

# In response to the commentary ‘Particle species dependence of cell survival relative biological effectiveness: Evident and not negligible’ by Thomas Friedrich, Marco Durante & Michael Scholz

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## To the Editor,

We appreciate the interest in our review article from 2011. We agree with the authors that there is clearly observable systematic particle dependence for the ions He, C and Ne in the V79 data set presented by us in [1], as pointed out by Friedrich et al. Yet we are still of the belief that our main conclusion holds, as this systematic trend is limited, when data points from additional particles are included. Furthermore, the mentioned systematic effect is hard to observe on the T1 and CHO cell lines presented in the same paper, although the data base is more limited in this case.

Our review was motivated by an earlier meta-analysis where a very limited data set indicated a strong dependence on particle type (as mentioned in [1]). When adding data points from our more extensive data base, this systematic effect became less evident, and even comparable with the general noise in the biology data, leading to the conclusion stated in our abstract.

We do not in our review question the existence of the particle-type dependent effect, however, as the stochastic noise has the magnitude as it is, one could possibly formulate a RBE(LET) dependency while accepting a certain error.

It is an over-interpretation of our speculation to propose that a crude approximate model should enter

the clinic, however, we do suggest that depending on the required precision for a given application a simplified RBE10%(LET) description may be possible.

The available data also clearly indicates that more high-quality RBE data are needed in order to reduce the stochastic error, which gives the clinical relevance. It is worth noting, that such errors can arise from non-uniform experimental irradiation- and data processing protocols applied at a multitude of facilities around the world. Coordinated efforts at large-scale facilities such as GSI and the suggested BioLEIR facility [2] using transparent and unified protocols would be desirable.

**Declaration of interest:** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

## References

- [1] Sørensen BS, Overgaard J, Bassler N. In vitro RBE-LET dependence for multiple particle types. *Acta Oncol* 2011;50: 757–62.
- [2] Holzscheiter MH, Bassler N, Dosanjh M, Sørensen BS, Overgaard J. A community call for a dedicated radiobiological research facility to support particle beam cancer therapy. *Radiother Oncol* 2012;105:1–3.