

Mini-symposium on Insulin in Control of Energy Expenditure & *Adipose Tissue Biology*
May 11, 2015, at the Institute of Physiology of the Czech Academy of Sciences

Address: Vídeňská 1083
142 20 Praha 4

PROGRAMME

14,00 – 14,10 Award ceremony for the best 2014 publications
of the Institute

14,10 – 15,10 **Bureš lecture of Prof. Michael P. Czech**
“Insulin in Control of Energy Expenditure”

Summary: Of the many pathways that cause insulin resistance and decreased energy expenditure in obesity, high circulating insulin levels may contribute significantly. Our data indicate that hyperinsulinemia promotes inflammation in adipose tissue through a MAP kinase-based mechanism, which in turn can have deleterious or beneficial effects on glucose tolerance depending on the physiological context. High insulin may also act through its stimulation of adipocyte fatty acid synthesis, which in turn appears to suppress white adipose browning, energy expenditure and whole body glucose homeostasis.

15,10 – 15,30 Refreshments

15,30 – 16,15 Lecture of Prof. Silvia Corvera
“Adipose tissue angiogenesis and metabolic disease”

Summary: Adipose tissue is capable of expanding many-fold during adulthood, therefore requiring the formation of new vasculature to meet oxygen and nutrient needs. Moreover, the adipose tissue vasculature is the developmental niche for adipocyte progenitors, and factors that affect angiogenesis can directly impact the generation of new adipocytes. Thus, appropriate adipose tissue angiogenesis is a critical element in adipose tissue expandability, and as such is a contributing factor to insulin resistance and metabolic disease. We have developed a model system to study the formation of human adipose tissue vascular networks, which consists of culture of adipose tissue fragments in hydrogel under a variety of pro-angiogenic conditions. This has allowed us to define factors that influence angiogenesis and the proliferation of adipocyte progenitor cells. We find that in both mouse and human the development of adipose tissue vasculature is controlled by IGF binding proteins, such as IGFBP4 and IGFBP5, and that alterations in the levels of these are predictive of insulin resistance in humans.

16,15 – 17,00

Lecture of Prof. Francesc Villarroya

“The secretory role of brown adipose tissue: towards the identification of new brown adipokines”

Summary: Brown adipose tissue activity is associated with a healthy metabolic profile, protective against obesity, type II diabetes and hyperlipidemia. This association is considered to be due to the thermogenic role of brown fat, the main site of adaptive thermogenesis, and, therefore, a sink of metabolite usage for energy expenditure. There are indications that, as discovered years ago for white fat, brown adipose tissue may release regulatory factors (brown adipokines or “batokines”) that may contribute to driving systemic metabolism to a catabolic profile thus promoting thermogenesis. FGF21, an anti-obesity and anti-diabetes endocrine factor, is a recently discovered example, as it is strongly released by brown fat in conditions of thermogenic activation. A combination of omics approaches (RNAseq, bioinformatics-based prediction of secretion,...) allowed us the identify novel candidate brown adipokines. Candidate-driven experimental approaches are allowing us to establish the identity and role of the candidate new brown adipokines. The recognition and characterization of the endocrine role of brown adipose tissue may provide novel clues to the healthy metabolic effects of active brown adipose tissue beyond its known intrinsic thermogenic activity.

17,00 – 17,30

Refreshments



SPEAKERS

Prof. Michael P. Czech, Ph.D.

Michael P. Czech is the Isadore and Fannie Foxman Professor and founding Chair of the Program in Molecular Medicine comprising 45 faculty research laboratories and several Howard Hughes Medical Institute Investigators at the University of Massachusetts Medical School. Czech’s laboratory addresses mechanisms of insulin signal transduction, metabolic regulation and insulin resistance in obesity and type 2 diabetes.

His group’s work revealed insights into the structures and functions of receptors for insulin and the insulin-like growth factors. His laboratory has applied RNAi-based technologies to discover functions of adipocyte proteins in regulating whole body metabolism and to develop therapeutic strategies for alleviating inflammation and metabolic diseases. Czech has mentored many graduate students and postdoctoral fellows who have gone on to become internationally distinguished scientists and academic leaders. He has authored approximately 300 publications, has served on several editorial boards and NIH Study Sections, and is a member of Scientific Review Board of the Howard Hughes Medical Institute. He has received the Outstanding Scientific Achievement Award of the

American Diabetes Association, 1982; the David Rumbough Scientific Award of the Juvenile Diabetes Foundation, 1985; NIH MERIT Awards, 1997-2005 and 2012-2017; the Elliot P. Joslin Medal, 1998; the 2000 Banting Medal & 2004 Albert Renold Mentorship Award of the American Diabetes Association, and the Jacobaeus Prize presented in Umea Sweden, 2009.

Prof. Silvia Corvera, M.D.

Silvia Corvera is Endowed Chair in Diabetes Research and Professor in Program in Molecular Medicine, University of Massachusetts Medical School. She received her MD degree from the National University of Mexico in 1983, and a MSc in Biochemistry at the same institution in 1984. She received a Fogarty International Fellowship from the National Institutes of Health to perform Postdoctoral studies. Prior to joining the faculty at UMMS, she held the position of Assistant Professor of Pathology and Laboratory Medicine at the University of Pennsylvania.

The goal of Silvia Corvera's team is to understand the cellular and molecular basis of adipose tissue function and its relationship to metabolic disease. Their most recent studies are focused on understanding the mechanisms of adipose tissue expansion during obesity in human adults. This process entails the hypertrophic growth of existing adipocytes, the differentiation of precursor cells to form new adipocytes, and the coordinate expansion of the adipose tissue capillary network. They believe that failure of any of these mechanisms can result in adipose tissue dysfunction, ectopic lipid deposition and metabolic diseases such as type 2 diabetes

Prof. Francesc Villarroya, Ph.D.

Francesc Villarroya is professor of Biochemistry and Molecular Biology and current director of the Institute of Biomedicine of the University of Barcelona. After research in CNRS (Paris) and New York University Medical Center, he established a research group in the University of Barcelona in the early 90's of the last century focused to the identification of the molecular actors controlling energy metabolism and adiposity. The role of mitochondrial function on energy balance and metabolism as well as the regulation of brown adipose tissue thermogenic activity were main interests.

Francesc Villarroya and his team identified major mechanisms of transcriptional control of the genes encoding UCP1, the key mediator of brown fat thermogenesis, and other uncoupling proteins. More recently, FGF21 was identified as a novel actor in the control of brown fat activity and its consequences in the control of systemic metabolism. Translational research has been developed in relation to human metabolic pathologies such as obesity and diabetes.. After the appearance of lipodystrophy and metabolic disturbances in antiretroviral-treated HIV patients, an extensive translational research program has been developed which allowed to identify relevant molecular events causing these alterations and potential tools to ameliorate or prevent them.