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Zachary J. Abernathy* (abernathy@winthrop.edu). *A Mathematical Model of Treatment of Cancer Stem Cells with Immunotherapy.*

Using the work of Shelby Wilson and Doron Levy (2012), we develop a mathematical model to study the growth and responsiveness of cancerous tumors to various immunotherapy treatments. We use numerical simulations and stability analysis to predict long-term behavior of passive and aggressive tumors with a range of antigenicities. For high antigenicity aggressive tumors, we show that remission is only achieved after combination treatment with TGF- β inhibitors and a peptide vaccine. Additionally, we show that combination treatment has limited effectiveness on low antigenicity aggressive tumors and that using TGF- β inhibition or vaccine treatment alone proves generally ineffective for all tumor types considered. A key feature of our model is the identification of separate cancer stem cell and tumor cell populations. Our model predicts that even with combination treatment, failure to completely eliminate the cancer stem cell population leads to cancer recurrence. (Received September 15, 2014)