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"Na^+/K^+ ATPase Regulation of Breast Cancer Motility"

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Background: Na^+/K^+ ATPase pump is a ubiquitously expressed, energy consuming protein in cell membranes. The Na^+/K^+ ATPase helps maintain osmotic equilibrium and membrane potential in cells. It has been found to be overexpressed in many cancers, but its impact on the development of cancer is unclear. The role that the energy consumption, ion transport and signal transduction mechanisms of Na^+/K^+ ATPase play on impacting the behavior of cancer cells is a major field of study in our lab. The present study examines the effect of blocking Na^+/K^+ ATPase function with different drugs on the motility of both highly and weakly metastatic breast cancer cells. We hypothesize bocking Na^+/K^+ ATPase pump with an inhibitor will decrease the rate of breast cancer cells motility *in vitro*.
Methods: In these experiments, we use a wound healing assay to measure cell motility in breast cancer cell lines, MDA-MB-231 and MCF-7 cell lines, a highly metastatic and moderate metastatic cell line respectively. Cells were seeded in a six-well plate at one million per well. After 24 hours, the cells were treated with an Na^+/K^+ ATPase inhibitor, ouabain at a concentration of 100 nM or digoxin at 500 nM concentration. Measurements of wound mark were taken at 0-hour , T=0, and 24-hour, T=24. The rate of motility of treated vs non-treated cells were compared.
Results: MDA-MB-231 cells treated with ouabain, or digoxin had a significant decrease in cell motility compared to non-treated MDA-MB-231 cells. The ouabain treated MCF-7 cells showed signs of toxicity at 100 nM concentration of ouabain and were therefore not measured.
Conclusion: Our results suggest that blocking sodium pumps deceases cell motility of MDA-MB-231 breast cancer cells *in vitro* and potentially shuts energy consumption into another signaling pathway that does not play a role in cell motility. In addition, the effective concentration of ouabain of highly metastatic affects differs from moderate metastatic breast cancer cell lines.