

Project abstract

Name of DKFZ research division/group:	<i>mRNA Cancer Immunotherapies (D194)</i>
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Group homepage: Please visit our website for further information on our research and recent publications.	<u>https://www.dkfz.de/en/mrna-cancer-immunotherapies</u>

PROJECT PROPOSAL

Our research team at the Helmholtz Institute for Translational Oncology Mainz, focuses on advancing cancer immunotherapy by leveraging the versatility and adjuvant properties of mRNA to enhance immunostimulatory effects in the tumor microenvironment (TME) and promote antitumor responses. Despite having revolutionized cancer treatment, application of immunotherapy remains limited in solid tumors largely due to the highly immunosuppressive TME. We aim to develop more effective cancer treatments and improve patient outcomes by exploring innovative approaches that combine: machine learning-assisted integration of cancer patient multi-omics data (e.g., genomics, transcriptomics) to decipher relevant immunotherapy biomarker profiles and identify novel targets; RNA-lipid nanoparticles technology, as a delivery platform for precise gene expression modulation in cells of interest; comprehensive immune phenotyping of the TME, using advanced flow cytometry, single-cell RNA sequencing, and imaging techniques; advanced model systems that preserve or recapitulate the heterogeneous TME cellular composition, including human tumor explant models (derived from patient fresh tissue specimens) and three-dimensional (3D) bioprinted *in vitro* tumour models (bioprints).

In close collaboration with our research and clinical partners at the DKFZ and the University Medical Center of the Johannes Gutenberg University Mainz, our projects currently include:

- Development of mRNA cancer vaccines targeting shared neoantigens in glioma and cervical cancer
- Reprogramming of the TME for enhanced antitumor immune response using systematic combinatorial and spatial mRNA interventions in pancreatic and colorectal cancer
- Design of advanced nanoparticles to precisely target specific cells or tissues to enhance drug delivery, reduce side effects, and improve treatment efficacy



FROM BEDSIDE TO BENCH
AND BACK

DKFZ Clinician Scientist Program
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- Development of cell-specific expression systems for functional programming of T and NK cells

As a translational research group, we are seeking a highly motivated candidate with a strong interest in translational tumor immunology and a passion for bridging fundamental research with clinical applications.



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