Behavioral Functional Tests and Genotoxicity Detection in Rats after Exposure to Low Density 1800MHz(CW) –RF

Xinan WU, Tianming CHENG, Ping LIU

Dept. of Public Health, Kunming Medical College. Yunnan 650031. P. R. China

Abstract

New telecommunications technologies have been introduced without full provision of information about their nature and without prior discussion within the scientific community about possible consequences for health. The average output power from the antennas of digital mobile phones is lower than that from earlier analogue models, but the maximum powers are greater, the exact patterns of radiation are different and these differences might influence their effects on people. As the costs of mobile phone technology have fallen, their use has increased dramatically and the overall levels of exposure of the population as a whole have therefore increased. Potential effects of exposure to radiofrequency and other electromagnetic fields are causing significant public and occupational health concerns and need scientific clarification. Electromagnetic fields (EMF) represent one of the most common and the faster growing environmental influences in our lives, about which anxiety and speculation are spreading. Health effects such as cancer, changes in behavior, memory loss, Parkinson's and Alzheimer's diseases, and many theirs, have been suggested as resulting from exposure to EMF.

Our experiment was motivated by research needs as defined by the World Health Organization(WHO), to clarify potential health risk of EMF's presented by cellular telephone technology. Appropriate endpoints for this study were determined by following arguments:

Firstly, Many of the process associate with reproduction are especially sensitive to toxic influences. Meiosis, fertilization and implantation of the embryo can all be disturbed by toxic insults. The high rates of cell division and differentiation in the developing fetus make it particularly vulnerable. It is therefore important to assess the possible effects of RF fields on fertility and development. Secondly, Functional or behavioral changes in an organism often occur prior to structural changes. Functional changes in the central nervous system(CNS) are among the earliest to become observable. Furthermore, the sensitivity of CNS-functions to interfering agents during development has been demonstrated many times in animals and human beings. Thirdly, more research is indicated that the hippocampal slice preparation

shows great potential for the study of RF field effects. Fourthly, studies of the genotoxic actions of RF radiation have been of value in supplementing epidemiological evidence about human disease.

To address and assess health risks in rats after prenatal or postnatal exposure to low level RF-EMF, the experiments were performed as below:

Reproduction and development effects;

Cognitive function changes;

Induced long-term potentiation (LTP)in the hippocampal slice preparation;

Ultrastructural observation in the hippocampus;

DNA damage in peripheral blood lymphocyte;

Micronucleus formation in polychromatic erythrocytes in bone marrow;

Abnormality of sperm in adult male animals.

Taken together, there is almost no experimental evidence that prenatal exposure to low level RF field affects fertility, development, learning, spatial memory and hippocampal ultrastructure in rats; DNA damage

Experiment have produce clear evidence that postnatal RF radiation is genotoxic at non-thermal levels in peripheral blood lymphocyte, but there is a absence of positive result coming from observation of micronucleus formation in polychromatic erythrocytes in bone marrow. Furthermore, no findings of hippocampal slices induced LTP exist statistically significance in between groups. Conclusion for our study were assessed by following reasons:

1. Prenatal exposure to low density RF-EMF

Differences between field-exposed and sham-exposed dams or offspring were not found in litter size, the evolution of body mass, the developmental landmarks, or abnormality of sperm. However, the difference in only auditory startle reflex of different groups in 6 behavioral developmental parameters was revealed to be affected as a result of increase slightly in power density.

The ability to learn to lever-press for food reinforcement during training sessions, efficiency (ratios of reinforcement vs. Lever presses in percent of possible efficiency) in male and female exposed and control subjects in the two steps of the six test schedules DRH and DRL were showed no difference except DRH8/4 test step, which operant performance in male dam of exposure to 0.5mW/cm2 RF-EMF was lower than either control or higher power density groups.

RF-induced effects in learning and spatial memory as assessed in a circular water maze. The exposed animals did not take longer to find the platform than did control subjects during the training session. In a "probe trial" without the platform present, exposed and control animals spent time in the quadrant of the maze that should have contained the platform were no difference.

There were absence of pathologically characterized changes in hippocampal ultrastructure between exposed and control groups.

2. Postnatal exposure to low density RF-EMF

DNA damage experiment have produce clear evidence that postnatal RF radiation is genotoxic at non-thermal levels in peripheral blood lymphocyte, but there is a absence of positive result coming from observation of micronucleus formation in polychromatic erythrocytes in bone marrow.

No findings of hippocampal slices induced LTP exist statistically significance in between experimental groups.

Conclusion: There is absence of our experiment evidence that exposure to low level RF affects learning and spatial memory in rats. However, DNA damaged in peripheral blood lymphocyte is clear evidence that RF radiation is genotoxic at non-thermal levels, but there is not simple to interpret and has uncertain implication for health. Indeed, Genotoxic effects induced by RF radiation should be paid much attention in our further research.