Targeting cyclic nucleotide signaling for modulation of inter-organ communication and cardiometabolic disease

Chairs

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Symposium Description

Cardiometabolic diseases — including obesity, type 2 diabetes, and heart failure — are increasingly understood as systemic conditions driven by complex cell cell and inter-organ communication networks. Mounting evidence indicates that cyclic nucleotide signalling pathways (cGMP and cAMP) extend well beyond classical secondary messenger role in intracellular regulation and participate in non-canonical cell-cell communication and intra-organ communication, and more importantly became central to the control of systemic metabolism.

Recent advances in FRET-based biosensor technology now permit real-time, compartment-resolved monitoring of cGMP dynamics in living cells and tissues and revealed novel non canonical roles of cGMP and cAMP in cell-cell communication and tissue metabolic homeostasis. In this context pharmacological targeting of soluble guanylyl cyclase (sGC), particulate guanylyl cyclases, phosphodiesterases (PDEs), and downstream effectors such as PKG and PKA represents a rapidly evolving therapeutic frontier in metabolic disorders.

This symposium brings together leading scientists working at the interface of cyclic nucleotide pharmacology, vascular biology, and metabolism. By integrating cutting-edge biosensor approaches, cell-type-specific genetic models, and human studies, the session will redefine cyclic nucleotides as pharmacological targets in cardiometabolic disease and inter-organ communication.

Proposed Speakers

The table below lists primary and alternative speakers..

Speaker	Affiliation	Topic
Prof. Kjetil Wessel Andressen *or Dr. Gaia Calamera* [PostDoc, Andressen/Levy lab]	*Dept. of Pharmacology, University of Oslo & Oslo University Hospital, Norway*	FRET-based cGMP biosensors: real-time monitoring of compartmented cyclic nucleotide signalling in cardiometabolic disease(1) *Key ref: Calamera et al., Commun Biol 2019 (PMID 31701023)*
Prof. Dr. Alexander Pfeifer *or PostDoc, Pfeifer lab*	*Institut für Pharmakologie und Toxikologie, Universität Bonn, Germany*	Spatial and temporal resolution cGMP signalling in adipose tissue and metabolic adaptation(2)
Prof. Brant Isakson	*University of Virginia, Charlottesville, USA*	NO/cGMP signaling in cross talk of lymphatics and cardiomyocytes in HFpEF(3; 4)

Speaker	Affiliation	Topic
Prof. Jon Lundberg	*Dept. Physiology and Pharmacolgy, Karolinska Institutet*	Nitrate supplementation and systemic cGMP signaling in cardiometabolic health.
Prof. Takaaki Akaike	*Dept. of Environmental Medicine & Molecular Toxicology, Tohoku University, Sendai, Japan*	eNOS as endogenous source of persulfide/sulfur signalling in intraorgan communication and cardiometabolic disease(5; 6)
Prof. Robert Lukowski *or PostDoc, Lukowski lab*	*Institut für Pharmazie, Universität Tübingen, Germany*	cGMP signalling in adipose tissue: focus on BK channel (7; 8)
Prof. Dr. Miriam M. Cortese-Krott	*Institut für Pharmazie, Universität Tübingen, Germany*	NO/cGMP signalling and endothelial heterogeneity in cardiometabolic disease(9)

Selected Key References

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2. Hoffmann LS, Etzrodt J, Willkomm L, Sanyal A, Scheja L, et al. 2015. Stimulation of soluble guanylyl cyclase protects against obesity by recruiting brown adipose tissue. *Nature Communications* 6:7235
3. Dunaway LS, Luse MA, Nyshadham S, Bulut G, Alencar GF, et al. 2024. Obesogenic diet disrupts tissue-specific mitochondrial gene signatures in the artery and capillary endothelium. *Physiological Genomics* 56:113–27
4. Luse MA, Dunaway LS, Nyshadham S, Carvalho A, Sedovy MW, et al. 2024. Endothelial-adipocyte Cx43 mediated gap junctions can regulate adiposity. *Function* 5:zqae029
5. Akaike T, Ida T, Wei F-Y, Nishida M, Kumagai Y, et al. 2017. Cysteinyl-tRNA synthetase governs cysteine polysulfidation and mitochondrial bioenergetics. *Nature Communications* 8:1177
6. Sawa T, Zaki MH, Okamoto T, Akuta T, Tokutomi Y, et al. 2007. Protein S-guanylation by the biological signal 8-nitroguanosine 3′,5′-cyclic monophosphate. *Nature Chemical Biology* 3:727–35
7. Illison J, Tian L, McClafferty H, Werno M, Chamberlain LH, et al. 2016. Obesogenic and Diabetogenic Effects of High-Calorie Nutrition Require Adipocyte BK Channels. *Diabetes* 65:3621–35
8. Krier J, Spähn D, Lopez DAJ, Nono JL, Seigner J, et al. 2025. PDE4D and PDE3B orchestrate distinct cAMP microdomains in 3T3-L1 adipocytes. *Br J Pharmacol*
9. Leo F, Suvorava T, Heuser SK, Li J, LoBue A, et al. 2021. Red Blood Cell and Endothelial eNOS Independently Regulate Circulating Nitric Oxide Metabolites and Blood Pressure. *Circulation* 144:870–89