

QING WANG, Department of Computer Sciences, Mathematics, and Engineering, Shepherd University, Shepherdstown, WV 25443, and CHRISTINE J. WANG, Crofton High School, Gambrills, MD 21054. Mathematical Modeling and Analysis of Tumor Growth in response to a Mixed Chemotherapy and Immune Checkpoint Inhibition Therapy.

Recent studies in some preclinical and clinical research suggest that combined immunotherapy targeting the immune checkpoint receptors cytotoxic T-lymphocyte-associated protein 4 (CTLA-4) and programmed cell death 1 (PD-1), or CTLA-4 and the PD-1 ligand (PD-L1) exhibits superior anti-tumor responses compared with each therapy alone. The use of chemotherapy has significantly improved the prognosis of patients with advanced cancer. In this project, we developed a multi-scale tumor growth model using a system of impulsive ordinary differential equations to describe the interactions among major players of the immune system and the tumor microenvironment. Mathematical analysis was conducted for better understanding of the long run behavior of tumor growth subject to mixed chemotherapy and immune checkpoint inhibition therapy. The objective of this study was to develop a platform to improve cancer management by in silico screening of optimal timing and dosage of the mixed chemotherapy and immune checkpoint inhibition therapy through anti-CTLA-4 and anti-PD-1 antibodies. This study was supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence.