How Industry and Politics Has Been Dealing with the Radiation Protection of People

A historical review

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Politics and industry take it for granted that, based on the current safety limits, people are reliably protected from health risks through mobile communication radiation. They assume that the safety limits are in line with the state of scientific research [1]. However, this assumption is contradicted by the research results from independent scientists [2]. Thus, it is obvious that the outcome of the – until now – largest biophysical experiment in the history of mankind with about 5 billion users of mobile phones is highly uncertain. The current safety limits that are solely based on the radiation's heating effect are essential for the economic success of the mobile communication technologies. To safeguard it, politics and industry misuse their position of power mainly to prevent further gains of knowledge. They preferably provide funds for pseudo-research the results of which are regularly used to refute the warnings of independent scientists.

The current safety limits create the legal basis for the worldwide spread of radiation technologies which does not have to take care of any health concerns. They guarantee the manufacturers and providers the release from liability for radiation-caused health damages because the courts relying upon the correctness of the governmental fixing of the safety limits always assume that, when observed, people and nature are reliably protected. Despite serious warnings from medical organisations [3,4,5] industry – for the reasons mentioned – has so far refused all measures suitable to gradually adapt the safety limits to the needs of the human organism. Politics, always susceptible to lobbying, agree upon even when people's health is concerned, which they are responsible to protect. How could this fatal development happen?

Before ending my professional life – being an involved scientist with a long-term experience in mobile communication research – I wish to point at past and current false developments. My move has three different motives:

- There is a real health hazard for the people through radiation technologies.
- There is a real threat to the freedom of science and research through politics and industry.
- There is a real threat to independent scientists with the courage to tell the truth, in the job as well as in person.

This threatening development has a background.

1950–1980: Deception in order to push through military interests

With the Sputnik, the USSR had passed the USA in October 1957 in conquering space. In October 1961 the Soviet Union detonated the so-called Czar bomb, a bomb 4,000 times stronger than the Hiroshima one. On October 27, 1961, American and Russian tanks stood arrayed against each other at the Berlin Checkpoint Charlie, only 100 meters apart. A nuclear war because of West-Berlin, which the U.S. Government under J. F. Kennedy could not afford to give up, was not ruled out anymore [6].

The USA feared to be surpassed by the USSR in weapons technology. The U.S. military concluded that a third world war could not be led successfully, when military technology based on radiofrequency radiation is hampered by low safety limits. Considering what is at stake in the political area they decided that the concerned soldiers and technicians in the factories could take a certain health risk, which anyhow was estimated to be a small one. However, the ethical and moral problem was that they refrained from informing the concerned.

In this global political environment the military dominated the scientific discussion on safety limits and science, already aware of the possible health hazards at that time, fell by the wayside. In agreement with the U.S. Government the U.S. Armed Forces – supported by the microwave industry – established safety limits

according to military requirements without taking much care of possible health concerns. At the same time they shielded the Government, which was not ready to openly take over the responsibility for this development, since it was afraid of negative consequences from the public opinion [7,8,9,10]. How the interests of the military-industrial complex were enforced is shown in the following examples.

A fatal theorem

To find a scientific reason for pushing through safety limits that correspond to the military interests seemed nearly impossible only a few years after World War II, because of the scientific data. Hermann Schwan from the Kaiser Wilhelm Institute for Biophysics in Frankfurt, who as many other distinguished German scientists continued his scientific work right after the war in the USA upon invitation of the U.S. Army, was the one who solved the military's nearly insoluble problem. At the University of Pennsylvania in Philadelphia, from where he dominated research in the area of electromagnetic fields (EMF) for years, he established so to speak *ex cathedra* that biological effects of radiofrequency radiation can only come about through heating of the tissue as other assumptions contradict the laws of physics. On this basis he proposed a safety limit of 10 mW/cm^2 in 1955, which is a tenth of the value that according to his calculations does generate heating. From Schwan's unproven theorem it was concluded that a search for non-thermal effects is not necessary and a sheer waste of money. Scientists claiming to have proof for the existence of non-thermal effects were ridiculed and funding of their research discontinued. That Schwan later changed his mind has been disregarded until today [7,8,10].

The Pandora project

The U.S. safety standards on the basis of Schwan's proposal were fixed at a time when in Moscow the American Embassy was continuously irradiated with radiofrequency electromagnetic fields of different characteristics, but low field strength. This took place between 1953 and 1976. There were no protests from the USA, and not even the Embassy personnel were informed. Fear was too big that, when this action became known, the further use of the radiofrequency technology by industry and military would be questioned in their own country, since a discussion on possible health hazards from the radiofrequency radiation was unavoidable. However, to find out what could have driven the USSR to such an unusual measure, the U.S. Army together with the CIA organized in agreement with the U.S. Government an extensive, but secret research project with the code name "Pandora" [10,11,12]. In April 1976 Henry Kissinger, at that time Secretary of State, summarized the findings obtained in Pandora in a telegram to the Embassy in Moscow as follows [13]:

The effects the Soviets calculated to achieve in the personnel serving (at least as early as 1960) included (A) Malaise, (B) Irritability, (C) Extreme fatigue. At this time the Soviets believed that the induced effects were temporary. Subsequently, it has been verified that the effects are not temporary. Definitely tied to such radiation and the UHF/VHF electromagnetic waves are: (A) Cataracts, (B) Blood changes that induce heart attacks, (C) Malignancies, (D) Circulatory problems, and (E) Permanent deterioration of the nervous system. In most cases the after-effects do not become evident until long after exposure - a decade or more.

The Zaret case

The ophthalmologist Milton Zaret, who collaborated in the Pandora project, was among the first scientists that were convinced of the existence of effects below the safety limits, i. e. so called non-thermal effects. On behalf of the U.S. Armed Forces he had examined around 1,600 servicemen from Air Force, Navy, and Army in the late 50's and had discovered cataracts in numerous young radar technicians, and this in the one eye they had focused the radar antenna with. Cataracts in both eyes are found in half of the seventy-year-old, but hardly in twenty- and thirty-year-old persons, and never only in one eye unless this one has somehow been injured from the outside.

Zaret's request to lower the safety limits was rejected by the U.S. Armed Forces, and the collaboration with him ended all the sudden. In an unbelievable campaign led by two high-ranking medical corps officers in agreement with the CIA, one tried to ruin Zaret's integrity as a person and as a scientist. They were supported by a flourishing microwave industry that already earned a lot of money with the production and marketing of radar tools and microwave ovens, and that feared for its business [10,12,14].

In a hearing of the U.S. Senate in 1973 described the state of his findings as follows [14]:

There is a clear, present and ever-increasing danger to the entire population of our country from exposure to the entire non-ionizing portion of the electromagnetic spectrum. The dangers cannot be overstated because most non-ionizing radiation injuries occur covertly, usually do not become manifest until after latent periods of years, and when they do become manifest, the effects are seldom recognized.

Since 1980: Deception in order to meet economic interests

Since the end of the Cold War and until today the mobile communication industry, privileged because of its increasing economic and societal impact, has been successful in maintaining nearly unmodified the safety limits which were established on the basis of military requirements. Many of the methods applied were taken from the tobacco industry and were certainly not in line with ethical and moral principles. In consultation with complaisant politicians the industry filled the national and international advisory and decision-making bodies with 'experts', whose 'right opinion' was more important for their election than their scientific qualification. Disguised as scientists these lobbyists assured the public that the development of the radiofrequency technology is economically needed, socio-politically forward-looking and, even more, also environment- and health-friendly.

Based upon the mobile communication industry's equally good relationship with at least parts of the media – likewise determined by giving and taking – it achieves that the message of the radiation's harmlessness is spread uncritically in public, and scientists who criticize this attitude are declared newcomers or even maniacs. The advertising budget of this industry is obviously considered a kind of compensation for the lost means from the tobacco industry, because of the ban imposed on advertising cigarettes, and is – who doubts – the pledge of this collaboration. In spite of this, it is astonishing that several of the most influential German organs, such as the *Süddeutsche Zeitung*, *Der Spiegel* and *Die Zeit,* which are considered to be highly obliged to independence and truth in their reports, are especially open for the concerns of the mobile communication industry. They present predominantly positive pictures of the radiation technology and its impact on society and criticize the critics of this industry in a way that the rules of balance, truthfulness, and independent search are invalidated. As the following examples show such strategies of playing-down possible health risks are typical for the currently prevailing mobile communication politics:

The EMF Project of the WHO

The WHO's EMF Project, which was to advise all governments of the world on how to deal correctly with radiation technologies, turned into a public relations organ under its coordinator, the Australian biologist Dr Michael Repacholi [15,16] in the years 1995 to 2006. Nearly half of its budget came from the electro and electronic industry, although the WHO's statute does not allow such a funding [17]. In the name of the WHO Repacholi, who became an industry consultant after leaving [18], informed the world that the safety limits do reliably protect people from health hazards and, therefore, no more measures for protection are required. Andrew Marino comments on Repacholi as follows [19]:

Michael Repacholi was as committed in his belief in the intrinsic safety of EMFs as had been Herman Schwan. Motorola and the other companies appreciated Repacholi's value, and with their help he became a kind of EMF czar at one of the agencies of the World Health Organization. From that bully pulpit he purported to teach the world about EMFs.

The attempt of the so-called International Commission on Non-Ionizing Radiation Protect (ICNIRP) to world-wide push through – with Repacholi's help – the revised U.S. safety limits finally failed because of the frequently expressed suspicion that the safety limits do not meet the demands. Besides by a few European countries harmonization was opposed by China, and especially by Russia. There, EMF research reaching back into the 50's had led to a quite different level of knowledge. On behalf of the German Federal Ministry for Telecommunication, an extensive research report by Karl Hecht and Hans-Ulrich Balzer based on hundreds of Russian studies had already given evidence of the long-term risks of radiofrequency radiation, but it was obviously not in line with the client's expectations and disappeared unnoticed in the archives of the governmental agency [20].

ICNIRP

A milestone in the establishment of safety limits in Europe was the founding of the Germany-based ICNIRP in 1992. Michael Repacholi was a founding member and the first chairman of this private syndicate with an official touch. After being appointed head of the WHO's EMF Project Repacholi was elected chairman *emeritus*, what he still seems to be today. He used his position to have ICNIRP officially acknowledged by the WHO and the EU including most of its member states, among them Germany. When it established the European safety limits it uncritically based its decision on Schwan's pseudo-theorem. The American safety limits were taken over with only minor alterations [21]. Although non-thermal effects and, thus, possible long-term effects such as the development of cancer and neurodegenerative disorders were not considered at all, their introduction was recommended by the WHO and EU to their member states. That the actual state of knowledge was ignored by ICNIRP or – even worse – deliberately distorted by leaving out all information industry did not appreciate has either not been recognized by the responsible governmental officials or – more probably – was consciously neglected [22,23].

It is well known that when risk management with an economical background is at stake private scientific organisations such as ICNIRP are by far less suitable than democratically appointed commissions [24]. The most important reason for this assumption is laid down in the ICNIRP's statute. It simply says: *Nominations shall be considered if they are submitted by the members of the Commission itself, the Executive Council of IRPA or the IRPA Associate Societies.* In this way it is guaranteed that the syndicate will never change its opinion since the affiliation of independent scientists is excluded forever. Conclusion: The ICNIRP must be immediately dissolved.

The German Commission on Radiological Protection

The German Commission on Radiation Protection (SSK) advises the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) in all matters concerning the protection of people from ionizing and non-ionizing radiation. From its six committees the Committee on Non-Ionizing Radiation is responsible for mobile communication radiation. In this area the SSK in the course of the years developed into an organisation that takes radiation protection literally. It tries to protect radiation itself from any suspicions that it may be health damaging. Responsible for this disastrous development is especially Alexander Lerchl from the private Jacobs University in Bremen, who, acting as chairman of the Committee on Non-ionizing Radiation, was a member of the SSK between 2009 and 2012.

Lerchl considers mobile communication radiation harmless to health and therefore concludes that it is useless to lower the current safety limits. His assumption is based on the results of the German Mobile Telecommunication Research Project (DMF), especially, however, on his own contributions which are classic examples of pseudo-research. In the meantime, it has been convincingly shown how Lerchl in his research as well as in his functions oversteps the limits, both in legal as well as moral terms [25,26]. Regarding the chair of the Committee on Non-Ionizing Radiation and the representation of this field, one cannot ignore that the task has often been assigned to scientists for whom electromagnetic fields have no relevance to health policy. All the evidence seems to indicate that industry takes care of their selection and politics of their appointment.

The German Mobile Telecommunication Research Project

Between 2002 and 2008 the German Telecommunication Research Project (DMF) was to find out, if after exposure to radiofrequency electromagnetic fields below the current safety limits health problems of people can be excluded with adequate certainty. About 17 million Euros were spent: one half provided by the industry, the other one by the German government. Before the start the SSK with the help of Repacholi identified open scientific questions and recommended research topics, and was then actively involved in the evaluation of the results during the project. No wonder with this constellation that the initial fears of health risks could not be confirmed. The German Federal Office for Radiation Protection (BfS), being the responsible organizer, stated that nothing points to any health effects and that the protection concepts underlying the current safety limits are not challenged [1].

As it looks like, funds provided by the industry may have been used to prevent that with funds from the Government evidence of health effects from radiofrequency radiation could be found – as shown in the

international literature. Research projects of the highest priority dealing with possible carcinogenic effects of the radiation and assigned to Alexander Lerchl were planned, conducted and evaluated in such a way, that from the scientific point of view the results must be considered meaningless [26,27]. Relying on Lerchl's loyalty, he was entrusted with a further research project after the DMF had ended, in which he investigated age-dependent effects of the radiation on development and differentiation of the central nervous system in juvenile rodents. Again, he remained true to his way of doing research. As expected by the industry, his new results support the view that the use of mobile phones is harmless for children, too. Yet, his client , the BfS, is obviously still not able to realize that funding of research projects like the one carried out by Lerchl with the tax payer's money is tantamount to mockery of the citizens.

Since 1995: The independent science stands up

The DMF is a good example on how in the last decades industry succeeded to take the lead in the area of research on electromagnetic fields. Funds for research were only provided to scientists ready to cooperate. With their assistance the research topics were formulated. Funding did not go to the research required from a scientific point of view, but to the one which best corresponded to the interest of the industry. The numerous papers that emerged in this way were either used to refute or at least to shed doubts on the critical results from the few scientists who remained independent. So it happened that the state of research on biological effects of electromagnetic fields is still in a poor state. And for decades politics tacitly consent to these goings-on.

For the first time the dominance of the industry-driven research was endangered in the 90's when Henry Lai and Narenda Singh from the Washington University had shown genotoxic effects of electromagnetic radiation in animal studies [28]. In a sort of 'war gaming' as they called it, which was especially pursued by Motorola, it was attempted to devaluate the research results by using slander and, thus, to exclude the researchers from further – also federal – funding [29,30,31]. But their work left its marks in independent science. Since then numerous papers have been published that show that both, low and radiofrequency electromagnetic fields dependent on field strength and modulation, modify the structure and function of genes not only in isolated cells, but also in living animals [32].

Since the turn of the millennium it has been repeatedly reported, that biological effects of relevance for the development of diseases are much less frequently observed in industry-funded research projects as compared to the ones with neutral funding [29,33]. ICNIRP, SSK and the other industry-controlled associations claim to know the reasons. They declare the critical results from independent science as being 'not robust' or even faked. It remains to be seen how long they can keep calm the people and the ones politically responsible for their health with such arguments.

As the following examples show industry is already on the way to slowly lose the lead in research and, thus, also the interpretation of the results.

The REFLEX study

The REFLEX study carried out between 2000 and 2004 was coordinated by me and funded by the EU within the 5th Framework Programme with more than 2 million Euros [34]. Two research teams, one at the Free University of Berlin and the other one at the Medical University of Vienna, had detected that radiofrequency electromagnetic fields below the safety limits own a genotoxic, i.e. a carcinogenic potential. However, this kind of result speaks seriously against the reliability of the current safety limits as claimed by politics and industry. Obviously, the mobile communication industry regarded the REFLEX study more and more as an annoyance directed against their interests. As it looks like, latest in 2007 – just when the EU was to decide on the funding of a REFLEX follow-up study – it considered steps against REFLEX unavoidable.

Three years after completion of the REFLEX study, the already mentioned Alexander Lerchl, who obviously did not want to serve politics and industry only as scientist, felt himself called upon, or – more probable – was ordered to solve the REFLEX problem. For this he started an unparalleled smear campaign against the REFLEX study and against me, the coordinator that still goes on. It is based on the story he invented, that the REFLEX

results are faked. In the meantime, two ethic commissions rejected Lerchl's accusation of fake and the REFLEX papers are still an integral part of the research literature [35]. But according to the principle *semper aliquid haeret* (something always sticks) the defamation of the REFLEX study was not without effect: The REFLEX follow-up study was not funded, although it scored high and was recommended for funding by the reviewers of the EU.

The BioInitiative Report

The 2012 BioInitiative Report is a team work of numerous internationally recognized scientists, in which the current state of knowledge on the so far known biological effects of electromagnetic fields are summarized in 28 chapters [32]. In the report it is explained why the safety limits of the radiofrequency radiation, solely based on thermal effects, have to be replaced with limits related to these known biological effects, if they should serve the protection of the people. It is true that the energy of microwave radiation is not strong enough to directly break chemical compounds, such as the DNA, in human and animal cells. But it is obviously able to indirectly modify structure and function of genes and probably also of other macro-molecules through which the cell metabolism can intensely be deranged.

As the human organism is a bioelectric system with heart and brain driven by bioelectric signals, it is certainly not surprising that with the increase of artificial electromagnetic fields fundamental processes in the human body can be changed, although varying from person to person. Possible results are adverse effects on the well-being up to the development of severe illnesses such as cancer and neurodegenerative disorders. Thus, it is high time that the governments take care of the matter. But politics prefer to listen to their 'experts' in ICNIRP, SSK and other industry-dominated public relations organisations who deny the BioInitiative Report any scientific relevance. They claim that the research work described in this report is either 'not robust' or out-dated. This applies obviously to most of the results from international research that cannot be brought in line with the outcome of the DMF [36,37].

The International Agency for Research on Cancer

The worst what happened to politics and industry up to now took place in Lyon, France, in the end of May 2011. The International Agency for Research on Cancer (IARC) of the WHO classified radiofrequency electromagnetic fields "possibly carcinogenic for humans" [38]. This decision is based on the vote from 30 scientists. There was one dissenting vote, and it came from a former German SSK member. Decisive for the classification were the results from epidemiological studies, especially from Lennart Hardell's team in Sweden. Both, the REFLEX study as well as studies with comparable results, were not considered. Otherwise classification would have to be changed to "probably carcinogenic for humans". It looks as if the WHO, out of consideration for their industry-friendly member states, refrained from further increasing pressure on the telecommunication companies in such a way that revenue-damaging preventive measures could not have been postponed by the governments any more.

How the telecommunication industry with its hired scientists tried to secretly take influence on the IARC may illustrate the following examples. Anders Ahlbohm from the Karolinska Institute in Stockholm, until 2011 regarded as one of the world's leading epidemiologist studying the effects of electromagnetic fields, was unmasked as lobbyist of the international industry shortly before the IARC workshop, where he was to take a leading role in his area of research. As a result he voluntarily refrained from taking part [39]. Already before the workshop the IARC refused Lerchl's participation, actually taken for granted for a member of the German SSK, because of his closeness to industry and his bias in this area of research [40]. Right after the IARC meeting enormous efforts started off from all the 'experts' who were surprised by this unexpected decision. All their attacks aimed at keeping within limits the negative impression on the public opinion. Especially explicit were Lerchl and some of his colleagues who even saw the scientific reputation of the IARC at stake [41].

Lennart Hardell

Lennart Hardell's team from the Orebro University in Sweden recently published results, which hardly leave room for doubt that the brain tumour risk significantly increases with the length and the frequency mobile and

cordless phones are used. The great impact of this research on the risk evaluation is demonstrated by the fact that these findings together with the ones from the INTERPHONE study were decisive for the IARC's decision to classify radiofrequency radiation "possibly carcinogenic for humans". The highest Italian court, too, referred to them when it acknowledged, in a lawsuit for compensation in October 2012, the long-term use of mobile phones being a possible cause for brain tumours. That Hardell's results just recently have been confirmed in a study from France strengthens their significance further [42].

It would be naïve to assume that the international mobile communication industry sits back and watches such a development. Just as with REFLEX, Alexander Lerchl again acted in the same manner he knows best: slandering. In an unusual rude attack he also suspected Hardell of fake. Unlike REFLEX he did not have to invent a suitable story, but could refer to an old, but unsuccessful intrigue against Hardell, with which more than 10 years ago it was tried to ruin him as a scientist. This happened in the interest of another industry, the products of which also harmed mankind and environment. The Swedish journalist Mona Nilsson, who had already unmasked Anders Ahlbom from the Karolinska Institute being a lobbyist of the mobile communication industry, wrote the story. It emerged a document that reveals in an impressive way how the career of scientists is endangered when their research results are in conflict with economic interests [43].

Against this background the Pandora Foundation supports Hardell's research projects with the conviction that his results will shorten the time until politics will finally be forced to give people's protection priority over industry's efforts to maximize its profit (http://www.pandora-foundation.eu/research-projects/hardell-project/index.html).

Conclusion

Since the beginning of the 50's in the last century the safety limits for radiofrequency radiation contradict the state of scientific research. They do not protect people exposed to radiation but the interest of industry and politics. The way how they were introduced, ensured and defended meets all criteria for 'institutional corruption' [44].

On June 23, 2013, the journalist Sven Goldmann described in the Berlin *Tagesspiegel* how this could happen:

… There are no big, classic dictatorships anymore despite a few exceptions … The new suppression is more subtle, it is not tied to any ideology. It is based on the division of the world in three classes: on the one side the poor. On the other side the rich. And in between as a new third class the nomenclature of economy and politics. The brokers who distribute the wealth. Who set the points for the future and hardly show interest in the general public and all the more for their own well-being.

During the last decades, the 'nomenclature', endowed with almost unrestricted economic and political power, surrounded itself with so called 'experts' who were ready – depending on funding and reputation – to adapt their own research to the requirements of their clients and to criticize contradicting findings from independent scientists as flawed or even fabricated. Until recently they could be sure that their ethical and moral misconduct would have no consequences. They could, as Andrew Marino was informed by one of those 'experts', be sure that critical research results would hardly be noticed, and even if they were, they would never gain acceptance, and even if they did, it would have no practical consequences [45].

As IARC's decision has shown, in the meantime industry and its hired 'experts' from science are threatened to slowly lose the lead in research. In spite of this, it will still take a while until the prevalence of chronic diseases such as cancer and neurodegenerative disorders cannot be overlooked anymore due to the continuing rise of the radiation intensity. Then at the latest the politicians responsible for radiation protection will be forced to deal with the matter. In this situation, independent science is asked to shorten this gap with new achievements in this area of research. Yet, this can only be successfully done when sponsors are found who out of social commitment are ready to contribute means to this kind of research, where the nomenclature of politics and industry fails to meet its obligation towards the interest of the citizens.

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