

AUTHORS' RESPONSE (SEPTEMBER 1, 2017) TO THE LETTER TO THE EDITOR CONCERNING THE PAPER “IMPACT OF ELECTROMAGNETIC RADIATION EMITTED BY MONITORS ON CHANGES IN THE CELLULAR MEMBRANE STRUCTURE AND PROTECTIVE ANTIOXIDANT EFFECT OF VITAMIN A – *IN VITRO* STUDY”

Dear Editor,

I am writing in response to the letter to the editor [1] concerning the paper entitled “Impact of electromagnetic radiation emitted by monitors on changes in the cellular membrane structure and protective antioxidant effect of vitamin A – *In vitro* study” [2]. This paper has evaluated the effect of electromagnetic radiation (1 kHz frequency, 220 V/m intensity) emitted by liquid-crystal-display (LCD) monitors on the concentration of malondialdehyde (MDA) that is a marker of lipid peroxidation. The study has also determined the antioxidant role of vitamin A during the exposure of blood platelets to electromagnetic radiation generated by LCD monitors. The results show the possible negative effect of electromagnetic radiation on the cellular membrane structure manifested by changes in malondialdehyde concentration and indicate a possible protective role of vitamin A in this process.

Due to the objections about the radiation source and values of the electromagnetic radiation we can explain that the

values of electromagnetic fields given in our article are the values measured in real terms emitted by the LCD monitors commonly used in the current period. Measurements were taken using the electrometers: Spectran NF – 5035 and Spectran HF – 6065 produced by Aaronia firm. In our opinion the measurements made under these conditions are correct. We measured the field by means of the measurement procedure on the location of points placed in front of the monitor adhering to the requirements of the Swedish Confederation of Professional Employees (Tjänstemännens Centralorganisation – TCO) [3] which specifies strict conditions for the measurement of exposure.

With regard to the question of the distance away from the monitor used in the *in vitro* study, we absolutely agree with the opinion that the standards set down by the Occupational Safety and Health Administration (OSHA) (according to OSHA) are 50 cm and 100 cm but from the realistic point of view these norms are usually ignored especially when using portable computers in the domestic area. Furthermore, we decided to choose the shorter distance because it is known

that the strength of the electromagnetic field (EMF) depends on the distance away from its source and the intensity of radiation decreases rapidly with the distance away from this source. This has been confirmed by us and other authors' studies. Chen et al. [4] and Zyss [5], assessing the exposure to EMF emitted from monitors dependent on the distance away from the appliance and also on the exposure time, have come to the conclusion that a man should keep the longest possible distance and shorten the time of exposure while working next to monitors.

Due to the fact that the results of scientific studies are ambiguous and that there are few studies carried out on human cells, we decided to investigate the effect of electromagnetic radiation (EMR) emitted by LCD monitors on one of the parameters of oxidative stress in human blood platelets. We believe that the assessment of risks from electromagnetic fields based on *in vitro* studies seems to be one of the most authoritative and reliable methods. It is known that changes taking place on the cellular level account for the response of an organism as a whole.

Countless research studies concerning the impact of electromagnetic radiation of diverse parameters on the matter prove the negative effect of this factor on health and life of living organisms. Nevertheless, the results of experiments do not lead to unequivocal conclusions. Despite numerous studies, it was impossible to identify in full statistical correlations between electromagnetic radiation of defined parameters and specific somatic effects in a human organism. In the field of electromagnetic radiation it is extremely difficult to demonstrate that there are cause-and-effect relationships. We, as researchers conducting studies on electromagnetic radiation need to remember that the interpretation of the observed phenomena is difficult because the effects of the activity of electromagnetic fields are usually weak, passing, difficult to reconstruct and repeat.

Furthermore, negative effects of EMF in the form of specific diseases are usually observed after a long time of latency and they become apparent often after years and for next generations.

In conclusion, we strongly believe that our study and the results of this study may help people to understand the consequences of using electric devices and show some preventive methods how to avoid health risk.

Key words:

Electromagnetic radiation, Malondialdehyde, LCD monitors, Vitamin A, Lipid peroxidation, Antioxidant vitamins

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