

## **Diabetic Complications Consortium**

**Title:** Non-Invasive Molecular Imaging in Early Diagnosis of Diabetic Complications

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### **1. Project Accomplishments:**

- A new molecular biomarker for early diabetic retinopathy has been identified. VEGFR-2 was found to be higher in the micro-vessels of diabetic animals, when compared to normal controls.
- An new imaging platform was developed to detect the micro-vascular VEGFR-2 in vivo.
- The upregulation of VEGFR-2 in the retina preceded other pathological signs of the disease.
- The increased level of VEGFR-2 in the diabetic retina was confirmed in human retinal samples

### **2. Specific Aims:**

#### **Aim 1) Establish early subclinical diagnosis of diabetic retinopathy.**

**Results:** We generated novel molecular imaging probes that target specific retinal endothelial surface molecules. We investigated the binding interaction of these agents with retinal endothelium in normal and diabetic animals using light-based confocal imaging. Specifically, we have identified the VEGFR-2 as a new biomarker of diabetic retinopathy in the living organism. These results have been published (1). A press release was issued by the Federation of American Societies for Experimental Biology about this work (3).

#### **Aim 2) Develop early diagnosis of systemic complications of diabetes through the eye.**

**Result:** To apply noninvasive molecular imaging in the retina for quantification, correlation, and prediction of the status of atherosclerosis, nephropathy, and hepatic steatosis, we established a novel model of retinopathy in type 2 diabetic animals (2). This new model of retinopathy in the *Nile Grass Rat* matches many of the features of the human disease. In addition these animals develop several of the other complications that occur in diabetes. This allowed correlation of the diabetes-related pathology in nonocular organs with the results of the molecular imaging in the eyes of these animals.

### **3. Publications:**

1. Sun, D., Nakao, S., Xie, F., Zandi, S., Bagheri, A., Rezaei Kanavi, M., Samiei, S., Soheili, Z. S., Frimmel, S., Zhang, Z., Ablonczy, Z., Ahmadi, H., and Hafezi-Moghadam, A. (2014) Molecular imaging reveals elevated VEGFR-2 expression in retinal capillaries in diabetes: a novel biomarker for early diagnosis. *FASEB J*
2. Noda, K., Nakao, S., Zandi, S., Sun, D., Hayes, K. C., and Hafezi-Moghadam, A. (2014) Retinopathy in a novel model of metabolic syndrome and type 2 diabetes: new insight on the inflammatory paradigm. *FASEB J* **28**, 2038-2046
3. Press release by Federation of American Societies for Experimental Biology [http://www.eurekalert.org/pub\\_releases/2014-09/foas-mpp090214.php](http://www.eurekalert.org/pub_releases/2014-09/foas-mpp090214.php)