Insights gained from mathematical modeling of HER2 positive breast cancer

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Abstract: As the understanding of cellular regulatory networks grows, system dynamics and behaviors resulting from feedback effects have proven to be sufficiently complex so as to prevent intuitive understanding. Mathematical modeling in engineering has traditionally sought to extrapolate from existing information and underlying principles to create complex descriptions of various systems, which could be analyzed or simulated, and from which further abstractions could be made. However, in studying biological systems, often only incomplete abstracted hypotheses exist to explain observed complex patterning and functions. The challenge has become to show that enough of a network is understood to explain the behavior of the system. Mathematical modeling must simultaneously characterize the complex and nonintuitive behavior of a network, while revealing deficiencies in the model and suggesting new experimental directions. In this talk, we describe the process of modeling treated regulatory networks in breast cancer. We demonstrate the use of the mathematical models in both understanding the system, and in suggesting new treatments. The talk will conclude with experimental results on HER2 positive cell lines. This is joint work with Soulaiman Itani, Young Hwan Chang, Jim Korkola, and Joe Gray.