Apr 23rd, 9:15 AM

Tumor Evolution During Immunotherapy: A Study of Parameters that Influence the Dynamics of a Mathematical Model Based on Darcy's Law

Sarah Redemalla
Northeastern Illinois University

TUMOR EVOLUTION DURING IMMUNOTHERAPY: A STUDY OF PARAMETERS THAT INFLUENCE THE DYNAMICS OF A MATHEMATICAL MODEL BASED ON DARCY'S LAW.

Sarah Redemalla[1], Dr. Emma Turian[1], [1]Department of Mathematics, Northeastern Illinois University, Chicago, IL 60625

Immunotherapy can help the immune system locate and attack cancer cells. Current mathematical studies that are modelling tumor regression under immunotherapy employ mainly exponential, logistic or Gompertz models to express the growth of tumor cell population. The main goal of our proposed mathematical model is to employ growth terms derived using Darcy's Law and use them in a tumor-effector cell system to identify the most influential parameters for the model. Our system of differential equations includes the dynamics of cancer and effector cells, where the latter describes cells that have the ability to kill. Using numerical simulations, our proposed derived equations allow for the prediction of meaningful parameter values such as tumor mitosis, apoptosis, and blood factor. We evaluate system's performance relative to existing models, by employing nondimensionalization and stability analysis techniques and use Monte Carlo simulations to identify the most influential parameters. Our model suggests that mitosis, apoptosis and tumor's diffusion length parameters derived using Darcy's Law play an important role in tumor dynamics.