

materials has confirmed predictions by the thermoelastic theory [Olsen and Lin, 1981]. Subsequently, direct detection of acoustic pressure waves in mammalian brain has been presented. Hydrophone measurements showed that pulsed microwaves induce acoustic pressure waves in mammalian brains, and the fundamental and second harmonics are nearly identical to those predicted by the thermoelastic theory [Olsen and Lin, 1983].

In this paper, we present measurements of pressure wave propagation in brains of cats irradiated with pulsed 2.45-GHz microwaves. Hydrophone output signals detected at various distances away from a small applicator clearly show the event of pressure wave propagation, i.e., characteristics of attenuation and time delay. Indeed, it is shown that microwave-induced pressure waves propagate with a velocity identical to acoustic waves inside the brain.

MATERIALS AND METHODS

The experimental arrangement is illustrated in Figure 1. Cats ($N = 4$; 4 to 5 kg body mass) were used in this experiment. Each animal was anesthetized using ketamine (25 mg/kg) injected intramuscularly and kept under surgical level of anesthesia using intravenous sodium pentobarbital supplementation. The animal was placed in a stereotaxic head holder (David Kopf, Tujunga, CA). Its body temperature was maintained at 37.5 ± 1.5 °C using a heating pad. At the end of each experiment the animals were killed with an overdose of sodium pentobarbital.

Following skin incision and partial separation of the nuchal muscle, a matrix of 12 small diameter holes (2 mm) was drilled through the dorsal portion of the skull. The locations of the 15 holes on the skull are shown in Figure 2a. Five holes (1-5) were drilled along the midline of the skull; in addition, ten holes, nos. 6-10 and 11-15, were drilled along two lines intersecting at the applicator. Figure 2b shows a mid-sagittal plane together with the locations of hydrophone and applicator during mea-

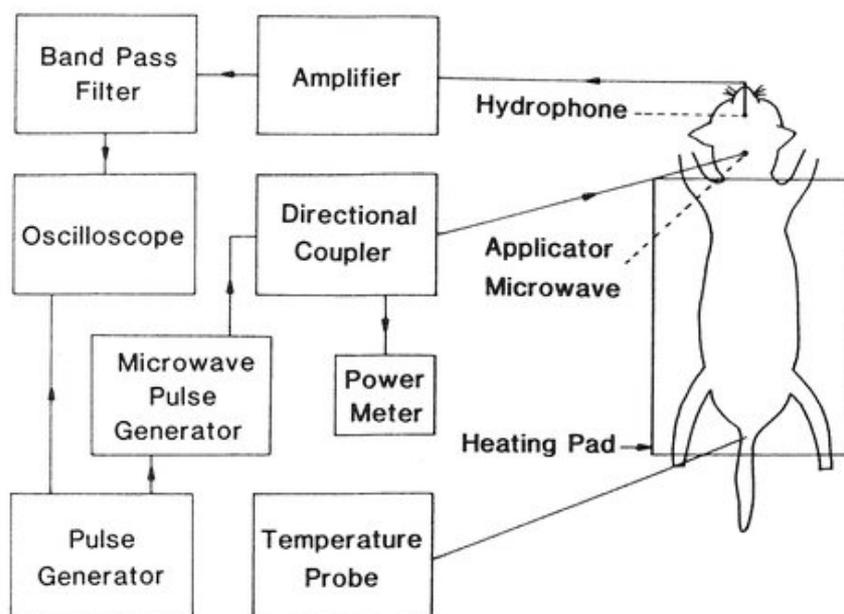


Fig. 1. Schematic representation of the anatomical placement, microwave source, and recording configuration.