

model. More importantly, they can be very different from each other and from the data given in **Tables 6**. For example, an SAR of 2.63 W/kg inside a block type phantom head was obtained for 600 mW of power radiating from an idealized 835 MHz dipole [Chen and Wang, 1994]. These results suggest the need for standardization in various modeling efforts to simulate mobile telephone exposure, and the difficulty encountered in dosimetric assessments. Accordingly, it may be concluded the anatomical configuration of the head and tissue inhomogeneity can all influence the maximum value and distribution of SAR in the head of a mobile telephone user. Moreover, available information from literature seems to indicate that the integrated SAR in the head is similar for a homogeneous or inhomogeneous model. The maximum SAR and its distribution in the head are closely related to the distance of the radiation element from the skin surface and the current distribution on the antenna. In other words, power deposition in the head is strongly influenced by the magnetic component of the field emitted by the radiating structure.

HEALTH EFFECTS OF RF AND MICROWAVE RADIATION

As mentioned above, research addressing the specific issues pertaining to the wireless communication spectra has begun only recently. Some of the on-going *in vitro* experiments are cell proliferation, DNA damage, gene expression, protein synthesis, embryonic development, and cancer promotion. The *in vivo* experiments involve DNA in brain cells, blood-brain barriers, neuroendocrine, electro-neuro-physiology, ocular effects, CNS tumorigenesis that includes T-cell lymphomas. This paper summarizes results from published studies using frequencies in the same spectral band and provide information on current research activity where appropriate. The summary will include carcinogenesis and cancer promotion by RF and microwave exposure, and other *in vitro* and *in vivo* experimental studies that involve primarily the central nervous system and other tissues in the head. A brief description of epidemiological studies on RF and microwave exposure is also included. The material should be of use for a preliminary risk assessment.

The effects of RF and microwave radiation on the human body have been under varying degree of scientific investigation for over the last half of this century [Adey, 1981, 1989, 1993; Michaelson and Lin, 1987] It is well known that at sufficiently high intensity, RF and microwave energy can produce adverse thermal effects [Lin, 1979, 1994; Adair, 1983]. However, aside from a skin burn that may result from direct contact with the bare radiating antenna, biological responses from gross tissue heating would be a minor consideration for exposure to radio frequency fields emitted by these wireless communication devices. Recent attention and research effort have converged on possible health effects that may occur following prolonged or life-long exposure at low levels.

Cancer Induction and Promotion

The potential effect on the central nervous system tumor induction from exposure to electromagnetic fields emitted by wireless communication technology has become a particular focus of concern. Some results from past studies using frequencies in the same spectrum band are summarized in **Table 7** for both continuous wave (CW) and modulated RF fields. The average SAR in W/kg is given unless indicated otherwise. It can be seen that there is only a

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