UNIVERSITÀ DELLA CALABRIA
DIPARTIMENTO DI MATEMATICA E INFORMATICA

Dipartimento di Matematica e Informatica

Avviso di Seminario

Lunedì 27 luglio 2015 – ore 11:00

Aula MT10 – cubo 30B primo piano

il prof. ***Vittorio CRISTINI***

ISI Highly-Cited Researchers in the Mathematics category (Thomson Reuters 2014)
Medical School and Institute for Molecular Medicine (IMM) at the University of Texas (UT)
Health Science Center, Houston

terrà un seminario dal titolo:

Mechanistic patient-specific predictive correlation of tumor drug response with microenvironment and perfusion measurements

Abstract

Physical properties of the microenvironment influence penetration of drugs into tumors. Here, we develop a mathematical model to predict the outcome of chemotherapy based on the physical laws of diffusion. The most important parameters in the model are the volume fraction occupied by tumor blood vessels and their average diameter. Drug delivery to cells, and kill thereof, are mediated by these microenvironmental properties and affected by the diffusion penetration distance after extravasation. To calculate parameter values we fit the model to histopathology measurements of the fraction of tumor killed after chemotherapy in human patients with colorectal cancer metastatic to liver (coefficient of determination $R2 = 0.94$). To validate the model in a different tumor type, we input patient-specific model parameter values from glioblastoma; the model successfully predicts extent of tumor kill after chemotherapy ($R2 = 0.7–0.91$). Toward prospective clinical translation, we calculate blood volume fraction parameter values from in vivo contrast-enhanced computed tomography imaging from a separate cohort of patients with colorectal cancer metastatic to liver, and demonstrate accurate model predictions of individual patient responses (average relative error = 15%). Here, patient-specific data from either in vivo imaging or histopathology drives output of the model's formulas. Values obtained from standard clinical diagnostic measurements for each individual are entered into the model, producing accurate predictions of tumor kill after chemotherapy. Clinical translation will enable the rational design of individualized treatment strategies such as amount, frequency, and delivery platform of drug and the need for ancillary non–drug-based treatment.

Il Direttore del Dipartimento
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