significant effects on the general health of the exposed rats. Furthermore, the survival curves were virtually identical for microwave and sham exposed rats. Also, there was no difference during any phase of the rats life times. Although the study endpoints and protocols used were different, the investigations by Chou et al. [1992] and those by Lai and Singh [1995, 1996] involved the same exposure apparatus. As mentioned previously, DNA strand breaks are known to play a role in carcinogenesis, the strand breaks observed by Lai and Singh and the statistically significant increase in primary malignancies observed by Chou et al. need to be further explored.

A study using frequencies and modulations specific to mobile telephones did not show any significant difference in tumor growth between microwave and sham exposed rats [Salford et al., 1993]. In particular, the study used pulse-modulated 915 MHz RF fields and two rat glioma models (RG2 and N32). Note that the growth rate of N32 is approximately 1/2 that of RG2. Tumor cells were injected stereotaxically into the right caudate nucleus of male and female rats (Fisher 344, 150-250 g). Starting on the 5th day after inoculation, intact (unanesthetized) animals were either microwave or sham irradiated in TEM chambers for 7 hr/day, 5 days/wk for 2-3 weeks. The modulation characteristics were 0.57 ms wide, 1 W pulses repeated at 0, 4, 8 (8.33), 16, 50, and 200 (217) Hz. The reported SARs were 0.008-0.4 W/kg. At 50 Hz, the pulse width was 6.67 ms and peak power was 2 W that produced a SAR of 1.00 W/kg Coronal sections of the brain were examined histopathologically and measured for tumor volume. Results indicate that prolonged exposure to mobile telephone microwave fields did not promote growth of either the faster or slower growing gliomas beyond their normal course. Note that these animals typically die from glioma 2-3 weeks after glioma cell implantation.

The Microwave Auditory Phenomenon

Human beings can hear microwave radiation at an average power density of about 1 mW/cm^2. This microwave auditory effect has become the best known and most widely accepted biological effects of microwave radiation [Lin, 1978, 1980, 1981, 1990; Chou et al., 1982]. It pertains to the auditory sensation of radar-like pulses by humans and laboratory animals [Frey, 1961; Guy et al., 1975; Lin et al., 1979a; Chou et al., 1985]. An audible sound is perceived which appears to originate from within or near the head. It has also been demonstrated electrophysiologically that auditory neural activity may be evoked by irradiating the head of laboraoory animals. The phenomenon has been shown to occur at an incident energy density threshold of 400 mJ/m^2 for a single one microsecond wide pulse of 2450 MHz microwave energy impinging on the head of a human subject (**Table 8**). The effect has been reported for microwave exposures across a wide range of frequencies (425-3000 MHz). When high peak power microwave energy is delivered as a single pulse or a train of pulses to the head, it is perceived as a single click or a tune corresponding to the pulse repetition rate [Guy et al., 1975]. The average power density required to elicit a response in human subjects with sensi-neural conduction impairment above approximately 3 kHz is several times that required for a subject with normal ahearing. The microwave auditory phenomenon is so very different from that associated with responses to CW radiation, initially, it had been interpreted to imply direct microwave interaction with the neurophysiological system [Frey, 1961, 1962].

Table 7. Carcin
microwave expo

Biologic Material	
Mouse fibroblast	
Human glioma cell	
Rat brain cell	
Mouse breast cancer	
or Skin cancer	
Rat primary malignancy	
Rat brain tumor 915 MHz	
Mouse colon cancer	

*2450 MH
acetate; D