



## Possible Biological Effects of Intermediate Frequency Magnetic Field Exposure in Mice

Akira Ushiyama\*<sup>(1)</sup>, Shin Ohtani<sup>(2)</sup>, Kenji Hattori<sup>(2)</sup>, Kazuyuki Ishii<sup>(2)</sup>, Keiji Wada<sup>(3)</sup>, Yukihisa Suzuki<sup>(3)</sup>

(1) National Institute of Public Health, e-mail: [ushiyama.a.aa@niph.go.jp](mailto:ushiyama.a.aa@niph.go.jp)

(2) Meiji Pharmaceutical University

(3) Tokyo Metropolitan University

**Aim:** Development of a wireless power transfer (WPT) systems that uses an intermediate frequency (IF) range is currently under development for practical use. Among various WPT systems, the system for electric vehicles is expected to produce a particularly large output. Under these conditions, the exposure level to human bodies supposed to be increased. Thus, in this study, in order to investigate the nonthermal effect of the intermediate frequency band magnetic field in the 85 kHz band on health, after developing an exposure apparatus for the mouse, we carried out exposure to the mouse,

**Methods:** In this study, a exposure apparatus which capable of exposing a strong magnetic field to mice was developed, and exposure was carried out under the condition that estimated a body induced electric field of 23.7 V/m, 54.6 V/m, and 70 V/m. In ICNIRP guideline for low frequency electromagnetic fields, the basic restriction for occupational exposure (head, body part, central nervous system) is about 23 V / m (body induced electric field) at 85 kHz. Using this exposure apparatus, IF-MF exposure was carried out for 5 weeks, 1 hour / day for consecutive 2 weeks except weekends using male mice (C57/BL6, 5 week old at the beginning of exposure). After the end of exposure, to explore the nonthermal effects of IF-MF, we set several endpoints and compared with sham exposed mice. The effect the blood biochemical index and the influence on the blood cell index were investigated. we also measured oxidative stress markers; 8-hydroxy-2'-deoxyguanosine (8-OHdG) and N-Hexanoyl lysine (HEL) in the urine samples. Additionally, to evaluate cranial nervous system neurophysiological effects, a new object recognition test, which is one of behavioral tests, was conducted to investigate the influence.

**Results:** Under this experimental condition, there was no significant differences between sham and IF-MF exposed mice in any outcomes.

**CONCLUSION:** Under the exposure conditions of this study, the magnetic field at 85 kHz band do not show any adverse biological effects. This indicates a nonthermal effect will not be problem if the current guideline is being followed, but further research is needed.