Multiscale model predicts dynamics of metabolic reprogramming in tumor spheroids

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Mathematical modeling provides the predictive ability to understand the metabolic reprogramming and complex pathways that mediate cancer cells' proliferation. We present a computational model [1] to predict the impact of intracellular metabolism on tumor growth. The model spans multiple time and length scales to recapitulate tumor growth: a detailed kinetic model of intracellular metabolite dynamics [2] on the order of minutes, reaction diffusion equations describing extracellular nutrient concentrations that change on the order of seconds, and cellular behavior including adhesion, proliferation, viability and cell state transitions, occurring on the timescale of hours. Through our model simulations, we investigate the responses of individual intracellular species under metabolic perturbations and quantify how those responses contribute to the response of the tumor as a whole. Excitingly, the model provides quantitative insight into the dynamic reprogramming of tumor cells at the intracellular level in response to specific metabolic perturbations. Overall, the model is a useful framework to study targeted metabolic strategies for inhibiting tumor growth.

REFERENCES

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