

Knowledge of electrical resistivity of tumor compared to normal tissue is important for the application of radio frequency ablation where it is necessary for estimation of energy dissipation distribution as well as for electromagnetic tumor detection. We measured the electrical resistivity of normal and tumor tissue in rats. Tumor growth was induced by injecting 10⁶ cells of the syngeneic colonic adenocarcinoma cell line K12/TRb in a subcapsular location in the BD-IX rat liver. Measurements were performed 4 to 6 weeks after induction of tumor. Tumor sizes were between 1 and 2 cm. We used plunge electrodes, the 4-terminal method and a computer automated measurement system to acquire data at 7 frequencies from 10 Hz to 1 MHz. At 10 Hz resistivity was ~950 $\Omega\cdot\text{cm}$ for normal tissue and ~250 $\Omega\cdot\text{cm}$ for tumor tissue. At 1 MHz resistivity was ~300 $\Omega\cdot\text{cm}$ for normal tissue and ~180 $\Omega\cdot\text{cm}$ for tumor tissue. At high radio frequencies only small differences in resistivities can be observed, mainly due to higher water content in cancerous tissue. At low frequencies current is restricted to extracellular space. The evident differences between normal and neoplastic tissue resistivity can be attributed mainly to necrosis and membrane breakdown within the tumor. Lack of supply of oxygen, glucose and other nutrients as well as accumulation of toxic metabolic waste products due to low vascular supply inside the tumor result in cell death and membrane breakdown. These conclusions are supported by histologic examinations following the measurement procedure and sacrifice of the animal.