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Mathematical Model of Muscle wasting in cancer cachexia

Cancer cachexia is a severe condition, characterized by the irreversible loss of skeletal muscle and adipose tissues, that is estimated to affect more than 50-80The standard understanding of cachexia is based on nutritional arguments, and describes a disregulated cellular metabolism. As such, existing mathematical models focus on metabolic balances. However, a new appreciation is forming for cancer-derived signaling factors that circulate through the host and may disrupt tissue function and homeostasis. Here, we present a novel mathematical model to explore the role of systemic cancer signaling in the development of cachexia. The model describes stem-cell regulated muscle tissue using ordinary differential equations and feedback control. I will discuss our model parameterization strategy, and then present model predictions on potential effects of cancer-derived factors through numerical simulation and sensitivity analysis. We then use our combined modelling results to identify potential treatment options. As no known cure exists for cancer cachexia, it is hoped that uncovering cancer-derived systemic factors that disregulate tissue homeostasis, will lead to the development of new targeted therapies with the potential to impact quality of life for many cancer patients.