

# Is Wireless Technology Safe?

Dr Donald Palmer,  
Christchurch, New Zealand

*The editors thank Dr Palmer for this contribution, the title being that of a talk he gave at the Helios Medical Centre earlier this year. He continues the theme raised by Anne Gastinger in our previous Journal 14.1, subsequently re-published in the New Zealand Journal for Natural Medicine, 2012. References to recent literature on this subject appear in both those articles.*

We live in a cosmos with an electromagnetic matrix which when energised from a source is able to carry a host of frequencies and wavelengths, seemingly in the same space. A narrow spectrum appears to us as visible light, the basis of which our visual-centred age determines the 'real' world of matter. On one side of the visible light spectrum we have longer wavelengths: infra-red extending through radar, tv broadcast, microwaves, cell phone frequencies, radio waves, and Extremely Low Frequencies (ELF) from power-lines and 50-60Hz appliances. On the other side of the visible rainbow, we have shorter wavelengths: ultraviolet, X-rays and gamma rays.

A physics equation helps to explain effects of various waves of the electromagnetic (EM)-spectrum. Electromagnetic waves travel at the speed of light: visible light is part of the spectrum.

$$v = f \times \lambda$$

Speed ( $v$ ) is a constant for all the different EM waves. Frequency ( $f$ ) and wavelength ( $\lambda$ ) are in an inverse ratio to one another to maintain a constant speed ( $v$ ): the longer the wavelength, the lower the frequency (cycles per second) and conversely, the shorter the wavelength, the higher the frequency. The more times a wave cycles up and down per second (Hz), the higher the frequency of the wave, and the greater its energy and ability to 'bounce an electron up and

down' to displace it from its atom to create an ion. An ion is an atom that has become charged and therefore reactive. High frequency radiation like UV and X-ray, called *ionising radiation*, are well recognised for their role in cancer through DNA damage caused by reactive free radicals they generate when atoms in DNA are ionised. On the other end of the spectrum, longer EM-wavelengths with lower frequencies are called *non-ionising radiation*. These generate thermal effects (e.g. infra-red heating) and less well-understood non-thermal effects. It is this region of the EM-spectrum that concerns us in this discussion on wireless technology.

Marconi, a 19<sup>th</sup> century Italian inventor, is regarded as the forefather of wireless technology. In 1895, after a series of concealed indoor experiments, he took his radiotelegraph outdoors and successfully transmitted 2.4 km over a hill. After patenting his invention, he went on to develop long-range radiotelegraphy equipment and was the first man to transmit wireless across the Atlantic in 1901-02. The company he formed, *The Marconi International Marine Communication Company*, contracted by the *White Star Line*, was later acclaimed for saving lives on the Titanic. In the words of Britain's Postmaster-General, "Those who have been saved have been saved through one man, Marconi... and his marvellous invention"<sup>1</sup>.

Wireless technology has been a significant achievement of modern civilisation. Countless lives have been saved. Sophisticated monitoring equipment warns of impending dangers, radar for storm and weather prediction, for ships and air travel, emergency services radio communication, satellites, GPS navigation and even probing outer space with radio-telescopes. Radio and television

1 Berretta, G. (2011, December 22). *Satellite Technology and international cooperation are a key answer towards the international crisis*. Slide 2 of presentation given at EIII AESS Conference, Rome, Italy. Retrieved October 28, 2012 from <http://www.slideshare.net/estelconference/satellite-technology-and-international-cooperation-are-a-key-answer-towards-the-international-crisis-giuliano-berretta>.

entertainment is streamed live through invisible waves into billions of homes. Garage doors, TV remotes, smart power-meters, DECT and cell phones, wi-fi, baby monitors - the list goes on. Wireless technology has been embraced for its convenience and benefits with little awareness of its potential harms. We imagine natural protection from this novel boon, unknown to biological systems prior to the technological revolution, except from lightning and solar flares.

*Non-ionising radiation* used in wireless technology is generally accepted as safe at levels set by ICNIRP/WHO, an international council given the task of protecting us from potential harm. Output levels of wireless phones and devices are regulated to prevent risk of burns and electric shocks. The output of a wireless device is called its SAR rating. The maximal output level is set at 1.6 W/kg, with a reported 50-fold safety factor for thermal effects. Researchers have since demonstrated DNA damage in animal studies from short-term exposure at levels of 0.6 and 1.2 W/kg, significantly lower than the ICNIRP<sup>2</sup> safety margin which does not take into account less understood non-thermal effects. Given the rapid expansion of wireless technology, further evidence is needed of its safety for all living systems which are fundamentally bio-electromagnetic by nature.

Bioelectricity has been well-studied in the human body. ECG traces show electrical activity in our hearts, EEGs record electrical waves as brain neurons fire and EMGs show electrical activity of activated muscles. At a cellular level, cell membranes are polarised by groups of ions concentrated on either side: millions of miniature batteries working in us all of the time. Life processes are bioelectrical. We are also affected by magnetism. Magnetic Resonance Imaging (MRI) shows that a human body can be magnetised in a strong magnetic field, each tissue having a specific magnetic signature. In a sophisticated magnetically-shielded laboratory in Germany, the magnetic field of the human heart has been demonstrated. Biomagnetism research

has shown migrating birds, fish and bees to have organs sensitive to the magnetic fields of their migration route or local environment. In magnetobiology, the effects of weak magnetic fields on living systems have been shown. We are, it seems, integrated with the electromagnetic matrix we live in.

Electromagnetic radiation is both wave and particle in nature. Light particles, called *photons*, are carried by all EM-waves. A photon's energy is dependent on the frequency of the associated wave. Non-ionising radiation has low-energy photons. Imagine driving down a tree-lined road with the sun shining through the trees from behind. The flickering light we observe as we drive through light-shadow-light-shadow is an example of a pulsatile EM-field. This flickering on-off irritates our eyes and in some people is sufficient to trigger epileptic seizures. When we are in a pulsatile field, such as a wi-fi zone or using a DECT cordless telephone, we are bombarded in a similar way by an invisible stream of low energy photons, travelling with the EM-radiation frequency the source or receiving device is transmitting. Is there an organ sensitive to this photon stream? Deep in the human brain is the pineal gland, a light-sensitive organ that produces melatonin. Melatonin is a hormone known for its effect in providing deep, regenerative sleep and restoring the brain after its wakeful activity. Experimental studies have shown that in non-ionising EM-fields, melatonin levels drop. This may manifest as sleep disturbance, insomnia, immune system defects, and impaired cognitive function and brain development, all symptoms that have been attributed to exposure to electromagnetic radiation.

Certain people manifest symptoms attributed to non-ionising radiation to a far greater degree than the general population report. A severely affected man, a Swedish mobile phone engineer, after years of high level exposure is now so sensitive that even in his rural home he has to wear a 25% stainless steel Faradic suit to shield himself from background EM-radiation. The condition of

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2 International Commission on Non-Ionizing Radiation Protection, <http://www.icnirp.de/index.html>

Electro-Magnetic Sensitivity has been described as acute distress and anxiety when exposed to even low levels of EM-radiation. Also reported are flu-like symptoms, a feeling of blocked ears, tinnitus, difficulty with hearing and sight, the feeling of being 'turned off', lethargy, dizziness, facial flushing, reduced cognitive function and memory, and, in severe cases, collapse. The duration and intensity of exposure does appear to correlate with symptom severity and, once established, resilience to electromagnetic fields remains lowered. If some people are severely affected, we could imagine that many people may be mild-to-moderately affected as we all share similar biochemistry.

Numerous biochemical mechanisms have been investigated to explain the symptoms of EM-exposure and include: histamine-mediated allergic-type reactions; destabilisation of calcium-potassium membrane complexes with reduced cell membrane integrity; intracellular leakage of an enzyme that breaks DNA and may damage genetic material; changes in the blood-brain barrier, a selectively permeable layer that protects the brain from substances in the blood, including toxins; changes in cell cycle proliferation. Certain proteins released when the body is under stress, called heat shock proteins, e.g. CRP, have also been measured in the blood after EM-radiation exposure.

There is much debate whether non-ionising radiation causes cancer or not. A UK study showed no increased risk; however an Israeli study found a 4-fold increased risk of cancer and a Swedish study a 5-fold increase of childhood glioma, a form of brain cancer. The difficulty in interpreting these trials is that there is such widespread exposure to EM-radiation now, that to recruit a valid, unexposed control group is not possible. We may not get a clear answer to the cancer debate.

It raises the question, "When can we be sure something is safe?" The Scientific Standard demands almost 100% certainty through reproducible experiments before group consensus is reached. Where this level of certainty does not

exist or where experimental data is conflicting, groups become divided. This is a very challenging situation and gives rise to strong opinions, usually expressed by experts in positions of power, selective publishing of experimental data, hype and misleading of public officials, policy-setting groups and governing bodies. Truth is the victim. Instead what is opted for is the Legal Standard. Here 51% majority opinion is regarded as enough to prove a point, which is then professed by scientific experts as carrying the same weight as the Scientific Standard demands. Is this enough given the extent of wireless technology unfolding in our homes, schools, public spaces, suburbs and country-side? Even if only a small potential risk exists, in a system that has settled for the legal standard, how can we be accurately informed to make responsible choices about our health and safety? Until we are informed by robust, undivided scientific evidence, awareness of sources of non-ionising EM-radiation will allow us to take simple measures to minimise risk of potential harm while still enjoying the benefits of the wireless revolution in a safer way. ♦

**For further information:**

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