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RESEARCH AREA

Open-angle glaucoma, diabetic keratopathy and corneal scarring are severe, non-retinal complications of diabetes. Their therapy is insufficient: POAG is treated by lowering intra-ocular pressure by medication or surgery; however, progression continues in many patients. Treatment of corneal dysfunction is largely symptomatic as well. Therefore preclinical research should aim at identifying disease mechanisms and novel antifibrotic therapies for both diseases. Renal ischemia/reperfusion injury-induced acute kidney injury develops in various clinical conditions and is the main cause of graft loss or delayed graft function following transplantation. Beside the shortage in donors, minimizing ischemia/reperfusion injury and thus improving long-term graft function remains a major and yet unsolved problem. Our aim is to characterize previously unknown molecular signaling mechanisms for the treatment of renal ischemia/reperfusion injury. By developing a new preservation solution containing Sigma-1 receptor agonists we could tackle the problem of donor shortage by optimizing the condition of expanded criteria donor grafts and extending maximum graft storage time. Idiopathic pulmonary fibrosis is the most common form of interstitial pulmonary diseases, with constantly growing incidence. The disease is associated with high mortality, as median survival after diagnosis is only 2-3 years. Main causes include environmental factors, infections and genetic factors. The latest studies suggest that fibrosis of the lungs is common among patients who recovered from the acute phase of a COVID-19 infection. Despite obvious clinical significance, the molecular mechanisms leading to fibrosis are largely unknown and currently there is no effective therapeutic agent which could prevent tissue fibrosis. Our aim is to identify the molecular pathways responsible for the protective effect of Sigma-1 receptor agonists, and thus to develop novel, effective therapies.

TECHNIQUES AVAILABLE IN THE LAB

In vitro models using cell lines as well as primer cells. Translational rodent models: diabetes, glaucoma, corneal scarring, kidney ischemia/reperfusion, kidney transplantation, bleomycin-induced pulmonary fibrosis, unilateral ureter obstruction etc. Molecular biology methods: Western blot, RT-qPCR, ELISA, CRISPR. Imaging: conventional histology, confocal-STED microscopy, functional MRI, mutiphoton microscopy.

SELECTED PUBLICATIONS

Hodrea, J., Saeed, A., Molnar, A., Fintha, A., Barczi, A., Wagner, L.J., Szabo, A.J., **Fekete, A.**, Balogh, D.B. (2022) SGLT2 inhibitor dapagliflozin prevents atherosclerotic and cardiac complications in experimental type 1 diabetes. **Plos One 17:** 2 Paper: e0263285.

Hosszu, A., Kaucsar, T., Seeliger, E., **Fekete, A.** (2021) Animal Models of Renal Pathophysiology and DiseaseIn. Pohlmann, Andreas (szerk.) **Preclinical MRI of the Kidney: Methods and Protocols New York, USA Springer (Boston) 720:** 27-44.

Balogh, D.B., Molnar, A., Hosszu, A., Lakat, T., Hodrea, J., Szabo, A.J., Lenart, L., **Fekete, A.** (2020) Antidepressant effect in diabetes-associated depression: a novel potential of RAAS inhibition. **Psychoneuroendocrinology 118:** 104705.

Lenart, L., Balogh, D.B., Lenart, N., Barczi, A., Hosszu, A., Farkas, T., Hodrea, J., Szabo, A.J., Szigeti, K., Denes, A., **Fekete, A.** (2019) Novel therapeutic potential of angiotensin receptor 1 blockade in a rat model of diabetes-associated depression parallels altered BDNF signalling. **Diabetologia 62:** 1501-1513.

Koszegi, S., Molnar, A., Lenart, L., Hodrea, J., Balogh, D.B., Lakat, T., Szkibinszkij, E., Hosszu, A., Sparding, N., Genovese, F., Wagner, L., Vannay, A., Szabo, A.J., **Fekete, A.** (2019) RAAS inhibitors directly reduce diabetes-induced renal fibrosis via growth factor inhibition. **J Physiol (london) 597:** 193-209.