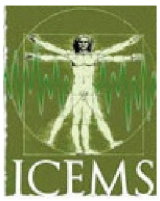

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ICEMS Position Paper on the Cerebral Tumor Court Case

Final Paper

On October 12, 2012, the Italian Supreme Court, namely the "Corte di Cassazione" (3rd level of judgment), confirmed a previous decision by the Civil Court of Appeals of Brescia (Decision December 22, 2009, no. 614) that ruled that the National Institute for Workmen's Compensation (INAIL) must compensate worker Innocente Marcolini who developed a tumor in the head due to long-term, heavy use of mobile phones while on the job.

The decision of the Supreme Court appears to view the correlation between mobile phone exposure and the development of a head tumor as *probable*, for legal issues.

Such a decision is supported by a consistent body of evidence on the link between mobile phone microwave exposure and head tumor onset, presented by L. Hardell and coll. (1999 - 2012), the INTERPHONE study (Int J Epidemiol 39, 2010) [1], and a study by S. Lönn, A. Ahlbom, P. Hall and M. Feychting (Epidemiology, 15:653, 2004) relating to benign tumors of the acoustic nerve[2].

All of these studies and more represent a scientific basis for the May 2011 IARC classification (2B) of radiofrequency as a possible carcinogen.

To establish a scientific basis for a more severe classification of mobile phone exposure as a *probable* carcinogen (class 2a), an important background of *in vitro* and *in vivo studies* is required, as well as the discovery of biophysical or biochemical mechanisms that could be involved in the induction of tumors. **We maintain that such a background is available today.** As a matter of fact, the epidemiological evidence above is also supported by important scientific findings regarding the biological mechanisms of EMF action on living organisms:

1) microwave-induced blood-brain barrier permeability, with consequent passage of albumin into the brain, was focused on by L. Salford, professor of Neurosurgery at the University of Lund (Sweden) and collaborators (*Microsc Res Tech* 27(6),1994), published also by *Environmental Health Perspectives,* a magazine of the NIH;
2) altered working of the calcium-potassium cell pump - a fundamental mechanism of living cells – due to extremely low frequencies was observed first by S. M. Bawin and W. Ross Adey (PNAS 1976, 73(6)), and then, with reference to amplitude modulated radiofrequencies, by C.F. Blackman et al. from the US EPA (radio SC 1979, 14(68));
3) D.B. Leyle and colleagues found diminished functionality of the immune system in people exposed to microwaves (*Bioelectromagnetics*, 1983, 4);
4) microwave-induced DNA single- and double-strand breaks were discovered by H. Lai and N.P. Singh of the University of Washington in Seattle (*Bioelectromagnetics,* 1995, 16; J Radiation Biol 1996 69(4));
5) altered micronucleation during cell reproduction was found by I. Udroiu, L. Giuliani and L.A. Ieradi (*Eu J Oncology,* 13(4), 2008; *Eu J Oncology Library,* Vol. 5:123, 2010);
6) F. Marinelli from the Institute of Molecular Genetics of the National Council of Research (CNR, Bologna) and colleagues found mechanisms by which electromagnetic fields influence the life cycle of cells by inducing abnormal apoptotic and survival signals (*J Cell Phys*, 2004, 198);

[1] This study provided considerable data, even though their interpretation by the INTERPHONE Study Group is debatable. For a more convincing interpretation, e.g., related to glioma, see: L. Hardell, *Wireless phone use and brain tumour risk*, in the ICEMS Monograph, Eu J Oncology, Library Vol. 5:363, 2010. This study was cited in the debate of the lawsuit by INAIL as a paper giving evidence of non incidence but the Court did not accept this thesis.

[2] This study was not quoted in the Sentence of the Court.

7) magnetic field-induction of ion currents in the cell, able to alter the chemical links, was discovered by M.N. Zhadin and V. V. Novikov of the Institute of Cell Biophsyics in Poushkino (*Biofizika*, 1994, 39(1); *Bioelectromagnetics*, 1998, 19(1)) and it was even independently investigated by E. Del Giudice, F. Barnes, G. Mengoli, L. Giuliani and others (*Bioelectromagnetics*, 2002, 23(7); 2005, 26(4); 2006, 27(1). *EBM*, 2006, 25(4), *BioMagnetic Res. and Tech.*, 2008, 6(1)), and confirmed by A. Pazur in Germany (*BioMagnetic Res. and Tech.*, 2004, 2(8)) and by D. Alberto *et al.* at the Politecnico in Turin (*EBM*, 2008, 27(3)) e (4));
8) the effectiveness of ion currents induced in cells by magnetic fields during the differentiation of stem cells was investigated by A. Lisi and the research group from ISPESL, CNR and Sapienza University of Rome (*Bioelectromagnetics*, 2004, 25(2); *J Cell Physiol.*, 2005, 204(2); *EBM*, 2006, 25(4); 2008, 27(2) and (3); *Cardiov. Res.*, 2009, 82(3)), and by S. Di Loreto at al. (*J Cell Phys.*, 2009, 219(2));
9) the effectiveness of ion currents induced in cells by magnetic fields in treating tumors has been shown independently by V. Novikov and collaborators (*Biofizika*, 1998, 43(5); *Bioelectromagnetics*, 2009, 30(5)), by I. Belyaev and collaborators at the Center for Cancer Research in Bratislava (*Bioelectromagnetics*, 2005, 26(5)), and by B. Pasha and colleagues at the University of Alabama (*British Med J*, 2011, Aug. and Dec.);
10) a correlation between mechanisms due to extremely-low-frequency magnetic fields and mechanisms due to pulsed microwaves from mobile phones was found. It is well known that the effect of mobile phones on health is correlated with the effect of low-frequency magnetic fields, as highlighted in the *Lancet* (2000) by Gerard Hyland of the University of Warwick;
11) electromagnetic induction of oxidative stress in cells was the focus of work by C. Georgiou of the University of Patras (*Eu J Oncology*, Libr. Vol. V:63, an ICEMS Monograph,2010).
12) the non-thermal coupling of microwaves and cancer tissues was investigated by J. Pokorny and colleagues from the Czech Academy of Sciences in Prague (*Eu Physics J*, 2001, 40). This was discovered earlier by E.H. Frick and S. Morse in 1926 (*J Cancer Res*, 1926, 10);
13) effects on pregnancy and on offspring due to microwave exposure were observed, inter alios, by N. Seyhan and colleagues from the University of Gazi in Ankara (*EBM, 2006, 25(4)*);
14) the antagonistic effect of 50 Hz frequency on the action of melatonin and tamoxifen in therapies was studied by C. F. Blackman and colleagues from the US EPA (*Bioelectromagnetics* 22(2):122, 2001);
15) a syncarcinogenic effect of extremely low frequencies combined with gamma rays was detected by M. Soffritti and colleagues from Istituto Ramazzini in Bologna (*Eu J Oncology,* Libr. Vol. V:219, an ICEMS Monograph, 2010). Gamma rays are ionizing radiation widely used in diagnostics and therapeutics, primarily for women.

Importantly, the ruling of the Supreme Court in Brescia underlined the discrepancies between the low evidence of risk found by industry-funded studies and the higher evidence of risk found by independent studies, such as those by the Swedish group directed by epidemiologist L. Hardell, spotlighting a significant issue of modern science: conflicts of interest and the problem of industry funding of research that is suspected of "bias," manipulating scientific results for marketing purposes. It is also important to underscore that before the decision of Brescia, which was ruled under the Civil Code since it was a work lawsuit, there were two other positive judgments in Italy under the Penal Code:

1) the case of the radio-TV stations of Magdalene Hill in Brescia[3], where the Court of Brescia – the same one that adopted the recent civil ruling – condemned the owners of radio-TV stations on the hill for "dangerous launching."[4]

[3] Court of Brescia, Sentence July 7 2008. Court of Appeals of Brescia, Sentence Nov. 21, 2011 no. 2622.

2) the case of Radio Vaticana in Rome, where the Italian Supreme Court was required to ascertain the penal relevance of emissions exceeding the *attention value* established in Italy, i.e., 6 V/m for the electric field due to RF/MWs, which was introduced by decree 9/11/1998, n. 381, in accordance with the position document of the Ministerial Committee (decree 6/2/1997) including P. Comba, M. Grandolfo and L.Giuliani[5].

The Supreme Court stated that radiofrequency emissions above 6 V/m represent a crime of "dangerous launching" punishable by Article 674 of the Italian Penal Code. Since Article 2043 of the Italian Civil Code states that damages caused by a delictual action have to be compensated, the Brescia Court's decision in favor of Mr. Marcolini was a logical consequence. Article 2043 of the Civil Code is, in fact, inherited from the Roman Right, specifically from the Lex Aquilia introduced by the Tribune Aquilio Gallo in 287 B.C., which stated that even damages caused by negligence ("culpa laevissima") had to be compensated. The Roman Right provides a specific law on damages so that judges need only establish whether or not a damage occurred (the so-called "an", that is the Latin word meaning "whether") and, then, determine the "quantum" (the Latin word meaning "how much") of the compensation.

In the Case of Magdalene Hill, the Italian Penal Court of Appeals stated that the violation of the Penal Code occurs every time exposure limits are exceeded. In the recent judgment regarding the work lawsuit in Brescia, the Civil Court of Appeals emphasized (at the beginning of the rationale of the decision): "*the use of cell phones or radio-telephones for many hours (5/6 every day), and the left ipsilateral use...have been fully witnessed. Based on this point, which quantifies the exposure level, the consultant of the Court must begin …*".

Two previous "an" were already established in the cases of Magdalene Hill and Radio Vaticana. However, the "quantum" had to be correlated to the extent of the damage. That was the main task of the consultant of the Civil Court of Appeals, Dr. Di Stefano, and of Dr. Grasso, neurosurgeon at the Brescia Hospital, consultant of Mr. Marcolini. In this regard, he showed the clear relationship between heavy ipsilateral exposures to mobile phone EMFs, as in the case discussed in the lawsuit, and the development of neuromas of the acoustic nerve, well known in epidemiological studies, especially those by Lennart Hardell.

Dr. Grasso underscored that the neuroma of the trigeminal nerve, discussed in the lawsuit, presented the same histopathology of the acoustic neuroma, already correlated to EMFs in epidemiology – both are schwannoma - and that the two tumors stem from the same cerebellar site from which the two nerves originate. Given that, it is possible to extend all considerations about acoustic nerve neuroma to the trigeminal nerve neuroma. The "an" - i.e., the causal nexus between heavy, ipsilateral, long-term use of mobile phones and the neuroma of the plaintiff - was reinforced, and the extent of the damage was recognized as being equivalent to that resulting from acoustic nerve neuroma.

Given the Italian Court cases, it is possible to conclude that the protection of public health from radiofrequency exposure could be improved by adopting a framework of restrictions, proceeding in several steps:

1) establish a framework for restricting people's exposure to radiation from cell phones, which are able to induce exposures of hundreds of V/m, especially in the connection phase, by extending the actual limits for whole-body exposures to partial exposures, as well. Partial

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[4] "Dangerous launching" is a violation of the Penal Code that refers to the launching of physical objects that can be dangerous into the environment. A ruling of the Supreme Court in the trial of Radio Vaticana stated that this violation could be applied to EMFs because of the equivalence of energy and matter.

[5] The Italian Framework Law 2001/36 on EMF protection provides three ceiling limits:

i) an exposure limit that should never be surpassed, either for acute or for long-term exposures;

ii) an *attention value* for places where people stay for more than four hours;

iii) a *quality limit* that is aimed at providing a progressive mitigation of people's exposures, with reference to more sensitive subjects. Progressive mitigation implies the *prudent avoidance* principle in projecting new installations, as a corollary of the precautionary principle, stated in law 2001/36, Art. 1. The Italian President of Council's Decrees, dated 7/8/2003, stated the respective limits as: 20 V/m (1 W/m^2) as *exposure limit*, 6 V/m (0,1 W/m^2) as attention value (the same value introduced with decree 9/11/1998 n. 381); while the quality limit is the same as the attention value, thus, in fact, denying its aim.

exposures include all exposures where, given the relative position of the electromagnetic source and of the target, the whole body is not directly involved (e.g., people's exposures due to portable devices, including mobile phones and cordless phones);

2) establish a framework for restricting people's exposures that includes ***attention values*** (i.e., ceiling values for non-occasional exposures), at least on the order of 1/100 of the ***reference levels*** reported in guidelines (e.g., in EU Rec. 1999/519/CE), as already provided by the law in Italy, in Switzerland and in Poland (6 V/m for RF/MWs, respectively, in 1998, in 1999 and in 2002) and in Russia (2003) and in China (13,5 V/m for RF, 2003);
3) penalize those who exceed attention values (as in the cases of Magdalene Hill in Brescia and of Radio-Vaticana in Rome, although nobody paid due to the "prescription of offenses");
4) provide legal compensation for damages. (This is easier today in Italy because of the three previous judgments: two under Penal Law and, the most recent, under Civil Law).

Given the amount of scientific evidence regarding the biological and health effects of radiofrequency radiation, new, biologically-based, safety standards need to be adopted to protect the health of mobile phone users[6].

Moreover, the *attention value* adopted in Italy, Switzerland and Poland for whole-body radiofrequency exposures needs to be defended, and then enhanced so as to reach a **ceiling value of 0,6 V/m for the electric field (1 mW/m2 for power density).** This value was previously proposed in the Salzburg Resolution (adopted at the Conference "Cell Tower Siting" organized by the Land of Salzburg on June 7-8, 2000), and more recently recommended by the Council of Europe (Parliamentary Assembly May 6, 2011, Doc 12608)[7]. Meanwhile, all previous achievements should be extended worldwide.

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Livio Giuliani, ICEMS Scientific Secretariat and Spokesman
Morando Soffritti, ICEMS Steering Committee Chairman

Edited by Marne Glaser and Francesca Romana Orlando, ICEMS Managing Secretariat.

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[6] Despite the classification of K. R. Foster in his so-called "Thermslist," the reference level of 10 W/m^2 for RF/MWs with a frequency higher than 2 GHz (61 V/m for the electric field), as reported in ICNIRP Guidelines (1998) and in IEEE C95.1 (1999, a revue of the 1991 std., revision of ANSI C95.1, 1982), is due to outdated and poor science that does not include in its database non-thermal effects and mechanisms of interaction between electromagnetic fields and living organisms. (For a survey, see "*Non-thermal effects and mechanisms of interaction between electromagnetic fields and living matter,"* an ICEMS Monograph, L. Giuliani and M. Soffritti eds., Eu J Oncology Libr. Vol. 5).
On the contrary, the common Italian, Swiss and Polish standard of 0,1 W/m^2 (6 V/m for the electric field), as well as the Russian and Chinese standards, take into account not only thermal effects but also non-thermal effects on organisms exposed to RF/MWs. (In Foster's "Thermslist," the Italian standard is not listed in the table of standards, even though it is mentioned in the text in association with the Swiss standard, both of which are reported as standards generically related to the precautionary principle. This is a very curious forgetfulness, since one of his references is a joint paper by K.R. Foster, M. Repacholi and P. Vecchia (Science 288:979, 2000), the latter having signed the Ministerial preparatory paper (Fogli di Informazione ISPESL, S(4), 1997, in Italian) for the Italian framework law. Perhaps K.R. Foster prefers not to list or discuss the rationale of the Italian standard, the earliest of the standards that are independent of the ANSI/IEEE model.

[7] As recently as this week, the Italian Government under Mr. Monti, who governs without having been elected and who served as a consultant of Goldman Sachs, issued a decree-law that repeals the attention value. While ostensibly maintaining the nominal limit value of 6 V/m, the new law states that this value will now be averaged over a 24-hour period (which includes nighttime when exposures are lower), rather than a 6-minute period, as previously established, thus allowing much higher peak exposures to occur. This is, in effect, a stealthy way of elevating the ceiling value for exposures.
The government of the Czech Republic has already erased the previously established RF/MW exposure limit of 6 V/m, as of 2002, in order to accommodate the Czech standard to IEEE C95.1 (1999).