Research profile for applicants

Name of DKFZ research division/group:	**Dendritic Cells in Infection and Cancer (D431)**
Contact person:	**Prof. Dr. Stella Autenrieth, stella.autenrieth@DKFZ.de, 06221-421290**
Group homepage: *Visit this website for further information on current research and recent publications.*	https://www.dkfz.de/en/virus-associated-carcinogenesis/d431-ag-autenrieth

RESEARCH PROFILE AND PROJECT TOPICS

Cancer is a complex disease characterized by the uncontrolled growth and spread of abnormal cells in the body. Despite advancements in treatment, cancer recurrence or relapse remains a significant challenge in clinical management. Relapse occurs when cancer cells reappear after a period of remission, often exhibiting increased resistance to treatment.
Circulating tumor cells (CTCs) play a crucial role in cancer relapse and therapy resistance. CTCs are cancer cells that have detached from the primary tumor and entered the bloodstream or lymphatic system, allowing them to travel to distant sites in the body. These cells can evade detection and survive in circulation, contributing to metastasis and the spread of cancer to other organs. Understanding and monitoring CTCs offer potential improvements in cancer management, including enhanced treatment strategies, early detection, and overcoming resistance mechanisms, ultimately improving patient outcomes.
The success of immunotherapy has led to numerous clinical trials aimed at gaining mechanistic insights and identifying predictive signatures for personalization. Modulating the immune system to treat cancers that have not responded to conventional chemotherapy has shown increasing potential for curative clinical benefits. Currently, the most commonly used therapeutic strategies include hematopoietic stem cell transplantation, immune checkpoint blockade, and adoptive transfer of chimeric antigen receptor (CAR) T cells.
Immune monitoring provides crucial insights into immune cell behavior at both the population and single-cell levels, which is valuable in many immunotherapy trials. Comprehensive phenotyping of immune cell populations helps clarify the cellular mechanisms underlying newly developed therapeutic approaches. It can also identify the presence of cellular and molecular signatures that stratify patients into different risk groups and/or help predict clinical response to therapy.
The human immune system is incredibly complex and diverse, necessitating the use of single-cell technologies for thorough analysis. Spectral flow cytometry allows for the simultaneous quantification of various molecular features. This capability facilitates the identification of a wide range of immune populations and cellular states. Additionally, it enables detailed

characterization of circulating tumor cells (CTCs) in a single assay, allowing for comprehensive immune monitoring of both small sample sizes and millions of cells from large patient cohorts. The project aims to conduct an in-depth characterization of CTCs and immune cells and their expression of immune regulatory proteins in patients with primary or relapsed gynecological cancers (GCs). It will compare these tumor and immune cells between peripheral blood and tumor sites, as well as identify specific cell populations or biomarkers that may explain sensitivity to chemotherapy and treatment responses. This research intends to contribute to the development of improved immune-modulating targeted therapies.
To achieve this, longitudinal analyses of blood, tumor, and liquid fluid samples from breast and ovarian cancer patients will be performed during therapy. The goal is to identify new therapeutic targets and biomarkers for early treatment response using techniques such as spectral flow cytometry, single-cell RNA sequencing (scRNA-seq), and functional assays.