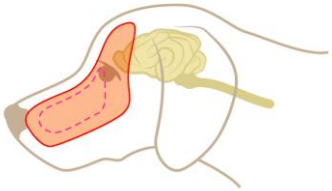
Main Research topic of Valeria Meier

Biologically based treatment planning

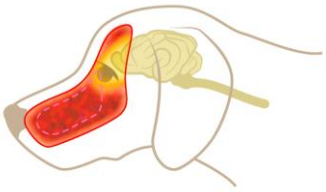
We plan to assess the superiority of deliberate heterogeneous dose prescription and delivery over homogeneous dose on the differences in tumor control. In our herein proposed approach, radiation dose to the tumor will be increased in all regions possible, limited only by the upper limit of tolerance of the respective surrounding normal tissues.

- Theoretical risk and tumor control probability calculations
- Randomized clinical studies animal patients with cancer, undergoing radiation therapy for their disease
- Calculations of risk of second cancer induction

Expected results / their impact for the field: A growing list of evidence highlights advantages of heterogeneous dose deposition in tumors. The herein proposed study aims to propagate theoretical calculation work into clinical treatments. As a result, the understanding of the effect of heterogeneous dose distribution will be greatly increased. This study is unique in that it will not only use theoretical dose, risk and outcome calculations, but also use animals with cancer as models with diseases in various anatomical settings to preliminarily validate the predictions.



A) Traditional dose distribution: homogeneous dose (orange) that can be given is limited by the proximity of the sensitive eye and brain. The dose remains orange over the whole tumor due to the priority of dose homogeneity.



B) Proposed approach of deliberate heterogeneous dose distribution: The sensitive organs limit the dose in the close proximity (complication risk is set at <10%). The rest of the dose is not constrained, allowing the computer algorithm a high degree of freedom for dose deposition. High dose areas are allowed and intended to compensate the sensitive-organ-caused underdosages.