

Interim Findings of Joint Research to Evaluate Biological Effects of Radio Wave Exposure

The aim of the study was to evaluate the biological effects of exposure to radio waves emitted by mobile phone base stations. The research used an *in vitro* exposure system developed by NTT DoCoMo that incorporated a horn antenna and dielectric lens in an anechoic chamber. The exposure system generates 2GHz-band Wideband-Code Division Multiple Access (W-CDMA) modulated-signal RF fields that meet the IMT-2000 specifications for third-generation mobile communications.

Researchers used 49 culture dishes as the exposure group and another 49 as the non-RF exposure group, and tested both groups simultaneously. This enabled them to examine a wide variety of changes in cells on a more extensive level than in previous studies of RF exposure. The RF exposure system has already been published in *Bioelectromagnetics*, the official journal of the nonprofit Bioelectromagnetics Society based in Washington, D.C.

The experiment was conducted at a dedicated laboratory at the Kashima Laboratory of Mitsubishi Chemical Safety Institute Ltd. The RF exposure system was installed in an anechoic chamber to shield against external electromagnetic fields. Four human cell lines derived from different sources were used: two from normal human fetal and infant tissues and two from human cerebral tumor tissues.

The strength of the microwaves ranged from one to 10 times the basic restriction of radio frequency radiation protection guidelines for radio waves emitted by mobile phone base stations in Japan. The maximum duration of RF exposure was four days, which is the length of time during which cells in tests would normally proliferate in their culture dishes if not exposed to RF fields (control group).

Using conventional methodology, four parameters were examined: number of cell proliferations, rate of cell proliferation (cell cycle), numbers of live and dead cells, and presence of DNA breaks in nuclei. Using a DNA microarray that allows measurement of up to approximately 40,000 identified human genes — the latest technique in life science for determining gene activity — the experiment also tracked changes in activity and types of genes during cell proliferation.

As a result of measuring these parameters in all of the RF exposure tests, it was confirmed that RF energy with a strength of one to 10 times the basic restriction in Japan had no effect on any of the four types of cells tested in terms of cell proliferation, gene activity and DNA. An analysis of gene activity found that approximately 20,000 genes (about half of the human genome) were active in these cells and that RF energy did not affect their activity.

The findings reconfirm that radio waves from mobile phone base stations do not affect the fundamentally vital process of cell proliferation and related gene activity.

The current findings will be presented at the Bioelectromagnetics (BEMS) Annual Meeting 2005 between June 19 and 24 in Ireland, and have also been submitted to the BEMS Journal.

RF Exposure System



Conducting Experiments

