# Mathematical Model Predicts Factors Driving Tumor Invasion

July 2 2009

Tumors are complex collections of cells whose behavior has proven difficult to understand, let alone predict. As a result, oncologists are often surprised by how a particular patient responds to a given course of therapy.

Enter mathematics. Using a sophisticated mathematical model that relates a wide variety of biological variables to disease progression, a research team headed by Vittorio Cristini, Ph.D., and Mauro Ferrari, Ph.D., the University of Texas Health Science Center in Houston, and David B. Agus, M.D., the University of Southern California and the Center for Cancer Nanotechnology Excellence Focused on Therapy Response, has shown that accounting for the shape and physical characteristics of the tumor margin and invasiveness of the tumor accurately predicts how a particular tumor will develop and metastasize.

The results of this study appear in the journal *Cancer Research*.

One of the major findings of this study is that tumor progression is not a random process, but rather one that responds predictably based on well-established biophysical laws, genetic effects, and the microenvironment surrounding a tumor, among other factors. The model predicts that different tumor morphologies—the shapes and structural features of a given tumor—influence a tumor's ability to infiltrate otherwise healthy tissue in a predictable manner. Tumor morphology is determined as part of the standard procedures used to characterize tumors from tissue biopsies.

The researchers note that this model may provide new insights into how a tumor is perturbed by various therapies. If so, this model could prove useful in designing new clinical endpoints in therapeutic trials and ultimately in predicting patient response to a given therapy based on the unique physical characteristics of that patient's disease.

This work, which is detailed in the paper "Multiparameter computational modeling of tumor invasion," was supported in part by the NCI Alliance for Nanotechnology in Cancer, a comprehensive initiative designed to accelerate the application of nanotechnology to the prevention, diagnosis, and treatment of cancer. Investigators from Brown University, University of California, Irvine, and University of Tennessee also participated in this study. An abstract is available at the journal's Web site.

Provided by National Cancer Institute (news : web)