Attila

Dr. Till Attila,
osztályvezető főorvos



Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment

¹*Bókkon István, ²Till Attila, ³Erdöfi-Szabó Attila

Poster presentation for International Conference of Preventive Medicine and Public Health
Theme category: Other

¹Doctoral School of Pharmaceutical and Pharmacological Sciences, Semmelweis University,
Budapest, Hungary

²National Institute for Medical Rehabilitation, Budapest, Hungary

³Director of BioLabor, Budapest, Hungary
2010

Abstract

While the health effects of low-frequency and intensity electromagnetic fields are controversial, an increasing body of evidence suggests that non-ionizing and low-frequency electromagnetic fields are capable of initiating various healing processes, such as the delay of fractures, induction of analgesia, inhibition of inflammatory processes, acceleration of wound re-epithelialization, decrease of fatigue, improvement of multiple sclerosis and chronic pulmonary disease, among others. Based on our years of experience testing a technique called non-ionizing *Electromagnetic-Own-Signal-Treatment*, here, we report the preliminary results for phantom pain reduction by this method under clinical circumstances. Our preliminary results showed not only a reduction in phantom pain in patients but also a marked improvement in their sleep and mood quality after the treatments. Here, we also suggest that some of the important effects of our method may be achieved via the redox balance of the body and redox-related neural plasticity. However, low-frequency and intensity electromagnetic fields can potentially provide useful methods for the treatment of diverse problematic disorders and can play important roles in public health of the 21st century medicine.

*Corresponding author: Bókkon István

Corresponding author's Email: bokkoni@yahoo.com

Corresponding author's Address: H-1238 Budapest, Lang E. 68. Hungary

Corresponding author's Phone: +36 20 570 6296



МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
Національна медична академія післядипломної освіти імені П.Л. Шупика
Головне управління охорони здоров'я м. Києва
Головне управління охорони здоров'я Київської облдержадміністрації
КЗ КОР «Київська обласна клінічна лікарня»

Нарада-семінар

кафедра неврології та рефлексотерапії

Національної медичної академії післядипломної освіти імені П.Л. Шупика

«Сучасні аспекти використання рефлексотерапії в медичній реабілітації»



25-26 листопада

м. Київ

методами рефлексотерапії сімейними лікарями дозволить підвищити якість надання медичної допомоги на етапі ПМСД. Передбачається, що дану програму буде розроблено та затверджено в кінці 2011 – на початку 2012 рр. і в II-III кварталі 2012 р. буде можливо розпочати підготовку сімейних лікарів по програмі даних циклів. Лікарі, які після проходження даних циклів виявляють бажання глибше вивчити теорію і практику рефлексотерапії, мають змогу пройти навчання на циклі «Спеціалізація з рефлексотерапії», програма якого розрахована на 3 місяці.

МЕТОД «EMOST» ELECTROMAGNETIC-OWN-SIGNAL-TREATMENT

Dr. Erdőfi-Szabó Attila PhD., Dr. Bókkon István PhD

(м. Будапешт, Угорщина)

ООО «BioLabor» по биофизическим и лабораторным услугам (Венгрия) и ООО «EMOST Nano-MED» по инновациям и производству медицинского оборудования (Венгрия) являются стратегическими партнерами Агентства регионального развития и международного сотрудничества «Закарпатье» (Валерий Грищенко/Erdőfi-Szabó Attila от 29.07.2011.). Целью сотрудничества являются проведение совместных украинско-венгерских исследований и развитие услуг в сфере обслуживания посттравматического стресса, перебоев со сном, аллергии, инконтиненции, реабилитации, аддикции, спортивного и детского здравоохранения.

ПРОФЕССИОНАЛЬНЫЕ УСПЕХИ

37 статей, 150 ссылок о методе, участие в качестве ведущего в 11-ти клинических исследованиях, опубликованы 5 научных статей в авторитетных медицинских журналах (см. ниже), за семь лет проведены более 600 профессиональных курсов по ПК, прочтены более 80 научных лекций.

РЕФЕРЕНЦИИ (с 2005 г., в 68 франшизных точках, смотри веб-сайт: www.biolabor.hu)

В рамках нашей системы работают 37 врачей, 45 специалистов натуральной медицины и 135 ассистентов на франшизных точках. С 2005 г. мы имеем более чем 40.000 довольных клиентов.

МЕТОД

Наш организм каждый день восстанавливает самого себя, вечером мы ложимся уставшим, а утром благодаря чему-то встаём «отдохнувшими», хотя мы не вводили дополнительную энергию. От чего это? Мы именно этим биологическим процессом занимаемся. Электромагнитные лучи, исходящие из Солнца в виде света и тепла обеспечивают основные условия жизни флоре и фауне. Электромагнитная энергия является основным условием Жизни, она лежит в основе молекулярных связей, поэтому надо было бы предполагать, что процедуры с электромагнитным методом не

альтернативные, а может быть универсальные способы лечения. Разработанным специалистами ООО «BioLabor» методом упорядочиваются собственные электрические и электромагнитные сигналы организма способом рефлексотерапии. Принимаются различного ритма и различной динамики потенциалы клиента, потом они аналоговым образом в определенных вариациях ослабляются и/или усиливаются и возвращаются в организм клиента. Именно такие, расширенные вариации потенциалов делают возможным их влияние на акционный потенциал, а таким образом, упорядочивание процессов на уровне молекул и клеток. Вариации потенциалов с определенной индикацией через поверхность кожи, расположенные в коже свободные нервные окончания, рецепторы и эффекторы, сосудистую систему, клетки Меркеля, иммунные клетки окажут непосредственное воздействие на центральную нервную систему, вегетативное симпатическое и парасимпатическое регулирование, иммунитет и информационную систему. Имеется возможность применения метода в электро-акупунктуре на стимуляцию, которая основана на собственных сигналах, этим достигается согласование взаимоотношений качеств потенциалов, осуществляющихся в данной зоне. Дальнейшим преимуществом является и то, что электрические потенциалы и нефизические моменты врача, осуществляющего терапию, остаются независимыми от клиента, что для обеих сторон предоставляет безопасность. Изменения происходят главным образом через окислительно-восстановительные процессы и точное регулирование нейротрансмиттерами. Вероятность появления побочных эффектов довольно маленькая из-за наличия рефрактерной фазы, уровень риска низкий, поскольку сигналы собственные, практически исключена перегрузка организма благодаря собственному уровню сигнала, а при их применении вместо риска интерференции искусственных (дигитализованных) электромагнитных сигналов имеется соответствующая, естественная когеренция. С этим методом можно работать с взаимосвязанными сигналами одновременно, поэтому имеется возможность сохранить их естественную взаимосвязь. С этим методом развиваются саморегуляция процессов, учебные и восстановительные способности организма. Благодаря тому, что на протяжении нескольких лет у нас приобретался благоприятный опыт по применению метода, стало возможным в некоторых областях регулярно им пользоваться. Кроме повседневного применения по некоторым направлениям, наш метод доказал своё право на существование так и в условиях стихийных бедствий, как и в особых военных условиях. Считается преимуществом метода и то, что требуется относительно малое количество процедур (4-6) и его эффект продолжительный.

ГЛАВНЫЕ ПРОЕКТЫ И РЕЗУЛЬТАТЫ

Разработка медицинских терапий

2005 г.: Центральная нервная система, нейровегетативная система; Настроение, концентрация, вялость; Нейротрансмиттерные процессы;

2006.г.: Ортомолекулярный и метаболический баланс; Педиатрия, лактозная и глютенная интолерантность; Кооперация сосудов, почек и сердца; Аллергия, качество сна, инконтиненция; Психонейроиммунология и её взаимоотношения, стресс и болезни

2007.г.: Когнитивные функции;

2008.г.: Природные бедствия, посттравматический стресс; Фантомные боли после ампутаций; Детские процедуры, рост, развитие, социализация; Чрезвычайные ситуации, физический стресс и психические травмы в армии.

СОБСТВЕННЫЕ ПУБЛИКАЦИИ

- Bókkon I, Till A, Grass F, Erdőfi-Szabó A (2011) Phantom pain reduction by electromagnetic treatment. **Electromagnetic Biology and Medicine**
- Bókkon I, Till A, Erdőfi-Szabó A (2011) Non-ionizing Electromagnetic-Own-Signal-Treatment. **8th European Biophysics Congress**. 23-27 August, Budapest, Hungary.
- Bókkon I, Till A, Erdőfi-Szabó A (2010) Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment. **International Conference of Preventive Medicine and Public Health**. 19-20 Nov. Pécs, Hungary.
- Bókkon I, Till A, Erdőfi-Szabó A (2010) Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment. **Nature Precedings** 10.1038/npre.2010.4989.1
- Bókkon I, Till A, Erdőfi-Szabó A (2010) Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment. **Hungarian Epidemiology** 7/4/Suppl. p:15. Abstract
- Bókkon I., Till A., Erdőfi-Szabó A. (2011) Effect of Electromagnetic-Own-Signal-Treatment on electrocardiogram and the concentration of urea, cholesterol, albumin, cortisol, creatin, TSH, CRP in serum. Under process.
- Bókkon I., Till A., Erdőfi-Szabó A. (2011) Pilot study, Effects of Electromagnetic-Own-Signal-Treatment on PTS in military actions. Under processes.

ЭЛЕКТРОМАГНИТНАЯ РЕФЛЕКСОТЕРАПИЯ

Dr. Erdőfi-Szabó Attila PhD., Dr. Bókkon István PhD., Schmidtné Dr. Németh Mária

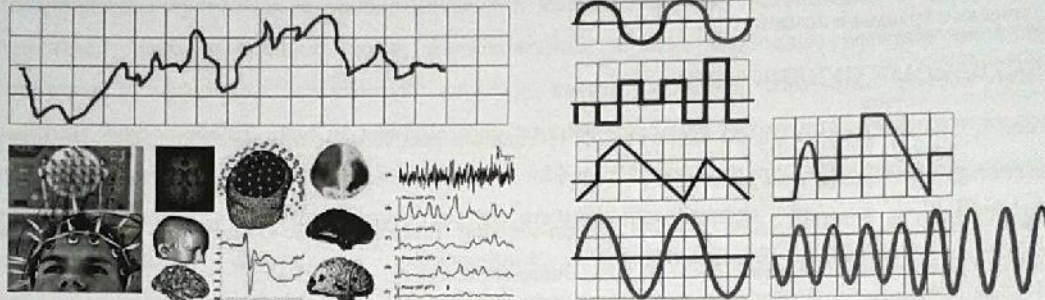
BioLabor Biofizikai és Laboratóriumi Szolgáltatások Kft.,
EMOST Nano-MED orvostechnikai Készülék Gyártó és Innovációs Kft.

Cím: 1122 Budapest, Városmajor u. 20. Magyarország, EU

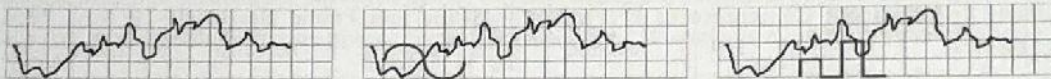
Telefon: +36 20 925 6116, cis@biolabor.hu www.biolabor.eu

(м. Будапешт, Угорщина)

Образ естественных сигналов (потенциалов) Образы искусственных ЭМ сигналов

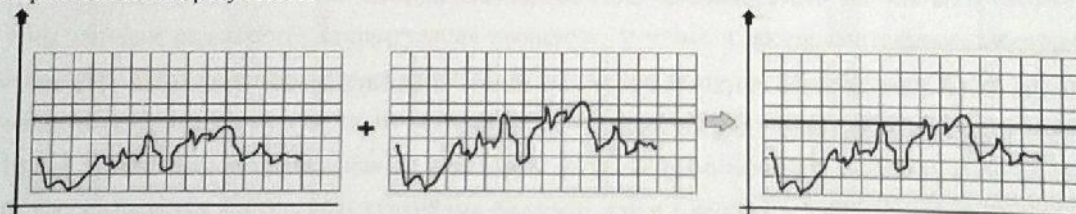


Относительно низкая результативность искусственных импульсов



BIOLABOR *Emost Redox 1.1*

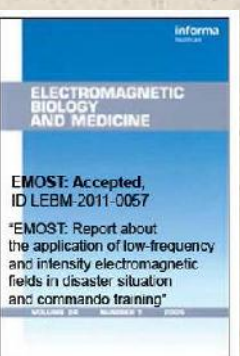
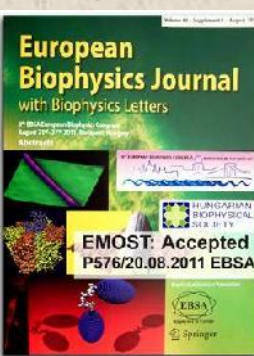
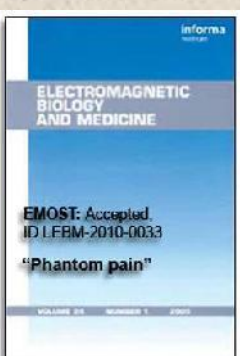
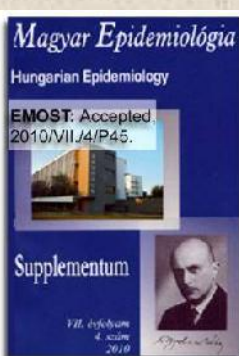
Восприятие, расширение, возвращение вариаций естественных сигналов имеют лучшие терапевтические результаты



Лечение с собственным электромагнитным сигналом (Electromagnetic-Own-Signal-Treatment т.е. метод «EMOST») означает ощущение и систематическое, расширенное возвращение экстремально низкоинтенсивных биоэлектрических и биоэлектромагнитных излучений (биопотенциалов) человеческого организма. Этот метод путём возвращения организму через поверхность кожи системы биологических сигналов годен к изменению силы биоэлектрических сигналов организма и к оказанию воздействия на биологические процессы биохимическим путём, к точному регулированию органов. Метод «EMOST» через ослабленные и нежно усиленные сигналы (потенциалы) способен достичь точного регулирования акционных потенциалов, изменить их подпороговые и надпороговые свойства, которые влияют на функционирование наших органов, усвоение питательных веществ, выделение гормонов, и иммунную систему.



Testing the EMOST, result: the patient is sleeping (!) in noisy classroom (!), no pains (!), only well-experience.

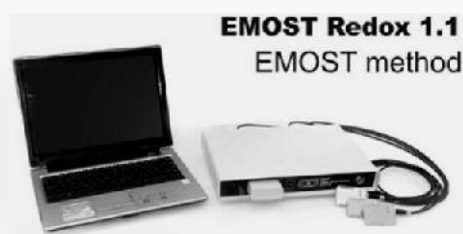


EMOST™ biophysical treatments to reduce the risk of aggressive behaviour in prisons

Biophysical electromagnetic managements

*by István Bókkon
2013*

EMOST Redox 1.1 Medical Device (Certificate: HU11/6192) controlled by a personal computer.



1. Background

1.1. Prisoners



Testosterone, norepinephrine, serotonin, glucose metabolism, and the aggression

Many studies on testosterone activity show a relation between high plasma levels and a tendency towards aggression. It was suggested that the interaction between low serotonin and high testosterone concentrations in the central nervous system has an important effect on the neural mechanisms involved in the expression of aggressive behavior. It seems that testosterone modulates serotonergic receptor activity that directly affects aggression, fear and anxiety. In addition, violent criminals have abnormalities in their glucose metabolism as indicated by decreased glucose uptake in their prefrontal cortex and a low blood glucose nadir in the glucose tolerance test. Low non-oxidative metabolism can be a crucial component in the pathophysiology of habitually violent behavior among subjects with antisocial personality disorder. The level of norepinephrine is also higher in aggressive prisoners than in moderately aggressive jailed inmates, which suggests a pronounced role of norepinephrine in the formation the aggressive behavior.

Sleep problems and aggression

Clinical studies revealed that sleep problems can be a contributory factor in the development of reactive aggression and violence. It seems that the relation between sleep problems and aggression can be mediated by the negative effect of sleep loss on prefrontal cortical working, namely the loss of control over emotions, including loss of the regulation of aggressive impulses to context- appropriate behavior. In addition, other potential contributing mechanisms connecting sleep problems to aggression and violence are most likely found within the central serotonergic and the hypothalamic-pituitary-adrenal-axis. Individual variation within these neurobiological systems may be responsible for amplified aggressive responses induced by sleep loss in certain individuals. Recent studies revealed that prisoners have higher levels of anxiety, sleep problems and depression than the general population.

Prefrontal malfunctions and aggression

Numerous researchers suggested that the relationship between prefrontal malfunctions and the likelihood of acting aggressively is mediated by the failure to adaptively use that we called the “executive cognitive functions”. Executive functioning allows people to respond to situations in a flexible manner, to make and adapt plans, and to base their behavior on internally held ideas rather than being governed solely by external stimuli. There are neuroimaging data that the prefrontal cortex plays an important function in the successful identification of facial expressions of emotion. The medial prefrontal cortex is most consistently activated by emotional stimuli, suggesting it has an essential role in emotional processing. Recent *Transcranial magnetic stimulation* (TMS) experiments also support the hypothesis of inhibition deficits and frontal cortex dysfunction in violent offenders when compared with non-violent control subjects. These prefrontal structural and biochemical malfunctions can cause the low arousal, poor fear conditioning, lack of conscience, and decision-making deficits that predispose to antisocial and psychopathic behavior. It is very possible that many aggressive behaviors come about mainly automatically, emotionally, and through conditioned association with other stimuli.

1.2. Prison officers and the burnout



Prison officers are exposed to special and very powerful stressors. The effects of this dangerous work on mental health are complex. WHO (2005) is predicting that by 2020, stress can be a major cause of workplace ill health. It is well known that prolonged or intense stress can have a negative impact on an individual’s mental and physical health. Workers who are stressed are also more likely to be unhealthy, poorly motivated, less productive and less safe at work (WHO, 2003).

Prison officers are among the most stressful of all occupations. The risk of suicide among prison guards is 39% higher than the rest of the working age population. Prison

officers - compared to the general population - have been found to have significantly lower life spans and higher rates of alcoholism, suicide, heart attacks, ulcers, and hypertension. Nowadays, officers have a high level of responsibility for the care, safety, security and rehabilitation of prisoners. In addition, there are large individual differences in the response to stress i.e. two prison officers can react in completely different ways to the same stressor.

Prison officers experience a number of negative feelings and attitudes leading to depleted emotional states (emotional exhaustion) such as burnout. The burnout is a tendency toward depersonalization, which occurs as employees become frustrated with their job and less concerned for their clients and results in increasingly negative work related attitudes. Maslach's model of burnout characterizes emotional exhaustion as depletion of emotional energy and a feeling that one's emotional resources are inadequate to deal with the situation.

2. EMOST (Electro-Magnetic-Own-Signal-Treatment) treatments

EMOST method and natural-based low-frequency and intensity electromagnetic signals

There has been increasing evidence about the health-promoting outcomes of low-frequency and intensity electromagnetic fields (LFI-EMFs) that are able to initiate different healing processes. EMOST medical device can detect non-linear, low-frequency and intensity bioelectric and bioelectromagnetic signals (as ECG or EEG signals) from subjects' skin by unique flat input/output electrodes. The collected signals are processed by computer of EMOST apparatus. The subjects are treated by processed signals originated from apparatus (signal density between 1 Hz - 1 MHz; intensity range is in natural pA mV). A particular feature of EMOST method - compared to most of electromagnetic equipments - is that the subjects' own bioelectro- bioelectromagnetic signals that are detected from skin can be processed in natural analogue mode (non-digitalized). The special analogue process makes it possible that the biophysical information content of detected and back-transmitted electro-electromagnetic signal is much larger than in digitized methods (Figure 1). Next, analogue signals are radiated back, using a flat electrode radiator through various signal density/signal combinations, with some signal amplification (-20dB- +60dB), to the skin's surface on the opposite side and extended by the higher range sounds of the signal (Figure 2).

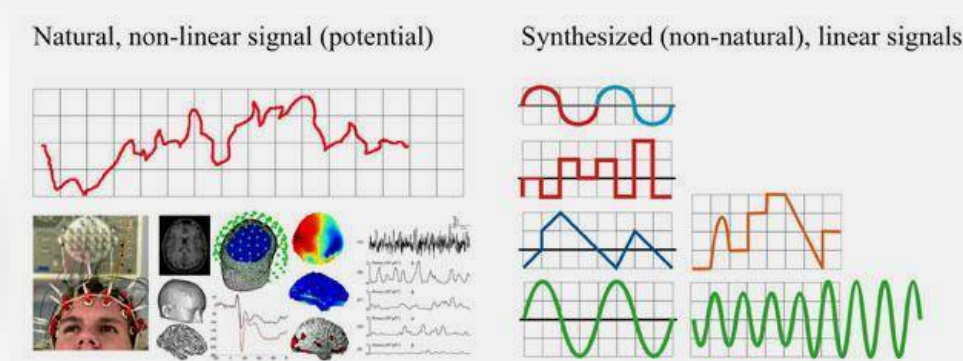


Figure 1. Differences of natural and synthesized (digitized) signals, or impulses

The EMOST[®] process

transmitting the natural based extrem-low intensity analogue signals back in natural range

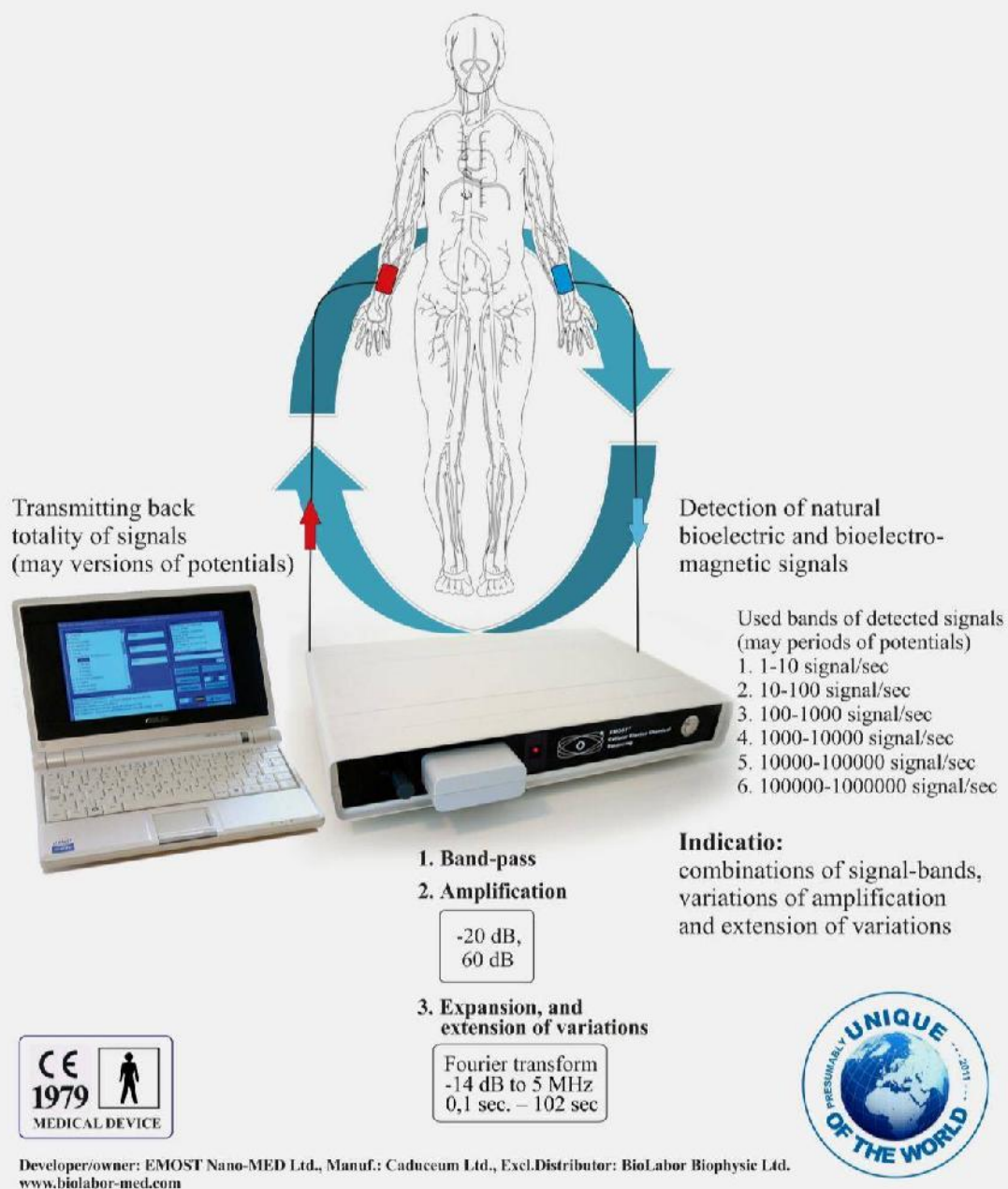


Figure 2. The EMOST process

EMOST method exerts its effect through the skin associated autonomous nervous system

The innervated skin is an incredible complex system and the largest organ of the body with numerous very important functions that is linked to the peripheral sensory nervous system (PNS), the autonomous nervous system (ANS), and the central nervous system (CNS). There is growing evidence that the cutaneous peripheral nervous system has essential roles in skin homeostasis as well as in diseases. Cutaneous nerves can react to stimuli from the circulation and to emotions. There is evidence that autonomic nervous system serves as a major component in the emotion response. Moreover, the central nervous system is directly (through efferent nerves or CNS-derived mediators) or indirectly (through the adrenal glands or immune cells) linked to skin functions (Figure 3). It suggests that skin, as our largest organ, can represent stress related conscious and unconscious emotions directly by efferent nerves and mediators from CNS or indirectly by the adrenal glands or immune cells. The represented stress related conscious and unconscious emotions can affect on biochemical, bioelectrical and bioelectromagnetic patterns. It is very probable that EMOST method exerts its major effect through the skin associated autonomous nervous system (ANS), which offers a unique therapy for the treatment of a numbers of different disorders. EMOST exposition can modulate biochemical, bioelectrical, and bioelectromagnetic processes in the skin, and the modulated skin signals can affect the neuroendocrine system and modulate brain activity through ANS.

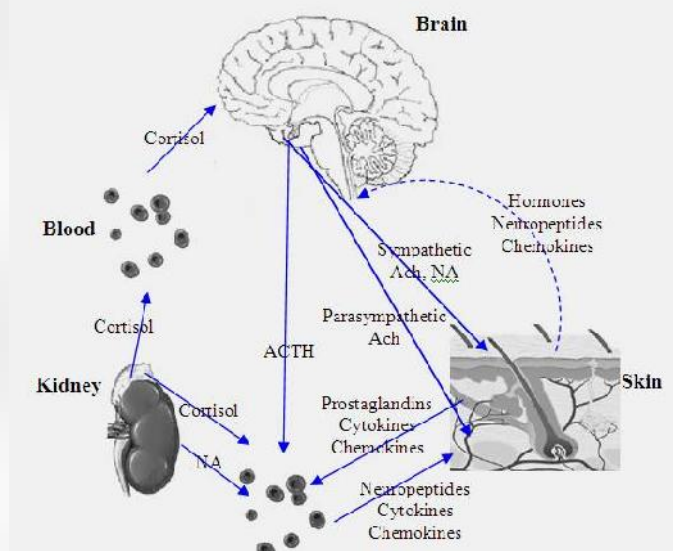


Figure 3. Schematic illustration about complex communication between skin cells and the nervous system. Ach =acetylcholine, NA=noradrenaline, ACTH= Adrenocorticotrophic hormone.

Why should be applied the EMOST method for prison officers and prisoners in prisons?

Our many years experience indicated (that we have published in academic journals) the efficiency of EMOST treatments for improve mental and physical states, i.e. stress reduction, sleep problems, improved mood, increased concentration ability, among them. The EMOST method has also been applied successfully to reduce stress under catastrophic conditions for many subjects (Figure 4). We also reported some preliminary experiments regarding the effectiveness of single EMOST treatment on some stress related serum parameters such as uric acid, albumin, cortisol, C-reactive protein etc. As we could see above, sleep and stress (aggression) are central problems under prison conditions. The systematic and routine application of EMOST treatment is not only able to reduce aggression, but also able to maintain overall health in prisons. Finally, the application of EMOST in prisons can produce significant cost saving and improve general health conditions.



Figure 4. In June, 2010 the biggest flood hit Felsőzsolca, in Hungary. Our photos have been taken in Felsőzsolca. (A) EMOST treatments of exhausted and stressed local residents, soldiers, firefighters. (B) Our car and local residents in a flooded street in Felsőzsolca, on June, 2010. (C) Residents used a boat to cross a flooded street in Felsőzsolca.

References

- Bókkon I, Erdőfi-Szabó A, Till A, Lukács T, Erdőfi-Szabó É. (2013) EMOST: Elimination of chronic constipation and persistent diarrhoea by low-frequency and intensity electromagnetic treatment in children: case reports. *Electromagnetic Biology and Medicine* In press
- Bókkon I, Erdőfi-Szabó A, Till A, Balázs R, Sárosi Z, Szabó ZL, Kolonics G, Popper G, (2012) EMOST: Report about the application of low-frequency and intensity electromagnetic fields in disaster situation and commando training. *Electromagnetic Biology and Medicine* 31, 394-403.
- Bókkon I, Till A, Erdőfi-Szabó A. (2011) Non-ionizing electro-magnetic-own-signal-treatment. *European Biophysical Journal*. 40 (Suppl. 1):S191.
- Bókkon I, Till A, Grass F, Erdőfi-Szabó A (2011) Phantom pain reduction by electromagnetic treatment. *Electromagnetic Biology and Medicine* 30, 115-127.
- Bókkon I, Till A, Erdőfi-Szabó A (2010) Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment. Available from Nature Precedings <<http://dx.doi.org/10.1038/npre.2010.4989.1>> (2010)
- Bókkon I, Till A, Erdőfi-Szabó A (2010) Phantom Pain Reduction by Non-ionizing Electromagnetic Treatment. *Hungarian Epidemiology* 7/4/Suppl. p:15.
- Roosterman D, Goerge T, Schneider S W, et al. (2006) Neuronal control of skin function: the skin as a neuroimmunoendocrine organ. *Physiol. Rev.* 86:1309-1379.
- Nordlind K, Azmitia E C, Slominski A. (2008) The skin as a mirror of the soul: exploring the possible roles of serotonin. *Exp. Dermatol.* 17:301–311.
- Raine A, Lencz T, Bihrlé S, LaCasse L, Colletti P. (2000) Reduced prefrontal gray matter volume and reduced autonomic activity in antisocial personality disorder. *Arch Gen Psychiatry.* 57:119-127.

- Virkkunen M, Rissanen A, Franssila-Kallunki A, Tiihonen J. (2009) Low non-oxidative glucose metabolism and violent offending: an 8-year prospective follow-up study. *Psychiatry Res.* 168:26–31.
- Chichinadze KN, Domianidze TR, Matitaishvili TTs, Chichinadze NK, Lazarashvili AG. (2010) Possible relation of plasma testosterone level to aggressive behavior of male prisoners. *Bull Exp Biol Med.* 149:7–9.
- Birger M, Swartz M, Cohen D, Alesh Y, Grishpan C, Kotelr M. (2003) Aggression: the testosterone-serotonin link. *Isr Med Assoc J.* 5:653–658.
- Gerra G, Avanzini P, Zaimovic A, Fertoni G, Caccavari R, Delsignore R, Gardini F, Talarico E, Lecchini R, Maestri D, Brambilla F. (1996) Neurotransmitter and endocrine modulation of aggressive behavior and its components in normal humans. *Behav Brain Res.* 81:19–24.
- Kamphuis J, Meerlo P, Koolhaas JM, Lancel M. (2012) Poor sleep as a potential causal factor in aggression and violence. *Sleep Med.* 13:327–334.
- Watson R, Stimpson A, Hostick T. (2004) Prison Health Care: a review of the literature. *Int J Nurs Stud.* 41:119–128.
- Condon L, Hek G, Harris F. (2007) A review of prison health and its implications for primary care nursing in England and Wales: the research evidence. *J Clin Nurs.* 16:1201–1209.
- Boudoukha AH, Hautekeete M, Abdellaoui S, Groux W, Garay D. (2011) Burnout and victimisation: impact of inmates' aggression towards prison guards. *Encephale.* 37:284–292.
- Hoaken PN, Allaby DB, Earle J. (2007) Executive cognitive functioning and the recognition of facial expressions of emotion in incarcerated violent offenders, non-violent offenders, and controls. *Aggress Behav.* 33:412–421.
- Bufkin JL, Luttrell VR. (2005) Neuroimaging studies of aggressive and violent behavior: current findings and implications for criminology and criminal justice. *Trauma Violence Abuse.* 6:176–191.
- Dodge KA. (2008) On the meaning of meaning when being mean: commentary on Berkowitz's "on the consideration of automatic as well as controlled psychological processes in aggression". *Aggress Behav.* 34:133–135.
- Philipp-Wiegmann F, Rösler M, Römer KD, Schneider M, Baumgart S, Retz W (2011) Reduced cortical inhibition in violent offenders: a study with transcranial magnetic stimulation. *Neuropsychobiology* 64:86–92.
- King Susan T. (2006) The Changing of the Guard: conceptualisations of prison officers' work in three South Australian prisons. Ph.D. thesis. <http://theses.flinders.edu.au/uploads/approved/adt-SFU20070313.175216/public/02whole.pdf>
-



КАЛЕНДАРНЫЙ ПЛАН

проведения работ по соглашению между Федеральным государственным бюджетным учреждением Медицинский радиологический научный центр МЗ РФ и компанией BioLabor Biofizikai Kft,

№№ пп.	Наименование этапов	Чем заканчивается этап
1.	Передача в ФГБУ МРНЦ МЗ РФ аппарата «EMOST Redox 1.1» и командировка специалиста МРНЦ в Будапешт для ознакомления с работой на данном аппарате	Акт передачи прибора 15.12.2012 Г.
2.	Проведении совместных предклинических испытаний на экспериментальных моделях стимуляции регенеративных и репаративных процессов с изучением эффектов на уровне гемопоэтических стволовых клеток	Промежуточный отчет 01.07.2013 г.
3	Поведении совместных предклинических испытаний на экспериментальных моделях стимуляции регенеративных и репаративных процессов с изучением эффектов на уровне мезенхимальных и стволовых клеток	Заключительный отчет 31. 12.2013 г.

 <p>Директор ФГБУ МРНЦ МЗ РФ, академик РАН А. Ф. Цыб</p>	<p>Генеральный директор ООО «НПП «Медприбор»» А. Е. Березнер</p> 	<p>Директор BioLabor Biofizikai Kft: Dr. Attila Erdofi-Szabo Ph.D</p> 
---	---	---

СОТРУДНИЧЕСТВО С ВЕНГРИЕЙ: ПЕРВЫЕ ШАГИ



Новый метод лечения - терапия собственными электромагнитными сигналами - вынес на суд специалистов МРНЦ доктор Аттіла Эрдефи-Сабо, профессор технического университета штата Орегон, являющийся разработчиком и владельцем собственного ноу-хау и представлявший венгерскую компанию Био-Лабор.

Свою презентацию доктор Аттіла Эрдефи-Сабо начал с музыки, звучащей с компьютера. Разные инструменты воспроизводили одну ноту с общей громкостью и в одном ритме. Ритм - вот ключевое понятие. Все живое на Земле подчиняется определенным ритмам, так же, как в каждом организме есть свои собственные ритмы, все процессы функционирования клеток, тканей, органов происходят синхронно.

Ритмы эти обусловлены слабыми электромагнитными колебаниями, которые излучает живой организм. Каждый орган, клетка имеет свой собственный спектр колебаний. При нормальном функционирующем организме эти колебания синхронизированы подобно тому, как инструменты в оркестре играют слаженно, подчиняясь дирижерской палочке. При патологии синхронность нарушается, как при отсутствии дирижера в оркестре начинается разлад. Чтобы восстановить синхронность, нужен дирижер. И таким «дирижером» выступает прибор, разработанный в Венгрии профессором Аттілой Эрдефи-Сабо. Он подобно радиолокатору улавливает собственные внутренние электромагнитные колебания организма и, «подправляя», синхронизируя их, возвращает обратно. При этом никакого внешнего электромагнитного воздействия не происходит: ведь прибор выступает именно как радиолокатор, а не как генератор и использует только собственные колебания организма. Одним словом, процедура не опаснее электрокардиограммы или электроэнцефалограммы - механизм тот же.

Сегодня прибор широко используется во многих странах Евросоюза в целях реабилитации, в первую очередь, инвалидов.

Тем не менее, наша медицина привыкла перестраховываться, прежде чем внедрять новые методы. Во время презентации возникло множество вопросов к докладчику. Например, профессор Анатолия Коноплинникова интересовало, проводились ли испытания метода на животных. Оказалось, что нет. И в ходе научной дискуссии решено было провести совместные исследования, используя мощную научно-техническую базу МРНЦ и опыт специалистов Центра в изучении последствий влияния различных видов излучения, в том числе, электромагнитных, на организм человека на клеточном уровне.

Перед началом презентации мы побеседовали с профессором Аттілой Эрдефи-Сабо о предыстории его визита в МРНЦ и дальнейших планах.

- Мы ищем научные связи Венгрии с Обнинском, - сказал он, - и считаем большой честью, что смогли сюда приехать и сделать сегодняшнюю презентацию. Содействовал нам в этой встрече господин Березнер Александр Львович. Но все это стало возможным благодаря директору Института, академику Анатолию Федоровичу Цыбу.

● - В какой стадии находится Ваше сотрудничество с МРНЦ?
- Конкретные шаги по научному сотрудничеству с Центром

В заключение нашей беседы господин Аттіла Эрдефи-Сабо сообщил несколько слов в адрес Юбилея - Медицинского радиологического научного центра:

▲ - Я должен подчеркнуть, что деятельность МРНЦ базируется на исследованиях и разработках мирового уровня. При этом хотел бы особо отметить такую характеристику его черты, как гуманизма: здесь в центре внимания - человек, и вся деятельность выстроена вокруг человека.

Вторая характерная черта, которую я считаю очень важной, это то, что МРНЦ задает вектор развития в области биомедицинских наук; служит ориентиром для многих институтов не только в России, но и по всему миру. Обусловлено это тем, что в МРНЦ не только ведутся научные исследования, но и имеется конкретная лечебная практика.

Благодаря сочетанию в одном центре и науки, и практического опыта развитие МРНЦ идет очень высокими темпами. Думаю, что те преимущества, которые сегодня имеет МРНЦ - общий итог прошедших 50 лет. Поэтому желаю Институту дальнейших крупных успехов в следующие 50 лет. И пусть эти преимущества, которыми сегодня владеет институт, обратились в еще большие преимущества.

● Страницу подготовила Елена Колотилина