Equations (37) to (40) represent the general solution for the acoustic signal in a spherical head exposed to pulsed microwave radiation. The solution consists of two parts: one is linear time dependent, and one is a harmonic function of time.

REPRESENTATIVE CALCULATIONS

The values for some of the physical properties of brain material are listed in Table 1. All except one are typical numbers obtained from the literature [18-20]. For the coefficient of thermal expansion, which does not seem to have been measured in the past, we have presumed a value equal to 60% of the corresponding value for water. These values may be used to estimate the frequency of the acoustic signal.

Table 1 Acoustic and thermal properties of brain material

Specific heat, c_h	0.88 cal/gm-^oC
Density, ρ	1.05 gm/cm^3
Coefficient of thermal expansion, α	6.9 x 10^{-5}/^oC
Lame's constant, λ	2.24 x 10^{10}dyn/cm^2
Lame's constant, μ	10.52 x 10^3dyn/cm^2
Bulk velocity of propagation, C_1	1.460 x 10^5cm/sec
Shear velocity of propagation, C_2	100 cm/sec

Using these parameters, we have from equation (25)

$$\tan(ka) = (ka)/[1 - 5.336 \times 10^5 (ka)^2] \tag{41}$$

We can show that the solution to equation (41), to within an accuracy of 10^{-7}, is an infinite sequence of eigenvalues, $k_m a = m\pi$, $m = 1,2,3,\ldots$.
The corresponding set of frequencies of vibration of the spherical head is

$$\omega_m = k_m C_1 = m\pi C_1/a \tag{42}$$

where C_1 is the bulk acoustic velocity of propagation and a is the radius of the sphere. The fundamental frequency of sound generated inside the spherical head is therefore given by

$$f_1 = C_1/2a \tag{43}$$

Figure 4 is a plot of the fundamental frequency of sound generated in the head as a function of head radii. The frequency varies from above 80 KHz for mice ($a \tilde{=} 1$ cm) to about 8 KHz for humans (a = 7-10 cm). Chou's [7] experimental results indicate that cochlear microphonic oscillations on the order of 50 KHz may be recorded from the round window of guinea pigs exposed to pulsed 918 MHz microwave radiation. The average brain radius for a guinea pig is about 1.2 cm. According to Figure 4, this head size will give rise to a fundamental sound frequency of 60 KHz in the guinea's head, this agrees reasonable well with Chou's experimental results [21]. The difference may be due to the head's nonspherical nature and nonhomogeneous character as well as to individual size variations of the guinea pigs' heads.