Personalized chemotherapy of tumor disease based on system modeling

Biaoru Li

Pediatric Hematology/Oncology

Research output: Chapter in Book/Report/Conference proceeding › Chapter

Abstract

Clinically, personalized medicine also referred to as precision medicine is a new medical model to be directly tailored for the care of individual patients. It is often called "the right treatment for the right person at the right time." Most successful examples of personalized treatments require a rational clinical genomic analysis. Following Research and Development (R&D) of techniques and analysis of clinical genomic expression, genomic expression profile along with system modeling has been increasingly applied for personalized therapy. Now personalized chemotherapy, one of personalized therapy, has been brought forward to the field of cancer. According to protocol of personalized chemotherapy from tumor tissue sampling to clinical application in queue, I will introduce the entire process including clinical sampling, analyzing mRNA genomic expression level with its diagnosis, discovering gene expression signature by system modeling and uncovering sensitive drugs from drugbank for clinical application. At present, after next-generation sequencing is brought into the new field, system modeling related with drugs discovery will make great contribution for future personalized chemotherapy of tumor diseases.
This model treated tumor cells as a single population and did not incorporate drug concentration-dependent cell cycle heterogeneities. Tumor growth with angiogenesis have also been modeled using multicell [19] and multiscale [20], [21] techniques, as well as multiscale modeling by incorporating drug therapy at the extracellular level [22] and drug combination for tumor treatment [23]. Tumor-induced angiogenesis was studied using a refined lattice-based model in which endothelial cells proliferate up a TAF gradient at a rate determined by the local interstitial pressure. We performed parameter sensitivity analysis to examine the robustness of the system of our model, that is to evaluate if varying key parameters may affect the results.