

# RADIATION AND HEALTH

Sergio Manzetti (M.Sc. Eng)<sup>1</sup>, Olle Johansson (Ph.D)<sup>2</sup>

1. Research Scientist, Fjordforsk Research, 5746 Undredal, NORWAY. Email: Sergio.manzetti@fjordforsk.no

2. Assoc. Professor, The Experimental Dermatology Unit, Department of Neuroscience, Karolinska Institute, 171 77 Stockholm, SWEDEN.

Radiation has become an ever-present entity in modern society. Through its applications in mobile telephone networks, internet connections and high frequency antennas, and through derivation from electric circuits, electromagnetic fields and radiation affect millions to billions of people world-wide<sup>1</sup>. The application of radiation-emitting technologies increases also with population density, and questions of the effects on public health are increasingly posed. Simultaneously, sleeping disorders are reported with increasing frequency in densely populated areas, and the current lack of legislation and regulation from public health authorities fail to prevent potential hazardous effects from these man-made electromagnetic field (EMF) sources.

The ubiquitous effects of electromagnetic radiation on health have been of widespread scientific and public interest for a long time. Its adverse effects on health have been demonstrated in a multitude of reports, and among them its manifestations on sleep disorders and depression<sup>2,3</sup>. EMF-exposure is associated with psycho-emotional and cognitive disorders through its effects on neurohormonal responses in the brain<sup>3</sup>, which affect neural responses that promote depressed mental states, reduced appetite and disturbances of cholesterol levels. The neurochemical responses to EMF are in turn represented by decreased levels of melatonin and serotonin<sup>4</sup>. Decreases in serotonin and melatonin are correlated with depression, insomnia and other neuropsychological disorders, and may also be part of breast

cancer generation as well as breast cancer treatment problems<sup>5</sup>.

In a study carried out in Northern Taiwan, Li and colleagues<sup>2</sup> mapped the prevalence of sleeping disorders among 5,078 inhabitants of an area strongly affected by radiation. This urban town area was exposed to a background power-frequency magnetic field level of more than 2 milliGauss (mG). The study revealed that the inhabitants suffered from difficulties of initiating sleep, maintaining sleep and waking up early. The study also reported that extensive exposure to computers is associated with all types of insomnia. Similar findings are also supported by another study<sup>6</sup>.

Radiation and electromagnetic sensitivity have furthermore been correlated with other problems, such as tinnitus<sup>7,8</sup>, a condition that is difficult to objectively demonstrate but that affects millions of people worldwide. EMF's effect on tinnitus may also be connected to its demonstrated effects on cerebral blood flow<sup>9</sup>. It, of course, affects brain physiology and several brain functions, indicating that EMF may substantially affect the brain in everyday life in strongly or moderately exposed surroundings.

The listed studies therefore invite public health legislators to initiate restrictions on EMF spread, and to study further the potential effects from radiation on human health and, finally, to provide potential solutions, such as:

- + Restrictions of wireless networks in schools, hospitals, residential areas, public transportation and similar locations.
- + Shield EMF-emitting antennas and installations; wherever possible use shielded cables, fiberoptic solutions, etc.

- + Investigate the health effects of the widespread implementation of wireless telecommunication networks in urban and rural areas. And do it now!
- + Update the allowed threshold for background radiation in populated areas.

## References:

1. World Health Organization (1996). *The International EMF Project*.
2. Groh KR, Readey MA, Ehret CF: Chronobiological effects of electric fields, in Wilson BW, Stevens RG, Anderson LE (eds): *Extremely Low Frequency Electromagnetic Fields: The Question of Cancer*. Columbus, OH, Battelle Press, 1990.
3. Wilson BW. (1988). Chronic exposure to ELF fields may induce depression. *Bioelectromagnetics*. 9:195-205. Review.
4. Li CY, Chen PC, Sung FC, Lin RS. (2002). Residential exposure to power frequency magnetic field and sleep disorders among women in an urban community of northern Taiwan. *Sleep*. 25:428-32.
5. Harland JD, Liburdy RP. (1997). Environmental magnetic fields inhibit the antiproliferative action of tamoxifen and melatonin in a human breast cancer cell line. *Bioelectromagnetics*. 1997;18:555-62.
6. Regel SJ, Tinguely G, Schuderer J, Adam M, Kuster N, Landolt HP, Achermann P. (2007). Pulsed radio-frequency electromagnetic fields: dose-dependent effects on sleep, the sleep EEG and cognitive performance. *J Sleep Res*. 16:253-8.
7. Holmboe G, Johansson O. (2005). Symptombeskrivning samt förekomst av IgE och positiv Phadiatop Combi hos personer med funktionsnedsättningen elöverkänslighet (Description of symptoms as well as occurrence of IgE and positive Phadiatop Combi in persons with the physical impairment electrohypersensitivity, in Swedish), *Medicinsk Access* 1:58-63.
8. Landgrebe M, Frick U, Hauser S, Hajak G, Langguth B. (2009). Association of tinnitus and electromagnetic hypersensitivity: hints for a shared pathophysiology? *PLoS One*. 4:e5026.
9. Huber R, Treyer V, Schuderer J, Berthold T, Buck A, Kuster N, Landolt HP, Achermann P. (2005). Exposure to pulse-modulated radio frequency electromagnetic fields affects regional cerebral blood flow. *Eur J Neurosci*. 21:1000-6.