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Analysis on the tumor size and weight effects of targeted osmotic lysis in a murine model of pancreatic cancer

Pancreatic cancer is one of the deadliest diseases in the world. It is a rare disease that produces 200,000 cases a year in the United States and has a 10% five year survival rate when all SEER (Surveillance, Epidemiology, and End Results) stages are combined. The main treatments for pancreatic cancer are chemotherapy, surgery, and radiation therapy. These current treatments have many adverse side effects that decrease the quality of life for the patient. The proposed project uses a new technique called Targeted Osmotic Lysis (TOL). This technique kills cancer cells without affecting non-cancerous cells and thereby reducing adverse side effects. It does this by taking advantage of cancer cells expressing more voltage-gated sodium channels (VGSCs) than that of noncancerous cells. TOL treatment works by stimulating VGSCs and at the same time blocking Na⁺K⁺ATPase sodium pumps with a pharmaceutical, digoxin. This allows Na⁺ to enter the cell and inhibit Na⁺ from leaving the cell, causing an osmotic lysis of the cancer cell. We proposed to examine methods to measure the effects of TOL on a murine model of pancreatic cancer. We hypothesized that TOL treated mice will have a decrease in tumor size and a decrease in body weight. The experiment measures size of tumor and weight of mice from four treatment groups (control, drug, stim, TOL) with a sample size of size for each group. The control group was treated with neither the drug nor stimulation, the drug group was treated with digoxin only, the stimulation group was treated with the pulse electric field (PEF) using a customized engineered coaxial ring device only, and the TOL group was treated with both digoxin and PEF stimulation. After treatment, we analyzed the weight of the mice and the size of tumors of each treatment group. The results showed a trend in decreased weight and size of tumor in the TOL group, but with no significant difference when compared to the other treatment groups.