REGISTRATION FORM FOR CZECH SCIENTIFIC INSTITUTION

1. Research institution data (name and address):

First Faculty of Medicine, Charles University
Institute of Biology and Medical Genetics
Albertov 4
128 00 Prague 2
Czech Republic

2. Type of research institution: Public university (veřejná vysoká škola)

3. Head of the institution: prof. MUDr. Milena Králíčková, Ph.D. – Rector

4. Contact information of designated person(s) for applicants:

Doc. RNDr. Dušan Cmarko, Ph.D. – Deputy Head
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Institute of Biology and Medical Genetics, First Faculty of Medicine, Charles University
Albertov 4, 128 00 Prague 2, Czech Republic

5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre:

Life Sciences: *Cellular and developmental biology* - cell biology, developmental biology, ageing biology, neurobiology

6. Description of important research achievements from the selected discipline from the last 5 years including a list of the most important publications, patents, or other results:

We showed that ribosomal genes in human cells are expressed discontinuously, and the bursts are alternated by periods of rare transcription events. Their transcription follows an undulating pattern with a predominant period of about 60 min. Moreover, according to our data, various loci belonging to the human rDNA intergenic spacer produce ncRNAs with different lifetimes and pathways of decay. We also presented a mechanism that regulates the canonical Wnt signaling activity at the transcriptional level through KDM2A-SF and KDM2B-SF lysine demethylases. KDM2A-SF and KDM2B-SF have the ability to negatively affect canonical Wnt signaling by binding to the promoters of Wnt signaling target genes such as axin 2 or cyclin D1. In the frame of study on low-voltage-activated Ttype Ca2+ channels that are key regulators of neuronal excitability both in the central and peripheral nervous systems we reported secretory carrier-associated membrane proteins 2 as a novel Cav3.2-interacting partner and potent repressor of the expression of the channel at the cell surface.

Publications:

- Smirnov E, Trosan P, Cabral JV, Studeny P, Kereïche S, Jirsova K, Cmarko D. Discontinuos transcription of ribosomal DNA in human cells. PLoS One. 2020 Mar 2;15(3):e0223030
- Vacík T, Kereïche S, Raška I, Cmarko D, Smirnov E. Life time of some RNA products of rDNA intergenic spacer in HeLa cells. Histochem Cell Biol. 2019 Oct;152(4):271-280
- Lađinović D, Pinkas D, Šopin T, Raška O, Liška F, Raška I, Vacík T. Alternative isoforms of KDM2A and KDM2B lysine demethylases negatively regulate canonical WnT signalling. PLoS One. 2020 Oct 26;15(10):e0236612
- Vacík T., Lađinović D., Raška I. KDM2A/B lysine demethylases and their alternative isoforms in development and disease. Nucleus 2018, 9(1):431-441
- Cmarko L, Stringer RN, Jurkovicova-Tarabova B, Vacik T, Lacinova L, Weiss N. Secretory carrier-associated membrane protein 2 (SCAMP2) regulates cell surface expression of T-type calcium channels. Mol Brain. 2022 Jan 3;15(1):1

7. List of no more than 3 important research projects in the selected discipline awarded in national and international calls to the institution in the last 5 years:

Czech Science Foundation

GA19-21715S Organisation of FC/DFC units in mammalian nucleoli

PI: Dušan Cmarko

budget 6,484,000 CZK

Czech Science Foundation

GA19-19779S Alternative isoforms of lysine demethylases in development and disease

PI: Ivan Raška

budget 7,305,000 CZK

8. Description of the available laboratory and office space for a Dioscuri Centre:

The Imaging Center for Biomedicine and Medical Nanotechnology is available for a Dioscuri Centre. Laboratory space is renovated and outfitted according to the needs of a modern imaging center. A list of equipment currently in operation at the Imaging Center can be found below in 9.

9. List of the available research equipment for a Dioscuri Centre:

The institute is equipped with equipment that allows it to perform cutting-edge research in the field of molecular and cellular biology. The following list of equipment is made up of four sections: equipment for light microscopy, for electron microscopy, for biochemistry and molecular biology, and for cell culture and analysis. **Olympus IX81 equipped with a Yokogawa spinning disk**, an iXon Ultra Andor EM-CCD Camera, a FRAPPA module, an APZ-X00 xy scanning and piezo-Z stage, an OKO-LAB live cell observation chamber and 4 laser lines (405nm, 488nm, 561nm, 640nm). **Olympus IX71 set up for structured illumination microscopy** with an LCOS programmable illumination array. This system is equipped with one EM-CCD Andor 885 camera and one low-noise sCMOS Andor Neo camera. **Zeiss Axiovert 200** with an Eppendorf microinjection system enabling rapid delivery of macromolecules and other substances into living cells. **Tecnai G2 Sphera 20 Electron Tomography Microscope** LaB6 emitter. The microscope is equipped with a Gatan USC 1000 (Model 894) 4 megapixel slow scan CCD camera, a cryo-box and tomographic specimen stage. **Transmission Electron Microscope FEI Morgagni**. A routine microscope equipped with a side-entry CCD camera MegaView III and iTEM imaging software. The institute is well equipped to perform biochemistry and molecular biology work. In addition to deep freezers and refrigerated centrifuges, instruments include the following chromatography systems: ELFO (Bio-Rad), HPLC system (Perkin Elmer) and FPLC (Pharmacia-Amersham). A CFX-96 Real Time PCR System attached to a C1000 Thermal Cycler (Bio-Rad) is used to perform quantitative PCR. A walk-in cold room is available to carry out experiments at 4ºC.

10. List of the additional benefits (other than listed in the conditions for hosting a DC, see invitation) that the Institution declares to provide for a Dioscuri Centre (i.e.: additional funds, personal benefits, dual career options, relocation support or other):

The hosting institution declares to provide for a Dioscuri Centre the Imaging Center that brings together an impressive array of imaging technologies, allowing life scientists to study normal and pathological processes from the level of a whole model organism down to that of a single molecule. The use of this infrastructure should lead in the coming years to important advances in basic and applied science.

11. Other information about the internationalization of the research institution, international researchers employed at the institution, the availability of English language seminars etc.:

Scientists from the hosting institute have collaborated with a number of laboratories abroad, which can be documented by common publications, projects, and common exchanges.

The most important partners are:

Department of Biology and Biotechnology, University in Pavia, Italy,

Jerzy Haber Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Krakow, Poland,

Department of Biochemistry and Structural Biology, Institute of Molecular Biology, Slovak Academy of Sciences, Bratislava, Slovakia,

Inserm, L'Institut du Thorax, Université de Nantes, CNRS, Nantes, France,

Department of Physiology and Pharmacology, Cumming School of Medicine, University of Calgary, Calgary, Canada,

Laboratory for Biological Geochemistry, École polytechnique fédérale de Lausanne, Lausanne, Switzerland,

Cell Biology and Epigenetics, Department of Biology, Technische Universität Darmstadt, Darmstadt, Germany.

Further internationalization of research within the institute will be achieved by building unequivocal connections with important foreign partners abroad who will significantly contribute to the aforementioned topics. This will result in joint publications, joint projects and common events (e.g. conferences and workshops).