



Review Article

Fielding a current idea: exploring the public health impact of electromagnetic radiation

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Summary Several publications in the scientific literature have raised concern about the individual and public health impact of adverse non-ionizing radiation (a-NIR) from electromagnetic field (EMF) exposure emanating from certain power, electrical and wireless devices commonly found in the home, workplace, school and community. Despite the many challenges in establishing irrefutable scientific proof of harm and the various gaps in elucidating the precise mechanisms of harm, epidemiological analyses continue to suggest considerable potential for injury and affliction as a result of a-NIR exposure. As environmental health has not been emphasized in medical education, some clinicians are not fully aware of possible EMF-related health problems and, as a result, manifestations of a-NIR may remain misdiagnosed and ineffectually managed. It is important for physicians and public health officials to be aware of the fundamental science and clinical implications of EMF exposure. A review of the scientific literature relating to the link between electromagnetic radiation and human health, several public health recommendations, and four case histories are presented for consideration.

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'A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.' Max Planck (Nobel Prize Winner—Physics).

It was only a few decades ago when individuals queued up in shoe shops and malls to view their

metatarsals under fluoroscopy machines; with expert reassurance that such a novelty was perfectly safe, the increased cancer rates in participants came as a surprise. While there is recognition of the potential cellular and tissue damage associated with exposure to ionizing radiation from X-rays, electromagnetic radiation (EMR) emanating from power lines, mobile phones, common electrical devices and some types of machinery has also begun to attract recent attention as a potential health hazard. Conflicting

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information is found in the medical literature; while some reports dismiss the alleged risk associated with EMR, various international bodies including the World Health Organization¹ and the International Agency for Research on Cancer² (IARC) have called for intense investigation of the impact of non-ionizing radiation (NIR) on human health in response to mounting research suggesting a link between adverse EMR and various afflictions including reproductive dysfunction, cancer and central nervous system (CNS) disorders.

Overview of electromagnetic spectrum and NIR

Radiation refers to a type of energy that is given off or ‘radiates’ away from the source of that energy. There are different forms of energy, each with distinct physical properties that can be measured and expressed in terms of frequency and wavelengths. Some waves have a high frequency, some medium and some low. The electromagnetic spectrum is a name used to describe a group of distinct energy forms that emanate from various sources; the energies released are referred to as types of EMR (Fig. 1). Exhibiting high frequencies are gamma rays, X-rays and ultraviolet light; lower frequencies of the spectrum include microwaves and radio waves. Light wave emission, which occurs at medium frequencies, provides for normal vision and the light we perceive; infra-red energy allows for the perception of heat.

Most energy forms such as X-rays, ultraviolet energy and radio waves are invisible and imperceptible to the human. Without specialized instrumentation, most frequencies cannot be detected and, as a result, people generally do not appreciate their exposure to energy fields in these ranges. Despite the lack of perception, exposure to high-frequency energy including X-rays is termed

‘ionizing radiation’ and is potentially damaging to human cells. By altering the atomic composition of cell structures, by breaking chemical bonds and by inducing free radical formation, sufficient exposure to ionizing radiation may inflict DNA damage or mutation, thus increasing the risk of malignancy or cell death.

Non-ionizing radiation

‘Non-ionizing’ radiation (NIR), generally referring to energy forms with lower frequencies, has been considered safe by many scientists and without adverse effects at common exposure levels. Recently, however, increasing evidence suggests that some frequencies of NIR may have potential to cause biological harm. Most of the research on the health effects of adverse NIR (a-NIR) has been done at: (1) extremely low-frequency (ELF) energy waves produced and emitted by power stations, power lines and some electrical equipment; and (2) radio and microwave frequencies given off by wireless communication technologies, cordless and cellular phones, and some electrical materials. Current study is also investigating the potential sequelae of intense exposure to a-NIR as a result of voltage originating from ‘dirty electricity’ and ‘ground current’.

Just as clean water can become polluted when it travels through a contaminated environment, electricity becomes increasingly polluted when it comes into contact with assorted types of electronic equipment. Regular or ‘clean’ electricity enters buildings at a frequency of 50/60 Hz; power becomes ‘dirty’ or polluted when it develops scattered higher-frequency signals as a result of contact with equipment such as computers, plasma televisions and some appliances. NIR generated by dirty power may radiate to contaminate the adjacent environment and is alleged to be

Non-Ionizing Radiation					Ionizing Radiation		
Extremely Low Frequency	Radio frequency	Microwave	Infra-red	Visible Light	Ultraviolet	X-Rays	Gamma Rays
Non Perceptible			Perceptible		Non Perceptible		
Possible Biological Damage at Some Frequencies						Destructive to Living Tissue	

Figure 1 Electromagnetic spectrum—types of radiation.

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