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Mathematical model of triple-negative breast cancer in response to combination chemotherapies


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Presenter Information

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Triple-negative breast cancer (TNBC) is a heterogeneous disease that is defined by its lack of estrogen hormone, progesterone hormone and human epidermal growth factor receptor 2 (HER2). The lack of receptors frequently results in poorer outcomes, higher rates of metastasis and recurrence since there are no viable targeted therapies. Combination chemotherapy treatments, radiation therapies, and surgery are the current standard-of-care for TNBC. We have built an ordinary differential equation model of TNBC and its response to a combination of chemotherapies, doxorubicin (DRB) and paclitaxel (PTX). This model was parameterized to longitudinal tumor volume and proliferation data, then validated using percent necrosis data for both a human cancer mouse model (MDA-MB-231) as well as a syngeneic, mammary carcinoma (4T1) mouse model. This novel mathematical model can give insight to the ordering, dosing, and timing of DRB and PTX treatment. More importantly, this model can also give insight to vital immunotherapies for TNBC, that we would not otherwise receive, due to its calibration to the syngeneic, mammary carcinoma (4T1) mouse model.