Relative to the bonfire of highly publicised novel systemic treatments flooding the global cancer market year after year, radiation oncology may be perceived by the casual observer as a comparably quiet backwater. A closer look, however, reveals a vibrant field. This is certainly true in terms of exciting technological developments such as the MR Linac, which is in the process of revolutionising image-guided radiotherapy, or FLASH-RT, whose ultra-high dose-rates promise to alleviate normal tissue damage through oxygen exhaustion.

Similarly inspiring new concepts and technologies have been shaking up the field of translational radiation biology, as testified by the collection of recent articles on precision radiation oncology assembled in this volume. Genomic, proteomic, kinomic and other "big data"-based predictors of treatment response are increasingly becoming available to help personalise radio- and multimodal therapy regimes. These are complemented by functional or radiomics-based imaging biomarkers detecting hypoxia and other tumour-specific features.

Other active areas in precision radiation oncology covered in this collection include the development of strategies for tumour radiosensitisation, e.g. by molecular targeting of oncogenic signalling or DNA damage response pathways or by targeted delivery of radiosensitzers such as high-Z nanoparticles. Also, the complex interactions of tumours, radiation and the immune system have become a hot topic that highlights radiotherapy as an attractive therapeutic agent to enhance tumour immunogenicity.

At the same time our toolbox of model systems has never been more impressive, with genetically engineered mouse models, patient-derived xenografts, orthotopic and immune-competent tumour models, 3D tumoroid, organoid and tissue slice cultures offering a wide choice of clinically more relevant experimental systems than the conventional 2D cell culture practices of past decades.

While all these thrilling developments open up fantastic opportunities for precision radiation oncology, we also face quite a few challenges. To start with, the very nature of personalised medicine means that finding large enough patient cohorts to conduct a meaningful clinical trial on a particular individual therapy approach is often impossible in a single centre setting, even when running entity-independent basket trials. Thus, large networks of closely aligned centres with harmonised diagnostic and treatment decision pathways, consistent follow-up practices and frictionless data usage and data sharing policies are required. Understanding the complex interactions and the ideal sequencing of multi-modal therapies remains another major challenge. Also, the amount of information generated using today's omics technologies requires appropriate data management strategies, information technology infrastructures and robust support by skilled bioinformaticians and data scientists, of whom there is a considerable shortage in many countries. Finally, an effective implementation of precision radiation oncology also relies on knowledgeable healthcare providers, and therefore requires continued educational effort. As one small step to address this last point, themed article collections such as the one presented here may help interested readers get an overview of recent developments and topics in this field.

Kai Rothkamm, PhD
Department of Radiotherapy and Radiation Oncology,
University Medical Center Hamburg-Eppendorf,
Germany