The Effect of Nutrient Levels on Chemotherapeutic Drug Efficacy in NCI-H460, Non-Small Cell Lung Carcinoma Cells

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While many pharmacological treatments show potential in a lab setting, clinical results show that cancer remains one of the most prominent causes of death throughout the world. These translational errors may be occurring because emerging knowledge of the tumor environment is still being converted into the model systems used to discover and evaluate new cancer chemotherapies. Cancer cells are characterized by uncontrolled growth, and their heightened metabolic needs are often accompanied with dysfunctional vasculature. This creates a unique microenvironment where cancer cells may receive varying levels of nutrients depending on their distance from the closest blood vessel. I hypothesized that the way cells react to chemotherapeutic drugs may be directly related to the amount of nutrients that is available to them from their microenvironment. In this study, non-small cell lung carcinoma (NSCLC) cells were treated with several chemotherapeutic drugs in varying nutrient conditions. It was found that cells treated with a cell-cycle dependent drug, mitoxantrone, experienced up to 84% more cell death in nutrient-rich medium than cells treated in nutrient-deficient medium. However, when treated with oxaliplatin, a transcription inhibitor, cells experienced 58% more cell death in nutrient-deficient medium than those in nutrient-rich medium. This suggests that nutrient levels have varying effects on drug efficacy depending on the drug's mechanism of action. These findings have implications for cancer drug discovery, treatment combinations, and drug administration so that the optimal environments in which drugs function are exploited. This novel discovery may have important implications in the future of cancer treatment.

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