

## КАКОЕ ЗНАЧЕНИЕ ПРИДАЕТСЯ ЭКОЛОГО-МЕДИЦИНСКИМ ПРЕДЕЛЬНЫМ НОРМАМ ДЛЯ ОХРАНЫ ЗДОРОВЬЯ ЧЕЛОВЕКА ОТ ВРЕДНЫХ ФАКТОРОВ ОКРУЖАЮЩЕЙ СРЕДЫ?

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### How Much Sense do Ecological/Medical Limit Values for Protecting Human Health from Environmental Harm Make?

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За последние 50 лет по всему миру отмечен чрезвычайный рост концентрации вредных для окружающей среды химических веществ (токсинов) в воздухе, почве, воде и пище, а также загрязнение окружающей среды шумом и микроволновыми печами (электросмог). Предельные значения, существующие для отдельных вредных веществ для защиты здоровья населения в разных странах оценены критически. Сделан вывод, что эти предельные нормы не всегда достаточны (учитывают потенциальный вред) для необходимой защиты здоровья человека, так как промышленность, как и политики часто придают большее значение экономике, чем охране здоровья. Таким образом, в реальном мире необходимо усиленно соблюдать и тщательно анализировать научно обоснованные предельные значения отдельных показателей, а также их взаимодействий для того, чтобы получить возможность профилактики и коррекции экологически обусловленных заболеваний.

Over the past 50 years, a rapid increase in chemical harmful agents (toxins) for the environment in air, soil, water, and food, as well as environmental pollution by noise and microwaves (electrosmog) has been noted worldwide. The limit values set for individual harmful agents to protect the public health in different countries are critically evaluated. The conclusion is reached that these limit values do not always offer the necessary protection of human health because industry and politics alike often follow the principle of putting economy before health. Therefore, realistic, scientifically based limit values ought to be strenuously pursued in order to achieve a protection against environmentally caused diseases.

### A Slow Poisoning Process in Humans Caused by Environmental Toxins?

So-called «scientific progress» has not only brought about technical advances intended to ease, in particular, the physical burden of mankind, but has also created chemical and physical «damaging agents» that may threaten or endanger human health and quality of life. Here is an example to illustrate this:

The production of synthetic chemicals, including pesticides, is an inflammation-stimulating new phenomenon that has been occurring increasingly since the middle of the 20th century [1]. These toxins may enter the human body along with food, air, pharmaceutical drugs, and liquids.

According to blood and urine tests conducted by the European section of the World Wide Fund for Nature (WWF, in the U.S. World Wildlife Fund) in 39 members of the European Parliament and in 14 Ministers of Health of various European countries in 2004, the following were found in the 53 subjects:

- 13 chemical residue products of phthalates and perfluor compounds
  - 25 pure chemical substances, of which were
    - 1 × flame retardant,
    - 2 × pesticides
    - 22 × PCB (polychlorinated biphenyls)
- [WWF-France 2004].

In the blood and urine of 53 well-known Europeans, 38 individual toxins were found, even if in small amounts only. However, 38 toxins inside the human body may add up, may enforce each other in interactions, and may intensify cumulatively. Based on a multitude of small amounts the effect of one «big amount» may evolve. This big amount then may trigger allergies, autoimmune disorders, oxidative and nitrosative stress, inflammation, chronic diseases, and oncologic pathologies [1; 3; 4].

The industry producing environmental toxins doubts the existence of such diseases. Referring to the toxin content of its individual products it is argued that in the affected humans only one one-hundredth of the amount that has been found, that has been shown to have toxic effects in mice [4]. However, mice are not humans.

American biologist Sandra Steingraber [4] has shown how absurd this industry assertion is. As part of the U.S. National Toxicology Program she [04] has tested, in co-operation with others, 400 chemicals that back then were industrially produced and were taken to be a representative sample of 75,000 products. The studies showed that up to 10% of those chemicals tested had to be considered carcinogenic. From these results, Sandra Steingraber concluded that the population back then was confronted with at least up to 7,500 industrial chemicals that posed a health hazard. As limit values worldwide are always set only for individual substances, not taking into account the effects of their adding up, of interactions, and cumulative effects, they do not protect public health, but instead support the arguments provided by industry.

## What Are Limit Values?

Limit values are parameters of influential factors set by psychobiological standards or legal provisions that, according to the latest scientific state of knowledge, are intended to preserve the long-term health of those affected.

For chemicals, that means:

Limit value = «The concentration of a substance as set by standards or legal provisions that, according to current scientific knowledge, is not harmful to humans or the environment; limit values based on toxicological evidence exist, e. g., for the maximum amounts of pesticides and carcinogens in food and in the air, or, for harmful substances in drinking water».

In addition, there are toxins spreading throughout our living quarters, e. g., originating from furniture, carpeting, paints, cleaners, etc. [5]. Nowhere is there monitoring about the spread of toxins from the human environment. In addition, the setting of limit values is constantly changing. Take the following example: In 2008, Food Watch reported that the limit value for dioxin of 8 picograms/gram in fish (cod, eel) and of 3 picograms/gram in dairy products had been exceeded multiple times. At the same time, however, the European Parliament debated a general raising of the limit values for the toxin dioxin to 25 picograms/gram, which for dairy products would be an 8-fold increase over current limit. What does this mean for children drinking milk? That is a question the European Parliament did not raise.

In addition to chemical damaging agents, physical damaging agents are to be considered as well, namely noise and ionizing and non-ionizing radiation. Limit values are demanded for these as well. According to my knowledge, the limit set for noise so far is the most realistic one, but not an optimum solution by far.

For example, when setting noise limit values, health definitions are taken into account. Unfortunately, there are differing views of the meaning of «health».

Conventional medicine defines health as the freedom from organically detectable diseases. A definition like that does not correspond to reality. The so-called «functional syndrome» or somatoform disorders (ICD 10F) are not taken into account.

As early as 1974, in the context of setting medical limits for noise, Klosterkötter [6—8] pointed to the conflict created for physicians and medical reviewers by two different definitions of health:

«Again and again, questions arise regarding the medical (health) relevance of guideline values. Depending on the degree to which one is affected, on the individual interests, and on the health definition employed, different opinions are found».

«If it is assumed, that only such noise is to be avoided, that, based on current knowledge, has been proven or is very likely to cause diseases or contribute to their development, higher noise emissions will be considered acceptable».

«However, if one considers the WHO's definition of health (i. e., the physical, mental, and social well-being, not the absence of disease or infirmity), then one would want to set the limit for acceptable noise so low that this well-being is not unavoidably impaired». Klosterkötter [6—8] has shown:

This approach opens all doors to arbitrariness. The noise limits set in Germany currently are those offering a certain protection to the population. In medical expert opinions regarding noise, various parameters are considered which are to help in providing noise protection, expressed as dB. These parameters are the following [9—11]:

Maximum sound level ( $L_{Amax}$ ) = brief, one-time noise burden.

Steady sound level ( $L_{Aeq}$ ) = sound/noise burden occurring over a day.

Usually, the outdoor sound level (e. g., for  $L_{Amax}$ ) is used, but in certain cases the indoor sound level is considered as well (e. g.,  $L_{max}$ ). For indoor sound levels one can also differentiate between open windows and partially open windows.

For the assessment of the damaging effects of noise, the following parameters are considered:

1. Auditory system (hearing disorders)
2. Vegetative-hormonal functions (e. g., blood pressure, cardiac parameters, and cortisol)

3. Night-time sleep (as disturbed by noise)
4. Noise burden in the daytime

In addition, special population segments in need of protection are considered: children (e. g., in children's homes, pre-schools), diseased persons (e. g., in hospitals), older persons (e. g., in nursing homes) etc. For these groups, noise level limits usually are set at about 5 dB less than general limits.

Lastly, a chronobiological aspect is also taken into consideration. For example, the human sensitivity to noise is lowest in the morning hours (8:00 a.m. to 12:30 p.m.), so that higher noise limits can be applied to these times. During lunch time (12:30 p.m. to 1:30 p.m.), during evening hours (7:00 p.m. to 10 p.m.) and at night noise sensitivity is high, so noise limits should be lower. Therefore, the following time periods were defined [9; 10]:

- Time period 1: increasing activation;
- Time period 2: high level of activation or low level of sensitivity;
- Time period 3: rest, natural nap time (siesta);
- Time period 4: high level of activation or low level of sensitivity;
- Time period 5: instable phase of lowered activation level;
- Time period 6: sleep, time of falling asleep, dominance of non REM sleep, i. e., physical rest;
- Time period 7: sleep, dominance of REM sleep, i. e., mental and emotional rest.

Most frequently, a steady sound level of < 32 db (indoors, i. e., in the bedroom) was postulated for the nighttime (time periods 6 and 7).

For most airports in Germany, no flights are permitted between 10:00 p.m. and 6:00 a.m. Frequently, airport owners ignore this, following the maxim of «economy before health». This view is also taken and supported by many politicians. They do not care about protecting the health of the affected population.

### **Radiation Protection, Chaos and Misdefinitions for More than 80 Years**

Ever since atomic bombs have been released onto two Japanese cities and since the nuclear reactor failure in Chernobyl in 1986, there is no denying the harmful and even deadly effects of ionizing radiation. X-rays as well can no longer be considered harmless. Here is an example that got a lot of attention (cf. Deutsches Ärzteblatt 104, issue 47, 23 Nov 2007, p. C2745—46). In an editorial, Vera Zylka Menhorn reported on very severe radiogenic complications from radiation therapy of rectal carcinomas administered before and after surgery. There were 326 affected patients who sued for damages. One woman died as a result of these complications.

The chief physician was cleared in all courts based on the reasoning that «the radiation method employed by him was an accepted form of medical treatment based on the 1988 state of medical knowledge», conforming to the state of the medical art. This example illustrates that radiation treatment with x-rays still constitutes a hazard for patients and that possible damages are not fully understood even today. The judgement of the court quoted has confirmed this.

There are many ordinances and limit values, but are they sufficient and comprehensive? They are not, according to the Hamburg example.

An excursion into the history of medicine shows that there have been many misorientations and miscalculations since x-rays have been used as diagnostic and therapeutic tools.

### **Roentgen (R) is the Wrong Unit for Medicine!**

In 1928, at the second international conference on radiology in Stockholm, the roentgen (R) was set as the unit for radiation damage. One roentgen was defined as the measure of that amount of energy that is released in one cubic centimeter of air. However, R exactly determines the degree of ionization, but not the amount of energy absorbed by tissues. That was the first error. R was a unit useful for physicists, but not for physicians. Yet, for years, R was used in medicine erroneously as the unit for «absorbable energy». This error was to be corrected in 1953, when the unit rad (rd) was introduced, rad meaning radiation absorbed dose. This measure, too, was suitable for the assessment of physical bodies, but not for the evaluation of life processes inside a human body.

Due to a continuing lack of clarity, the units roentgen (R) and rad (rd) were not included in the International System of Units (SI) introduced in 1978. In medical dictionaries, rad is listed as an obsolete unit measuring energy dose, and R (roentgen) is listed as an obsolete unit of the ion dose. However, analogues were created: Instead of roentgen, the SI unit coulomb/kilogram (C/kg) was included, and instead of rad (rd), joule/kilogram (J/kg).

$$1 \text{ R} = 258 \mu\text{C}/\text{kg} \text{ measuring ion dose}$$

$$1 \text{ rd} = 0.01 \text{ J}/\text{kg} \text{ measuring energy dose}$$

Which physician could possibly find his or her way through this jungle of units? And who would assure her or him that these are the correct parameters for protecting patients? Conclusion: For ionizing radiation, including x-rays, there continues to be a need for establishing limits.

## A Major Danger for Humankind: Environmental Pollution by Electromagnetic Radiation

In December 1971, a governmental report titled «Program for Control of Electromagnetic Pollution of the Environment» was published in the U.S. Nine experts appointed by the White House Office of Telecommunications Policy (OTP) had written this report. Even back then, this governmental report illustrated the environmental hazards posed by increasing use of microwaves in technical communication and industry at a level not known before.

The following are quotes (back-translated from German) from this U.S. governmental report:

«The electromagnetic radiation of radar, television, telecommunication devices, microwave ovens, industrial heating processes, medical radiation devices and many other sources penetrate today's environment, both in the civil as in the military field. ...»

«Unless suitable preventive and control measures based on an understanding of the principles of the biological effects of electromagnetic radiation are introduced in the near future, over the next decade humankind will enter into an era of environmental pollution by energy comparable to that of today's chemical environmental pollution...»

«The consequences of underestimating or ignoring the biological damage that may occur due to long-term radiation exposure, even at low radiation levels, may be detrimental to public health».

However, according to Brodeur [12, 13], this governmental report never became widely known to the public. Neither the microwave industry nor the military in the U. S. were interested in this, and, therefore, in spite of scientific evidence of a microwave syndrome caused by non-thermal/biological effects of high-frequency microwaves, the limit value of 10 mW/cm<sup>2</sup> remains in force today.

### The Governmental Report was Forced by U.S. Scientists

That was the «Symposium on the biological effects and health implications of microwave radiation» held from September 17 to 19, 1969, in Richmond, VA. Editor of the proceedings: St. F. Cleary; U.S. Dept. of HEW 1970. All of the leading microwave experts from the U.S. convened at this symposium and discussed the results of their research. There were many independent scientists among them who had obtained information regarding the reasons for the setting of low limits for microwaves in the Soviet Union that were to protect human health. This information confirmed their own results and experiences according to which many signs and symptoms caused by microwave effects cannot be explained by thermal impact alone.

These independent scientists appealed to the participants of the symposium to finally recognize their Soviet colleagues as their peers, as scientists of integrity, and to not ignore them when conducting research in the U.S. in the future. They even reminded them that the low dose limits for x-rays and ionizing radiation set in the Soviet Union had initially been ridiculed, but had later on been recognized as appropriate.

Particularly impressive was U.S. physician Allan H. Frey. He had studied the effects of high-frequency microwaves in the previous years and had found in animal experiments and other studies that microwave impulses at a intensity of 0.03 mW/cm<sup>2</sup> have a strong impact on the brain, in particular on the centers of the vegetative nervous system [14—18]. Of course, industry representatives also attacked Frey. However, as he was of national renown, he prevailed and directed a passionate appeal to the audience of the Richmond symposium. He advocated for leaving behind «mathematical calculations» that supposedly had long shown that microwaves were harmless to nerves. Rather, everybody was to recognize how little was actually known about how nerve centers function, and how little, therefore, one could say for certain about the relationship of radio frequency radiation and the functions of the human body. Finally, he explained: «I did not conduct my experiments in humans for ethical reasons, for I have seen too much already. I myself carefully avoid any exposure to invisible high-frequency electromagnetic waves. Therefore, I do not think that I could allow people into the effective range of electromagnetic fields, i. e., to expose them to the radiation and to honestly explain to them that this would be in the least bit safe for them». (see also [12, 13]).

In the U.S., the limit values for microwave radiation were set without a scientific basis.

At the 1955 microwave conference at the Mayo Clinic in Rochester, Minnesota, experts from medicine, military, research institutions, and industry came together. There were controversial discussions, it was doubted whether animal experiment results in which cataracts, changes in gonads, CNS disorders, and others were found could be transferred to humans, and there were differences regarding the inexplicability of symptoms such as head aches, changes in blood counts, visual disturbances, lack of concentration, «hearing of radar radiation», loss of memory in humans and others at low power density prevented agreement from being reached. In view of the chaos of differing opinions, Hermann P. Schwan of Philadelphia University supported the physically determined heat theory. He suggested a limit

value of 10 mW/cm<sup>2</sup> for the occupational protection of those exposed to microwaves as the maximum allowable power density, and most attendees accepted it.

Today, the population of our planet is permanently exposed to pulsed microwave radiation due to the wireless communication network. In wireless communication, information is carried by pulsed microwave radiation, i. e., electromagnetic radiation pulsed and amplitude modulated between 400 MHz (Tetra), 900 MHz (cell phones), 1950 MHz (UMTS), 1880 MHz (DECT), and 2400—5800 MHz (WLAN). This radiation frequently is referred to as EMF (electromagnetic field) radiation.

In the fall of 2007, an group of international researchers, the BioInitiative Working Group, published a 600 page report providing evidence of the harmfulness of EMF radiation. Co-authors from Europe were Michael Kundi (of the University of Vienna) and David Gee, director at the European Environment Agency (EEA). Based on this report, the European Environment Agency (EEA) warned of parallels to the dangers, policy, and history of asbestos, benzene, and PCB: «A new report raising concerns about the effects of electromagnetic fields (EMF) on human health calls for tougher safety standards to regulate radiation from mobile phones, power lines and many other sources of exposure in daily life. The report, 'Bioinitiative: A Rationale for a Biologically-Based Public Exposure Standard for Electromagnetic Fields' was compiled by the BioInitiative Working Group, an international group of scientists, researchers and public health policy professionals. The EEA has contributed to this new report with a chapter drawn from the EEA study 'Late lessons from early warnings: the precautionary principle 1896—2000' published in 2001. The EEA study reviews the histories of a selection of public and environmental hazards, such as asbestos, benzene and PCBs, from the first scientifically based early warnings about potential harm, to subsequent precautionary and preventive measures. Cases on tobacco smoking and lead in petrol are forthcoming». [19]

In Western Europe, in the U.S., in Australia, and in South America, there is a similar jungle of definitions of non-ionizing radiation as was observed for x-rays earlier. Initially, field strength was measured in mW/cm<sup>2</sup> for the range above 300 MHz. As stated above, it was set at 10mW/cm<sup>2</sup> in 1955. Since the late 1990s, field strength in this range is reported as W/m<sup>2</sup>. This change supposedly had practical reasons. Finally, in 1998, the mysterious SAR (specific absorption rate) was created by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The unit for this is W/kg. Finally, there also are the terms Tesla and V/m to describe magnetic and electrical field strengths.

The setting of the SAR limit values was described by the authors in this way:

«When setting limit values, at first, base values are determined. They refer to the biologically important but hardly measurable unit, to the «specific absorption rate» SAR, as well as to the more accessible unit of intensity of power density directly at the body's surface» [20]. (Note: According to these authors, the term power flow density is used to describe the intensity anywhere along the beam. Power density is measured for the intensity at the radiated surface.) «As by definition it cannot be monitored whether the base values are exceeded or not, reference limit values for the measurable dimension of the field, the electrical field strength, are set. As these can only be approximated based on mathematical models, the limit values set by individual countries and organizations may differ even if they are based on the same base limit values». [21]

This pseudo-scientific foundation of limit values is used to delude the people of Western Europe into thinking that the microwave radiation of wireless communication is harmless for children as well. Scientific evidence to the contrary has been provided [22].

In the former Soviet Union, electromagnetic radiation was handled in a radically different manner. Compared to the U.S. and Western Europe, the limit value was not only set at three orders of magnitudes lower, but the exposition time and the type of radiation (pulsed or continuous) was also taken into account. In the latest manual on electromagnetic safety four scientists [23] of the Russian Academy of Medical Science even tabulated the maximum allowable levels of radio frequencies and microwaves at 30 minutes intervals that are now valid for Russia.

### **In the Soviet Union, Early and Wide Ranging Measures Against the «Microwave Syndrome»**

During the period after World War II (1950—1960) there were widespread activities in the Soviet Union to investigate the impact that microwave radiation has on humans. This was done on the one hand in the context of space medicine (very little was published about this part of the work and only insiders knew about the results) and on the other hand in the context of occupational medicine and occupational hygiene.

In Western countries, in particular the works by Russian authors Zinaida Gordon [24, 25] and Pressman [26] in English have become known, but also those by Malysev and Kolesnik [27]. For example, since 1948, at the Moscow Institute of Industrial Hygiene and Occupational Diseases [24] long-term studies have been conducted in co-operation with various clinics, involving more than 1,000 individuals and lasting more than 10 years. In these studies, the typical symptoms of microwave syndrome were described: neuro-vegetative disorders, neuroses, depression, tiredness in the day-

time, decrease in performance, insomnia, head aches, cardiovascular regulatory changes of various kinds, hyperactivity, and restlessness.

The following was found:

The longer the exposure lasted [24], the stronger were the symptoms and the stronger the sensitivity towards microwave radiation became. These findings support cumulative effects of non-ionizing radiation.

Interactions with air temperature, humidity, noise, light intensity and life style were taken into consideration as well in assessing the EMF effects at the Moscow Institute of Industrial Hygiene and Occupational Diseases.

In her occupational medicine book, Zinaida Gordon [24] argued for strictly following the protective regulations when working with radio frequency fields. She promoted this with absolute determination. As early as in November 1958, the Soviet Health Minister issued an ordinance on «Precautions for Individuals Exposed to Microwave Generators».

Hygienic standardization (30 KHz — 30 GHz) of the limit values was based on animal experiment models and their extrapolation to humans. There were five levels of reaction for radiation effects defined:

1. Physiological normal reaction
2. Physiological adaptation
3. Compensation
4. Reparative, reversible maladaptation
5. Irreversible Maladaptation

From my point of view, the Soviet Union has been the only country in which EMF radiation limit values were set based on scientific knowledge. However, it still is questionable, whether their limit values provide optimum protection and whether the appropriate parameter was used.

### **Moscow Signal Weaker than Lowest Soviet Union Limit Value**

The following event that took place in Moscow and became known as the «Moscow Signal», raised doubts about whether EMF radiation field strength is the correct parameter for setting limit values.

On February 07, 1976, the Los Angeles Times published an article on the «firing» of high-frequency EMF radiation at the U.S. embassy on Moscow's Tchaikovsky Street. The article read in part (back-translated from German):

«Ambassador Walter J. Stoessel has informed part of his 125 embassy staff in Moscow that the Russians are using microwave radiation in order to wirelessly tap conversations held at the embassy; they were to understand that such radiation exposure over time might affect their health». According to the Los Angeles Times article of February 7, 1976, Ambassador Stoessel emphasized in this classified staff information that

- pregnant women should avoid the risks posed by the radiation,
- microwave radiation may cause not only disturbances of the nervous system but also leukemia, skin cancer, eczema, and cataracts,
- the intensity of the radiation of the Soviet microwave tapping system was far below the very low safety limit valid in the U.S.S.R. which is part of strict Soviet occupational safety regulation, and
- that it was possible for them to ask for a transfer to a position outside the Soviet Union.

According to Brodeur this «firing» at the U.S. embassy with microwaves had been practiced since 1962 as a countermeasure to the alleged tapping of conversations of Politburo members in their cars by means of a 1000 Watt transmitter located in the U.S. embassy. Brodeur [12, 13] also provides documents as proof of this. Because of this, across the street from the U.S. embassy a transmitter was installed that was to impair the function of the 1000 Watt transmitter. Around the clock, stochastically pulsed electromagnetic waves were transmitted, apparently also with stochastically varied frequencies, at a field strength of  $1 \mu\text{W}/\text{cm}^2 = 0,001 \text{ mW}/\text{cm}^2$ .

For comparison:

Soviet Union limit value:  $0,01 \text{ mW}/\text{cm}^2$

U.S. and Western Europe limit value:  $10,0 \text{ mW}/\text{cm}^2$

U.S. science journalist Paul Brodeur conducted precise research and wrote in detail about the background of the «Moscow Signal» in his book «The Zapping of America» [12]. He also reports on diseases of embassy employees, that I summarize as follows: It is a fact, that secret chromosomal tests that the U.S. State Department ordered to be done on returning employees of the Moscow embassy, showed chromosomal damage that the general public never was informed of. The order was given as early as 1967/1968 by the U.S. State Department. Special tests had to be conducted over a period of 18 months on all «Moscow returnees» [12, 13]. As a chief witness in this context, Brodeur names Dr. med. Thomas H. Griesinger who was relieved from his office at George Washington University's medical school because he allegedly said that «in these tests strangely many chromosome breaks» were found in U.S. embassy employees who had formerly been stationed in Moscow.

In summary, based on available facts [12, 13] it can be stated that

— three out of four U.S. ambassadors who had been assigned to Moscow in the period from 1962 to 1979 have died from malignant diseases that may have been a consequence of radiation;

— e. g., in the first study of 213 employees of the U.S. embassy in Moscow, 64 showed an increased white blood cell count of more than 40%; later studies in other embassy employees confirmed that one third of them had an increased white blood cell count of more than 40%;

— at various times children with leukemia who had lived at the U.S. embassy in Moscow were taken back to the U.S.;

— there were additional adults with cancer among the returning employees of the U.S. embassy; the prevalence of cancer allegedly was higher than that of the general population;

— the physician who cared for the members of staff of the U.S. embassy in Moscow, Dr. T. A. Johnson, reported in the Washington Post in 1976 that many members of the U.S. embassy complained about the following symptoms: mental stress, sleep disturbances, internal inflammation, stomach ulcers, and, in men, erectile dysfunction.

Dr. Johnson allegedly called these complaints hypochondria! According to press reports, Johnson encountered these complaints only among the staff members of the U.S. embassy on Tchaikovsky street, not among ambassadors (20) and staff of embassies of other countries (90) in Moscow, whom he also cared for [12].

The U.S. embassy in Moscow, the U.S. Department of Defense, and several secret services that were, under strict observance of secrecy were consulted, allegedly were clueless as well as helpless in the face of this radiation with magnetic waves [13].

The question arises, why, at the height of the Cold War, the U.S. remained sailed between 1962 and 1976? Regarding this question, Brodeur reports the following: During a summit meeting of the government leaders of the U.S., President Johnson, and the U.S.S.R., Premier Kosygin, in June 1967 in Glassbaro, Kosygin allegedly was asked by Johnson to cease radiating the U.S. embassy in Moscow with magnetic waves. Moscow's counterargument to this request was: The radiation of  $0.001 \text{ mW/cm}^2$  was four orders of magnitude lower than the U.S. limit value [12].

My explanation is as follows: If the U.S. had protested «noisily», then their own limit value of  $10.0 \text{ mW/cm}^2$  might have been threatened. Industry and military were not, and continue to be not interested in lowering this value to the Soviet level. I have come to this conclusion also because of the following, my own experience:

In 1996, when we were running a private institute for stress research, the German Federal Telecommunications Authority (Mainz)-today known as the Federal Network Agency-asked us (job order no. 4231/630402, dated November 14, 1996) to conduct a review of the Russian technical literature of the years 1960—1996 on the topic «Biological effects of electromagnetic fields in the frequency range of 0—3GHz on humans» and to present a summary of about 100 pages.

We included 878 Russian publications in this summary (120 pages). Having completed it by the agreed date, we submitted the requested document along with photocopies of the original papers (three binders). However, we never received an official response. An inquiry on our part yielded the information that our document had immediately been archived. It was never made accessible to the public. An employee of the agency informally told us when we inquired by telephone that the low EMF radiation limit value in Russia «had shocked everyone». The so-called Moscow signal, therefore, was harmful at an EMF radiation field strength that is four orders of magnitude lower than the current limit value in the U.S. and Western Europe. Thus, the question arises whether field strength is the appropriate parameter at all for setting a limit value? As the only parameter it certainly is not! This is supported by many scientific findings Hecht et al. 2009; Richter und Zimmer 2008].

## **The Ideas for Measuring Individual Electrosensitivity or EMF Overload and for Setting Limit Values**

One could measure bioelectrical and biomagnetic properties of humans, e. g., utilizing appropriate nanotechnologies, as influenced by EMF burdens. To this end, detectors (such as Röntgen's dosimeter) are to be developed, that immediately signal an overload of an individual's electromagnetic system.

I consider the individual electromagnetic sensitivity factor of humans a better measure than any limit values that leave many questions open and, in their current form, are completely inadequate for protecting humans from EMF radiation.

If a limit value should be necessary, e.g., because it is demanded by politicians and legal experts, than the limit value for non-ionizing radiation ought to be completely re-defined and re-characterized.

The following factors should be taken into consideration in setting such a new limit value:

1. Daily exposure time.
2. Annual exposure time.
3. Cumulative effects.
4. Type of transmission: Continuous wave, regular, pulsed, stochastically pulsed.
5. Frequency and frequency variability of EMF radiation.

6. Health state of the individual.
7. Pharmaceutical drug effects in the individual.
8. Interactions with other immission factors such as noise and chemicals.
9. Interactions of the frequencies of the many transmitters in a given city or a given area.
10. Co-radiation of others, e. g., through mobile and cordless phones.
11. Sleep of the individual (measured sleep).
12. Special protection for children, pregnant women, sick and older people, as practiced in noise protection.

Given the chaotic situation I described regarding the setting of limit values for various harmful agents one might ask whether these ideas are not completely illusory? I can answer no to this question. How so? In Germany, a little over two years ago we founded an organization named «Kompetenzinitiative zum Schutz von Mensch, Umwelt und Demokratie e. V.» (Competence Initiative for the Protection of Humans, Environment, and Democracy). In this organization, that by now is in operation on an international level, experts have come together to get the politicians in power to protect us against environmental toxins and physical emissions. Such measures would include a science-based establishment of limit values, in particular for EMF radiation.

In September, a brochure on this topic was published, titled «Why limit values are harmful and don't offer protection, but are upheld nevertheless. — Evidence of a scientific political scandal». In this brochure, edited by K. Hecht, M. Kern, K. Richter, and H.-C. Schreiner, all of them members of the board of «Kompetenzinitiative zum Schutz von Mensch, Umwelt und Demokratie e. V.», nine experts contribute conclusive scientific papers on today's handling of limit values for EMF radiation. So far, this brochure has been effective and has triggered an open discussion. For example, it was made possible that members of this organization were given the opportunity to speak in the U.S. parliament, i. e., in the House of Representatives in Washington, as part of a hearing on the harmful lasting effects on human health of EMF radiation.

I wrote this paper for the journal «Vestnik» in order to encourage the members of the Russian section of the International Academy of Sciences, who also have committed themselves to the protection of human health and the environment, to engage in united activities against the pollution of the environment by toxins, radiation, and noise, and to demand limit values, that are not set for individual harmful agents, but based on the complex effects of toxins, radiation and noise.

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