Marta Patena
Radna Miasta Krakowa

Kraków, 31.05.2017r.

INTERPELACJA

Panie Prezydencie,

W imieniu zainteresowanych bezpośrednio oraz pośrednio wszystkich mieszkańców Krakowa,
bardzo proszę Pana Prezydenta Miasta Krakowa o uzyskanie merytorycznego raportu wraz ze źródłowymi wynikami badań z projektu pt.

„Identyfikacja wpływu pól elektromagnetycznych niskich i wysokich częstotliwości na organizmy żywe"

realizowanego z wniosku: nr N N511 351737 (nr umowy: 3517/B/T02/2009/37)
realizowanego w okresie od 2009-10-05 do 2012-04-04 przez jednostkę:
Politechnika Śląska, Wydział Elektryczny.
Proszę także o uzyskanie informacji o wysokości kwoty środków finansowych przeznaczonych na jego wykonanie.

Narodowe Centrum Nauki jest państwową agencją wykonawczą w rozumieniu ustawy z dnia 27 sierpnia 2009 r. o finansach publicznych powołaną do wspierania działalności naukowej w zakresie badań podstawowych.
Dlatego dziwnym wydaje się, że zarówno mieszkańcy indywidualnie jak również organizacje społeczne nie mogą, mimo usilnych starań, uzyskać informacji o wynikach tych badań.
Pan Poseł Józef Lassota odesłany został do jednostki odpowiedzialnej za realizację ww. projektu i otrzymał z NCN publikacje w języku angielskim. (zał.)
Nadzór nad NCN sprawuje Minister Nauki i Szkolnictwa Wyższego.

Proszę Pana Prezydenta o uzyskanie szczegółowych wyników badań z wniosku: nr N N511 351737 (nr umowy: 3517/B/T02/2009/37) realizowanego przez Politechnikę Śląską, Wydział Elektryczny.

Gdyby Pan Prezydent uznał za stosowne przetłumaczenie angielskojęzycznych publikacji dołączonych do interpelacji, to proszę o udostępnienie tych tłumaczeń w odpowiedzi na interpelację.

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NARODOWE CENTRUM NAUKI

Dyrektor
Narodowego Centrum Nauki
DRP.070.2.2017

Kraków, 13 kwietnia 2017 r.

Szanowny Pan
Józef Lassota
Poseł na Sejm Rzeczypospolitej Polskiej

Szanowny Panie Pośle,

w odpowiedzi na pismo z dnia 31 marca 2017 r., przesłane do Centrum w dniu 4 kwietnia 2017 r. dotyczące prośby o udostępnienie raportu merytorycznego wraz ze źródłowymi wynikami badań w ramach projektu NN511 351737 pt. „Identyfikacja wpływu pól elektromagnetycznych niskich i wysokich częstotliwości na organizmy żywe" uprzejmie informuję, że podmiotem kompetentnym do udostępnienia materiałów o charakterze merytorycznym, do którego należy skierować wyżej wymienioną prośbę jest Jednostka odpowiedzialna za realizację ww. projektu.
Jednocześnie Narodowe Centrum Nauki przesyła wyniki badań opracowane w ramach projektu w postaci pięciu publikacji.

Z wyrazami szacunku

DYREKTOR
NARODOWEGO CENTRUM NAUKI
Zbigniew Błocki

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Effect of Static Electric Field Generated Nearby High Voltage Direct Current Transmission Lines on Prooxidant-Antioxidant Balance in Rats

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Abstract-**In this study the influence of long-term, whole-body exposure to strong, static electric field generated usually nearby High Voltage Direct Current (HVDC) transmission lines on prooxidant-antioxidant balance in blood and liver of rats was investigated. Experimental material consisted of 96 male Wistar rats that were randomly divided into 3 groups (32 animals each). The rats from two experimental groups were exposed for 56 consecutive days (8 hours daily) to static electric field with electric field intensity values of 16 kV/m and 35 kV/m respectively, in a specially designed experimental system. The control animals were subjected to a sham-exposure in the same experimental system, during which no electric field was generated between electrodes. At 14th, 28th and 56th day of exposure cycle and then in 28th day after the end of exposure cycle a part of animals from all groups (8 rats at a same time) was dissected in Morbital narcosis. Then in the obtained plasma, erythrocytes lysates and liver homogenates the activity of some antioxidant enzymes as superoxide dismutase, mitochondrial superoxide dismutase, extracellular superoxide dismutase catalase, glutathione S-transferase, glutathione peroxidase, glutathione reductase and catalase as well as the concentration of malone dialdehyde were determined with use of spectrophotometric methods. Basing on the obtained results, it was confirmed that long-term exposure of rats to static electric field with high values of electric field intensity generated nearby HVDC transmission lines does not cause any essential changes in the intensity of lipid peroxidation in erythrocytes, while in plasma leads to temporary stimulation of this process with subsequent compensatory inhibition and final normalization after the end of exposure cycle. Moreover in was noticed, that it causes changes in enzymatic antioxidant system in form of temporary inhibition of activity of most antioxidant enzymes during exposure cycle with subsequent compensatory increase in this activity after the end of exposure cycle in erythrocytes (especially in case of higher values of electric field intensity), as well as varied changes in activity of particular enzymes in plasma. The long-term exposure to static electric field with high values of electric field intensity causes also compensatory changes of enzymatic antioxidant system activity in liver tissue, enabling maintenance of prooxidant-antioxidant balance in the organism of experimental animals and inhibition of peroxidation process. Presented data indicate that construction of air HVDC transmission lines according to actual compulsory regulations enables to avoid serious health hazards for human population related to disturbances of prooxidant-antioxidant balance.**

I. INTRODUCTION

Long-term exposure to various external physical factors (among them different forms of electromagnetic fields) cause so-called oxidative stress in living organisms, resulting in generation of an increased amount of reactive oxygen species, changes in the activity of antioxidant defense system as well as stimulation of lipid peroxidation in biological membranes and subsequent apoptotic cell death [1]-[6].

The divergence of obtained experimental results regarding disturbances of prooxidant-antioxidant balance in animals' tissues under the influence of electromagnetic field is related mainly to different physical parameters of electric field and experimental models used by particular authors [7]-[9].

In recent years transport of electric power using air High Voltage Direct Current transmission lines becomes very common. So far in available literature there are lacking reports presenting the results of experimental studies dealing with the influence of strong static electric fields on the prooxidant-antioxidant balance, though in our opinion investigations regarding this problem are of a great importance [10].

The aim of the study was to estimate the influence of long term, whole-body exposure of rats to strong, static electric field with physical parameters generated nearby High Voltage Direct Current transmission lines on the intensity of reactive oxygen species generation analyzed indirectly, basing on the measurement of lipid peroxidation marker – malone dialdehyde (MDA), as well as on the activity of enzymatic antioxidant defense system, in the conditions of potential oxidative stress, both in blood and liver tissue.

II. MATERIAL AND METHODS

Experimental material consisted of 128 male Wistar albino rats aged 6 weeks, weighting about 150 g. During the whole experiment all animals were placed in identical environmental conditions (constant temperature 22 ± 1°C and humidity of air) under a 12 h light-dark cycle) and fed with standard laboratory pellet food Labofed B (15 g per day) and free access to tap water. All animals were randomly divided into 4 equal groups (32 animals each) with no significant differences in body weight.

The animals from 3 experimental groups were exposed for 56 consecutive days (8 hours daily, alternately between 7^{00}÷15^{00}, 15^{00}÷23^{00} and 23^{00}÷7^{00}, similarly as in case of electric current transmission lines staff working in shifts) to static electric field with different electric field intensity values in a specially designed experimental system consisting of autotransformer, high voltage transformer 220V/60000V, cascade rectifier, water rheostat, 2 electrodes with round shape and specially profiled edges placed in a distance of 50 cm

IV. DISCUSSION

In our previous experiment [16] we found that strong, static electric field with parameters higher than those allowed by actual legislative regulations in construction of HVDC transmission lines causes transient inhibition of antioxidant enzymes activity in erythrocytes with subsequent compensatory stimulation of this activity after the end of exposure cycle. In turn the results of other researches confirmed that long-lasting exposure of rats to static electric field caused compensatory shift of the intensity of lipid peroxidation on a new level of dynamic balance [8], [9].

Catalase, glutathione peroxidase, glutathione reductase, glutathione S-transferase and superoxide dismutase are main antioxidant enzymes, that collaborating with each other create a chain of reactions protecting the organism against toxic action of reactive oxygen species especially in form of development of membrane lipid peroxidation [17], [18].

A transitory increase in malone dialdehyde concentration, especially in plasma, in the initial phase of exposure to static electric field, indicates a stimulation of generation of reactive oxygen species, resulting in activation of lipid peroxidation, under the influence of this physical factor. In turn bidirectional changes of the activity of particular antioxidant enzymes are probably related to exhaustion of their basic reserves in the initial phase of exposure cycle, with subsequent compensatory activation induced by higher level of free oxygen radicals, both in blood and in the liver tissue. Those connected changes of activity of all antioxidant enzymes lead to the restitution of prooxidant-antioxidant balance on novel higher level, resulting in decrease in malone dialdehyde contents in liver tissue and plasma after the end of exposure cycle. It seems to support a thesis that such exposure does not cause any persistent intensification of lipid peroxidation in biological membranes.

V. CONCLUSIONS

Basing on the obtained results, it was confirmed that long-term exposure of rats to static electric field with high values of electric field intensity generated nearby HVDC transmission lines does not cause any persistent essential changes in the intensity of lipid peroxidation (estimated by means of measurement of malone dialdehyde concentration) in erythrocytes, while in plasma leads to temporary stimulation of this process with subsequent compensatory inhibition and final normalization after the end of exposure cycle.

Moreover in was noticed, that long-term exposure of rats to static electric field with high values of electric field intensity generated nearby HVDC transmission lines causes changes in enzymatic antioxidant system in form of temporary inhibition of activity of most antioxidant enzymes during exposure cycle with subsequent compensatory increase in this activity after the end of exposure cycle in erythrocytes (especially in case of higher values of electric field intensity), as well as varied changes in activity of particular enzymes in plasma.

The long-term exposure to static electric field with high values of electric field intensity generated nearby HVDC transmission lines causes compensatory changes of enzymatic antioxidant system activity in liver tissue, enabling maintenance of prooxidant-antioxidant balance in the organism of animals and inhibition of lipid peroxidation.

Presented data indicate that construction of air High Voltage Constant Current transmission lines according to actual compulsory regulations enables to avoid serious health hazards for human population related to disturbances of prooxidant-antioxidant balance in living organisms.

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Effect of Exposure to Static, High Voltage Electric Field Generated Nearby HVDC Transmission Lines on Behavior of Rats

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Abstract— The effect of long-term, whole-body exposure to strong static electric field generated usually nearby high voltage direct current (HVDC) transmission lines on behavior of rats, basing on estimation of locomotor activity, exploratory activity, space memory and irritability was analyzed in this study. Experimental material consisted of 16 male Wistar albino rats aged 8 weeks, weighting 180–200 g. During the whole experiment all animals were placed in identical environmental conditions, under a 12 h light-dark cycle with free access to standard laboratory pellet food and tap water. All animals were randomly divided into 2 groups (8 animals each). The rats from experimental group were exposed for 56 consecutive days (8 hours daily) to static electric field with electric field intensity values of 25 kV/m (usually measured nearby actually existing HVDC transmission lines), in a specially designed experimental system. Rats from control group were sham-exposed in the same experimental system, with no electric field generated between electrodes during exposure. The evaluation of behavior was made at 24 hours before first exposure, at 24 hours after first exposure, at 7th, 14th, 21st, 28th, 42nd and 56th day of exposure cycle and at 28th day after the end of a cycle of exposures. A locomotor activity was determined in the "open field" test, an exploratory activity was examined in the "hole" test, space memory was determined by means of water maze test and an irritability was investigated by means of Nakamura and Thoenen's score test. As a result of repeated exposures in experimental group of electric field-exposed rats a significant decrease in the number of episodes of crossings (at 7th day of exposure cycle), peepings (at 7th and 14th day of exposure cycle) and defecations (at 28th day of exposure cycle) in the "open field" test was observed as compared to control animals. On the other hand in experimental group of electric field-exposed rats no significant changes in the water maze crossing time, in the number of episodes of rearings and washing in the "open field" test as well as in the number of head dips in the "hole" test and in irritability score were observed comparing with control animals. On the basis of obtained results one can conclude that long-term, whole-body exposure of rats to strong, static electric field with parameters generated nearby actually existing HVDC transmission lines causes only a transient, significant reduction of locomotor activity in the initial phase of exposure cycle, without any other persistent changes in the behavior.

1. INTRODUCTION

In available literature there are only few data on the influence of 50–60 Hz electric fields generated nearby electric field transmission lines on the function of brain resulting in behavioral alterations in occupationally exposed humans [1, 2]. In experimental studies it was found that low frequency high voltage electric fields can change the behavior of mice, rats, and nonhuman primates; however, these transitory changes were probably secondary to detection of a novel stimulus, and did not suggest acute adverse effects [3–7]. The aim of this study was to estimate in an experimental model the effect of long-term, whole-body exposure to strong static electric field with physical parameters, which frequently occur nearby actually existing high voltage direct current transmission lines on such behavioral reactions as locomotor activity, exploratory activity, space memory and irritability in rats.

2. MATERIAL AND METHODS

Experimental material consisted of 16 male Wistar albino rats aged 8 weeks, weighting 180–200 g. During the whole experiment all animals were placed in identical environmental conditions (constant temperature $22 \pm 1°C$ and humidity of air) under a 12 h light-dark cycle with free access to standard laboratory pellet food and tap water. All animals were randomly divided into 2 groups: experimental and control (8 animals each) with no significant differences in body weight.

4. CONCLUSION

Long-lasting, whole-body exposure of rats to strong, static electric field generated usually nearby high voltage direct current transmission lines causes only a transient, significant reduction of locomotor activity in the initial phase of exposure cycle, without any pathological disturbances of exploratory activity, space memory or irritability.

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EFFECT OF STATIC ELECTRIC FIELD GENERATED NEARBY HIGH VOLTAGE DIRECT CURRENT TRANSMISSION LINES ON BEHAVIOR IN RATS

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***Abstract** – The influence of long-term, whole-body exposure to static electric field with physical parameters generated nearby HVDC transmission lines on behavior in rats was investigated. Rats were exposed for 56 consecutive days (8 hours daily) to static, electric field with intensity of 16 and 25 kV/m or sham-exposed, respectively. Before the beginning and then in particular days of the exposure cycle an evaluation of a locomotor activity, exploratory activity, space learning and irritability was made. Only a transient reduction of locomotor activity in the initial phase of exposure cycle without any effect on exploratory activity, space learning and irritability was observed.*

Introduction

High voltage power lines generate the highest electric field intensity that are likely to be encountered by people. The maximum unperturbed electric field intensity directly under 400-kV transmission lines is about 11 kV/m at the minimum clearance of 7,6 m, although people are generally exposed to fields well below this level. At 25 m to either side of the 50-Hz electric line the field intensity is about 1 kV/m. Objects such as trees and other electrically grounded objects have a screening effect and generally reduce the strength of the electric fields in their vicinity. Buildings attenuate electric fields considerably, and the electric field strength may be one to three orders of magnitude less inside a building than outside it. Electric fields to which people are exposed inside buildings are generally produced by internal wiring and appliances, and not by external sources. Contemporary high-voltage power lines have been designed to carry direct current (DC), therefore producing both electrostatic and magnetostatic fields. Under a 500-kV High Voltage Direct Current (HVDC) transmission line the static electric field intensity can reach 30 kV/m or higher [1]. Strong electric fields are found mainly in close proximity to high currents [2]. In the electric power industry, high currents are found in overhead lines and underground cables, and in busbars, in power stations and substations. The busbar close to generators in power stations can carry currents up to 20 times higher than those typically curried by the 400-kV transmission line [3]. So far only few people live at a distance of 50-300 m from high voltage power lines, so these lines are the major source of exposure for less than 1% of the population [4]. In recent years in many countries high voltage direct current (HVDC) transmission lines are constructed, also in areas inhabited by many people. So far in available literature there are only a few reports [5] presenting the results of experimental studies dealing with the influence of strong static electric fields on the behavior of experimental animals, though in our opinion investigations regarding this problem are of a great importance. The aim of the study was to estimate the influence of long term, whole-body exposure of rats to strong, static electric field with physical parameters generated nearby High Voltage Direct Current transmission lines on their behavior by means of routine experimental tests.

sufficiently large surface charge density may be perceived through its interaction with body hair (especially on the head) and by other effects such as spark discharges (microschocks). The electric field perception threshold in people depends on various factors and can range between 10-45 kV/m. It was found that in healthy volunteers annoying sensations are produced by fields with intensity about 25 kV/m [11]. In available literature there are lacking studies dealing with chronic or delayed effects of exposure to static electric fields. Few studies of the acute effects of static electric field effects have been carried out. On the whole, the results suggest that the only adverse acute effects are associated with direct perception of fields and discomfort from microschocks. Taking into account that neither results of the present study nor none of the studies conducted to date gave no evidence of persistent adverse health effects of static electric field on rat's behavior, other than those associated with the perception of the surface electric charge, it seems that observed transient, behavioral effects are related to possible stress resulting from prolonged exposure to the field.

Conclusions

Long-term, whole-body exposure of rats to strong static electric field, with physical parameters generated nearby actually constructed High Voltage Direct Current transmission lines causes only a transient, significant reduction of locomotor activity in the initial phase of exposure cycle, without any effect on exploratory activity, space learning and irritability of the animals.

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Effect of Exposure to Static, High Voltage Electric Field Generated Nearby HVDC Transmission Lines on Antioxidant Activity of Hepatocytes in Rats

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Abstract— The effect of long-term, whole-body exposure to strong, static electric field generated usually nearby high voltage direct current (HVDC) transmission lines on activity of some antioxidant enzymes in homogenats of liver tissue of rats was investigated in this study. Experimental material consisted of 64 male Wistar albino rats aged 8 weeks, weighting 180–200 g. During the whole experiment all animals were placed in identical environmental conditions under a 12 h light-dark cycle with free access to standard laboratory pellet food and tap water. All animals were randomly divided into 2 groups (32 animals each). The rats from experimental group were exposed for 56 consecutive days (8 hours daily) to static electric field with electric field intensity values of 25 kV/m (usually measured nearby actually existing HVDC transmission lines), in a specially designed experimental system. The control animals were subjected to a sham-exposure in the same experimental system, during which no electric field was generated between electrodes. At 14th, 28th and 56th day of exposure cycle and then in 28th day after the end of exposure cycle a part of animals from all groups (8 rats at a same time) was exsanguinated in Morbital narcosis. Then in homogenats prepared from obtained liver samples the activity of some antioxidant enzymes as catalase, glutathione S transferase, glutathione peroxidase, glutathione reductase and superoxide dismutase was determined with use of spectrophotometric methods as well as the concentration of malone dialdehyde (marker of intensity of oxidative processes in tissues) was estimated. As a result of repeated exposures in experimental electric field-exposed group of rats a significant increase in activity of glutathione peroxidase and glutathione reductase at 56th day of exposure cycle, a significant decrease in superoxide dysmutase activity at 14th day of exposure cycle as well as no statistically significant changes in activity of catalase and glutathione S-transferase both during and after the end of exposure cycle were observed. Moreover in experimental group of rats a significant decrease in malone dialdehyde concentration in homogenats of liver tissue at 28th day after the end of exposure cycle as compared to control rats was observed. On the basis of obtained results it was concluded that strong static electric fields with parameters generated usually nearby high voltage direct current transmission lines does not cause any persistent unfavorable effect on antioxidant reactions in the liver of rodents. These data indicate that proper construction of high voltage direct current transmission lines enables to avoid serious health hazards for human population related to disturbances of antioxidant processes in living organisms.

1. INTRODUCTION

Some experimental data indicate that strong electromagnetic fields generated nearby electric field transmission lines can produce an increased amount of reactive oxygen species in tissues, resulting in stimulation of peroxidation of membrane lipids leading to apoptosis and death of cells [1, 2]. As in our previous experiment [3] we found that strong, static electric field with parameters higher than these allowed by actual legislative regulations in construction of high voltage direct current transmission lines causes transcient inhibition of antioxidant enzymes activity in erythrocytes with subsequent adaptative stimulation of this activity after the end of exposure cycle, the aim of the present study was to estimate the influence of long-term, whole-body exposure to static electric field with parameters usually generated by actually existing transmission lines on activity of some antioxidant enzymes and concentration of malondialdehyde (a marker of intensity of pathological oxidative processes in living organism) in liver homogenats of rats.

2. MATERIAL AND METHODS

Experimental material consisted of 96 male Wistar albino rats aged 8 weeks, weighting 180–200 g. During the whole experiment all animals were placed in identical environmental conditions (constant

5. CONCLUSIONS

Exposure to static electric field with physical parameters generated usually nearby HVDC transmission lines does not cause any persistent, harmful effect on antioxidant reactions in liver of experimental animals. These experimental data indicate that proper construction of high voltage direct current transmission lines enables to avoid serious health hazards for human population related to disturbances of antioxidant processes in living organisms.

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Identification of Impact of Electromagnetic Fields at Low and High Frequency on Human Body

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Abstract—The article reviews the current state of large-scale studies about the impact of electromagnetic field on natural environment. The scenario of investigations – simulation of natural conditions at the workplace, taking into consideration the influence both low and high frequency electromagnetic fields is shown.The biological effects of low and high frequency electromagnetic fields are below presented. Results of investigation with animals are shown. The norms and regulations concerning the levels of electromagnetic field intensity are reviewed.

Keywords—Electromagnetic field and environment, biological effects of electric field on human body, simulation of natural condition at workplace

I. Introduction

ELECTROMAGNETIC fields of different frequencies interact with the body in different ways. At low frequency the harmful influence to the human body coming into existence in surrounding the line and devices of electrical power engineering stations.Heating is the main biological effect of the electromagnetic fields of radiofrequency fields.
The areas of current scientific investigation about interactions between living organisms and electromagnetic fields are at extremely low frequency (50 - 60 Hz) and at frequencies generated by cell (satellite) phones (in the kilo-, mega- and giga-Hz range).

Research works carried on intensively during the past two decades concern of determining development potentialities of cancers (child's leukemia, brain tumors and lymphatic illness) under the influence of the electromagnetic field and of coming into existence of illness of the electromagnetic nervous system.

Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if electromagnetic fields do have an effect on natural environment, but the results to date contain many inconsistencies.

The mistakes of examinations are as consequence of statistically wrong selection of the investigated group, of incorrect information about the daytime exhibition and impossibility of the selection of the optimal control group.

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In addition the aim of the examination is conditioning results (producer-issuers).

Countries set their own national standards for exposure to electromagnetic fields. However, the majority of these national standards draw on the guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This non-governmental organization, formally recognized by WHO, evaluates scientific results from all over the world. Based on an in-depth review of the literature, ICNIRP produces guidelines recommending limits on exposure. These guidelines are reviewed periodically and updated if necessary.

The basic for the ICNIRP guidelines are the results of analysis and experiments making around the world. The rules in many countries (national standards) are drawing as consequence of these international guidelines [1,2].

From prescriptive regulations concerning the environmental protection it results that assumed and applied in Poland acceptable values of intensities of electromagnetic fields 50 Hz in the natural environment are a more rigorous from recommended in the European Union and by the World Health Organization.

The comparison of permissible public exposure levels – for electric field for ICNIRP (recommendations from 1998) and Polish ordinance (2003) are shown – as example, in figure 1.

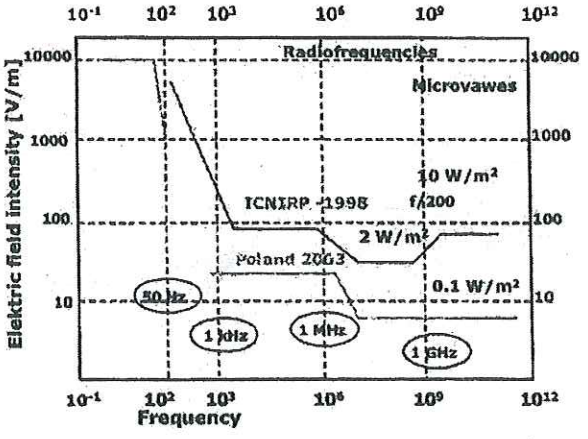

Fig. 1 Permissible public exposure levels in electric field

electromagnetic field generator, realized in the form of a mobile terminal multiple ranges Nokia, (far field interaction zone). The principle idea of laboratoryis shown in Figure 5.

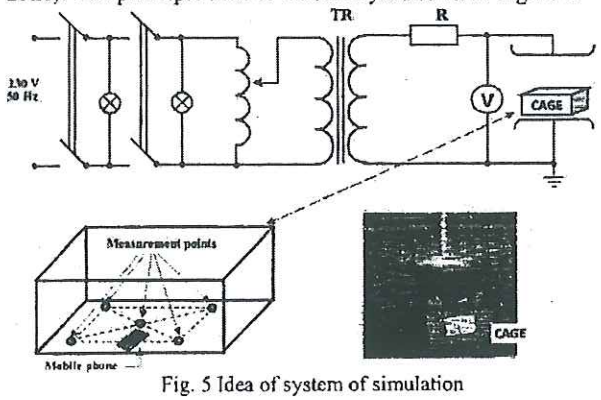

Fig. 5 Idea of system of simulation

In the experiment on an animal model research material were rats, male Wistar, 8-week, which were divided randomly into four equal groups: a control group subjected to sham exposure (during which the system was not generated showroom electromagnetic field), a group subjected to the action field electromagnetic current of 10 kV/m is generated in a typical transmission line surrounded by an alternating current with a frequency of 50 Hz, a group subjected to an electromagnetic field generated by a standard mobile phone with a frequency of 900-1800 Mz and a group subjected to the simultaneous interaction of the electromagnetic field intensity 10 kV/m generated in the environment of the AC transmission lines with frequency of 50 Hz electromagnetic fields generated by mobile phone with a frequency in the range 900-1800 Mz (simulation of daily activity of engineers working close to electric devices and talking by mobile phone during work). Each group consisted of 10 animals. Cycle times daily 8-hour exposure of animals from different groups on appropriate forms of interaction of the electromagnetic field was 28 days. After the exposure to electromagnetic field or sham exposure the animals were necropsied under anesthesia to obtain blood for biochemical research, as well as tissues and organs for histopathological evaluation and implementation of the homogenates for biochemical determinations. The resulting serum and tissue homogenates prepared in the near future will be carried signs include the following biochemical parameters: the activity of selected antioxidant enzymes: superoxide dismutase, glutathione peroxidase and catalase, and selected markers of oxidative stress (dialdehyd malonic). The results of simulation will be published in the next future.

VII. Final Remarks

In presented paper the current state of studies about the influence of electromagnetic field on natural environment as well as the scenario of simulation of natural conditions at the workplace are presented.The effects of external exposure to electromagnetic field on the human body and its cells depend mainly on the electromagnetic field frequency and magnitude or strength. Low and high frequency electromagnetic waves affect the human body in different ways. At low frequencies, external electric and magnetic fields induce small circulating currents within the body. The main effect of radiofrequency electromagnetic fields is heating of body tissues.

To find the protection at workplace close to h.v. devices and by using mobile phones the simulation of natural conditions must be take into account.

Animal studies are essential for assignation effects in human organisms whose physiology resembles that of humans to a degree. Results of diverse studies (cellular, animal, and epidemiology) must be taken into consideration together before any conclusions about possible health risks of a suspected environmental hazard.

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