USACHPPM
Readiness thru Health

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Just the Facts...

Electromagnetic Interference of Video Display Units by Extremely Low Frequency Magnetic Fields

Introduction

In recent years, the question has been asked, "Is there a possible link between video display terminal (VDT) use and miscarriage?" The question comes from reports of occasional groups or "clusters" of miscarriage among VDT workers. Yet the most comprehensive epidemiological studies to date are telling us that the risk of miscarriage among VDT workers does not differ from the risk of miscarriage within the whole population. In spite of such epidemiological findings, there is still concern within the workforce about this question. Some of the factors that have been suggested as causes in these continuing allegations include stress, ergonomics, and electric and magnetic fields (EMFs). This fact sheet reviews the EMF issues pertinent to the question.

Health Issues, VDTs, and EMFs

There are two categories of EMFs from VDTs, classified according to relative energy level. The most energetic of the two is called "ionizing," and the least energetic is called "nonionizing." The type of ionizing radiation found in VDTs is x-radiation. The typical VDT has been fully and permanently shielded to assure that there is virtually no x-radiation present outside of the VDT itself.

There are several different nonionizing frequency/ wavelength emissions associated with a VDT. These include light, which comes from the screen; heat or infrared, which comes from a variety of sources in the VDT (filaments, resistive components, etc.); and sub-radiofrequency EMF. The sub-radiofrequency EMFs generally occur in two frequency bands. The lower band is called Extremely Low Frequency (ELF) and is generated by the 60-Hz electric power components and wires in the VDT. The higher band is called Very Low Frequency (VLF) and is generated by several electrical and electronic components of the VDT (oscillators, fly-back transformer, etc.).

The 19 March 1991 issue of The New England Journal of Medicine contains a summary report of the most comprehensive epidemiological study to date on this question (reference 3). In an article titled "Video Display Terminals and the Risk of Spontaneous Abortion," the following conclusion was reported: "The use of VDTs and exposure to the accompanying electromagnetic fields were not associated with an increased risk of spontaneous abortion in this study." The EMFs specifically addressed in this conclusion are ELF; however, the fact remains that the VLF exposures were present as well, whether quantified, considered, or not and the negative finding also applies to such exposures.

Some studies have confirmed biological effects from exposure to EMFs at very high power levels or "dose rates" (so called "thermal" effects at VLF and electrical shock and burn effects at ELF). When these effects occur in humans, they can have negative health effects if the exposure time is long enough. The levels of VLF and ELF associated with VDT EMFs are several orders of magnitude less than the levels that could produce such dose rates. There is no confirmed negative health effects associated with EMF exposures to the levels found even very close to VDTs.

The National Institute of Environmental Health Sciences Working Group Report (reference 4) concludes that there is inadequate evidence for an association between exposure to ELF EMF and the risk of cancers.

EMF Exposure Control Levels

The exposure control standard for ELF EMF is documented in C95.6 (Reference 1). The standard is designed to prevent excitation of nerves (electro stimulation). The maximum permissible exposure (MPE) level for arms and legs at 60 Hz is 6300 mG. The controlled environment MPE level for the head and torso is 2710 mG. For the uncontrolled environment (general public) the MPE for head and torso at 60 Hz is 904 mG. At 60 Hz the environmental electric field

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MPE for whole body exposure is 20 kV/m for the controlled environment and 5 kV/m for the uncontrolled environment (general public). The maximum levels measured anywhere around the VDTs are 0.015 kV/m and 20 mG (tight against the back of the cabinet). Typical levels found in the worker position are 0.002 kV/m and 2-3 mG. The highest ELF levels against the cabinet will also reduce to 2 V/m and 2 mG about 30 cm from the cabinet, in any direction. Additional information on this subject is available from the World Health Organization (references 4 & 5).

The following Table compares typical ELF-EMF exposure levels:

TABLE. Common ELF EMF Exposure Levels.

Source	Electric Field (kV/m)	Magnetic Field (mG)
Power Line (500 kV)*	1-10	10-100
Electric Range	0.2-5	20-100
Electric Blanket	0.1-5	1-40
Electric Razor	0.05-1	4-600
Electric Toaster	0.005-0.1	1-50
VDT	0.002-0.015	2-20
Home Background	0.001-0.01	0.1-10

* Measured at the typical right-of-way (ROW)

Additional information on ELF EMF from numerous other studies is available in references 4 to7.

Conclusions and Recommendations

The ELF EMF emission from VDTs and electric appliances is well below the standard (reference 1). There is no known link between VDT EMF exposures and miscarriage, or cancer, or for that matter any of the several reported negative health effects alleged as caused by EMFs from VDTs. The Environmental Protection Agency draft report which concluded there is a possible but not proven link between ELF EMFs and certain cancers was critically flawed and will probably remain unpublished. The claims in that draft report and other alleged claims linking ELF EMF with cancer are based on several epidemiological studies that have been challenged, even by the epidemiological community. A government sponsored report (Reference 2) concluded "...there is no convincing evidence in the published literature to support the contention that exposures to ELF-EMF generated by sources such as household appliances, video display terminals, and local power lines are demonstrable health hazards." This report does support continued research efforts to understand ELF EMF interactions with biological systems.

The USACHPPM will continue to collaborate with the rest of the U.S. Government and other agencies world-wide in the ongoing study of VDT-related real and alleged issues and other critical preventive medicine issues. We will continue to inform all affected personnel of our findings and will support the development and enforcement of exposure standards where this is necessary to protect the health and safety of workers in every environment. Strategies to avoid exposure to ELF EMFs are not warranted at this time based on present knowledge. The VDT users should not be encouraged to take evasive action to avoid ELF EMF exposure. Also, the use of ELF EMF reduction screens should be discouraged. When choosing a VDT, the ELF EMF levels should not be used as selection criteria.

References

1. Institute of Electrical and Electronic Engineers, "C95.6 IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz," 23 October 2002, New York

2. Oakridge Associated Universities Report 92/F8, Health Effects of Low-Frequency Electric and Magnetic Fields. Prepared by an Oak Ridge Associated Universities Panel for the Committee on Interagency Radiation Research and Policy Coordination, June 1992.

3. Schnorr, T. M., et. al., "Video Display Terminals and the Risk of Spontaneous Abortion The New England Journal of Medicine, Vol 324, No. 11 (19 March), pp 727-733, 1991.

4. Assessment of Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields, NIEHS Working Group Report, August 1998.

5. Questions and Answers About EMF, National Institute of Environmental Health Sciences and U.S. Department of Energy, January 1995.

6. International Labour Office, "Visual Display Units: Radiation Protection Guidance" International Labour Office, Geneva 1994.

7. World Health Organization (WHO) Fact Sheet No 201, July 1998 URL http://www.who.int/inf-fs/en/fact201.html