Modeling cancer biology

Science, Biology

Article Review Cobb, Kristin. Modeling Cancer Biology, Biomedical Computation Review, (Spring, 2007), 3 (2), 16-24. In this article Dr. Kristine Cobb explains, citing evidence from joint experiments by mathematicians and biologists, how mathematical models are transforming the fight against cancer. The article points out that the mathematicians' works are rarely referred to or put to use by the biologists and stresses the need for collaborative work between them in the light of the benefits revealed by the cases cited. For example, Dr. Natalia Komaroa models the inactivation of APC tumour suppressor gene, the initiating event in colon cancer, for estimating the number of stem cells in the bottom of each microscopic pit of colon tissue (called crypt). In another example, Dr. Galit Lahav studies the tumour suppressor gene p53, both theoretically and experimentally. She feels that models will help biologists to predict the behaviour of the network in response to different treatments and also to experiment with new ideas (Cobb, p. 19.). Dr. Zvia Agur's model of three inter-connected modules of partial differential equations revealed that a single anti-angiogenesis drug is insufficient to eliminate a tumour and the clinical trials with Avastin monotherapy subsequently confirmed the results. Dr. Vito Quaranta's experiments in modelling the invasion by cancer cells in collaboration with mathematician Dr. Alexander Anderson revealed that radiation, chemotherapy and normal drugs may actually accelerate the growth of cancer cells (p. 22.). In Kristin Swanson's opinion (as cited in Cobb, 2007), rather than using diagnostic MRI alone, if it is used along with her model simulating spread of glioma cells in brain tumour, it will be possible to predict survival with very reasonable accuracy for an individual patient (p.

23.). The point that emerges out of these examples is the need for much more joint collaborative efforts of biologists and mathematicians. Initiatives like the “ Integrative Cancer Biology Program (ICBP)” will help promote such collaboration. Quaranta feels that the mathematics-driven simulations will become more common and this will drastically alter methods of experimental oncology for the better (Cobb, p. 24.). The article ends with a general feeling of optimism about a fast approaching new era in cancer biology.