Enhancing Breast Cancer Treatment Efficiency Using Circadian Rhythm

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Twelve percent of women develop invasive breast cancer (National Cancer Institute, 2012). Breast cancer is the second leading cause of cancer deaths in women in the United States, killing over 40,000 annually. Chemotherapeutic drugs, such as Taxol, have harmful side effects. Yielding maximal benefits from chemotherapy is desired. The circadian rhythm is the daily cycle that regulates many physiological processes. Variations in biomarker levels of the hormones cortisol and melatonin represent this rhythm. Tumor cells may reproduce at a greater rate when cortisol levels are peaking during morning hours. Treating cancer when cortisol is highest may be more effective. MCF-7 Breast Adenocarcinoma cells were resuscitated, cultured, and fed until cells reached 70% confluency. Cells were sub-cultured into 96 well plates. Cortisol and melatonin were diluted to the micro-molar level, and Taxol was diluted to the nano-molar level. Wells were treated with cortisol, cortisol + Taxol, cortisol + melatonin, melatonin, and Taxol. MTT assay was run after zero and 48 hours. Cortisol increased cell proliferation with an average optical density of .082 after 48 hours. Statistical significance was proven when cells were treated with cortisol + Taxol as average optical density decreased from .048 to .025 between zero and 48 hours. Melatonin and Taxol alone showed little proliferation difference between zero and 48 hours which might imply most cell death occurred immediately after treatment. These results could suggest more effective treatment with Taxol when cortisol levels are high.

Awards Won: