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# New Perspectives of Bioelectromagnetics in Biology and in Medicine: DNA Spectra for Diagnostic Purposes

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**Abstract.** A new perspective for the use of bioelectromagnetics in biology and in medicine is open. Montagnier and his collaborators highlighted a physical approach to the diagnosis of several diseases, base on detecting the spectra of the DNA of cells, pathogenic agents or tumor cells. The DNA is prepared in an aqueous solution. The method uses the Schuman frequency, or any ELF, to induce the DNA solution to emit electromagnetic signals in the range 300 - 4000 Hz that are producing spectra that result to be typical for each disease. Preliminary tests performed at the facility of Italian CNR – Area Tor Vergata (Rome) – seem to confirm the effectiveness of this diagnostic approach. Further tests have to be performed. The method seems to be related to the same biophysical theory – based on Quantum Electrodynamics – that is the basis of other important effects, now employed to new therapeutic approaches.

## I. Background

### *I.1 – ISPESL-CNR research: the magneto-induced differentiation of stem cells*

*I.1.1 – The Ion Cyclotron Resonance (ICR)*

Before others could notice the many possibilities of application of electromagnetism in biology, a group of ISPESL and CNR researchers (Giuliani L., D'Emilia E., Grimaldi S., Ledda M., Lisi A.), on the basis of preliminary results which correlated the exposure to low frequency magnetic fields with the tissue response and with the processes of cellular maturation [1-3], decided to focus on the use of weak magnetic fields for the differentiation and maturation of stem cells [4]. A breakthrough was made with the Liboff-Zhadin's effect study [5-7], which allowed the creation and implementation of a *magnetic cell differentiator*, patented jointly by CNR and ISPESL [8], and with the partnership with N. Bobkova and M.N. Zhadin [9-10]. It was understood that the greater biological effectiveness was related to the use of ICR, rather than the frequency (50/60 Hz) and this allowed us to refine the protocols of cell exposure, thus achieving the first successes of magneto-induced cell differentiation [11]. A collateral discovery was given by the experimental confirmation of the fact that the ICR is capable of moving currents of ions into the cell, as explained in [12ª], whence comes the following figure 1, and as can be seen better in the videos available on You Tube [13].

*I.1.2 – A possible treatment of heart attack*

The collaboration with the Sapienza University of Rome - Department of Experimental Medicine - made it possible to successfully apply these techniques to the differentiation of *primary cardiac cells* in *cardiomyocytes* [12ᵇ]. The result is a promising approach for the treatment of heart attacks [14]. The research *in vitro* needs to be followed by the preclinical study *in vivo* on nude mice, and then the clinical experimental study, phase 1. A research project for a preclinical study is starting today with the grant of the Italian Ministry of Health. The project involves the collaboration of the mentioned research group ISPESL-CNR, of the Florence University (Cardiolgy and Nuclear Medicine), of the Institute for Cancer Research *B. Ramazzini* of Bentivoglio in collaboration with Luc Montagnier, Emilio Del Giudice, Prigogine Prize 2009 and others. The project involves the removal, by biopsy from consenting patients, of primary cardiac cells at the Careggi Hospital, and replication *in vitro* in [12ᵇ], with the replacement of the culture technique *cardiosphere*™ (patented by the researchers of La

Sapienza) with the technique of *cultured in microgravity*, thanks to a change in the magnetic differentiator designed and built by the same research group ISPESL-CNR, still to be patented, independently or as an extension of the previous patent.

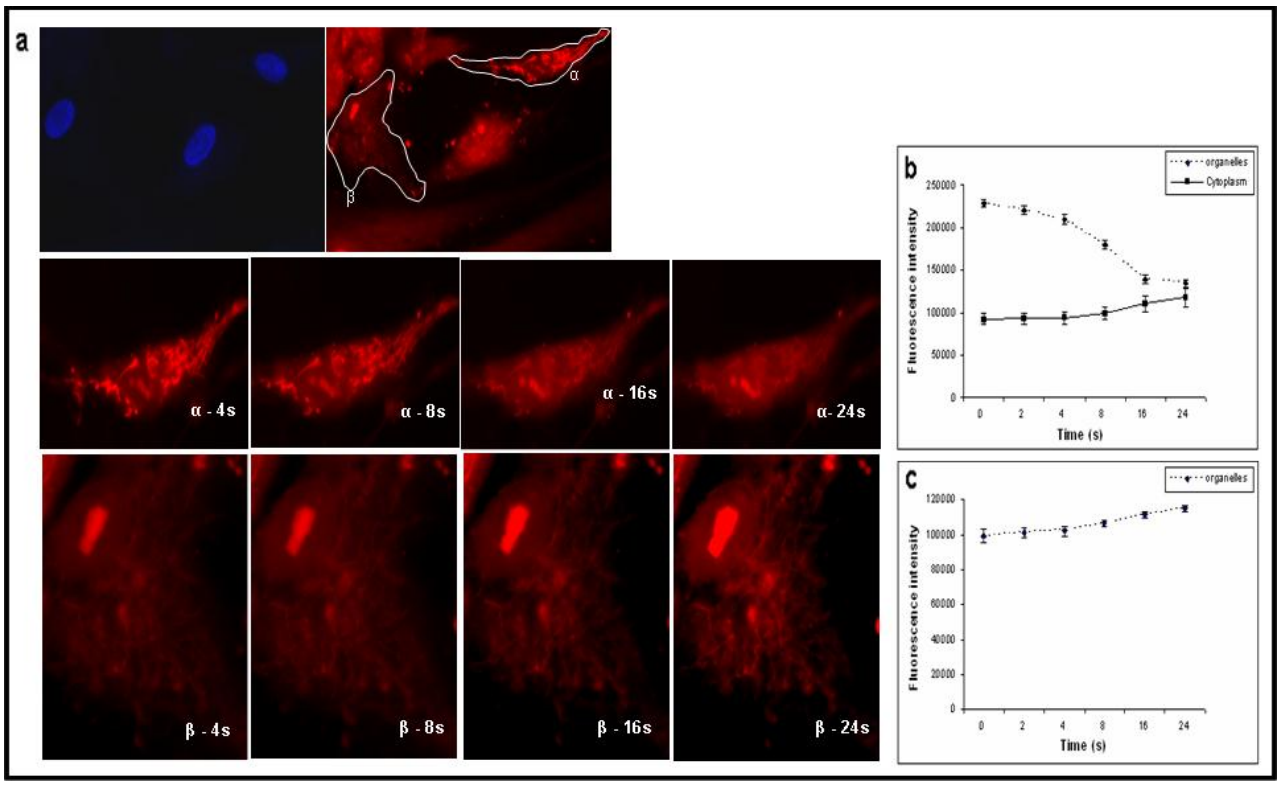


**Fig. 1** (from [12]) – Scan every 4 seconds of organelles within a cardiac human cell, incorporating a fluorescent marker of intracellular calcium. The blue areas at the top of the first slide and identify the areas α and β better resolved in subsequent slides.
*α:* mitochondria that lose calcium during exposure to Ca-ICR.
*β:* cytoplasmic organelles that incorporate the calcium released from mitochondria.

*I.1.3 – ICR for musculoskeletal developing*

The technique of cell differentiation and of the magneto-induced cell maturation appears likely to also apply to other tissues, particularly the epithelial [4[a,c]] and muscular one [16]. The latter figure was anticipated already in a study by researchers from ENEA and Padoa University [17], which in fact confirms the already known effect of electromagnetic fields of promoting ostheocitary proliferation and maturation [5[a]], on which is based the work of machinery used in orthopedics for fractures reduction in all the hospitals in the world.

The effect, which can lead to an increased and more rapid development of bone and muscle, could be exploited to design garrisons, such as clothing, bracelets, and collars, both in the adjuvant therapy of development that in the production of sports clothing to be spread both in the professionals' area as in the amateurs' world.

### *I.2 - ICR for the treatment of cancer*

There are many patents for electrical devices using magnetic fields to treat cancer [15]. The total lack of understanding, till now, of the magnetic fields interaction mechanisms with the living matter resulted in the created of machines based only on limited clinical experiences that have not been well validated.

However, recently, V.V. Novikov, Zhadin's colleague who worked on the discovery of the eponym effect, has published, with others, an important work showing the effectiveness of ICR in the Ehrlich cancer treatment in rats [18].

In the current state of knowledge it is not completely surprising. It should be considered that tumor cells are immature cells that have not completed their cycle of differentiation and maturation. So that a method, such as the one for the magneto-induced differentiation, capable of inducing differentiation in stem cells, which are also immature cells, it should not fail to cause a differentiation in cancer cells. The malignant cells could differentiate into benign tumor cells or at least less aggressive. This will lead to an improvement or a containment of the cancer effects, such as the containment of ascites in rats by Novikov *et al.*. On the other hand, the discovery of coherence in living matter opens a promising perspective, any new understanding of carcinogenesis [19].

Other suggestions are coming from the improvements of other applications of ICR [20-21] or of the coupling between the electric polarity of cancer tissues with electromagnetic fields [22-30].

### *I.3 - Risks related to use of electromagnetic devices*

On the other hand we cannot neglect the existence of risks related to the use of electromagnetic devices. Evidences of this kind of risks are not coming from healthy practices but from the daily use of electric and electronic devices.

#### *I.3.1 – Early evidences of risk*

Since 50s years, thermal effects of electromagnetic non-ionizing fields were evidenced, due to professional diseases of radar-technicians [31]. In the same period, thermal mechanisms of interaction of MWs with living tissues were fully highlighted. The main mechanism was recognized in the interaction of an electromagnetic wave with the electric dipole of the molecule of water. A living tissue is full of molecules of water, whose rotational motion induces an increase of temperature due to the Joule effect.

Twenty years later many scientists became persuaded of the existence of non thermal effects on living organisms due to radiofrequencies and MWs and it was more and more related with some other properties of waves than amplitude, as the waveform, i.e. the presence or absence of modulation and the frequency of modulating wave [32]. In some cases, the efficacy of electric field alone was considered too while the efficacy of magnetic field alone, with reference to the band of ELF, was early adopted [33]. Despite the knowledge of action mechanisms of ELF were not satisfying; soon epidemiologic data indicated a strong relationship between ELF and arising of cancer, peculiarly of childhood leukemia, while the nexus between RF/MWs and cancer was assumed by a minority of scientists only almost twenty years later [34]. At that time an unifying hypothesis were suggested involving both effects due to high voltage lines and to AM radiofrequencies or TV signals: amplitude modulated radiofrequencies acted with a mechanism overlaying the penetrating efficacy of the carrier way and the direct magnetic interaction of the ELF, due to the amplitude modulation in ELF band [35]. The same hypothesis supported the analysis of the risk related to the use of mobile phones by children [36].

*I.3.2 – Brain tumor risk*

In the last decade strong epidemiologic evidence was reached of a nexus between ipsilateral head exposure to microwaves from handy and arising of brain tumors and new evidences for the risk related to occupational exposure to RF was achieved [37]. This fact can be related with both thermal [38[a]] and non-thermal effects of RF/MWs [38[b]].

*I.3.3 – What do we learn from beneficial about risks?*

We recognize that a nested net of signals in ELF/ULF/LF band is acting in vital processes. These signals are usually very weak and are limited in narrow windows of frequency and of amplitude.
From the point of view of survival, this fact is very important, because macro phenomena are filtered in band and in amplitude: in fact only signals strictly tuned with specific frequencies and amplitudes seem to be efficacy or impacting. On the other hand this required exactness makes hard to decode and to reproduce signals useful for diagnostics and therapeutics.

However the Shannon principle on the ratio of signal and noise teaches us that we need keep As Low As Reasonably Achievable all the artificial signals that become noise in the context of the network of our own inner vital signals.

***I.4 – Physical diagnostics "selon Montagnier".***

A new perspective to diagnostics has been open by the Montagnier developing a physical approach instead the usual biochemical approach to detect bacterial or viral inflammations.

*I.4.1 – Spectra of DNA in the LF band*

In his speech to the Meeting of Nobel Laureates in Lindau in 2010 [39], Luc Montagnier illustrated the stages of the progressive knowledge of DNA, up to his latest discovery: the existence of molecular complexes in the double helix that are able to act as an antenna working in the band of LF, typically between 300 and 4000 Hz.

In two works of 2009, the Nobel Prize highlighted that the emission spectrum, due to the DNA of bacteria and viruses in inflammatory processes, is typical of the infecting organism and can therefore be considered as a means of diagnosis of infections [40]. Furthermore, in the case of HIV, the response of the physical diagnostic method seems to be more sensitive than the biochemical analysis. The physical method reveals the echo of the virus also in the serum of patients who, following treatment with antiretrovirals, are negative for biochemical analysis [40[b]]. The discovery immediately aroused great controversy, resulting in the skepticism of several scientists, mostly from USA, while the University of Shanghai has dedicated a laboratory to the great French biologist, where he will develop applications of his revolutionary discovery.

However his discovery seems to be based on a strong theoretical basis, whose links with Quantum Electrodynamics has been highlighted in [41].

***II – Improving physical diagnostics "selon Montagnier"***

***II. 1 - A test at Tor Vergata CNR laboratories***

During the last visit of Luc Montagnier, on February 16, 2011, to the laboratory of Tor Vergata, where the ISPESL-CNR patented magnetic differentiator is installed, experiments were carried out to compare the spectra of the DNA of Escherichia coli and of human colon carcinoma, detected and recorded in the non-magnetic room at Tor Vergata, with the spectra previously registered by the group of Montagnier in his labs in Île-de-France and in Camerun. Comparative experiment has been successful for Escherichia coli, while DNA of human colon carcinoma cells did not result comparable spectra.

However our preliminary results are showing that the spectrum of human colon carcinoma is quite different from that of serum only or from that of distilled water, the same water used for the preparation of the aqueous solutions of DNA on the same occasion.

### *II. 2 Materials and methods*

The facility of CNR – Tor Vergata, including the shielded room toward magnetic and electromagnetic fields, has been equipped in such a way to replicate the experiments of the Montagnier's group (fig. 2).

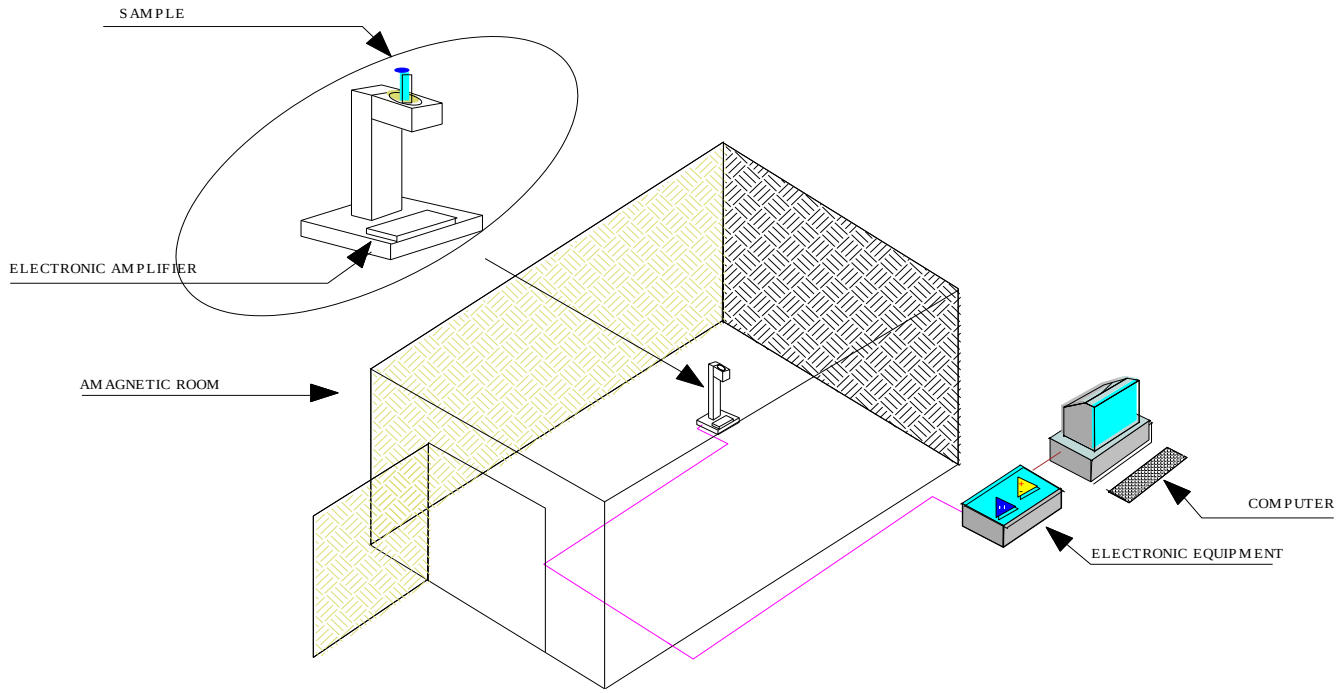


**Fig. 2** – The room shielded against magnetic and electromagnetic noise as it was equipped to replicate the experiments of the Montagnier's group.

The detecting coil, connected to the electronic amplifier, is shown in the upper left corner. A vessel with the sample is put in the coil. This equipment was located within the amagnetic room. Electronic devices, including a notebook powered with batteries, were located outside of the room, linked by means of a shielded wire, and then replaced with an optical fiber.

The electronic equipment is able to provide a signal tuned to the Schuman frequency (7.8 Hz). According to the protocol of the experiments of Montagnier and his collaborators, such a frequency, as well any ELF, is able to stimulate the emission of electromagnetic signals from the DNA of bacteria or of cells, diluted in the sample.

Our test has been led first recording the noise, then recording the spectra detected from the sample, initially full of pure water, subsequently filled with an aqueous solution of DNA of cells belonging to a line of human colon carcinoma coming from the bank of the CRN – Area Tor Vergata. Finally the spectrum coming from the PSB serum ehere tumoral cells were cultured has been recorded.

### *II.3 - Results*

The resulting spectra are shown in the following Fig. 3.

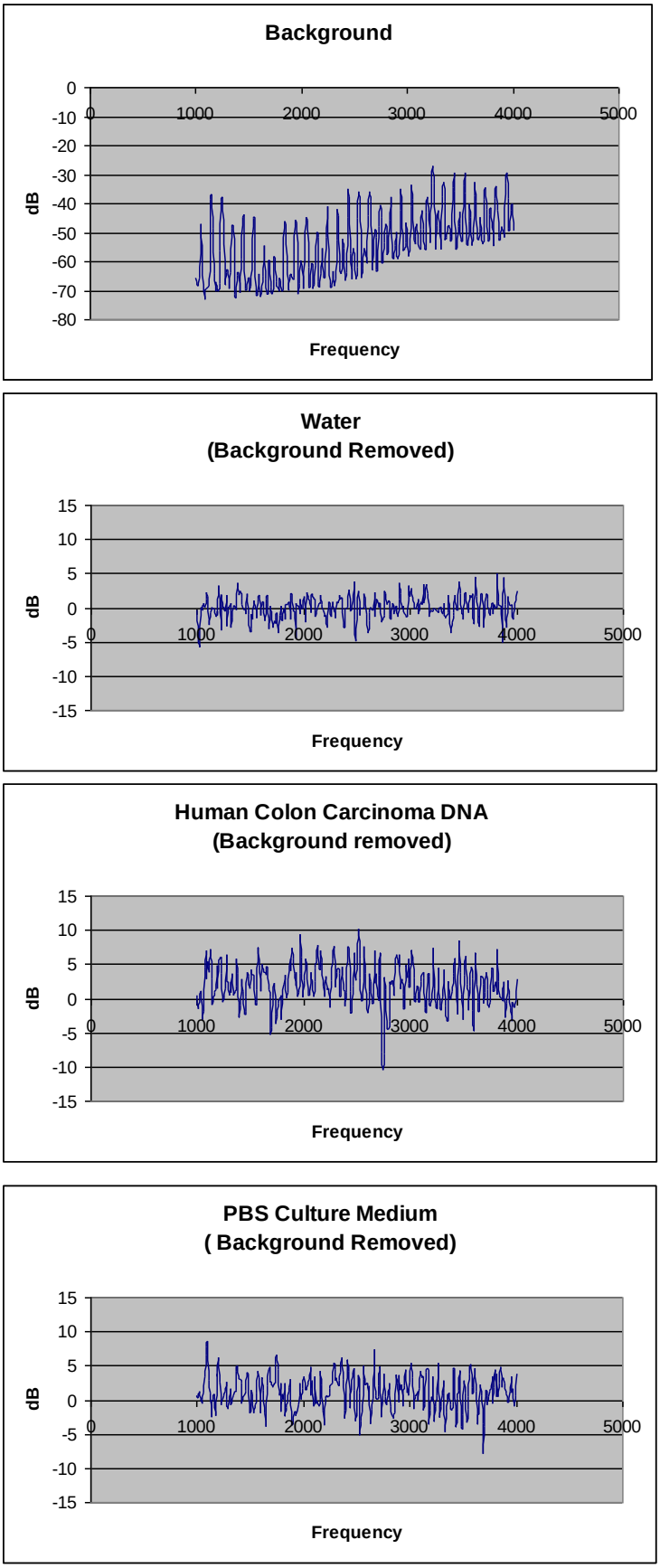


**Fig. 3** - Detected spectra. In all the spectra, except the first one, the noise due to the electromagnetic background is removed.

It is impressive that the spectrum of the vessel fill of aquaeous solution of DNA of human colon carcinoma shows an absorption peak in the neighborhood of 2,8 kHz.

However the upper results are preliminary results that have to be replicated and confirmed.

## III - Conclusions

Preliminary results are confirming that the physical approach for diagnosis of inflammations or other also severe diseases, of Luc Montagnier and of his collaborators, seems suitable to enable us to early detect the diagnosis, discriminating spectra related to the DNA, of several pathogenic agents, including bacteria and virus.

Furthermore the method can be extended to the case of several degenerative diseases, including some kind of tumors, of which we ignore today the possible viral nature [40a].

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