HSG tumor cells (2). Beuve *et al*. use D_t = 10 Gy, which is not appropriate. The inaccuracy of a ''factor of 10'' results from this wrong choice of D_t. Using the value of 30 Gy would result in a much better agreement with the experimental data and essentially make their attempts to ''improve'' the model unnecessary.

The proposed improvement is based on the claim that the final slope s_{max} is a more reliable parameter to represent the photon dose response curve than D_t. We have already stressed the importance of the final slope s_{max} as a determinant of the relative biological effectiveness (3), but the data reported recently (4) indicate that the optimized values for s_{max} would spread as significantly as the values for D_t. Moreover, for choosing the appropriate parameters it makes no difference whether D_t or s_{max} is adjusted, because they are both linked by $s_{max} = \alpha + 2\beta D_t$.

Furthermore, if the authors conclude that improvements of the LEM are required, it remains unclear why they did not use the most recent version of the LEM (2) for their comparison.

The authors also claim that they present the first application of the LEM to tumor cells. This is not correct, because we have made extensive comparisons of the model prediction for inactivation of HSG tumor cells over a wide range of LET values (2).

In addition, the authors claim to have introduced a new, alternative method for the LQ analysis of survival curves. Again, this is not original, because the analysis based on a linear fit to the data plotted as $-\ln(S(D))/D$ was proposed already by Chapman (5) and used later (e.g., by Skarsgard *et al*.) (6).

Finally, the clinical results for tumor control after carbon ion treatment are consistent with the data extrapolated from low-LET radiotherapy (7). This indicates that the LEM already in its present implementation represents an accurate tool for treatment plan optimization in ion beam radiotherapy.

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1. Beuve M, Alphonse G, Maalouf M, *et al*. Radiobiologic parameters and local effect model predictions for head-and-neck squamous cell carcinomas exposed to high linear energy transfer ions. *Int J Radiat Oncol Biol Phys*. In press.
2. Elsässer T, Scholz M. Cluster effects within the local effect model. *Radiat Res* 2007;167:319–329.
3. Scholz M, Elsässer T. Biophysical models in ion beam radiotherapy. *Adv Space Res* 2007;40:1381–1391.
4. Elsässer T, Krämer M, Scholz M. Accuracy of the local effect model for the prediction of biological effects of carbon ion beams in-vitro and in-vivo. *Int J Radiat Oncol Biol Phys* 2008;71:866–872.
5. Chapman JD. Biophysical models of mammalian cell inactivation by radiation. In: Meyn E, Withers HR, editors. Radiation biology in cancer research. New York: Raven Press; 1980. p. 21–32.
6. Skarsgard LL, Harrison I, Durand RE. The radiation response of asynchronous cells at low dose: Evidence of a substructure. *Radiat Res* 1991;127:248–256.
7. Schulz-Ertner D, Karger CP, Feuerhake A, *et al*. Effectiveness of carbon ion radiotherapy in the treatment of skull-base chordomas. *Int J Radiat Oncol Biol Phys* 2007;68:449–457.

IN RESPONSE TO SCHOLZ *ET AL.*

To the Editor: We thank Drs. Scholz and Elsässer for their interest in our article (1) and address a response to their objections.

The authors did propose a D_t value of 30 Gy (2) for V79 cells, but also values of 12 and 17 Gy (3). We decided to consider D_t = 10 Gy because Paganetti and Goitein (4) independently reported a general agreement with this value for V79 cells irradiated with protons. We would like to stress that Scholz and Kraft (5) described the local effect model (LEM) as a model with no free parameters as compared with Katz model (6), and recently emphasized that ''no data for high-LET [linear energy transfer] radiations are required to determine the input parameters of the model, and no free parameters have to be fitted'' (7). We clearly demonstrated that D_t could not be measured nor set arbitrarily, but should be fitted from at least one set of experimental data with high-LET radiations.

We agree with the authors that s_{max} and D_t seem equivalent through $s_{max} = 2\beta D_t + \alpha$. Nevertheless, the experimental determination of (α,β) is influenced by biologic fluctuations. We clearly pointed out that s_{max} is less sensitive to (α,β) fluctuations and thus more reliable than D_t.

We indeed referenced the work of Elsässer and Scholz (2), which is presented as ''a first test of the extended local effect model on experimental data.'' Because V79 and XRS were derived from normal tissue, and because at no point in the article were HSG cells described as tumor cells, we understandably considered HSG cells as also being normal.

We missed the less recent works of Chapman (8) and Skarsgard *et al*. (9), which did not concern LEM, although we did highlight that a linear fit to data plotted as –ln(S(D))/D is very adaptable to the application of LEM for which accurate determination of β is crucial.

With regard to our choice of the original version of LEM, this is the version most likely to be chosen in the treatment planning system of the future European hadrontherapy centers for clinical data comparison. Since 1997, many patients have been treated at Gesellschaft für Schwerionenforschung using the TRiP98 (treatment planning for particles) code with the original version of LEM and not the more recent (2). It is this that led us to evaluate the original LEM and conclude on the need for a set of data concerning various tumor cell lines for treatment-planning optimization. A comparison of all available models will determine the most appropriate for clinical application.

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1. Beuve M, Alphonse G, Maalouf M, *et al*. Radiobiologic parameters and local effect model predictions for head-and-neck squamous cell carcinomas exposed to high linear energy transfer ions. *Int J Radiat Oncol Biol Phys* 2008;71:635–642.
2. Elsässer T, Scholz M. Cluster effects within the local effect model. *Radiat Res* 2007;167:319–329.
3. Scholz M, Kraft G. Track structure and the calculation of biological effects of heavy charged particles. *Adv Space Res* 1996;18:5–24.
4. Paganetti H, Goitein M. Biophysical modelling of proton radiation effects based on amorphous track models. *Int J Radiat Biol* 2001;77:911–928.
5. Scholz M, Kraft G. Calculation of heavy ion inactivation probabilities based on track structure, x ray sensitivity and target size. *Radiat Prot Dosimetry* 1994;52:29–33.
6. Katz R, Ackerson B, Homayoonfar M, *et al*. Inactivation of cells by heavy ion bombardment. *Radiat Res* 1971;47:402–425.
7. Scholz M, Kraft G. The physical and radiobiological basis of the local effect model: A response to the commentary by R. Katz. *Radiat Res* 2004;161:612–620.
8. Chapman JD. Biophysical models of mammalian cell inactivation by radiation. In: Meyn E, Withers HR, editors. Radiation biology in cancer research. New York: Raven Press; 1980. p. 21–32.
9. Skarsgard LL, Harrison I, Durand RE. The radiation response of asynchronous cells at low dose: evidence of a substructure. *Radiat Res* 1991;127:248–256.

CONTOURING CARCINOMAS BY FDG-PET: IS THE ROLE OF TUMOR BIOLOGY UNDERESTIMATED?: IN REGARD TO MACMANUS *ET AL.* (*INT J RADIAT ONCOL BIOL PHYS* 2008;71:2–4)

To the Editor: We read with great interest the editorial by MacManus and Hicks (1), who critically review most of the problems concerning primary tumor delineation using fluorodeoxyglucose-positron emission tomography (FDG-PET), suggesting that automated contouring approaches are confined to physician-defined regions of interest. However, cases of tumors with smaller T-volumes as identified by FDG-PET with respect to computed tomography are often reported.