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RESEARCH AREA

Developing and optimizing novel therapies against solid tumors and autoimmune diseases based on genetically reprogrammed immune cells, particularly using chimeric antigen receptors (CAR) and chimeric autoantigen receptors (CAAR) in T and NK cells. As a mechanistic background, the molecular assembly and function of immune synapses recruited by various CARs that contain versatile costimulatory domains and/or drive additional signaling pathways through other ectopic genes or RNA interference is also being explored.

Exploitation for diagnosis, prognosis, or therapeutic targeting of the interactions of receptor tyrosine kinases and integrins. Developing microscopic and other spectroscopic/cytometric methods for the quantitative analysis of molecular interactions and signaling processes in situ in cells and tissues with a view to migrate these methods to histopathology diagnostics.

Understanding the molecular dynamics of the corneal limbal stem cell niche, defining non-invasive in vivo imaging modalities that correlate with age or disease-related limbal stem cell deficiency (LSCD) and creating improved methodologies for regenerating corneas with LSCD (in cooperation with the Department of Ophthalmology, University of Debrecen).

TECHNIQUES AVAILABLE IN THE LAB

Basic cell and molecular biology techniques: cell culture (cell lines, ex vivo explants, spheroids), immunofluorescence labeling, flow cytometry and cell sorting, viability / proliferation assays, Western blotting, cloning, transfection, viral transduction. Cryosectioning, immunohistochemistry, digital pathology. Microscopy techniques: fluorescence, confocal, AiryScan, fluctuation microscopy (FCS, FCCS), fluorescence lifetime imaging (time and frequency domain), Förster resonance energy transfer (FRET), digital image processing and analysis. Preclinical tumor models and small animal imaging (luminescence, CT).

SELECTED PUBLICATIONS

Csaplár, M., Szöllősi, J., Gottschalk, S., **Vereb, G***., Szöőr, Á*. (2021) Cytolytic Activity of CAR T Cells and Maintenance of Their CD4+ Subset Is Critical for Optimal Antitumor Activity in Preclinical Solid Tumor Models. **Cancers 13:** 1-19.

Szöőr, Á., Tóth, G., Zsebik, B., Szabó, V., Eshhar, Z., Abken, H., **Vereb, G.** (2020) Trastuzumab Derived HER2-specific CARs for the Treatment of Trastuzumab-Resistant Breast Cancer: CAR T Cells Penetrate and Eradicate Tumors That Are Not Accessible to Antibodies. **Cancer Lett 484:** 1-8.

Tóth, G., Szöőr, Á., Simon, L., Yarden, Y., Szöllősi, J., **Vereb, G.** (2016) The combination of trastuzumab and pertuzumab administered at approved doses may delay development of trastuzumab resistance by additively enhancing antibody-dependent cell-mediated cytotoxicity. **mAbs 8:** 1361-1370.

Petrás, M., Lajtos, T., Friedländer, E., Klekner, Á., Pintye, É., Feuerstein, B., Szöllősi, J., **Vereb, G.** (2013) Molecular interactions of ErbB1 (EGFR) and integrin-β1 in astrocytoma frozen sections predict clinical outcome and correlate with Akt-mediated in vitro radioresistance. **Neuro-Oncology 15:** 1027-1040.

Takács, L., Tóth, E., Losonczy, G., Szántó, A., Bahr-Ivacevic, T., Benes, V., Berta, A., **Vereb, G.** (2011) Differentially Expressed Genes Associated with Human Limbal Epithelial Phenotypes: New Molecules That Potentially Facilitate Selection of Stem Cell-Enriched Populations. Invest. **Ophthalmol Vis Sci 52:** 1252-1260.

Roszik, J., Szöllősi, J., **Vereb, G.** (2008) AccPbFRET: an ImageJ plugin for semi-automatic, fully corrected analysis of acceptor photobleaching FRET images. **BMC Bioinformatics 9:** 346.