

Electromagnetic biocompatibility through CMO

Compensatory Magnetic Oscillation

at the level of DNA

**Effects of electromagnetic radiation
from GSM mobile phones
on DNA and stress proteins and
biological protection through CMO-Tecno AO
(compensatory magnetic oscillation)**

2003

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Commentary, summary and extracts of key points
from the article by Professor R. Goodman**

**Effects of mobile phone radiation on reproduction and development in *Drosophila melanogaster*
David Weisbrot , Hana Lin , Lin Ye , Martin Blank , Reba Goodman
Journal of Cellular Biochemistry. Volume 89, Issue 1, 2003. Pages: 48-55**

DNA – HSP – EMF - CMO -Tecno AO

DNA (DeoxyriboNucleic Acid) / HSP (Heat Shock Proteins) / EMF (Electromagnetic Fields)
CMO (Compensatory Magnetic Oscillation) / T.A.O. (Technology of Autonomous Oscillators)

*Effects of electromagnetic radiation
from GSM mobile phones
on DNA and stress proteins and
biological protection through CMO – Tecno AO
(Compensatory Magnetic Oscillation)*

Commentary, summary and extracts of key points from the article by Professor Reba Goodman in 2003 published in the Journal of Cellular Biochemistry : Effects of mobile phone radiation on reproduction and development in Drosophila melanogaster “

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Professor R. Goodman (Dept of Pathology – Columbia University Health Sciences- New York) is one of the world experts in genetics and the study of biological effects of electromagnetic fields on DNA.

In particular, she has done much work and published on the changes in stress proteins activity (Heat Shock Proteins or HSP) in relation to the exposure of organisms or cellular cultures of different types to electromagnetic fields (EMF).

These proteins are omnipresent throughout evolution, from the most primitive bacteria to man. In evolved organisms, HSP are present in all tissue as well as in cytoplasm, in mitochondria, in endoplasmic reticulum or the cell nucleus. As the name indicates : Heat Shock Proteins, « proteins of thermal shock », HSPs are synthesised following stress or shock.

If thermal shock was the first known factor capable of inducing the synthesis of these proteins, a host of other factors that cause the production of HSP have been identified since their discovery in the 70s. Oxidants and free radicals, certain heavy metals, ethanol, metabolic poisons (arsenic), a lack of glucose, etc....all induce the synthesis of HSP in cell culture systems.

ELF electromagnetic radiation, even of low intensity, also induces their synthesis. (*cf. Goodman magnetic field of 60Hz on man*)

HSPs are involved in many physiological or physiopathological processes, in many very varied situations, all of which makes it difficult to take a simple view of their role, since their functions cover very different fields.

It is possible to say that HSPs have two mutually contradictory roles : ” The « good » HSP, which have many beneficial functions, such as the control of the folding of proteins, called the role of a chaperone with the prevention or correction of the denaturation and agglomeration of proteins with its opposite, the « bad » HSP which are involved in some physiopathological processes such as autoimmune illnesses, infectious sicknesses and bacterial virulence factors ; they are also involved in prion diseases.”

All HSP are markers of cell distress. In effect, the higher the expression of these proteins, the greater the stress.

On the genetic level, it is the activation of the gene *c-myc* which causes the synthesis of HSP 70 proteins. HSP 70 protein increases when the organism is in the presence of toxins and is therefore considered as a significant marker for the evaluation of environmental pollution.

Professor Goodman’s team has studied certain DNA chains and has previously demonstrated the activation of the genes *c-myc*, *c-fos* and *c-jun* following the exposure of organisms to radio frequencies or to extremely low frequency (ELF) radiation at very low intensities, so low as to rule out any possibility of thermal effects.

These three genes, *c-myc*, *c-fos* and *c-jun*, also have an important role in the regulation and control of the development of organisms and are known to be involved in the cells carcinogen process.

The study of these factors of cell growth is also crucial to the evaluation of electromagnetic pollution, since their regulation by the growth hormone (GH) correlates to the general development of the organism, its metabolism, the death and renewal of cells, and in certain conditions, the promotion of cancerous cells. This growth activity is controlled by the genes *c-fos* and *c-jun*, through the DNA controlling sequence called SRE (Serum Response Element).

OBJECT OF THE STUDY

This new study by Professor R. Goodman of Columbia University NY (2003) has the objective of quantifying the impact of radiation from mobile phones on DNA and in particular at the level of the genes *c-fos* and *c-jun*, by measuring :

- the induction of the synthesis of HSP 70
- the level of SRE

The study has created a greater understanding of the influence of EMF from mobile telephones on the functions of growth, reproduction, possible cancerisation, and to put forward HSP as a new indicator of the degree of biological stress of the exposed cells.

The study has also evaluated the *biological effect of a compensatory technology using magnetic oscillation* « Compensatory Magnetic Oscillation -CMO technology (TecnoAO-MP12) », tested as a protector of cells against the genetic effects of radiation.

The results of the measurements are as follows :

RESULTS

	Controls, without GSM	exposed to GSM	exposed to GSM + CMO
HSP 70	1.0	3.6	1.7
SRE	1.0	3.7	1.0

These results demonstrate cellular stress linked to the exposure to a mobile telephone, through increased production of the HSP 70 proteins (3.6 times base level), as well as the overproduction of the cell's growth factor by the activation of SRE (multiplied by 3.7).

Following this study, the authors underline the necessity to question the « safety standards» applied to mobile telephones based on SAR (Specific Absorption Rate) by adding to them or replacing them by biological values that take into account the genetic response to this electromagnetic pollution. HSP provides viable and sensitive biological markers which can act as the basis for realistic safety standards in respect of mobile telephones.

The return to normal of SRE (at 100%) through CMO protection, together with the reduction of 73% in HSP, in comparison to the organisms exposed to radiation from a GSM telephone, provide an irrefutable biochemical proof of the effectiveness of this innovative biotechnology.

These results of protection of the stress proteins and DNA through the addition of compensating electromagnetic oscillators (CMO-Tecno AO) to mobile phones, corroborates the results of bioprotection for all the biological parameters of cellular and systemic stress previously studied with CMO (micronuclei, calcium, ACTH, corticosterone, neurogenesis, embryonic mortality, melatonin, cortisol, monocytes, nitric oxide)

CONCLUSION

This publication in the « Journal of Cellular Biochemistry » is a further validation of the CMO-Tecno AO technology, which brings a reply and a solution to the problem of biological effects caused by exposure to mobile telephones. The confirmation of the biological effectiveness of this protective technology at the level of the most critical controls of cells (DNA), should make it easy for Industrialists and Politicians to put into effect the Precautionary Principle.

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ANNEXE

Abstract of : **Effects of mobile phone radiation on reproduction and development in *Drosophila melanogaster***. David Weisbrot , Hana Lin , Lin Ye , Martin Blank , Reba Goodman. Journal of Cellular Biochemistry. Volume 89, Issue 1, 2003. pages: 48-55

In this report we examined the effects of a discontinuous radio frequency (RF) signal produced by a GSM multiband mobile phone (900/1.900 MHz; SAR \sim 1.4 W/kg) on *Drosophila melanogaster*, during the 10-day developmental period from egg laying through pupation. As found earlier with low frequency exposures (0 Hz to 100 MHz), the non-thermal radiation from the GSM mobile phone increased numbers of offspring, elevated *hsp70* levels, increased serum response element (SRE) DNA-binding (i.e. DNA regulator -which is *c-fos* and *c-jun* genes expression) -and induced the phosphorylation of the nuclear transcription factor, ELK-1.

The rapid induction of stress proteins *hsp70* « *heat shock gene* » within minutes, by a non-thermal stress, together with identified components of signal transduction pathways, provide sensitive and reliable biomarkers that could serve as the basis for realistic mobile phone safety guidelines.

Extract page 54, chapter : “**Biological criteria for realistic cell phone safety standards**”

“It is important to note that all but the last of these studies(*) have used exposures from pure RF fields. The present study, therefore, adds to the demonstration that biological effects occur with an actual cell phone. The experiments reported here can be reproduced since cell phones can be readily purchased and the ELF and RF fields we utilized are well characterized.”

(*) « ...In vitro studies include increases in chromosome aberrations and micronuclei in human blood lymphocytes (Garaj-Vrhovac et al.,1992), increased ornithine decarboxylase activity (Litovitz et al.,1993), single and double strand DNA breaks (Lai and Singh, 1996) , increases in cell proliferation (Kwee and Raskmark, 1998), increased levels of the stress protein *HSP70* (DePomerai et al.,2000) and non thermal activation of the *HSP27/p38MAPK* stress pathway (Leszczynski et al.,2002).

Studies using in vivo models provide additional examples, including increased permeability of blood-brain barrier in rats (Persson et al., 1997) promotion of lymphoma in transgenic mice (Ripacholi et al., 1997) and pathological effects induced by embryonic and post-natal exposure to EMF radiation by cellular mobile (Youbicier-Simo and Bastide, 1999, 2001) »

Extract from : **Electromagnetic fields may act directly on DNA**. Blank M. Goodman R., Journal of Cellular Biochemistry. Vol: 75, Issue: 3, 1999, p 369-374

”A wide variety of environmental stimuli induce the expression of stress response genes, including high temperatures, hypoxia, heavy metal ions, and amino acid analogs. Stress genes are also induced by low frequency magnetic fields.

The cellular response to magnetic fields is activated by unusually weak stimuli, and involves pathways only partially associated with heat shock stress. Since magnetic fields interact with moving charges, as we have shown in enzymes, it is possible that magnetic fields stimulate the stress response by interacting directly with moving electrons in DNA.“

BIOELECTROMAGNETISM

HEALTH AND ELECTROMAGNETIC COMPATIBILITY

BIOLOGICAL EFFECTS OF ELECTROMAGNETIC RADIATION : POSSIBLE PATHOLOGIES AND METHODS OF PREVENTION

How to apply the Precautionary Principle in the field of Public Health for the exposure to electromagnetic fields (EMF) of low intensity, such as those emitted by mobile telephones, their relay masts, screens of visual display units and telecommunications.

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Summary

This article will deal in the first instance with the assessment of electromagnetic compatibility between living organisms and electrical or electronic equipment, that is to say with the biological compatibility or incompatibility of exposure to a non-ionising electromagnetic radiation.

Secondly, going beyond the criteria set in terms of physics for Electromagnetic Compatibility standards between machines, which are the technical considerations of manufacturers of electronic equipment, we shall address the concept of **Electromagnetic Biocompatibility and the research that has made its realisation possible, which could lead to its** general acceptance and the setting of appropriate health standards.

Over the last forty years scientific literature has highlighted many instances of the effects of non-ionising electromagnetic fields (EMF) (in the spectrum of extremely low frequencies (ELF), micro-waves (MW), micro-waves pulsed in ELF...etc) on biological parameters studied in animals and in man.

Today the biological disorders observed are still the subject of scientific and political debate as to their role in pathology in man or in the breeding of animals. In particular in relation to exposure to high tension power lines, to machines and installations relating to telecommunications (computers, television), or to mobile telephones and their emitting relay masts.

These debates and the accumulated data and facts lead the legislator logically to the « Principle of Precaution » and give rise to comment on the tools and methods relevant to its application.

For the scientist, they stimulate studies directed towards finding a technological solution to prevent problems that may give rise to potential health problems, through a necessarily biophysical approach, which leads to the concept of « Electromagnetic Biocompatibility ».

In reality it is not conceivable to stop the technological development of electronic products which multiply every day, creating an accumulation of different electromagnetic fields in the space inhabited by man.

But this growth means account must be taken of the electromagnetic sensitivity of a living organism, inherent to its biological functioning, which is itself electromagnetic !

Bio-compatibility of artificial electromagnetic fields

Just as the assessment of pollution is correlated with tests and experimental facts, so the development of standards and biological protection should also depend on the results of experiments.

It should not be possible to introduce scientific and technological discoveries to the market without their ability to maintain or improve human quality of life and man's physical and mental health having been proven.

This is however not the case for the majority of industrial and technological developments that affect the life and daily comfort of the population.

To be biocompatible is not to produce any negative effect in the short, medium or long term on the health or balance of a living organism.

Particles of both inert and living matter are, through their atomic structure, linked electromagnetically. So - since living organisms are electromagnetic in nature at the level of their atoms, their cells, their structures - one can assume that the phenomenon of interference and resonance found in classic Physics apply to a living organism.

- The observation of biological malfunctions and pathological symptoms originating from chronic electromagnetic stress in general supports this assumption.
- Alternatively, thanks to these laws of physics, it has been possible to develop electromagnetic (EM) therapies and EM bioprotection technologies by modifying or cancelling the biological responses to external polluting EMF.

A score of studies of different biological parameters and of the human response to exposure to EMF from equipment used by the public, show that it is possible to reduce the observed biological effects through the simultaneous use of a technology of compensatory magnetic oscillation (CMO) and so to prevent the development of possible public health problems.

The possibility of establishing a technology to achieve *electromagnetic biocompatibility* with any biologically incompatible radiation is a new method, at once effective and realistic of applying the *Precautionary Principle*, a principle which, legally, depends on the state of current proven scientific knowledge.

*

A new publication in April 2003, has been added to the dossier, which confirms the significance of the parameters studied for their electromagnetic bio-sensitivity and which validates the effectiveness of bioprotection by compensatory oscillation (CMO-Tecno AO).

The study in question is that by Professor Reba Goodman (Columbia University, New York) - specialist in the biological effects of electromagnetic fields on the genome. This experiment concentrated on the effects of mobile telephone radiation on the Heat Shock Proteins (HSP) and on DNA and their protection through the above technology. It shows that - despite the low intensity of the non-thermal radiation from the mobile telephone -, DNA is electromagnetically sensitive and the production of heat shock proteins increases greatly, and additionally that an oscillation of ultra low intensity (CMO-Tecno AO) is capable of compensating for and correcting these effects of stress.

Rf. this dossier (pages i to vi) : EM Biocompatibility at the level of DNA

(* Effects of mobile phone radiation on reproduction and development in *Drosophila melanogaster*.)

Weisbrot D, Lin H, Ye L, Blank M. and Goodman R. Journal of Cellular Biochemistry. Vol. 89, Issue 1, 2003, pages 48-55. <http://www3.interscience.wiley.com/cgi-bin/issuetoc?ID=104088364>)

**ELECTROMAGNETIC BIOCOMPATIBILITY
INTERACTIONS BETWEEN ELECTROMAGNETIC FIELDS AND LIVING BEINGS
EXAMPLES OF THE USE OF THE PRECAUTIONARY PRINCIPLE.**

R. Messagier, M. Fillion-Robin, I. de Joncourt . International Centre of Research in Electromagnetic Biophysics - Tecnolab

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**ELECTROMAGNETIC BIOCOMPATIBILITY
INTERACTION OF ELECTROMAGNETIC FIELDS
WITH LIVING ORGANISMS.
EXAMPLES OF THE APPLICATION OF THE PRECAUTIONARY PRINCIPLE**

I. 1. The concept and reality of electromagnetic biocompatibility

“Electromagnetically biocompatible” describes any process, item, device, factor, which emits an electromagnetic field of low or high intensity in the various frequency ranges of the electromagnetic spectrum and does not directly or indirectly adversely affect the health or the balance of a living organism, be it in the short, medium or long term. It respects the hippocratic principle : “Primum non nocere”. A fortiori : Any EM emitter that maintains or improves health is deemed “ biocompatible ”

This concept concerns and should be applied to :

- all devices, systems, equipments, installations and electrical/electronic components, which are capable of inducing biological disturbances - be it in the short, medium or long term - in a living organism exposed to their radiation;
- medical devices that emit radiation as well as therapeutic methods that use irradiation;
- all electromagnetic protection devices marketed to protect users from electromagnetic fields (including those emitted from video display units, mobile phones and GSM base transceiver station (BTS) : these devices are protective only if they create EM biocompatibility with the related polluting EM field.

The setting of electromagnetic biocompatibility is the suppression or the maximum possible reduction of any biological disruption induced by an irradiating process, item, device or factor. This biocompatibility can be established through the correction of these noxious effects by devices, techniques or processes creating EM biological compatibility for the exposed living systems.

(CMO-Tecno AO technology meets this new concept)

Today the WHO considers that the increase in electromagnetic pollution at home and in the workplace is a factor that is increasing the general level of stress for the population. The International Agency Research in Cancer (IARC) has classified ELF (Extremely Low Frequencies from 0 to 3000 Hertz) as a “carcinogenic factor, with limited or possible evidence”.

The population is continuously submerged in the ever-expanding fields of technological origin. Man is affected by these fields, as are other living organisms. These assumptions have been confirmed by a huge amount of scientific evidence (Bersani, 1999).

However, at the same time, many authors have noted that the physical origins of this phenomenon are not yet clear, with biological phenomena often seeming to be paradoxical. This enables certain people to speculate on the safety aspects of EM radiation in directions that are not always compatible with Science. In particular, the manufacturers of everyday electrical appliances, such as mobile telephones, computers and televisions continue to confirm that their products are risk-free, based on the fact that the radiation emitted by their products is not intense enough to provoke the deleterious heating of biological tissues.

Simultaneously, however, a great number of experiments demonstrate that weak and hyperweak EM fields may have an impact on living tissues and even on whole organisms and that the effects of these fields on the living body are characterised by “windows” for biological responses.

Such observations contradict the paradigm on which existing safety standards are based, which is that EM fields can only induce biological effects if they cause a heating of tissues or - for extremely low frequencies (ELF) - if their intensity exceeds fixed limits.

I. 2. The inadequacy for living organisms of current non-ionising radiation standards

Current safety standards, which have been fixed for the exposure of people, consist of limiting the intensity of radiation. They are exclusively established by the same physical measure of the quantity of energy radiated from the emitter or absorbed by the inert material that is exposed to it (SAR).

Safety standards in Western countries do not provide an appropriate level of protection, in comparison with Eastern countries (for example, Russia), which are much more restrictive, resulting from their experience of non-thermal and ELF effects.

“More generally, current UK and European Community Electromagnetic Compatibility (EMC) legislation requires that all electronic goods offered for sale in the EU continue to operate satisfactorily up to an electric field exposure of 3V/m.

Unfortunately, however, the same concern does not currently extend to the alive human organism, which is generally considered immune from adverse influences of GSM radiation, on account of its intensity* being far too low to cause any deleterious degree of heating of body tissue (as quantified through the so-called specific absorption rate, or SAR); indeed for humans, contrary to the case of electronic instrumentation, this heating is generally considered to be the only adverse effect possible. Furthermore, paradoxically some thermally based safety guidelines (such as those of ICNIRP or CENELEC) actually permit users to be exposed to electric fields over ten times stronger than the EMC standard of 3V/m (for electronic devices) ! [G.Hyland]

**Intensity is expressed either as an electric (magnetic) field strength in V/m (Tesla), or as a power density, in units of Watts/cm², according as whether near or far field conditions obtain - the former being relevant to handset use, and the latter to public exposure in the vicinity of a Base-station.”*

- about extremely low frequencies (ELF) and non-thermal effects

In a scientific analysis carried out by Western and the former Soviet Union experts in 1998 regarding works that had been completed in Eastern countries and which to that date were unknown in the West, experts recommended that the establishment of standards protecting humans against radiation should take into consideration very low and extremely low frequencies (Grigoriev, 1998). This recommendation came at an appropriate moment, in particular because extremely low frequencies have been recently classified amongst potentially carcinogenic agents (Portier and Wolfe, 1998).

In 2001, standards would have to take into consideration the decision taken by the International Agency for Research in Cancer (IARC), an agency belonging to the World Health Organisation, of classifying the range of frequencies of ELF in the category “class 2B”, that is a “carcinogenic factor, with limited or possible evidences”.

This classification of carcinogenicity for the ELF range shows that the athermal effects should be generally taken into consideration (as ELF belong to a range of frequencies that have no thermal effects).

- paradoxes between the standards specified for different radiation emitting machinery

EM standards are established according to frequency ranges and by the level of exposure (intensity, power), although that results in certain paradoxes:

- no standard is established for the ELF emitted from cellular telephones, whilst the intensity of ELF given off by mobile handsets (which are held next to the ear) may reach a power between 10 and 25 times higher (1.8 μ T to 5.2 μ T; Linde T. and Mild Kh.) than that of MPR3 standards which relate to the ELF emitted by computer screens (0.2 μ T at 50 cm)

- whilst residents have *continuous* exposure to emitting relay masts and base stations of mobile telephony, as well as their micro-wave radiation being modulated in ELF, there is no recommendation, guideline or directive which takes into consideration the non-thermal effects of ELF signals from a relay station.

Furthermore, it is ironic to note that current legislation in the EU on **ElectroMagnetic Compatibility (EMC)** requires that all electronic devices that are on sale should function satisfactorily until being exposed to an electrical field of up to 3V/m;

- however, for the living organism, human safety standards (which are still absurdly based on strictly thermal considerations [i.e. exclusively considering intensity], such as the ICNIRP or CENELEC standards), permit users to be exposed to electrical fields that are over ten times stronger than the level set by **EMC** standards of 3V/m for electronic items.

- **about micro-waves, thermal effects, mobile phones and S.A.R.**

Standards, or rather recommendations, for mobile telephony only concern exposure levels that could lead to heating effects in tissues, of acute level and in the short term, as a direct response to “high doses”.

Standards for emissions from cellular telephones, which are valid for the range of micro-wave frequencies of 0.8-0.9 to 1.8-1.9 GHz are based on heating, as quantified by the evaluation of the Specific Absorption Rate (S.A.R.) of energy by the tissues.

Therefore they only take into consideration the thermal effect.

“Most of the time, SAR measurement is applied either to animal cadavers or to synthetic equivalents of tissues or “phantom” organs, whose physical and chemical properties are compared to those of living tissues. As SAR cannot be measured in a living human brain in its “electromagnetic” activity : the probe is submerged in a liquid that is meant to simulate the electrical properties of biological tissues.

The “phantom” is only the synthetic replica of the volume of a human head filled with a saline liquid which corresponds to physiological serum. However, phantoms and bodies are inert objects, which by their very nature are lifeless, and are therefore unable to give any measurable biological response. As a result, the SAR is only the physical signature of the electrical component of micro-waves and in this respect has no biological meaning, since its measure is not contemporaneous of the observation of a biological effect on the living organism. Of course, the measure of the SAR on the living organism presents technical problems that are more than difficult to solve ! We may therefore question the validity and the usefulness of the SAR as it is currently measured or calculated, except as a simple indication of the quantity of energy deposited in tissues.” [B.J.Youbicier-Simo]

- **Reducing radiation is not a solution given biological results**

For computer screens, the MPR3 standards take into consideration the non-thermal effects of ELF on health (as ELF belong to a range of frequencies where there is no thermal effect and that standards require a maximum reduction in the intensity of their emissions, which corresponds to an attempt to regulate non-thermal or athermal effects).

However, despite this standard for a minimum intensity of ELF, biological disturbances and health problems result (Youbicier-Simo 1997; Bastide 2001), as will be demonstrated in the published studies that are described later on in this document.

For the “guidelines or recommended limits” regarding mobile telephones (any legal standard does not yet exist) , only the thermal effect (SAR) of micro-waves is quantified, whilst the ELF and their non-thermal effects are not taken into consideration.

However, despite this limitation (SAR) – or the progressive reduction - of the intensity of micro-waves by the manufacturers and even after the total removal (experimentally) of micro-wave radiation, biological disturbances are seen with the same degree of intensity (Youbicier-Simo 2000-2001; Bastide 2001).

The Extremely low frequencies (ELF) of computer screens, mobile telephones and base stations for mobile telephones cannot be removed : neither the reduction in intensity, nor the techniques used to filter the other frequency ranges, are able to provide a solution for the effective protection of living organisms.

As the quantitative and proportional relationship of the “dose-effect” is not linear, i.e. **the intensity** of the electromagnetic field, its increase or reduction does not lead to proportional biological

response (either increases or falls) in living organisms that are exposed to these fields, we cannot systematically expect a reduction in the symptoms of biological stress (or prevent the onset of stress processes at the cellular and organs levels) through reducing the intensity or the power of the ELF radiation or micro-waves.

It is clear that the increased number of relay antenna of lower power than those in existence does not guarantee that there will not be any biological reaction or response, nor the safety of residents' health guaranteed. No studies by the industrial or governmental research networks have been published on biological reactions to exposure to a base station of strong or weak intensity.

However, the results of a study on embryo mortality carried out by TECNOLAB for three levels of BTS (Base Transceiver Station) exposure : at 41V/m, 6V/m and 2V/m show that the highest level of toxicity is found at 41V/m (79% mortality) it falls at 6V/m(51% mortality), and that, although lower, toxicity is still present at 2V/m (32% mortality).

- Where biological protection is concerned, why are the principles of these standards questionable?

Because a protection standard for living bodies should mainly rely on biological responses. But at present these standards are established according to theoretical values and conventional physics, obsolete criteria that are inappropriate for living organisms.

Indeed, theoretical works in biophysics and the most recent experiments in animals or human beings have shown that:

1) There is no limit for a lower theoretic intensity limit with a non-ionising effect on the cell of a living being", (Dr.V. Binhi in "Magnetobiology" - Academic Press).

Living organisms are sensitive to ultra low intensities of external fields because the organism itself functions by using extremely low electromagnetic energy.

This sensitivity implies:

- Either at atomic level : the capacity for example for the eye to detect a single light photon. (For the record : the photon is the elementary particle carrying the smallest amount of electromagnetic energy specific to each frequency).

- Either at cellular level : the capacity for the proteins and the genome to respond, to be affected or to react at ultra weak intensity and extremely low frequencies;

- Either, at organ level : e.g. the capacity of the brain or the heart, to enter into resonance with similar external frequencies and intensities. The heart emits at the intensity of 100 000 femtoTesla for electrical frequencies of 1 to 2 Hz. The strength of magnetic emission of a human brain is around 150 femtoTesla for electrical frequencies of 0 to 31.5 Hz. The magnetic storm induced in the brain by an epileptic seizure produces an induction of 1000 femtoTesla for frequencies close to 17-18 Hz. Remember that the ELF magnetic field of a video screen is 250 nanoTesla at a standard work station, which is one million times higher than those developed by the above mentioned organs.

2) the duration of exposure and its chronicity are key factors in determining biological reactions (Pr. Y. Grigoriev).

3) the prolonged usage of standard apparatus does not exclude the possibility of either acute toxicity expressions or the symptoms of chronic stress (Bastide; Canavan; Clements-Croome; Stepanov; Miyata; etc.).

(1)See biblio. ref. "1. Standards"

II. Interference and resonance between EM radiation and the fields of living cells

II. 1. At the level of biophysics : the disruptive effects of EMF on ionic exchanges

The particles that make up inert matter as well as those of living matter are identical, and have electromagnetically linked exchanges. The atomic structure is composed of the positive electrical charge of protons and of the negative electrical charge of electrons surrounding the nucleus.

The atoms that form the four fundamental elements that make up living systems (carbon, hydrogen, oxygen and nitrogen) are linked by their electrical and magnetic properties. Therefore man is a living matter and the atoms of which he is composed, from his cells to his organs, are essentially electromagnetic.

- Oscillations and ionic interferences of living cells

The living cells release various coherent electromagnetic emissions within a very large spectrum of frequencies. The ions that they themselves contain generate two known types of electromagnetic fields, ELF and microwaves:

- **ELF ionic oscillation is that of the "cyclotronic resonance"** of ions, which corresponds to the rotation of the ion around its axis. Its frequency varies slightly depending on the geomagnetic field.- The mean values of cyclotronic resonance of the main ions are:

Sodium = 30Hz; Potassium = 17 Hz; Potassium41 = 50 Hz; Calcium = 35 Hz; Magnesium = 55 Hz; Lithium = 100 Hz; etc.

The frequencies of these cyclotronic resonances characteristic of the ions present in the organism lies within the spectral frequency band of common electrical appliances, or of their first harmonics. For example the refreshment of a screen occurs between 60 and 100 Hz; the ELF emissions of a mobile telephone include the 30-40 Hz range, in which lies calcium frequency (35Hz) or 217 Hz which is the first harmonic of iron 51, etc.

Therefore, interference from electrical appliances with living organisms is obvious and is in the scope of basic Physics.

Furthermore, these assumptions have been largely proven experimentally for the calcium ion (Ca⁺⁺): *"...much research has been carried out, with results proving that: ...- the membrane Ca is probably the target of the EMF – mechanisms affecting the modification of calcium flows in the brain cannot be explained by traditional theories of biochemistry... one has to note that the existence of this window effect calls into question – at least partly – the concept of the threshold of activity and therefore the safety level established from the SAR or the intensity of the field..."* (MIRO L. Risks linked to radio-electro-magnetic rays – *Editions techniques- Encycl. Med. Chir (Paris – France), professional Toxicology-Pathology, 16-521-D-10, 1994, p.6)*

- **Microwave ionic oscillation** is that of the **lateral oscillation** of ions in the cavities of the proteins : the ions Ca⁺⁺ and Mg⁺⁺ for example oscillate between 1 and 2 GigaHertz, which are precisely the carrier-frequencies of mobile phones using the GSM and DCS systems.

From these non-thermal biophysical phenomena, it results an inadequacy between the present Safety standards and biophysical reality ... as discussed in the following paragraphs:

Extracts from : « **Theoretical and Experimental Evidences where Present Safety Standards Conflict with Reality** » M.Fillion-Robin, V.N.Binhi ; *Electromagnetic Environment . Health in Buildings Conference; Royal College of Physicians, Proceedings May 2002 London.*

....."Why do cardiac people have malaise, blackout, during a magnetic storm ? (Y. Gurfinkel) Why is there a correlation between the level of electromagnetic background and the incidence of cancer [Portier *et al.*, 1998] ? Why do so many medical centers use electromagnetic exposures to treat a wide variety of disorders in humans?

Both experimental findings and theoretical developments indicate that EM fields — even when they are too weak to be able to provoke any degree of deleterious heating of the tissues — may result in a variety of different biological effects.”...

“Nevertheless the thermal effect of electromagnetic fields is the only effect that is currently considered in the development of electromagnetic safety standards (e.g. for cellular telephony).

Indeed, there are other influences, such as **quantum molecular interference**, that may cause non-thermal biological effects which illustrates a similar functioning of resonance.

The interference of quantum states of ions with groups of molecules explains many of the paradoxes concerning the non-thermal effects of EMF “...

“Binhi (1997) suggested that a nonlinear effect, involving the interference of quantum states of ions and molecules bound within some proteins – particularly calcium and calmodulin, is a general molecular target for the external EM fields.

The ion interference mechanism predicts several peaks of biological effects in many cases: modulated magnitude magnetic fields, magnetic vacuum, pulsed magnetic fields (Binhi 1998), weak AC electric fields, shift and splitting of MBE spectral peaks under the rotation of biological samples, combined action of different magnetic fields and magnetic noise, bioeffects of modulated micro-waves.”

“In accordance to the ion-interference mechanism, the threshold field for biological responses to the ELF electric field falls into the range of hyperweak electric fields [Binhi *et al.*, 2000]. Ion interference mechanism applied to rotating biophysical structures, such as DNA-RNA fragments, provides a basis for understanding how weak EM fields affect biology [Binhi, 2000]. Of special interest is the existence of molecular gyroscopic degrees of freedom, because these degrees of freedom are not thermalised on biologically relevant time scales. Therefore, mechanisms that involve molecular gyroscopes can account for the biological effects of hyperweak EM fields [Binhi, 2002]. It is important to keep in mind that the possibility of the interference mechanism depends on the value of the local static magnetic field. Since this field varies in a complicated manner throughout the interior of modern buildings, the interference effect at the molecular level and consequently the biological endpoint, may not be reproducible in different places, even when all other EM fields are the same.

All living matter is built from the same molecular bricks — amino-acids and proteins. Despite their inherent differences they have very similar biophysical structures. Therefore, it is clear that the interference mechanism (a molecular physical theory) is equally applicable to biological systems having different levels of complexity. If an effect exists for one biological system at given EM fields, one may expect one for another biological system exposed to the same EM fields. The only condition for this is the presence in both systems the *same* molecular EM target.

Molecular mechanisms of biological sensitivity to EM fields are consistent with the fundamental quantum limit of sensitivity to electromagnetic radiation.”

(2)(3) See biblio. ref. "2. Biophysics - Mode of action - 3. Ultra-weak fields"

II. 2. Biological parameters disturbed by EMF and possible consequences for human

> Indicators of biological incompatibility with EMF

The results of numerous works in biology enable medical science to establish possible links between disrupted biological parameters that are observed under chronic exposure to EMF and certain pathologies.

The studies that have been cited in this document were completed in several universities in France and other countries, in co-operation with the laboratory TecnoLab, an international centre of research in electromagnetic Biophysics. They have been published, or publications are in progress, in peer-reviewed international scientific journals.

All the following parameters, which have each been studied by this research team, were retained for their relevance in terms of potential deleterious effects. The results of experiments themselves are developed in the following chapter.

a/ Calcium

Calcium ions are involved in the activity of numerous body enzymes. Subsequently, any change in the intracellular level of calcium is likely to induce changes in intracellular enzymes, notably those of kinase proteins involved in signal transduction. (Dayanithi G, -INSERM Montpellier)

For example, in rat pituitary cells exposed to electromagnetic radiation from a mobile phone, the reported simultaneous increase in the intracellular concentration of Ca^{++} and the increased secretion of ACTH (adrenocorticotrophic hormone) have modified the activity of enzymes involved in the synthetic cascade of this hormone.

When there is an accumulation of intracellular calcium, the latter is the result of a shift in ion charges, which are otherwise deficient in other parts of the body. It is possible to assume that these changes in intra and extracellular concentrations cause the body to make use of mechanisms designed to recover or return calcium to “normal” levels, inducing, as such, cellular stress with a risk of a loss in balance during long term exposure, or the striking of a new balance/equilibrium on another potentially pathological level of functioning.

Ionic movement of Ca^{++} is subsequently going to have an impact on the movement of other ions whose metabolism is interdependent, notably inverse shifts in Mg^{++} (Magnesium).

In terms of the Central Nervous System (CNS) and the neuromuscular system, it is known that Ca^{++} plays a very important role in neuromuscular excitability, notably in the autonomous nervous system. These abnormalities could result in disorders like spasmophilia with other kinds of malaise and functional secondary deregulation of organs or main functions such as the heart, circulation, digestion, respiration, pain sensitivity or sensitivity to other stimuli.

b/ Corticosterone – ACTH

Changes in hormone release can also be a primary consequence of these ionic abnormalities, with abnormal changes in ACTH, cortico and mineral-steroid hormones, calcitonin, PTH, and melatonin. (B.J. Youbicier-Simo, M. Bastide, -Montpellier University, 1997, 2001. Alonso G.-CNRS Montpellier; Dayanithi G, -INSERM Montpellier, 2001)

Changes in these hormones cause, in turn, systemic disorders:

- In the nervous and muscular systems, psychological instability, irritability, tendency towards depression, concentration and memory disorders, insomnia, muscular weakness, cramps, contractions.

- In the immune system, a drop in the performance of defense mechanisms against bacteria, virus, parasites, allergies (degranulation facilitation of histamine releasing cells), tendency towards maintenance or worsening of inflammatory or auto-immune diseases in genetically predisposed individuals.

c/ Melatonin

It has anti-radical, anti-tumor, and sleep inducing properties. At high doses, it also possesses anti-epileptic properties.

The reduction in melatonin observed in many studies (B.J. Youbicier-Simo, M. Bastide, MESR- MENRT- Montpellier University, 1997, 2001) could therefore cause a decrease in the recycling systems of free radicals with, as a consequence, the acceleration of oxidative stress, premature aging, and acceleration of an already developing tumor process.

Sleep disorders are also possible, causing in turn, a cascade of tiredness and fatigue that can lead to depression..

A significant reduction in melatonin could also lead to an increase in epileptic seizures in patients or predisposed individuals.

d/ Nitric Oxide

An increase in exhaled NO (E. Stepanov ; V. Binhi – Russian Academy of Sciences – 2001) leads to the assumption that there is a possible local increase in blood in the organ the most exposed to a mobile phone during a call: the brain.

NO, like calcium, is however a ubiquitous messenger. Its properties are vasodilating and pro-radical.

An increase in plasma or a local increase could be the cause of other more virulent free radicals causing cell damage, consuming peripheral melatonin, reinforcing the effects of a reduction in melatonin, (i.e. pro-tumoral), and an aging accelerator.

Locally, NO can be neurotoxic. It is possible that a decrease in neurogenesis in the hippocampus may also be related to it.

In terms of the external ear, vasodilatation can be a source of heat and redness and for the inner ear, of dizziness or loss of balance due to changes in blood flow in equilibration organs.

e/ Immune response

Immune depression in young chicks exposed to screens (B.J. Youbicier-Simo, M. Bastide, Montpellier University, 1997, 2001) should lead to work focused on the possibility of benign chronic or recurring infections like a “head cold”, or even more serious ones, as factors contributing to further compromising HIV carriers or other slow developing virus.

f/ Neurogenesis

The decrease in the neurogenesis of hippocampus cells (Youbicier JB; Alonso G; CNRS Montpellier –2001) could be at the root of memory disorders; since this structure is involved in short term memory and learning mechanisms. A renewal problem for these cells could cause abnormalities of these functions.

g/ Cell cores

The multiplication of micro-cores observed in immune cells (lymphocytes – macrophages) (Youbicier-Simo JB.; Fernandez A.; CNRS Montpellier; 2001) is a sign of dysfunction of the cells in question resulting in their death and destruction or in their anarchic development leading to a subsequent rise in cancer risk.

h/ Embryo mortality

The observance of a very significant rise in embryo mortality in chickens (B.J. Youbicier-Simo, M. Bastide, Montpellier University, MESR-MENRT 1997, 2001; Pr. Y Grigoriev 2001 – Russian Academy of Sciences, Moscow; F. Battelier -INRA, Tours France) can result in consideration of the possibility of early spontaneous abortions, the increase of which has already been debated with screen work.

i/ Corneal damage

The corneal lesions reported by some (M.Miyata, Univ. Tokyo – 1999) can result in keratitis or kerao-conjunctivitis, especially if the repair mechanisms, which are mediated by exchanges of nervous information and ionic exchanges, are disturbed.

j/ Chronic stress symptoms

The symptoms reported in the clinical investigations of Prof. Clements-Croome tend toward the direction of the pathogenic hypothesis presented above. In fact, when in these investigations, the compensatory oscillation technology developed by TecnoLab was used to neutralize the biological effects of EMF, a 33% mean decrease was observed in the number of symptoms reported in VDU or mobile phone users (900 individuals), which was quantified through a scale designed to assess environmental stress.

A significant decrease is noted in :

- Ocular irritation,
- Inflammation of the respiratory tree and the ENT sphere,
- Fatigue,
- Mood, sleep disorders ,
- Memory disorders,
- Headaches,
- Articular pains ...

All of these symptoms can be superimposed on the list of disorders that can occur pursuant to biological effects triggered by EMF exposure and listed above.

Inducing a biological effect in a living organism through exposure to a EMF means making this organism or some of its cells compensate for this effect, to reestablish its anterior balance through an adaptation effort, with energy consumption, which constitutes a constraint imposed on the cells of the organism, thus electromagnetic-caused stress. They are further consistent with the **process of biological stress of electromagnetic source** developed by the TecnoLab research team.

(4) See biblio. ref. ”4. Experimentations –EM exposures”

III. Research into the corrective effects on the biological disruptions through exposure to therapeutic or compensatory EM fields.

III. 1. Non-thermal electromagnetic therapies

We can already understand the electromagnetic sensitivity at very weak intensity of a living organism through the established therapeutic efficacy of exposure to sub-thermal electromagnetic fields of various kinds under clinically controlled conditions, such as in connection with accelerating the healing of bone fractures, for example, or by increasing the efficacy of ionising radiation so that smaller doses can be used.

Perhaps even more remarkable is microwave resonance therapy, which can restore homeostasis in a wide range of pathologies by utilising ultra-low intensity radiation of a specific frequency.

In cardiology, an example of the therapeutic use of sequences of microwave radiation (of 42 GHz at 10 microwatts per cm²) leads to a reduction in arterial tension and a slowdown in a person's heartbeat, in addition to a sedative effect (N. Lebedeva). In general, Russian hospitals use frequencies from 30GHz to 300 GHz at extremely low intensities, of just a few microwatts.

(5) See biblio ref. 5. "Therapeutics"

III. 2. History of the principle of electromagnetic bioprotection :

CMO (Compensatory Magnetic Oscillation)

Following to the research approach of electromagnetic therapies, whose application encourages the repair of (bone) tissue, the arrest of destruction processes or of anarchic multiplication, regulates the dysfunctioning of cells, some biophysicists have sought to produce effects of biological protection against external pollutant fields, using other fields which encourage biological equilibrium.

Developed along the lines of the Russian school, which is highly advanced in the domain of electromagnetic Biophysics, and the work of several Europeans, such as C. Smith, F-A Popp or J. Benveniste, has come the research and discoveries of TecnoLab. TecnoLab has developed and validated a principle of biological protection through ultra-weak compensating emissions, produced by electromagnetically treated saline solutions, leading to the creation of Compensatory Magnetic Oscillators (CMO).

At about the same time in 1995, E. Fesenko demonstrated (confirming the work of Kislovsky in 1971) that saline solutions that had been EM treated "remembered" their EM treatment and therefore had modified the long-term functioning of Potassium membrane channels.

In 1995, V. Lobishev, followed by V. Novikov in 1999, showed that the luminescence of aqueous solutions that contained impurities or various proteins, after an EM treatment (using weak fields) could modify their physical and biological characteristics for several months...

In 1999, A. Goldworthy demonstrated the removal of structural calcium from the membrane surface of cells in the presence of EM treated water.

In fact, the biological effects of electromagnetically treated aqueous solutions have been studied by different scientists for over thirty years. Whilst biophysicists had been able to observe that aqueous solutions – which make up the basic essentials of living organisms – might be modified by an irradiation, more recently they learnt and noted that the water contained in living organisms was disturbed by the exposure to an increasingly dense artificial electromagnetic environment.

Following this line of research, TecnoLab's team, directed by Maurice Fillion-Robin, took on a major challenge: attempting to determine a specific and expected biological effect that offsets the biological effects of disturbing emissions coming from the most ubiquitous radiating devices in daily use, through the specific electromagnetic treatment of saline solutions.

The quantum mechanics established that a large number of different ions (Ca^{++} , K^+ , Na^+ , Mg^{++} etc.), which are usually linked to proteins, may be unexpectedly freed by the presence of ultra-weak fields. These environmental fields act on the phase and the form of the wave function of the ion concerned and promote its release from the protein to which it should normally remain linked, so causing biological disorders that generate electromagnetic stress and associated symptoms.

In theory, this phenomenon may be counterbalanced by a compensatory electromagnetic oscillation, which aims to maintain the phase and the initial form of the ionic cloud concerned: Tecnolab's scientific team developed CMO (Compensatory Magnetic Oscillation) which enabled this result to be obtained.

A new biophysical approach to study the interactions of non-ionizing radiation with matter has given prominence to the importance of the biological response of a living organism under electromagnetic exposure, as opposed to the reaction of inert matter.

In fact, the biological response is adapted and specific to each organism, while the reaction of inert matter is foreseeable and systematic.

The adaptive nature of the biological response of a living organism exposed to electromagnetic signals can be explained :

- at a physical level, by the complexity of physical interactions between natural and artificial (man-made) electromagnetic fields surrounding living organisms ; such as complexity being inherent in the specific features of the interfering fields (frequency, amplitude, form, phase, est.)

- at a biological level by the multitude of potential action mechanisms (VN.Binhi) likely to account for interactions between exogenous fields (natural and artificial) and endogenous ones generated by target organisms.

The various models of biomagnetic reception (V.Binhi) allow investigation of fine mechanisms underlying the global biological response clearly shown by in vivo tests.

Tecnolab has applied such an experimental process :

- to show clearly the induction of **electromagnetic stress** by non-ionizing radiation from commonly used devices and installations;

- to design a technology, whose compensation oscillation makes radiating devices bio-compatible.

In order to assess the protective effectiveness of these different oscillators, specifically tuned to each type of stressing radiation from electronic devices, several studies were performed in animals (embryology, immunology, endocrinology, cell biology) and in humans (clinics, psychophysiology, neuropsychology, ophthalmology) in different universities.

In order to design a bio-protection for man in an electromagnetic field that passes through him, producing within him several changes, the research team began by looking for an electromagnetic re-balancing for man, through a compensating emission when his own electromagnetic functioning is subject to the stress of the artificial radiation that surrounds him.

The scientific group Tecnolab gave priority to the links between ultra-weak external or exogenous fields and their subtle resonance effects with ultra-weak internal or endogenous fields of living organisms.

The studies of each one of the parameters - whether hormonal, of immunity, neuroendocrinal., micro-cellular, embryonic, genetic, of blood, ophthalmological and clinical, as mentioned earlier (calcium, corticosterone, ACTH, melatonin, immunoglobulin G, nitric oxide, cortisol, monocytes, DNA) - were carried out at the same time as the development of the protection technology through compensatory emission, which was aimed to correct the biological effects by its oscillation "superimposed" or "simultaneous" to the polluting fields.

The application of this principle of bioprotection, by an oscillation of ultra-weak intensity, specifically used to compensate ionic interferences induced by EM fields from each type of radiating apparatus, took place in all the experimental protocols that have been cited above :

Out of all the biological parameters that have been studied, the evaluation of the efficiency of the compensatory oscillation was completed by comparing the results between : the exposed-group,

that was only exposed to the radiating /polluting device, with the results of the protected-group that was exposed to both the radiating/polluting device and simultaneously to the compensatory oscillator, with a placebo group and with the control-not exposed group. This control group was the reference to assess the biological and health equilibrium, as well as the criterion of biocompatibility.

On all biological parameters that were studied, results showed a very significant improvement, i.e. an advanced level of biological protection, a return to normality. And for many of them a total correction of the biological disruption: in these cases, results were identical for the non-exposed group and the exposed group plus the compensatory oscillator.

CMO means Compensatory Magnetic Oscillation, a principle of Tecno AO passive devices – AO, meaning “autonomous oscillator”, because they have no external energy source. The different oscillators are developments of CMO, whose principle is based on the transfer of information via ultra-weak fields entering in resonance with the ultra-sensitive receptors of living organisms.

These devices are specific to each of the apparatus that are used the most by the public (such as the mobile phone, VDUs, portable computers, relay masts): their ultra-weak magnetic signals are tuned with the frequencies of polluting radiation. These oscillators are autonomous and comprised of a saline solution that is structured by an electromagnetic charge, so being activated and oscillating. The solution is contained in an aluminium antenna (international patents). This non-ionising and non-toxic oscillator produces a magnetic induction of ultra-weak intensity, which may be measured like magnetic inductions of biological origin, in femtoTesla by SQUID (Superconducting Quantum Interference Device).

The compensatory emission is designed to maintain the links between ions and proteins in cells that have been disturbed and therefore protect the natural electromagnetic functioning of cells up to organs such as the brain or eye.

Biological experiments carried out by Professor Madeleine Bastide at the University of Montpellier since 1993 have demonstrated that the oscillators maintain their information over time. Indeed, the results for protection shown by biological response (embryogenesis, immunology, endocrinology) were the same after two years of using the oscillators.

(2)(3)(4)(5)(6) See biblio. ref.

IV. The application of the precautionary principle through an electromagnetic biocompatibility technology

If the biological effects linked to EMF exposure are removed or reduced in any way, we may therefore predict that this approach would *ipso facto* eliminate the possibility or the existence, whether questioned or not, of their biological or deleterious stress effects (which could lead to more or less fairly serious pathologies).

This stress may be effectively avoided at the molecular and ionic levels by ensuring the biocompatibility of EMF with the components of living organisms, thanks to the use of the compensatory magnetic oscillation (CMO*) technology as tested by TecnoLab. This technology significantly reduces the effects of electromagnetic stress and should prevent the appearance of pathologies that could result from this.

Making any artificially stress inducing EM field biocompatible seems to be possible thanks to this innovating research and developments.

This approach for bioprotection - by ensuring EM biocompatibility – should be widely developed in the future and therefore will enable a concrete application of the precautionary principle.

* CMO = Compensatory Magnetic Oscillator : Tecno AO technology

IV. 1. Relevance of biological parameters studied in terms of public health

J. Youbicier-Simo ; extract from: Electromagnetic Fields and Living Systems, 2002

” The choice of each biological parameter was dictated by its relevance as an indicator of disease states.

It is for this reason that embryo mortality is a marker for the abnormalities that occur during development (teratogenesis).

Abnormal changes in blood levels of ACTH (adrenocorticotropic hormone) and corticosteroids (corticosterone, cortisol) are symptomatic of stress. In addition, corticosteroids are immuno-suppressors, and in healthy individuals, their immuno-suppressive action is counteracted by the immuno-stimulating action of melatonin, which ensures maintenance of the biological parameters relevant to physiologic limits (homeostasis). Subsequently, the prolonged imbalance of this equilibrium outside physiologic limits could have an impact on the body’s defense capabilities in warding off, for example, a microbial attack.

Increased formation of micronuclei in cells can be a sign of cell cycle dysfunction, apoptosis (cell death) or carcinogenesis. Finally, a decrease in neuron proliferation (neurogenesis) in the hippocampus can be associated with short-term memory disorders.

Physiological disorders caused by electromagnetic rays are generally associated with changes in calcium concentrations in target cells. Given that calcium is also an important mediator (second messenger) in most of the important intracellular biochemical reactions, abnormal changes could be harmful to health. “

(6) See biblio. ref. “6. Transposition of results of experiments in animals to humans

IV . 2 To normalise the biological response to EMFs in animals with CMO

Three animal models were used by TecnoLab: chicken, mice and drosophila . These animals were exposed to electromagnetic radiation from different products: computer screen, television set, mobile telephone, lap-top computer, BTS antenna for mobile telephony.

For each study, the biological effect of normalisation obtained by the compensatory oscillation (CMO) installed on the item emitting the radiation, in comparison with the biological effects of radiation from items that were not equipped and with groups that were not exposed.

Immature organisms (embryo, chick and adult chickens, young healthy mice, i.e. animal models in the growth phase) or compromised subjects (mice with cancer) are used ; since these organisms are known to be the most sensitive to changes in environmental factors.

The use of actual emitting devices for experimental purposes enables the study of the full electromagnetic spectrum of each device, while taking into account actual spectral features of the emitted rays (intensity, frequency, form, phase, magnitude, modulation, etc.), which is not the case when the radiation is simulated in the laboratory with wave generators.

The exposure protocols applied in study animal models are toxicological in kind, i.e. the exposure is either chronic (computer, TV), or repeated (mobile phone, relay station) and long-term (3 to 15 weeks). Experimental approaches of this nature that place animals in extreme exposure conditions offer several advantages. It enables:

- to test actual EMF toxicity thresholds;
- to detect sensitive targets;
- to predict the impact of long term exposure on a human scale;
- to explain probably the absence of biological effects that characterize the great majority of studies with a too short term exposure

**Experimentations
and
Results of EM biocompatibility with CMO -Tecno AO**
(Detailed results, protocols and references of published works available on demand)

2/ a Embryogenesis

The study of embryo mortality rate of a species (chickens) reveals abnormalities that appeared during its development and which led to its death.

This study shows that even for a continuous exposure to the polluting device radiation (leading to the death of the majority of embryos), the compensatory oscillation is capable of maintaining or protecting the fundamental vital processes, reducing the rate of mortality to almost the normal level.

On the contrary, these results highlight the level of severe biological toxicity of EMF from the apparatus that were tested and particularly that of ELF's. Indeed, the virtual elimination, via filtering, of micro-wave radiation from mobile phones did not reduce the level of toxicity (NB. The magnetic field of ELF's may not be filtered or suppressed).

% Mortality of embryos (*chickens*)

(Youbicier-Simo B-J., Bastide M., 1997-2001 University of Montpellier)

	CONTROLS	EXPOSED	EXPOSED + CMO (Tecno AO)
VDU screen (computer and TV) cathodic tubes	23%	57%	29%
Portable computer/laptop (LCD) (liquid cristal screens)	16%	61%	31%
Cellular phone	15%	59%	27%
Only ELF of a cell phone	15%	76%	27%
(microwaves filtered , only. ELF's radiation)			
GSM BaseTransceiver Station BTS mast (0.9GHz)	15%		<i>(in progress)</i>
41V/m - 6V/m - 2V/m		79% - 51% - 32%	

2/ b Hormonal system

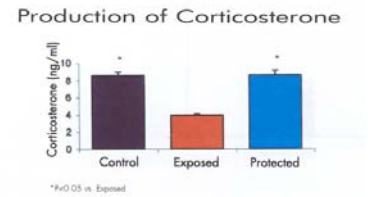
The production of **corticosterone** (in young chickens) and **cortisol** (in mice), both adrenal hormones, is stimulated by the pituitary gland (or hypophysis) in the brain, which is the “crossroads” of hormonal and immune regulations, themselves interdependent. This gland controls biological stress and counteracts inflammatory processes.

The state of biological stress observed in exposed animals returns to normal with the compensatory oscillator. These same results will be shown also in humans, precisely in the study of chronic stress symptoms.

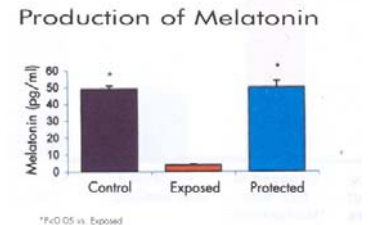
The virtual suppression of the melatonin production under EMF exposure clearly shows the inability of exposed animals to control their stress levels. On the contrary, the presence of the compensatory oscillator enables this hormone to reach normal rates. For that matter, melatonin is well known for being electromagneto-sensitive.

Young chickens - exposed 38 days to VDU screens –computer and TV - (cathode ray tubes)
(Bastide M, 1997 - Youbicier-Simo B-J ,2001 Univ. Montpellier)

Production of corticosterone :
 exposed = reduction of 50% compared with controls
 exposed + CMO = normal rate equal to controls
 * P< 0.05 vs.Exposed

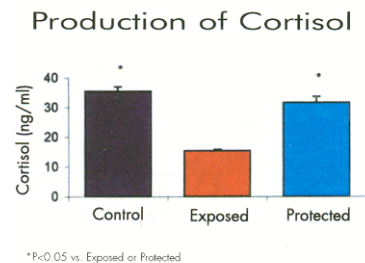


Production of melatonin :
 Exposed = reduction of 80% compared with controls
 exposed + CMO = normal rate equal to controls
 * P< 0.05 vs.Exposed



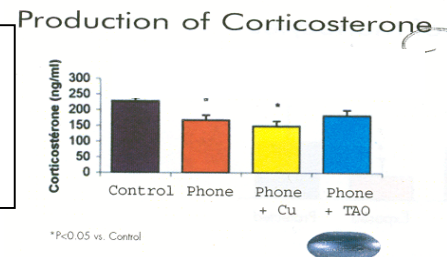
Mice - exposed for 15 weeks to VDU screens (cathode ray tubes)
(Dr. Faivre-Bonhomme ; University Hospital Paul Brousse, Paris)

Production of cortisol :
 Exposed = reduction of 57% compared with controls
 exposed + CMO = reduction of 8% compared with controls
 * P< 0.05 vs.Exposed or Protected



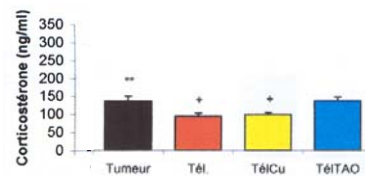
Health mice - exposed for 5 weeks to cell phone (GSM)
(Youbicier-Simo B-J , Bastide M., 2001 Univ. Montpellier)

Production of corticosterone :
 Exposed = reduction of 30% compared with controls
 exposed + CMO = reduction of 12% compared with controls
 * P< 0.05 vs. Control

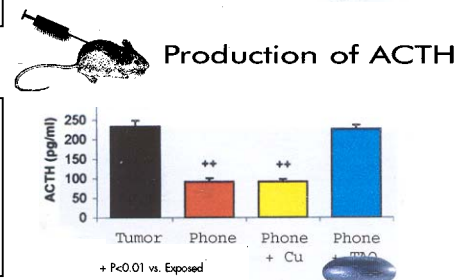


Cancerous mice - exposed for 15 weeks to cell phone (GSM)
(Youbicier-Simo B-J , Bastide M., 2001 Univ. Montpellier)

Production of corticosterone :
 Exposed = reduction of 30% compared with controls
 exposed + CMO = normal rate equal to controls
 * P < 0.01 vs. Control ; + P< 0.01 vs. Exposed



Production of ACTH :
 Exposed = reduction of 60% compared with controls
 exposed + CMO = normal rate equal to controls
 + P < 0.01 vs. Exposed



2/ c Immune system

Simultaneously to hormonal depletions, the production of **IgG anti-bodies** (immunoglobuline G: a protein of the class of antibodies) is suppressed amongst chickens which are exposed to a cathode ray tube screen, as well as the number of white blood corpuscles (monocytes) decreases, which shows a depression of the **immune system**. Those that are exposed + CMO show a level of antibodies and a production of monocytes that equals the level shown by those that are not exposed.

Young chickens - exposed 38 days to VDU screens (cathode ray tubes)

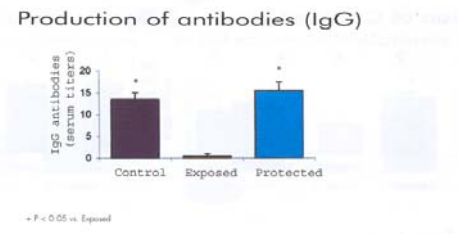
(Bastide M, 1997 - Youbicier-Simo B-J, 2001 Univ. Montpellier)

Antibodies production (IgG) :

exposed = reduction of 95% compared with controls

exposed + CMO = normal rate equal to controls

+ $P < 0.05$ vs. Exposed



Mice - exposed 15 weeks to VDU screens (cathode ray tubes)

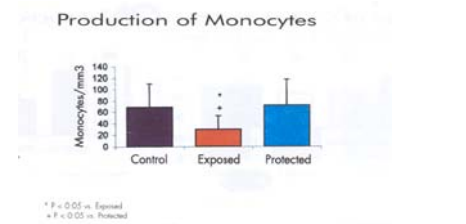
(Dr. Faivre-Bonhomme ; Hôpital Paul Brousse, Paris)

Production of monocytes :

exposed = reduction of 58% compared with controls

exposed + CMO = normal rate equal to controls

* $P < 0.05$ vs. Exposed ; + $P < 0.05$ vs. Protected



2/ d Neurogenesis

Mice – exposed to cell phones GSM / 11 weeks

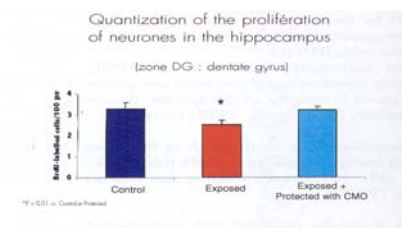
Alonso G. - CNRS, Univ. Montpellier ; Youbicier-Simo B-J - TecnoLab

Proliferation of neurones :

exposed = 25% less new neurones compared with controls

exposed + CMO = prolifération equal to controls

* $P < 0.01$ vs. Control or Protected



2/ e Genome . DNA . Micronuclei

This test consists of counting under microscope the number of fragments of DNA that are present and excessive in the peritoneum macrophages (white corpuscles, cells of the immune system) of animals that have been exposed or those that have been exposed + CMO.

These micronuclei that are present in the cell represent one initial possible step of cancerous process, if these abnormal cells are not eliminated by defence systems of the organism.

Therefore, the high number of cells that include several micronuclei (over 2 cores) for the GSM exposed organisms - clearly shows the impact of its radiation at the fundamental level of the biological system - and the virtual normalisation obtained with the compensatory oscillation (CMO) confirms the results in embryogenesis, as described above.

Mice – exposed to cell phone **GSM** / 15 weeks

Youbicier-Simo B-J - TecnoLab ; Fernandez A.- CNRS, Univ. Montpellier

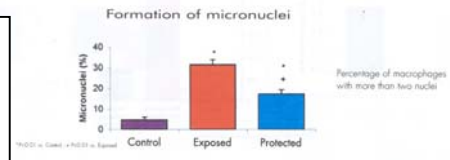
Multiplication of DNA micronuclei:

% of cells with more than 2 micro-cores :

exposed = increase of 33% compared with controls

exposed + CMO = 18% compared with controls

* $P < 0.01$ vs. Control ; + $P < 0.01$ vs. Exposed



2/ f Calcium

We saw (page 9-10) the key role of calcium in all exchanges between cells, and particularly for the nervous system tissues. The following test measures the concentration of **calcium** in the cells of the hypophysis, the centre for hormones regulation, and shows that the exposure to GSM radiation doubles its concentration.

At the same time, the release of **ACTH** (stress hormone) by the same gland is quadrupled. The CMO applied to the GSM brings these both parameters back to normal levels; parameters which are essential factors for the regulation of hormonal and immune systems.

Mice – exposed to cellular phones **GSM** / 15 weeks

(Dayanithi G – INSERM, Univ Montpellier)

Concentration of intracellular Calcium

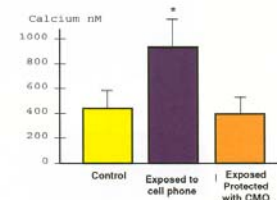
in the cells of hypophysis (pituitary gland)

exposed = increase of 100% compared with controls

exposed + CMO = normal compared with controls

* $P < 0.001$ vs. Control or Exposed and Protected

Concentration of intracellular Calcium in the cells of the pituitary gland



* $P < 0.001$ vs. Control or Exposed and Protected

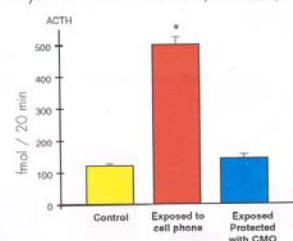
ACTH hormone release by the cells of the pituitary gland

exposed = increase of 400 % compared with controls

exposed + CMO = normal compared with controls

* $P < 0.001$ vs. Control or Exposed and Protected

ACTH release (hormone of stress) by the cells of the pituitary gland



* $P < 0.001$ vs. Control or Exposed and Protected

IV . 3 **To normalize the biological response to EMFs in humans**

Results of EM biocompatibility with CMO-Tecno AO

(Detailed results, protocols and references of published works available on demand)


3/ a Nitric Oxide (exhaled) in the respiratory system

This test developed by the General Physics Institute was carried out for the first time using GSM cell phones in Moscow : evaluation of the rate of nitric oxide exhaled by users of cell phones.

Nitric oxide(NO) is a vasodilator and a marker of tissue inflammation, of cell suffering and of biological stress.

Nitric Oxide 40% increase, present in respiration (exhalation), after 15 days of GSM use is a clear indication of the non-biocompatibility of the cell phone.

CMO applied to the GSM cell phone for another 15 days enabled the return to normal of NO production and shows that the biocompatibility of the GSM has been established by the use of the technology.

Experimental conditions	Parameter	Cellular phone GSM		Authors
		EMF	EMF+CMO	
Duration of the test = 15 days x 2 10 healthy men 45 min/day (Double blind study)	Concentration of exhaled Nitric Oxide marker of cell stress: n = 1.00 ppm	NO production 1.40 + 40% increase	NO production  1.00 = normal	E. Stepanov General Physics Institute (Moscow)

3/ b Symptoms of stress

The symptoms of stress that were studied in the protocol of Pr. D. Clements-Croome (Reading University, UK), “Building Sickness Syndrome” are usually linked to ergonomic and environmental factors and to general stress at the workplace in buildings. The chronic exposure to GSM radiation or to computer screens provokes the same type of symptoms in both cases : those of a neuropsychological nature, those of a functional nature and those of an inflammatory nature :

- fatigue, tiredness, weariness; migraine, headaches; concentration; irritability, stress; depression, pessimism; loss of short-term memory.

and/or: pain and stiffness of the neck; shoulders; arms and elbows, hands, wrists, fingers, pain of lower back

and/or: dry, itchy or tired eyes, cough, sneezing; blocked or runny nose; dry throat, thirst; sore throat, cold, flu, rashes or itches, breathing difficulties

The experiments were carried out independently at the same time with double-blind and crossed groups with or without CMO. Therefore statistically between 35% and 40% of stress symptoms found by the physicians amongst users of GSM and computers appear to be linked to chronic exposure to their radiation.

As a reminder and a possible correlation with these clinical results, note that the inflammatory parameters observed in humans exposed to such radiation, as well as immune, hormonal and cellular parameters studied in animals exposed to the same radiating devices, have shown depressions or major dysfunctions, which were indicators of a biological stress.

With CMO, the general average of symptoms that disappeared:
51% (mobile phones) et 33% (screens)

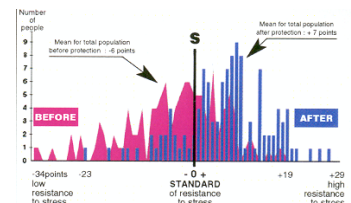
Experimental conditions	Parameter : Chronic stress symptoms	GSM Cellular phone		Authors
		EMF	EMF+CMO	
Test duration = 2 months 12 persons 1 to 3h / day (Double blind study)	« <i>Building Sickness Syndrome</i> » :	Average = 10 symptoms / per person	Average = 4.9 symptoms /per person ↓ suppression of 51% of symptoms	Prof. Clements-Croome Reading University, UK

Experimental conditions	Parameter : Chronic stress symptoms	Computer screen		Authors
		EMF	EMF+CMO	
Test duration = 2 months 965 persons (study in double blind)	« <i>Building Sickness Syndrome</i> » : -tired eyes -headaches -fatigue, tiredness -concentration -irritability, tension -cold, flu, cough -neck pain/stiffness -lower back pain, etc.	Average = 6.6 symptoms / per person ↗	Average = 4.4 symptoms /per person ↘ suppression of 33% of symptoms	Prof. Clements-Croome Reading University, UK

3/ c Resistance to stress

The “Stroop Color Word Test,” which is used worldwide by companies and by the army, quantifies the ability to resist the stress due to the interferences of different simultaneous information which include factors of speed, alertness and concentration. Computer screens (VDU) workers that were protected by CMO statistically improved their average resistance to stress by 15% relative to the period without CMO. That shows that the EMF of the computer screen is stressful and that it reduces performance at work. In addition, the results of each individual may be modified by a magnetic oscillator which compensates for these stress effects of electromagnetic origin.

Experimental conditions	Parameter :	Computer screen		Authors
		EMF	EMF+CMO	
Test duration = 1 month 119 VDU workers in Europe + 308 in Japan (Double blind study)	“ <i>Stroop Color Word test</i> ” = Stress state and Resistance to stress standard = 1	↓ = 0,94 = decrease in resistance to stress	↗ = 1.07 + 14.9 % improvement in resistance to stress	J-L. Marande Occupational Health Medicine Cochin University Hospital (Paris)



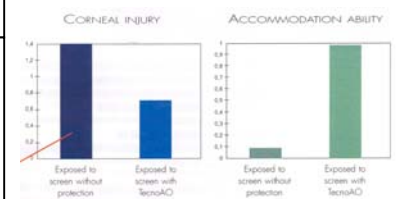
3/ d Ophthalmology

The works carried out by Prof. M. Miyata in humans and animals on the EMF effects on eyes and sight have shown that the complaints and ocular pathologies of screen users are linked to the electromagnetic fields of these items. All the results of injuries on animals - using screens that were covered with a black cloth (in order to eliminate luminosity, contrasts or stroboscopic effects) - also indicate that filter shielding screens, (which are only designed to improve visual comfort), do not protect against EMF sight effects and do not make computer screens biologically compatible with the eye or vision.

Vacuoles on the cornea are observed after four hours of playing a video game using a television set. The installation of CMO on the TV set has a corrective effect on these abnormalities in all tested ocular symptoms: it protects against cornea injury, reduces ocular fatigue and increases the ability of visual accommodation.

(Japanese Review of Clinical Ophthalmology, Vol. 11, N.93, p32-35, p1634-1637, 1999)

Experimental conditions	Parameters : ophthalmology	TV screen at 1.20m		Authors
		EMF	EMF+CMO	
Test duration = 4 hours continuously 2 sessions / 1 week distance 10 healthy women	-corneal injuries	= 1400	↘ - 50 %	Prof. Mikio Miyata Kitasato University Tokyo
	-accommodation = speed to relax	= 0.827	↘ - 20%	
	-accommodation of near point	= 0.083	↗ ability x 10	



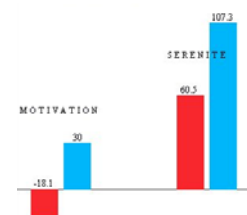
3/ e Neuropsychology

Professor A. Canavan, a neuropsychiatrist, (University of Luton, UK) evaluated the psychological and emotional state of 100 students working on screens at his university. This experiment was a crossed double blind test, for 2 periods of two weeks, by the Mood Test – Peveler and Johnson (quantification of a person's mood).

On the one hand, the increase in the level of arousal (alertness, drive, enthusiasm, liveliness, apathy, sleepiness, drowsiness, sluggishness, etc.) of the students led to a 48% difference between students using placebo and those using CMO.

Furthermore, the reduction in the level of distress (worry, tension, uneasiness, peace, relaxation, calm) showed a 46.8% difference between students using placebo and protected students.

Therefore the exposure to EMF from screens alters the psychological state and a protected electromagnetic environment, which is biologically compatible, maintains a normal level of arousal and enables people to resist distress.



CONCLUSION

It is necessary to take into account the possibility of **pathological effects resulting from the chronicity of radiation exposure, the accumulation and interactions of different types of electromagnetic sources and finally from a saturation threshold for the human organism and its homeostatic equilibrium, due to the increasing number of emitters of EMF of different bio-active frequency ranges.**

Particularly as the biological effects that were observed on all parameters confirmed the induction of a **process of chronic biological stress**, and that they indicate that a chronic exposure – even though it is at low intensity, i.e. without any thermal effect – is a factor of **electromagnetic stress**.

If the effects of this electromagnetic stress are removed or reduced, by any means, we may predict that this action will *ipso facto* eliminate the possibility or the existence of their deleterious effects and should prevent the promotion of **predictable pathologies that could result from this stress.**

The development of a **protective strategy that aims to make sources of electromagnetic pollution biocompatible** has been fully considered in the scope of the work completed by Tecnolab's Research Centre over the past ten years. The Centre's work has consisted of determining the biological incompatibility of certain non-ionising radiation in our daily environment, in addition to testing the protective effect of a compensatory emission of hyper-weak intensity that is specifically tuned to the ionic interferences induced by the stressing radiation of each of the emitting devices.

Normalised biological responses are the result of the restoration of **electromagnetic biocompatibility** between the radiating source and the living system.

Therefore, the results of bioprotection for all biological parameters of cellular and systemic stress studied with CMO*, produced by the emission of an ultra-weak compensatory field, show that this stress may be avoided at molecular and ionic levels.

These results were obtained during protocols of intense exposure by the installation on the radiating devices of compensatory autonomous oscillators (CMO) as developed by Tecnolab. These CMO have been tested in the different universities mentioned in this report and whose work has featured in peer-reviewed scientific publications.

The confirmation of the biological efficiency of this bioprotection technology at the level of **the most crucial cell regulation (DNA)**, makes it possible for Manufacturers and Politicians to take decisions regarding the simple and rapid application of the precautionary principle.

***(DNA, HSP, micronuclei, calcium, ACTH, corticosterone, neurogenesis, embryo mortality, melatonin, cortisol, monocytes, nitric oxide)**

**International scientific « peer reviewed » publications of the experimental works
concerning the application of Compensatory Magnetic Oscillation (CMO)
Tecno AO biotechnology [AO : Autonomous oscillators]**

BIOELECTROMAGNETICS, VOL 18, NUMBER 7, 1997 pages 514-523

**« Biological Effects of Continuous Exposure of Embryos and Young Chickens to Electromagnetic Fields
Emitted by Video Display Units »**

B. J. Youbicier-Simo, F. Boudard, C. Cabaner, and M. Bastide,

Laboratory of Immunology, College of Pharmacy, University of Montpellier 1 - France

PROGRESS IN RADIATION PROTECTION (IRPA Publication Series)

NON IONIZING RADIATION, NIR 99, VOL 1, 1999, pages 213-242

**« Electromagnetic Biocompatibility at Workplace : Protection Principles, Assessment and Tests. Results
of an EMF Protective Compensation Technology in Humans and in Animals »**

G. J. Hyland¹, D. J. Clements-Croome²

1- University of Warwick, Coventry, UK and International Institute of Biophysics, Germany

2- University of Reading, UK

JAPANESE REVIEW OF CLINICAL OPHTHALMOLOGY

VOL 11, NUMBER 93, 1999, pages 1634-1637, 32-35

« Ocular functions during loading by visual display terminal and the effect of Tecno AO »

Yayoi Satou, Akiko Hara, Kouji Oono, Hiromi Kikuchi, Hiroe Matsuzaki, Tatsuto Namba and Mikio Miyata

School of Medicine Kitasato University, 1-15-1 Kitasato, Sagamihara, Kanagawa, 228-8555, Japan

HEALTHY BUILDINGS 2000 : Exposure, Human Responses and Building Investigations, SYR INDOOR AIR

VOL. 1, 2000, pages 119-124

« Computers and Health in the Workplace »

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2- Jukes Association, Old Coudson, UK

RADIOPROTECÇÃO (Radioprotection) The Journal of the Portuguese Society for Radiation Protection (IRPA)
, VOL I, NUMBER 8 and 9, 2000-2001, pages 105-123, ISSN 874-7016

**« Review of Studies Validating the Protective Efficacy of a New Technology (*) Designed to Compensate
Potential Adverse Bioeffects Caused by VDU and GSM Cell Phone Radiation.» (Tecno AO : international
registered patent)**

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INDOOR AND BUILT ENVIRONMENT

VOL. 10, NUMBER 5, 2001, pages 91-98

**« Toxicologic study of electromagnetic radiation emitted by television and video display
screens and cellular telephones on chickens and mice »**

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Montpellier I.

2- Tecnolab Research Centre, Chalon sur Saône, France

JOURNAL OF CELLULAR BIOCHEMISTRY

VOL. 89, Issue 1, 2003, pages 48-55

"Effects of mobile phone radiation on reproduction and development in *Drosophila melanogaster*"

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<http://www3.interscience.wiley.com/cgi-bin/issuetoc?ID=104088364>

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(See the bibliography with 96 references) STOA Publications
- Final study : www.europarl.eu.int/stoa/public/pdf/00-07-03_en.pdf (35 pages in English)
- Briefs and Executive Summaries : www.europarl.eu.int/stoa/publi/default_en.htm (in 11 languages)
Project number (2000/07/03) date 03/2001
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