Sleep Pattern Changes in Rats with Wireless Multi-channel Subcutaneous Electrodes after Exposed to Radio-frequency Electromagnetic Fields

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INTRODUCTION

Sleep is considered one of the important cognitive functions in living subjects, and there had study reported that using mobile phone before bed causing people to take longer time to reach the deeper stages of sleep and to spend less time in them, interfering with ability to repair damage or suffering from the day. This study was to scientifically examine whether the mobile phone RF EMF at 910 MHz has an effect on changing the sleeping patterns in rats.

MATERIALS AND METHODS

Six SD rats were examined by using a blue tooth wireless on-line monitoring system. The system has a set of 6 electrodes implanted subcutaneously to the rat brain and body, taking the signals of EEG, ECG, body temperature simultaneously, and the acquired data, including different sleep phase times, sleeping durations; sleeping interruptions with before and after RF exposures, were group collected, analyzed and compared.

The rats were divided into two groups, one received average SAR of 1 and 5 W/kg, and the other received average SAR of 10 and 20 W/kg, before and after exposed to RF EMF radiation for a period of 1 to 3 hours.

RESULTS

From the experiments, it showed that there were no significant differences on EKG signals and body temperature changes in the two groups, but with significant changes in shortening sleep durations and increasing sleep interruptions in the rat group received higher SAR of 1 and 20 W/kg.

CONCLUSIONS

The study indicated that during exposure to 910MHz of mobile phone RF EMF, there have some tendency on changing the sleeping patterns, demonstrated by sufficient high SAR to the rat brain. More rigorous experimental design and precise simulation SAR with XFDTD software are suggested for further exploration.

REFERENCES

A wireless multi-channel electrodes device is placed on the rat’s head; the device has six subcutaneous electrodes implanted into rat’s brain and body.

A blue tooth receiving circuit is used to retrieve signals emitting from the implanted electrodes.
The received signals included ECG, EEG and body temperature, and were further analyzed with sleep phase times, sleeping durations and sleeping interruptions.

The XFDTD software is used to simulate the power deposition patterns into the rat brain. A more precise simulation to SAR in the brain is currently under developing.