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Thermal (rf) and non-thermal mechanisms of nanoparticles induced/enhanced cancer cell apoptosis JAREK WOSIK, University of Houston, DHIYA KETHARNATH, University of Missouri Kansas City, MATTHEW J. WARE, BIANA GODIN, The Methodist Hospital Research Institute, WANDA ZAGOZDZON-WOSIK, University of Houston — It was demonstrated that the *rf* procedures can be non-invasive and cancer selective when combined with nanoparticles (NPs) that work as *rf* heating enhancers. However, there are disparities, between theory and experimental results, especially for non-magnetic NP. Therefore, it is necessary to elucidate the physical mechanisms that control the reported *rf* heating. We have constructed an apparatus for *rf* heating, which allows for applying either E_{rf} or H_{rf} fields in the kHz-MHz frequency range. Our results of specific absorption rate (SAR) measurements for both magnetic and nonmagnetic of NPs indicate that *rf* electric field also plays the role in heating of magnetic NPs and that in the nonmagnetic case only interface losses are responsible for the observed heating. In search for a more efficient and non-thermal method, we have explored a cancer cell death through mechanical stress imposed on the cell membrane. We have designed a special setup to apply either static or ac magnetic fields/gradients (up 300T/m) to cultured cancer cell lines with/without PNs added. The fields and gradients, and forces applied were simulated using HFSS/Maxwell software. Pancreatic adenocarcinoma cell line, AsPC-1 stained with DRAQ7 were studied. Very strong dependence of number of dead cells on applied field strength was observed. Discussion of the two mechanisms (*rf* and non-*rf*) of observed apoptosis will be presented.

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