Non-Ionizing Radiation & Children's Health

International Joint Workshop
18 - 20 May 2011, Ljubljana, Slovenia

POSTER ☒

PLATFORM PRESENTATION ☐

Prenatal And Early Life Exposure To 2.45 GHz WiFi-Like Signals: Methodologies For Dosimetric Assessment

Rosanna PINTO, VANNI LOPRESTO, CATERINA MERLA, ROSSELLA LODATO, CLAUDIO PIOLI, AND CARMELA MARINO

Unit Of Radiation Biology And Human Health, ENEA, Casaccia Research Centre, Rome, Italy

Studies on the biological effects of exposure to electromagnetic fields (EMF) on pregnant and newborn animals are considered one of the highest priority in the EMF health risk assessment. One of the most critical issues of the exposure assessment is the determination of the induced specific absorption rate (SAR, W/kg) throughout the whole exposure period. Indeed, consistent changes in body mass and size occur during pregnancy and childhood. Hence, the determination of the power efficiency (SAR per 1 W input power, W/kg/Win) variations must be taken into account to rigorously control the induced fields.
The presented exposure system consists of two special transverse electromagnetic (TEM) cells originally designed to operate at 900 MHz. The feasibility of using this exposure system at 2450 MHz-WiFi frequencies was studied. Both TEM cells allow to realize a blind exposure between EMF and sham-exposed groups.
In this paper, a methodology for the dosimetry of this set-up used for prenatal and early life exposure of mice to WiFi-like signals (2412-2484 MHz) is presented. Procedure for experimental dosimetry for both targets consisted of weighing mice every day and then performing power balance measurements to assess the power efficiency variability over the whole exposure period.
Results on pregnant mice: the variation in terms of body weight did not substantially change the efficiency of the exposure system during the whole exposure period.
Results on early life exposure: the SAR vs. weight curve was obtained, an absorption peak for a weight of about 5 g was found, suggesting a possible whole-body resonance phenomenon.
In the first case it was necessary to provide an estimate of the induced SAR in the embryos. A realistic numerical model of a pregnant mouse (13th day of pregnancy, eight fetuses, total body weight 35 g) was realized from SPIRAL-TC scans. The dosimetric study was performed considering two different tissue compositions of the modeled homogeneous uterus, in terms of assigned dielectric properties. In one model the uterus consisted only of muscle (modeling only the presence of pups), in the other one the assigned dielectric properties consisted of an average of 50% of muscle and 50% of amniotic liquid.
The dosimetric results obtained from the two kinds of target were used for the daily control of the reference input power to the exposure system, through dedicated software, thus allowing to maintain constant the induced SAR over the exposure period.