Cancer is the second leading cause of death in the United States and novel methods of treating advanced malignancies are of high importance. Of these deaths, prostate cancer and breast cancer are the second most fatal carcinomas in men and women respectively, while pancreatic cancer is the fourth most fatal in both men and women. Developing new drugs for the treatment of cancer is both a slow and expensive process. It is estimated that it takes an average of 15 years and an expense of $800 million to bring a single new drug to the market. However, it is also estimated that nearly 40% of that cost could be avoided by finding alternative uses for drugs that have already been approved by the Food and Drug Administration (FDA).

The research presented in this defense describes the testing, identification, and mechanistic evaluation of novel methods for treating many human carcinomas using drugs previously approved by the FDA. A tissue culture plate-based screening of FDA approved drugs will identify compounds that can be used in combination with the protein TRAIL to induce apoptosis selectively in cancer cells. Identified leads will next be optimized using high-throughput microfluidic devices to determine the most effective treatment conditions. Finally, a rigorous mechanistic analysis will be conducted to understand how the FDA-approved drug mitoxantrone, sensitizes cancer cells to TRAIL-mediated apoptosis.