The Joint Annual Meeting of
The Bioelectromagnetics Society and the
European BioElectromagnetics Association
co-organized with the European COST EMF-MED Action BM1309

Abstract Collection

Visit Ghent (http://www.visitgent.be)
# Table of Contents

**Disclaimer** ................................................................................................................................. 4

**Plenary Sessions** .......................................................................................................................... 5

Session: P1 - Plenary 1: A "safe" evolution for Wireless Power Transfer: the EM compliance of systems and devices .................................................................................................................. 5

Session: P2 - Plenary 2: Characterization and manipulation of cells with E fields ...................... 7

Session: DA - The d’Arsonval Lecture .............................................................................................. 7

Session: P3 - Plenary 3: Can we induce adaptive response with EM stimulation? The new frontier of immune system and EM field interaction ........................................................................ 8

Session: CL - Chiabrera Lecture .................................................................................................. 9

Session: P4 - Plenary 4: Need of a breakthrough in clinical application of hyperthermia: shared knowledge, gaps and challenges ................................................................................. 10

Session: P5 - Plenary 5: New avenues of epidemiological research – added value or old challenges, or both? .................................................................................................................... 11

**Platform Sessions** ....................................................................................................................... 14

Session: S1 - Molecular and cellular responses to RF exposure ......................................................... 14

Session: S2 - Instrumentation, measurements and protocols .......................................................... 30

Session: FA - Student Flash Poster Session A .............................................................................. 50

Session: S3 - Pulsed electric fields: theoretical and experimental modelling .............................. 56

Session: S4 - In vivo exposure: ELF, IF, RF .................................................................................... 74

Session: FB - Student Flash Poster Session B .............................................................................. 90

Session: S5 - Human studies: ELF and RF .................................................................................... 97

Session: S6 - Electromagnetic interference on implanted devices .................................................. 117

Session: S7 - Computational models for medical applications ..................................................... 135

Session: S8 - Epidemiology studies ............................................................................................... 157

Session: S9 - Pulsed electric fields: from cells to animals ............................................................ 172

Session: S10 - Measurements for safety assessment ..................................................................... 181

Session: S11 - Innovative perspectives for medical applications .................................................. 197

Session: S12 - Public Policy and Safety assessment .................................................................... 207

Session: S13 - Computational dosimetry .................................................................................... 226

Session: S14 - In vitro exposure: static and ELF ........................................................................ 244

Session: PA - Poster Session A .................................................................................................. 262

Session: PB - Poster Session B .................................................................................................. 578
Tutorials ........................................................................................................................................... 857
  Tutorial 1: Standards development activities of the IEEE International Committee on Electromagnetic Safety .............................................................. 857
  Tutorial 2: How to conduct personal radiofrequency electromagnetic field measurement surveys .. 862
  Tutorial 3: “The Erice-EBEA School framework” - Neuroprotective effects of EM fields: from preclinical to clinical studies .................................................. 863
Workshops & Side Meetings ............................................................................................................ 864
  IEEE ICES meeting ....................................................................................................................... 864
  Session: M1 - BEMS Board Meeting ......................................................................................... 864
  MMF Workshop ......................................................................................................................... 868
  Session: M2 - EBEA Council Meeting ....................................................................................... 868
  Session: M3 - EBEA General Assembly .................................................................................... 868
  Session: M4 - BEMS Business Meeting .................................................................................... 868
  MCM meeting COST Action BM1309 ...................................................................................... 868
  Session: W1 - Workshop 1: Spatial averaging: towards a better basis for standard procedures ....869
  Session: M5 - BEMS-EBEA Merger Meeting ......................................................................... 870
  Session: W2 - Workshop 2: Short workshop on implementation of the EMF Directive ........... 870
  Session: W3 - Workshop 3: Single cell electromagnetic exposure and analysis: experimental considerations, coupling of optical imaging techniques, and biological outcomes ......................................................... 873
  Session: M6 - BEMS Board Meeting ....................................................................................... 890
  Session: M7 - EBEA Council Meeting ..................................................................................... 890
Sponsors ........................................................................................................................................... 891
  Gold Sponsors ............................................................................................................................. 891
  Bronze Sponsors .......................................................................................................................... 893
  Conference Supporters .............................................................................................................. 894
Author Index ................................................................................................................................... 895
The low power electromagnetic millimeter waves influence on the cellular indicators of leucopoiesis

Vitali Kalantaryan\textsuperscript{1}, Radik Martirosyan\textsuperscript{1}, Tsovinar Adamyan\textsuperscript{2} & Emma Gevorkyan\textsuperscript{2}
\textsuperscript{1}Microwave Radiophysics, Yerevan State University, Yerevan, Armenia, 0025
\textsuperscript{2}Human and animal physiology, Yerevan State University, Yerevan, Afghanistan, 0025

Keywords: In vivo, RFI/Microwaves, Work in Progress

Presented by: Vitali Kalantaryan

On the base of our experimental results and the literature data we conclude that the low intensity millimeter waves elevate the functional state of the blood cells, the functional potential of the leukocytes, preparing the cells to resist against other agents.

At the present time, a dramatic change in the human life style has led to restriction of motive activity and to a sedentary lifestyle. Today, the computer technology is evolving into different fields of human activity and is becoming indispensable for work and the learning process. Relative non-motile stages create a stress reaction, the tension of regulatory mechanisms, the movements in the immune system and the reduction of the reserve capacity of the organisms. These processes are responsible for the development of pathologic processes in the organisms. The results of experimental investigations show that in the case of hypokinesia, the concentration of lysozyme, the amount of complimentary lymphocytes and immunoglobulins are decreased. In addition, it was observed that the functional activity of neutrophilis decreased as well. As a consequence of this the resistance of the organism against various infections and diseases decreases. Therefore, it is important to find means that under the hypomotile conditions will help either to prevent and correct such deviations. The clinical and experimental data of numerous investigations have shown that the electromagnetic waves are considered to be a new, highly efficient method for the treatment of various diseases. They have anti-stress effect on neuroendocrine and immune systems, as well as on the peripheral

<table>
<thead>
<tr>
<th>Thermodynamic parameters</th>
<th>Non-irradiated</th>
<th>Irradiated, with frequencies (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>50.3</td>
</tr>
<tr>
<td>DNA – netropsin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$-\Delta H$, kcal/mol</td>
<td>9.1±0.2</td>
<td>9.5±0.2</td>
</tr>
<tr>
<td>$\Delta S$, cal/(mol·K)</td>
<td>8.6±0.2</td>
<td>11.2±0.2</td>
</tr>
<tr>
<td>poly(A)poly(U) - netropsin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$-\Delta H$, kcal/mol</td>
<td>9.1±0.2</td>
<td>9.3±0.2</td>
</tr>
<tr>
<td>$\Delta S$, cal/(mol·K)</td>
<td>5.9±0.2</td>
<td>7.6±0.2</td>
</tr>
</tbody>
</table>

Figure 3. Table 3. The values of enthalpy ($\Delta H$) and entropy ($\Delta S$) binding netropsin with irradiated and non-irradiated double-stranded nucleic acids.
regulatory structures, suppress tumor cell's growth [1-7]. It has been shown that the millimeter waves increase the functional activity of leucocytes, particularly neutrophils and lymphocytes. Thus they can increase the physiological protection and the level of resistance of an organism. There is high interest to study the changes in morphological indicators of the blood under hypomotile conditions, because the blood system is connected to the all working systems of the body. Therefore, the aim of the present work is to study the changes of morphological indicators in the blood of animals that have been pretreated by the millimeter waves under the condition of hypokinesia.

Our investigations have shown that in the initial period (5-10 days), the hypomotility causes distributional leukocytosis. The number of leukocytes was increased by about 28% (p < 0.001) compared to the initial stage. In the leukocytes formula lymphocytosis, neutrophilis, basophilia, monocytopsis and eosinophilis were observed. These changes are results of the activation of blood distributional leucopoiesis mechanisms. According to the literature data, the hypomotility, as a stress factor, reduces the organism resistance, the amount of lysozyme, compliments and induces movements in the immune system. Analyzing the literature data and the data obtained in our work we conclude that under the initial stage of the hypomotility influence the body mobilizes its recovery and defense mechanisms, which provide the vital activities at the expense of the us of the functional reserves, but the long-term impact induces the strain in regulatory mechanisms and the reduction of reserve capacities of the organism. Therefore, in the next series of experiments, for the rectification of the negative effects of hypokinesia the animals have been pretreated by the millimeter waves during 20 days. From the analysis of the obtained results it follows that after the 20 days irradiation the standards of the morphological indicators of leucopoiesis have been increased and, on that background, the significant changes in the indicators of leucopoiesis have not been observed. According to our data, the EMR pre-treatments of animals elevate the potential of regulatory systems and prevent the negative effect of hypomotility on blood system, resulting in the disappearance of the changes in indicators of leucopoiesis. Thus, under stress condition the millimeter waves are able to alter the function of immune system, which is one of the main mechanisms for the correction of the state of the organism. It was shown that under hypomotile condition the functional activity of the neutrophils and lymphocyte is decreased, and on the contrary, in neutrophils the activity of hydrophilic enzymes is elevated, which can promote the development of the processes of cytolysis, and, consequently, the tissue damages. Such different by directed recoveries suppress the natural defense forces in body’s cells. Under the influence of the millimeter waves in the neutrophils and lymphocytes the activity of succinate dehydrogenase is increased, which is an evidence of the energetic level of these cells. It is known that the fertile cells participate to the regulation of the adaptive processes at cellular level and have a significant influence on the properties of the neutrophils. Under hypomotile condition, the degranulation level of the fertile cells is increased. Under the combined effect of the millimeter waves and hypokinesia, the degranulation level of the fertile cells is decreased, that is why they are considered as regulators.

References

7. V. Kalantaryan, R. Martirosyan, Y. Babayan, L. Nersesyan, H. Stepanyan Preliminary Results of Influence of Nonionizing Electromagnetic Radiation on Tumor and Healthy DNA and Role of Water American Journal of Medical and Biological Research. 2014, 2(1), 18-25

**Figures**

![Graph showing changes in peripheral white blood indicators under hypomotile dynamics.](image)

**Fig. 1:** The changes of peripheral white blood indicators under hypomotile dynamics. *- p<0.05, **- p<0.01, ***- p<0.02, ****- p<0.001.

- **Legend:**
  - Black: Numbers of leucocytes in initial blood
  - Pink: Band neutrophil
  - Blue: Segmented neutrophils
  - Grey: Eosinophils
  - Purple: Basophils
  - Blue: Monocytes
  - Cyan: Lymphocytes

Figure 1. The changes of peripheral white blood indicators under hypomotile dynamics. *- p<0.05, **- p<0.01, ***- p<0.02, ****- p<0.001.
PA-145 [14:30]

**A reverberation chamber for animal exposure at millimeter waves**

Abdou Khadir Fall¹, Christophe Lemoine¹, Philippe Besnier¹, Maxim Zhadobov², Ronan Sauleau², Frederic Percevault³, François Ferrière³ & Yves Le Dréan³

¹Institute of Electronics and Telecommunications of Rennes (IETR), UMR CNRS 6164, INSA of Rennes, Rennes, France, 35708

²Institute of Electronics and Telecommunications of Rennes (IETR), UMR CNRS 6164, University of Rennes 1, Rennes, France, 35042

³Transcription, Environment and Cancer Group, Institute of Research in Environmental and Occupational Health (IRSET), INSERM U1085, University of Rennes 1, Rennes, France, 35042

**Keywords:** In vivo, RF/Microwaves, Work in Progress

**Presented by:** Abdou Khadir Fall

A mode stirred reverberation chamber (RC) is designed to conduct in vivo studies in the 60-GHz band. This exposure system has suitable features for experiments on animals. An interface, for temperature measurements using an infrared (IR) camera, is designed in the chamber wall in order to measure the specific absorption rate and/or the power density inside the chamber.

---

**Figure 2.** The changes of peripheral white blood indicators in irradiated animals under hypomotile dynamics. *- p<0.05, **- p<0.01, ***-p<0.02, ****-p<0.001.