Using nanoparticles to defeat cancer

In the Nano Argovia project NCT Nano, researchers are exploring a new immunotherapy approach to cancer treatment

Three teams are collaborating to characterize a novel, targeted immuno-oncology approach. TargImmune Therapeutics (Basel), the Department of Chemistry at the University of Basel, and the Department of Biosystems Science and Engineering at ETH Zurich in Basel (D-BSSE) are studying nanoparticles that smuggle a specific cargo into cancer cells. This cargo concurrently triggers targeted cancer cell killing and an anti-tumor immune response, destroying the tumors. In the Nano Argovia project NCT Nano, the researchers are identifying key parameters that are necessary to support the development of TargImmune's novel therapeutic for the clinic.

Significant advances have been made in the field of cancer therapy in the past few years. However, cancer remains a major contributor to morbidity and mortality worldwide. Numerous treatment modalities have been developed and approved for the treatment of solid tumors including small molecules, antibodies and cell-based therapies. However, due to tumor heterogeneity as well as suppression of and escape from anti-tumor immune response, resistance to treatments continuously emerges. More recently, immune-modulatory antibodies have shown significant efficacy in several indications. Nonetheless, only a subset of the patient population is responsive, therefore leaving the majority of patients without an effective treatment. TargImmune Therapeutics is developing a novel platform technology based on the research from the Hebrew University of Jerusalem. The technology utilizes chemical vectors that selectively enter cancer cells and smuggle in a specific cargo, bringing about cell death and simultaneously triggering an immune response against the tumor.

Safe transport

The cargo is packed with a chemical vector, forming nanoparticles. These nanoparticles should be stable and allow safe delivery of the cargo in patients, while ensuring that the cargo is not broken down by enzymes and reaches the targeted cancer cells without affecting healthy non-cancerous cells. The factors that affect nanoparticle stability and contribute to the efficacy of the treatment are being studied and optimized at the laboratory of Professor Cornelia Palivan from the Department of Chemistry at the University of Basel.

Various parameters must be identified

TargImmune's technology has proven highly effective in several mouse models. However, before the drugs can be used in human clinical trials, it is necessary to identify the optimal conditions for drug formulation. To do so, the Palivan group will test a range of key parameters relating to the nanoparticle's stability, including physico-chemical properties, reproducibility and quality control. The Palivan group will also contribute to the understanding of how the particles bind and smuggle the cargo into the targeted cells, using various microscopy techniques.

The group led by Professor Yaakov (Kobi) Benenson from the D-BSSE will use next generation sequencing to investigate the activity of the novel nanoparticles in a variety of cell lines, as part of this interdisciplinary collaboration.

“We’re optimistic that our approach can help countless patients around the world in their fight against cancer. The Nano Argovia project allows us to gain important insights that will contribute to the development of our drugs to the clinic.”
Dr. Maya Zigler, project manager of NCT Nano and Head of Research at TargImmune Therapeutics