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Clinical Cancer Research

Letter to the Editor

Modeling the Tumor Growth Profiles in Xenograft Experiments—Letter

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We read with interest the proposal of Zhao and colleagues (1) concerning the analysis of tumor xenograft experiments and the accompanying commentary (2) that further highlights the main advantages and limitations of the suggested approach. However, I would like to point out to a distinct aspect of tumor xenograft growth not adequately addressed by Zhao and colleagues (1) and Heitjan (2), which deserves a short remark.

Zhao and colleagues (1) assume exponential growth or regression during the whole xenograft experiment. Although this is a sufficient operational approximation that facilitates the model calculations and is approximately fulfilled in many cases, it is biologically quite irrelevant, as it presumes a tumor growth that totally escapes from any form of growth restriction or homeostatic control. The presented approach is efficient enough to heuristically analyze corresponding tumor xenorgaft experiments; however, it lacks the potency to adequately interpret alterations in the pattern of tumor growth after treatment.

Particularly, quantification of growth retardation, as usually approached through tumor growth data modeling with the help of sigmoidal growth curves (logistic, Gompertz, etc.), may provide quite valuable and biologically interpretable information concerning tumor biology and therapeutic response (2). For example, we have previously shown that the growth pattern of first-generation renal cell carcinoma xenografts in nude mice is not exponential and that the prognosis of the patients correlates with the rate of growth retardation of the tumor xenograft, being better for tumors with a higher degree of growth retardation (3). Also, phenomena related to tumor dormancy and their consequences for the evaluation of treatment strategies can be conceptualized only within the framework of tumor growth patterns with growth saturation kinetics (4).

Finally, treatment usually changes the pattern of tumor growth, leading in many cases to complexly altered growth dynamics of treated or relapsed tumors compared with untreated controls, especially with the current use of biologics. Treatment can substantially alter the growth pattern of xenografts in nude mice by affecting not simply growth rates but also the process of growth retardation (5). Accordingly, following a partial response tumor regrowth may start with lower growth rates than controls; however, the treated tumors may ultimately become even larger due to a parallel inhibition of the process of growth retardation. Nonexponential extensions of the model proposed by Zhao and colleagues (1) are welcome for a more versatile approach to the evaluation of tumor xenograft experiments.

Disclosure of Potential Conflicts of Interest

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