PHYSICS AND ASTRONOMY
COLLOQUIUM

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"Effects of Radiation on Tumor Cell Migration"

Abstract

Conventional radiobiology models radiation as a treatment that kills a percentage of cells within the target tumor, with this killing efficiency dependent on the radiation type, dose, and biological factors such as cell type, cell cycle status, and oxygenation. Recently, it has been shown that the process of metastasis, in which tumor cells migrate from their parent tumor to distant sites to form secondary lesions, may function in reverse, resulting in the transit of cells from the circulation and/or secondary tumors back to the primary cancer. We hypothesized that this process of tumor reseeding may limit the efficacy of focal treatments such as radiotherapy, because untreated cells returning to the treated tumor could lead to tumor regrowth. In this talk I will review our efforts to observe, quantify, and characterize this process, including the development of clinically relevant conformal radiotherapy techniques for small animals and molecular imaging methods to track migrating cells. We have demonstrated that irradiation of cancer cells *in vitro* results in the production of the cytokine granulocyte macrophage colony stimulating factor (GM-CSF), which acts as an attractant for migrating tumor cells. Through the development of donor and recipient mouse models of cancer, we have shown *in vivo* that radiotherapy of breast cancers attracts circulating tumors cells (CTCs) to the site of irradiation and results in tumor recurrence. Furthermore, we have observed that irradiation of normal mammary tissues, muscle, and skin can attract CTCs, suggesting that radiation may similarly attract tumor cells to normal tissues and promote metastasis. These novel findings suggest that cancer radiobiology may be driven not solely by cell kill but also by cell migration, and encourage further investigation of these phenomena in other tumor types and in the clinical setting.

Wednesday, February 3, 2016
3:00 p.m.
Bob Wright Centre
Room A104