

Radio Frequency as the Risk Factor of Cancer, yes? No?

Dr Mohammad Esmail Akbari¹, Dr Minoo Shahani¹

¹ Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Thanks to author with a good and challengeable announcement for article 8(1):66-68.

Electrical power is an integral part of modern civilization. Static electric and magnetic fields, as well as low-frequency fields (at 50 or 60 Hz), are produced by both natural and man-made sources. At extremely low-frequency (ELFs), the photon energy is exceedingly small, thus it cannot damage to DNA in a direct interaction. The studies on effects of electric and magnetic fields to humans have been a long history, which came back to 1969. International Agency for Research on Cancer (IARC) initiated a program to evaluate the carcinogenic risk of exposure for humans. After the epidemiological studies on cancer cases, results have been summarized and the quality assessed, a judgment is made concerning the strength of evidence that the agent, mixture or exposure circumstance in question is carcinogenic for humans.

The results of most genetic toxicology studies of ELF magnetic fields have been negative; also there is little evidence that ELF electric or magnetic fields can cause malignant transformation on cells in cell culture. There have been few studies on the effects of ELF electric and magnetic fields on DNA repair or genomic stability in mammalian cells, so the results are inconclusive. There is some evidence for an effect of magnetic fields on cellular kinetics, for example few studies using *in vitro* systems to show enhancement of apoptosis. The results of studies on cell proliferation using a variety of exposure conditions and cell types have varied from inhibition to enhancement.

The cell proliferation response to physical and chemical factors has also been reported to be altered by exposure to ELF magnetic fields. The available experimental evidence suggests that ELF electric or magnetic fields are not cytotoxic for cells [1, 2]. The effects of ELF electric and magnetic fields on cell signal transduction have been reported that they may changes in intracellular calcium levels and protein phosphorylation, but a number of studies have reported opposite findings. These results cannot be

used to identify plausible cancer-related pathways. Several research groups have reported changes in gene expression resulting from exposure to ELF magnetic fields. However, other studies have failed to replicate many of these results. The risk for cancer can also be enhanced through systemic effects in humans or animals. For example, it has been suggested that the melatonin hormone may suppress mammary cancer through hormonal mechanisms. Although most experimental studies of the possible immunotoxicity of exposure to magnetic fields have yielded negative results, effects on T-cell proliferation capacity in animals have been reported. However, the effects are inconsistent. The occupational environment is one domain in which humans are exposing to RF radiation. Many studies have shown the relationship between hazardous occupation [3] and risk of cancer. As studies of Thomas et al. (1987) and Bereg et al. (2006) [4] and another researches, job title may be increased the risk of cancer. Also, the Swedish studies showed an association between glioma and acoustic neuroma in people who more cellphone users [5, 6]. The cases which are introduced by Dr Houshyari maybe have been involved in the unclassifiable dose as ELF and need to more consultation by details.

Regarding to this kind of studies, there is inadequate evidence in humans for the carcinogenicity of extremely low frequency magnetic fields in relation to all other cancers and for the carcinogenicity of static electric or magnetic fields and extremely low-frequency electric fields [7].

As a conclusion, extremely low-frequency magnetic fields are possibly carcinogenic to humans. Static electric and magnetic fields and extremely low-frequency electric fields are not classifiable as carcinogen agent for humans.

References

1. Li W, Ray RM, Thomas DB, Yost M, Breslow N, Goa DL, et al. Occupational exposure to magnetic fields and breast cancer among women textile workers in Shanghai, China. *Am J Epidemiol.* 2013;178(7):1038-45.

2. International Agency for Research on Cancer (IARC): Volume 80. Lyon, France. 2002;page328.
3. International Agency for Research on cancer (IARC) volume 102. Lyon, France. 2013;page129.
4. International Agency for Research on cancer (IARC) volume 102. Lyon, France. 2013; page130.
5. Lonn S, Ahlbom A, Hall P, Feychting M. "Long-term mobile phone use and brain tumor risk." *American epidemiol J.* 2005;161(6):526-535.
6. Mahdavi SM, Rezaei-Tavirani M, Nikzamir A, Ardeshiryajimi A. 12 Hz electromagnetic field changes stress-related hormones of rat. *Journal of Paramedical Sciences.* 2014;5(4).
7. International Agency for Research on Cancer (IARC): Volume 80. Lyon, France. 2002;page338.