1154-92-573 **James M Greene** and **Cynthia H Sanchez-Tapia*** (hixacyn@gmail.com), 110 Frelinghuysen Road, 1st floor, Hill Center. Department of Mathematics, Rutgers University, Piscataway, NJ 08854, and **Eduardo D Sontag**. *Control Structures of a Cancer Drug Resistance Model.*

The more recent experimental discovery of epigenetic and phenotype plasticity suggests that chemotherapy can produce drug-resistant clones. In this work, we seek a treatment protocol which maximizes the time to reach a critical tumor size. We utilize both the Pontryagin Maximum Principle and differential-geometric techniques to characterize solutions that maximize the time until treatment failure. The necessary conditions then imply that the optimal control can be synthesized as a combination of bang-bang and path-constrained arcs. We also investigate the dependence of the control structure and treatment efficacy as a function of both the chemotherapeutic cytotoxicity and the rate at which resistance is induced by the drug. Our results suggest that the latter may significantly alter the outcome of treatment, and may in fact be more important than drug toxicity in certain parameter ranges. Hence, the propensity of a treatment to promote resistance is clinically significant, demonstrating the need for further experimental and mathematical research. (Received September 07, 2019)