

## **TYMPANIC TEMPERATURE DURING THE EXPOSURE TO ELECTROMAGNETIC FIELDS EMITTED BY CELLULAR PHONE-PART II: EXPERIMENTS ON MEN**

*E. Gadzicka, A. Bortkiewicz, M. Zmyslony, W. Szymczak, H. Tokura, Department of Work Physiology, Institute of Occupational Medicine, Lodz, Poland.*

For hand-held radiotelephones used by the general public, International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommends that the localized SAR in the head be limited to 2 W/kg averaged to 10g tissue in the head. This limit protects telephone users from the thermal effect of the radiation, but temperature rise, even when it is within the admissible range, may cause physiological effects. However, the problem has not been clarified yet. The aim of the experiment was to assess the temperature changes during exposure to EMF emitted by mobile phones. Before attempting to determine the effect of mobile phone EMF exposure on the tympanic temperature (Tty), we made sure that the tympanic thermometer met the EMC (electromagnetic compatibility) requirements, i.e. its operation was not disturbed by mobile phone EMF, provided that the Tty was measured in the ear at the side of the head opposite that to which the telephone was applied. In order to explain if materials with dielectric properties similar to those of the biological material are heated during the exposure to EMF, we conducted a phantom experiment. The experiment was performed using the container with dimensions corresponding roughly to the dimensions of the human head. The container was filled with 0.9% NaCl. Exposure time was 60 min. Before the exposure, mean temperature of the saline was  $23.14 \pm 0.04^\circ\text{C}$ , while after the exposure it was  $23.38 \pm 0.10^\circ\text{C}$ , and the difference was statistically significant,  $p < 0.000001$ . The second step of experiment was performed in seven young men, aged 19-29 (mean age 23.35.3) years, who were examined twice: on a day without exposure (C) and on a day with continuous exposure (E) to cellular phone EMF for 60 min at 900 MHz, SAR 1.23W/kg. Written consent was obtained from each of the participants prior to starting the experiment. The test was performed in the laboratory under controlled conditions. From 6 to 7 the subjects were examined by a physician, and were subjected to the resting ECG with heart rate variability analysis. From 7 to 8 p.m. the subjects used cellular phone. The subjects were not informed which day was (E) and which (C). From 8 p.m. till 11 p.m. the subjects listened to music. During the experiment the arterial blood pressure (BP), heart rate (HR) and Tty were monitored. This paper is limited to data on the tympanic temperature. Tty was measured every 10 s by a thermistor probe (ST-21S, sensor Tecnica Co.) attached to the tympanic membrane from about 6.30 p.m. to 11 p.m. We compared Tty during the day (E) and day (C) separately for 2 periods: (1) 7-8 p.m., (2) 8-11 p.m. using Wilcoxon matched-pairs signed-ranks test, for each subject and for the whole group. Mean Tty during (1) and (2) differed significantly between day (E) and (C) ( $p = 0.0000$ ). The analysis of Tty of each subject revealed individual variations. Further investigations are being performed to explain these differences.

alab@sunlib.p.lodz.pl