Abstracts

Effect of Surface Cooling and Blood Flow on the Electromagnetic Heating of Tissue

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Temperature profiles are calculated in tissue models exposed to microwave radiation, by solving the heat transport equation taking into account thermal conduction, thermal convection due to blood flow, and surface cooling of the tissue. We consider two idealized models representing limiting cases of the microwave heating behavior of actual tissue sections. The first consists of a semi-infinite tissue slab exposed to plane electromagnetic radiation; the second considers focused microwave heating in a finite volume of tissue. In both cases, the steady state temperature profile is largely determined by the blood flow and can be considerably different from the microwave energy deposition pattern. In the steady state, the blood flow at physiological levels creates an effective diffusion length of about 1 cm which averages out the temperature variation in the tissue.

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