AbstractID: 5921 Title: Brain Phantom for Validation of Low Frequency Ultrasound Heating Divices

Abstract

Ultrasound thermal therapy of the brain may emerge as an independent modality of treating radioresistant tumours. Prior to clinical use, the heating technologies must be accurately evaluated either in animal models or in brain phantoms. In this paper, a gel phantom based on bovine powder gelatin in ethanediol is proposed. A heuristic method was used to determine an accurate percentage of powder gelatin in ethanediol. In our phantom, at 10.54 % of gelatin in ethanediol the following physical properties were obtained: density of 1040 kg/m^3 $\pm$ 1.0 % at 24 ^{o}C; acoustic speed of 1540 m/s $\pm$ 0.8%; the amplitude attenuation coefficients of (61 ± 2), (113 ± 4) and (175 ± 5) dB/m at 1, 1.6 and 2.25 MHz, respectively. The average thermal conductivity in the gel was (0.532 ± 0.054) W/m/K at 24^{o}C. The sources of uncertainties in determination of acoustic and thermal properties of the gel are discussed. Both the thermal and acoustic properties of our phantom correspond closely to those reported for brain in the literature. The concentration of the gelatin in the solvent is similar to protein content in the brain, thus suggesting that the protein concentration is of primary importance in tissue phantom preparation.