

Scientific News

The following contributions refer to recent scientific original sources on the effects of mobile communication radio-frequency fields. The selection of publications was made by the author, Professor Roland Glaser, and reflect his personal opinion concerning their relevance.

- The Department of Cancer Biology at the Center for Radiology and Oncology at the University of Washington performed tests on possible genotoxic effects of radio-frequency fields (835.62 MHz FDMA, 874.74 MHz CDMA, 0.6 W/kg) in cell cultures. As usual for such tests, the C3H 10T1/2 cell transformation assay was applied. After 7-days' field exposure and the usual 42-days' cultivation neither untreated cells, nor cells pretreated with ionising radiation (4.5 Gy), afterwards showed anomalies giving evidence for any radio-frequency effect [Roti, J.L.R., Malyapa, R.S., Bisht, K.S., Ahern, E.W., Moros, E.G., Pickard, W.F., and Straube, W.L.: Neoplastic transformation in C3H 10T1/2 cells after exposure to 835.62 MHz FDMA and 847.74 MHz CDMA radiations. *Radiation Research* 155 (2001) 239-247].

- A considerably stronger field exposure was applied by a group at the Ctr. Environm. Radiat. Toxicology of the University of Texas. Here, blood cells (lymphocytes) were taken from healthy test persons and over 24 hours exposed to a frequency of 834.62 MHz (SAR value: 4.4-5.0 W/kg). After 48- to 72-hours' cultivation within the cells no anomalies could be found (micronuclei, chromosome fragments, double nuclei). As a positive control, part of the cells was treated with gamma radiation of 1.5 Gy replacing RF exposure. Here, the changes mentioned above occurred with high significance [Vijayalaxmi, Pickard, W.F., Bisht, K.S., Leal, B.Z., Meltz, M.L., Roti, J.L.R., Straube, W.L., and Moros, E.G.: Cytogenetic studies in human blood lymphocytes exposed in vitro to radiofrequency radiation at a cellular telephone frequency (835.62 MHz, FDMA). *Radiation Research* 155 (2001) 113-121].

- A new study by the Finnish group of Kiovisto and Krause has been published. In two test series, participants were exposed to GSM signals (902 MHz, 217 MHz pulsed, mobile phone with 0.25 W power at a distance of 4 cm) of 30- and 60-minutes' duration, respectively. In a double-blind experiment the following possible symptoms were examined: headache, dizziness, nausea, skin irritations, skin reddening, heat flushes. For none of these symptoms could a difference between exposed and non-exposed persons be found [Koivisto, M., Haarala, C., Krause, C.M., Revonsuo, A., Laine M., and Hamalainen, H.: GSM phone signal does not produce subjective symptoms. *Bioelectromagnetics*, 2001, 22(3): 212-215].

• As was the case last year, a new contribution of a Russian group on the impact of a 902.4 MHz low-intensity field (0.06 mW/cm²) on the electroencephalogram of human participants has been published in a scientific journal. Whereas last year's article found differences in the waking state, the follow-up study deals with the sleep EEG. Regrettably, the study is quite inconsistent concerning both dosimetry as well as statistical evaluation [Lebedeva, N.N., Sulimov, A. V., Sulimova, O.P., Kotrovskaya, T.I., and Gailus, T.: Cellular phone electromagnetic field effects on bioelectric activity of human brain. *Critical Reviews in Biomedical Engineering* 28 (2000) 323-337; by the same authors: Investigation of brain potentials in sleeping humans exposed to the electromagnetic field of mobile phones. *Crit. Rev. Biomed. Engin.* 29 (2001) 125-133].

• In a double-blind experiment performed at the Institute for Occupational and Environmental Medicine of the University of Munich, 8 male students were exposed to GSM-modulated fields (900 MHz) for 4 hours in a special exposure chamber. Each person took part in 20 sessions of exposure or sham-exposure. A circularly-polarised field with an average power density of 1 W/cm² was emitted from an antenna placed at a distance of 10 cm behind the subject's head. No effect on the concentration of melatonin, cortisol, neopterin and immunoglobulin A (SIgA) in the participants' saliva during, and for several hours after, field exposure could be confirmed [Radon, K., Parera, D., Rose, D.M., Jung D., and Vollrath, L.: No effects of pulsed radio frequency electromagnetic fields on melatonin, cortisol, and selected markers of the immune system in man. *Bioelectromagnetics*, 2001, 22(4): 280-287].

• During a comprehensive animal experiment (in total 900 Sprague-Dawley rats), a group at Washington University dealt with the question of whether pulsed or unmodulated 860-MHz high-intensity fields (average SAR in the brain 1 W/kg) at long-term exposure (6 hours/day, 5 days/week, from 2nd to the 24th month after birth) affect brain tumour development induced by a special carcinogen (ethylnitrosourea). Different combinations of field-exposure type and carcinogen concentration were tested in 15 groups of 60 animals each, including control groups. No significant effect, either of pulsed or of continuous fields as described above, on the development of tumour promotion could be found in the brain or in the spinal cord. A slight trend could be evidence for an increase of tumour development velocity in the case of pulsed fields with the application of the highest carcinogen concentration. However, this may be an insignificant random result, since the error bounds are $\pm 14\%$ [Zook, B.C. and Simmens, S.J.: The effects of 860 MHz radiofrequency radiation on the induction or promotion of brain tumours and other neoplasms in rats. *Radiat. Research*, 2001, 155(4): 572-583].

the science

Report from

- Noteworthy is the most comprehensive epidemiological study until now on a possible correlation between cancer diseases and mobile phone use recently performed in Denmark. Following the inspection of 723,000 registrations of Danish mobile phone participants between 1982 and 1995 and after eliminating those registrations assigned to companies, etc., 420,095 persons were registered as a cohort, of which 7.1% had used their mobile phone for at least three years. Evaluation was made using the Danish cancer registry. In this cohort, in total 3,391 cases of cancer occurred compared with the 3,825 cases to be expected. The decrease in part resulted from a decrease of lung cancer cases (do mobile phone users smoke less?). Still, the incidence rate of salivary gland cancer (0.72), leukemia (0.97), brain and other neuronal tumours (0.95) was below 1.0, though not significantly so. The authors conclude: this first national incidence rate study does not support the hypothesis claiming that the use of a mobile phone promotes an increased incidence of tumours in the brain or in the salivary glands as well as of leukaemia or other cancer types. Of course, we must add that technical properties of the mobile telephones and therefore the nature of the user exposure have changed during this time period [Johansen, C., Boice, J.D., McLaughlin, J.K., and Olsen, J.H.: Cellular telephones and cancer - A nationwide cohort study in Denmark. *J. National Cancer Institute* 93 (2001) 203-207].

- In a short overview, M.H. Repacholi of the WHO dealt with health risks of mobile radio also referring to a WHO publication of the year before. His summary is: "None of the recent assessments concludes that exposure to radio frequencies of mobile phones or base stations leads to disadvantageous health consequences." However, he admitted that there still are knowledge gaps that will have to be closed during the following 3-4 years. The author warned emphatically against undermining internationally-recommended scientifically-verified limit values by unnecessarily introducing precautionary values. In his view, the presently-valid limit values fully suffice to ensure a riskfree use of mobile radio [Repacholi, M.H.: Health risks from the use of mobile phones. *Toxicology Letters* 120 (2001) 323-331].