

REGISTRATION FORM

This is a registration form for Host Institutions wanting to establish a Dioscuri Centre of Scientific Excellence within Dioscuri 4 call.

1. Research institution data:

Łukasiewicz Research Network – PORT Polish Center for Technology Development,
Sieć Badawcza Łukasiewicz – PORT Polski Ośrodek Rozwoju Technologii
Stabłowicka 147, 54-066 Wrocław, PL

2. Type of research institution¹:

Institute of Łukasiewicz Centre

3. Head of the institution:

Dr. Andrzej Dybczyński, Director

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

Beata Lubicka, International Project Specialist, beata.lubicka@port.lukasiewicz.gov.pl
tel. 727665560, Sieć Badawcza Łukasiewicz – PORT Polski Ośrodek Rozwoju
Technologii ul. Stabłowicka 147, 54-066 Wrocław, PL

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

Life Sciences: Applied life sciences and biotechnology

¹ As specified in “Addressees of the call”

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

a) Selected Publications:

- Stawski Wojciech, Hurej Karolina, **Skonieczny Janusz**, Pawlicki Miłosz, *Organoboron Complexes in Edge-Sharing Macrocycles: The Triphyrin(2.1.1)–Tetraphyrin(1.1.1.1) Hybrid*. „Angewandte Chemie International Edition” vol. 58, iss. 32 (2019), p. 10946-10950. **IF 12,257**. DOI: 10.1002/anie.201904819.
- Ortiz-Rivero Elisa, Prorok Katarzyna, **Skowicki Michał**, Lu Dasheng, Bednarkiewicz Artur, Jaque Daniel, Haro-González Patricia, **Lipiński Tomasz**, *Single-Cell Biodetection by Upconverting Microspinners*. „Small” vol. 16, iss. 19 (2020), art. no. 2002055. **IF 11,459**. DOI: 10.1002/smll.202002055
- **Misiak Małgorzata**, **Skowicki Michał**, **Kowalczyk Agnieszka**, Prorok Katarzyna, Arabasz Sebastian, **Lipiński Tomasz**, Bednarkiewicz Artur, *Biofunctionalized upconverting CaF₂:Yb, Tm nanoparticles for Candida albicans detection and imaging* “Nano Research” vol. 10, iss. 10 (2017), p. 3333–3345. **IF 7.354**. DOI: 10.1007/s12274-017-1546-y
- Alvarez-Suarez Paloma, Gawor Marta, **Prószynski Tomasz J.**, *Perisynaptic schwann cells - The multitasking cells at the developing neuromuscular junctions*. „Seminars in Cell and Developmental Biology” vol. 104 (2020), p. 31-38. **IF 6,691**. DOI: 10.1016/j.semcd.2020.02.011
- Żywicka Anna, Fijałkowski Karol, **Junka Adam**, Grzesiak Jakub, El Fray Mirosława, *Modification of Bacterial Cellulose with Quaternary Ammonium Compounds Based on Fatty Acids and Amino Acids and the Effect on Antimicrobial Activity*. “Biomacromolecules” vol. 19, iss. 5 (2018), p. 1528–1538. **IF 5.738**. DOI: 10.1021/acs.biomac.8b00183

b) Selected patents:

In cooperation with 732 scientists from Wrocław and Poland, 152 Research & Development projects have been implemented at Łukasiewicz – PORT in the nano and biotechnology fields. As the result, 95 Polish and 30 European patent applications have been prepared. So far 72 patents have been granted including 26 European and 4 American ones. Exemplary patents granted in the area of **Applied life sciences and biotechnology**:

- US9890194/PAT.220297 An epitope and its use
- EP16846943.5/US15759822, A method for detection and selection of hybridoma cells producing the desired antibodies
- EP2656078 A method of differentiating oncogenic changes of the thyroid, a kit to embody the method and the use of metallothionein (MT) for differentiating oncogenic changes of the thyroid
- EP3058094 Method for detection of decreased susceptibility for anticancer adjuvant chemotherapy in breast cancer patients
- EP2680821 Liposome formulation comprising an anti-tumour active substance, method for its preparation and pharmaceutical compositions comprising it
- US10197572/EP3158340 Method and kit for detection of deltanoid-resistant leukemia cells and antibody for use therein
- US9074017/EP2705048 Pure albumin and its method of preparation and detection
- EP3003389/US9878051 Bordetella pertussis LOS-derived oligosaccharide with pertussis toxin glycoconjugate and its application in the prophylaxis and treatment of infections caused by Bordetella pertussis
- PAT.229904 Method of preparing esters of lactic and lactylactic acid in alcoholysis reaction of aliphatic poliester
- PAT.229194 Neoglycoconjugate of Escherichia coli R1 LOS oligosaccharide and Clostridium difficile toxoid and its application in anti-bacterial vaccines
- PAT.228355 Method for detection of decreased susceptibility for anticancer adjuvant chemotherapy in breast cancer patients
- PAT.227390 Method and kit for detection of deltanoid-resistant leukemia cells and antibody for use therein.

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

1. Development of new melanoma therapy based on aptamer carrier

Project financed by the National Centre for Research and Development under the Smart Growth Operational Programme, implementation from 2020-01-02 to 2021-06-30 total amount €0,54 mil. Project Consortium Łukasiewicz Research Network – PORT Polish Center for Technology Development with PURE BIOLOGICS S.A. The aim of the project is to develop an innovative, aptamer-drug conjugates (ApDCs) - based solution for melanoma treatment. Standard melanoma therapy has low efficacy and carries a high risk of evoking unwanted side-effects. The new report from American Cancer Society (ACS) shows that melanoma is the fifth most commonly diagnosed cancer in the U.S. among both men and women. Thus, new targeted therapy to melanoma - specific protein will address high unmet medical need in this field. The solution of this project proposal will be used to treat melanoma patients. Considering the steady increase in new melanoma cases noted every year, the proposed ApDCs-based therapy has high commercialization potential. Moreover, the search for new, highly specific and effective treatment is in line with the new trends in global drug-conjugate market.

2. Amotl1 mutant mice as a novel model of human psychiatric disorders associated with social dysfunctions

Project financed by the National Science Centre total amount €0,49 mil. In the proposed research we will characterize Amotl1 knockout (KO) mice as a novel mouse model of neurodevelopmental psychiatric disorders and explore the role of Amotl1 in the brain. Numerous studies documented the role of Amotl1 in the regulation of cellular polarity and cancerogenesis, however, its function in the brain has not been studied. Interestingly, Genome-wide Association Study revealed that Amotl1 could be the potential genetic factor related to mood disorders (GeneCards) and several studies implicated *Amotl1* locus with schizophrenia. Our preliminary results strongly suggest that Amotl1 KO mice have morphological and behavioral abnormalities apparent in mouse models of psychiatric disorders. Although similar structural or functional defects appear in many neurodegenerative disorders like autism or anxiety-related disorders, the results from MRI studies and behavioral tests are the most similar to those observed in mouse models of schizophrenia. In this project we will focus on characterization of behavioral deficits and alterations of brain morphology including structural MRI analysis of mouse brain as well as analysis of neuronal morphology in Amotl1 mutant mice. The experiments planned in this study will significantly contribute to the field and will include cutting-edge techniques.

3. The development and testing of innovative technology for the production of specific antibodies and a device for the rapid virus diagnostics, including SARS-CoV-2, amenable for the implementation in the field of diagnostics, therapy and prevention in epidemiological emergency state.

Project financed by the National Centre for Research and Development under the Fast Track Program, implementation from 2021-01-01 to 2023-06-30 total amount €0,3 mil. The outbreak of the COVID-19 pandemic has put the health care systems around the world in an extremely difficult situation. The disease is often asymptomatic, but still infected people contribute to the epidemic spread by infecting other people, as the virus is easily transmitted by droplets. At the same time the infection can cause severe symptoms with relatively high morbidity rate, in particular in the group of elderly people and patients with immunocompromised immune system or accompanying diseases. Additionally, one of the most common symptoms of the disease is respiratory distress, requiring treatment at intensive care units and the use of respirators. In the situation of excessive number of patients requiring such a treatment, medical facilities often becomes overloaded. Effective prevention of the virus spread requires, first of all, appropriate medical facilities performing quick, cost effective and high-throughput diagnostics, allowing for the identification of infected individuals, followed by appropriate actions, e.g. isolation and quarantine. In addition, the availability of such tests is crucial, preferentially if they can be produced and conducted based on domestic resources,

ensuring functioning of the national health system during pandemic associated with the global supply chain lockdown. Currently, the COVID 19 diagnostic is based on molecular tests (PCR), which, apart from their advantages, also have some weak points: high cost, the need for qualified personnel and relatively expensive equipment, the possibility of false negative results and finally, the need for supplies from abroad. The project aims at the development of a device enabling cheap and high-throughput diagnostics of patients for the presence of SARS-CoV-2 virus. Additionally, the proposed system will be based on the detection of protein antigens of SARS-CoV-2 virus.

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

Łukasiewicz Research Network – PORT Polish Center for Technology Development is a unique center built on the largest infrastructural project in Poland in the R&D area, with over 23.000 m² of fully-equipped laboratory and office space. For Dioscuri Centre we offer open-space laboratories dedicated for research groups and modern, fully furnished offices ranging from 12 to 35 m². The laboratories are fully equipped and dedicated for: nucleic acid analysis, microbiology, cell biology and signalling, light and electron microscopy, histology, radioisotopic analysis, protein biochemistry and analytical chemistry. The list of laboratories includes: Biobank, Bioimaging, Cell Culture, DNA Analysis, Elemental Analysis, Flow Cytometry, Infrared Spectroscopy, Mass Spectrometry and Chromatography, Microbiology, Molecular Interactions, Nanobioengineering, Nuclear Magnetic Resonance, Virology and Cell Biology. The institute is determined to grow and has the capacity to open new research groups, particularly in the Life Science - Innovative Medicines area.

PORT Analytics

Laboratory performs the qualitative and quantitative analysis with determining the structure of chemical compounds in the scope of:

MS Proteomics: peptide analysis with the “bottom up” method and fragmentation type CID, HCD and ETD in order to identify proteins, post translation modification analysis (phosphorylation and glycosylation), peptide quantitative analysis (SRM/MRM), de novo proteins identification, “top down” method protein analysis.

MS and NMR Metabolomics: profiling and identification of metabolites in clinical samples (serum, urine) and tissue material, analysis of low molecular weight substances.

MS Pharmacokinetics: DMPK analysis of medicines and their derivatives in physiological liquids (serum, urine), test of medicines and cosmetics components, identification and structure determination of medicines and dietary supplements.

NMR Pharmacology: identification and purity of active pharmaceutical substances.

MS MALDI Imaging: identification and analysis of protein and metabolites distribution in tissues.

MS MALDI Biotyper: an innovative method of identification of microorganisms in biological materials (bacteria, yeasts, fungi).

Cell Lab

The Cell Analysis Laboratory provides multidisciplinary support in solving unique challenges in the area of research and development. The laboratory is focused on the cell-based assays essential for studying cellular mechanisms that provide in-depth knowledge about monitoring of the numbers, phenotype or behavior of cells including proliferation, apoptosis, death, migration, transformation and others.

The laboratory uses its modern laboratory infrastructure, extensive scientific experience and a modern approach to research project management. We offer our clients individual research services, up to complex projects.

Vivarium

Animal studies using laboratory mice.

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

Łukasiewicz Research Network – PORT Polish Center for Technology Development is ready to support the Dioscuri Leader to establish collaborations within Łukasiewicz - PORT research leaders, local Universities and Research Institutes, support his/her applications for research and R&D grants, build scientific collaborations and relations with local SME.

Nucleic acids analysis:

Robot for DNA/RNA/protein isolation QIASymphony (Qiagen)
Homogenisers: TissueLyzerII (Qiagen) and CryoMill (Retsch)
Spectrophoto- and spectrofluorimeter NanoDrop 8000 and 3300 (ThermoFisher Scientific)
Real-time PCR thermal cycler (CEIVD) Rotor Gene Q (Qiagen)
Pipetting robot Piro (DORNIER-LTF)
Capillary electrophoresis Fragment Analyzer (Advanced Analytical)
Pyrosequencer PyroMark Q24 (Qiagen)

Cell cultures:

Class II Laminar Flow Cabinets (LaboGene)
CO₂ incubators (Binder)
Bioreactors: Biostat STR 50l, Biostat RM, Biostat B Twin (Sartorius)
Roller bottles incubator
Reverse-phase contrast microscopes
Electroporators
Automatic cell counter
Microbial incubators and bioreactors

Protein engineering:

HPLC/FPLC (Dionex Ultimate 3000/AKTA Explorer)
Multifunctional workstation (Tecan FreedomEVO 150/8) with multimode plate reader Infinite 200 Pro for all detection techniques
Multimode microplate readers (2104 EnVision, EnSpire Multimode Plate Reader, Spectra MaxPlus 384)
Highthroughput differential scanning calorimeter (MicroCal VP-Capillary DSC)
Isothermal titration calorimetry (ITC) – MicroCal ITC200
Zetasizer DLS/SLS (Nano ZS)
Circular Dichroism (CD) Spectropolarimeter (Jasco J – 815)

Isotopic analysis:

automatic high throughput a/b liquid scintillation & luminescence counter
automatic high throughput gamma counter / spectrometer g
systems for high resolution imaging of multifluorescent-, chemifluorescent- and radioisotope-labeled samples
systems for 1D and 2D electrophoresis and blotting of proteins and nucleic acids
cell culture systems
liquid chromatography systems (FPLC, HPLC)
Spectrofluorophotometer (FP-8500-JASCO Corp)
Spectrophotometers (Cary 300, Agilent 8453)

Flow cytometry:

Flow cytometer BD LSR Fortessa
Flow cytometer BD FACS Canto II
Flow cytometer BD FACS Calibur
Sorter BD FACS Aria Fusion

Histology:

Laser microdissection system Leica LMD 7000
Vacuum infiltration processor VIP 6 SAKURA
Tissue embedding console system TEC 5 SAKURA
Automated slide stainer PRISMA SAKURA
Automated glass coverslipper SAKURA
Rotary microtome AutoSection SAKURA
Histology slides preparation set
Microtome with cryostat CRYO 3 SAKURA
Vibratome
Microscope with color camera

Microscopy:

Inverted fluorescence microscope – Carl Zeiss AxioVert A1 with PlasDIC contrast
Spinning disk confocal microscope Zeiss Cell Observer SD
Laser scanning confocal microscope Leica SP8 MP
Image analysis software [Imaris, Huygens Professional, Image-Pro Premier, SlideBook
Cross beam scanning electron microscope with ion beam Auriga 60, Zeiss
Ultramicrotome EM UC7, Leica
Cryo chamber FC7, Leica
Automatic contrasting device EM AC20, Leica
High vacuum sputter EM ACE600, Leica
Tissue processor EM TP, Leica

Analytical chemistry:

iCE3500 AAS Spectrometer (Thermo Scientific)
VP100 Continuous Flow Vapour Generator producing hydride and mercury cold vapours (Thermo Scientific)
EC100 electric furnace for atomization of samples processed by a hydride generation device (Thermo Scientific)
ETHOS One microwave digestion labstation with HPR-1000/10S high-pressure segmented rotor (Milestone)
Muffle furnace, ball mill, homogenizers
FT-IR Nicolet 6700 Spectrometer (Thermo Scientific)
FT-IR Nicolet iN10 Microscope (Thermo Scientific)
High-resolution hybrid mass spectrometer LTQ Orbitrap Elite ETD (Thermo Fisher Scientific)
Maxis Impact Mass Spectrometer (Bruker)
MALDI-TOF with biotyper, image prep and sample preparation robot (Bruker)
The 700 MHz Bruker AVANCE III HD NMR spectrometer
Bruker SCION TQ – Gas chromatograph with triple quadrupole mass spectrometer
Agilent 7890A Gas chromatograph with two detectors – FID, ECD
Thermo GC-MS ITQ — Gas chromatograph with ion trap

The above described equipment will be available to the Dioscuri Leader in jointly agreed scope and conditions.

10. List of the additional benefits (other than listed in call text) that the Institution declares to provide for the Dioscuri Centre:

Łukasiewicz – PORT strategy and organizational rules facilitate the high degree of novelty approaches in research and efficient transfer of research results into innovative future technologies. The location of Łukasiewicz – PORT is absolutely unique; in historical, green Campus Pracze: 11 000 m² of lab space on 27 ha of campus area, 100 ha of an area surrounding the Campus, intended by the city of Wrocław for R&D investments, 13 km from the centre of Wrocław, dedicated parking lot, and an old park nearby, excellent communication thanks to the proximity of motorway bypass, airport and train station 100 meters from the campus.

In order to best facilitate and increase the success of sustainable operation of the Dioscuri Centre Łukasiewicz – PORT declares the following organizational and scientific benefits for the Leader:

- a) Supporting the on-boarding installation and start-up package for the lab.
- b) The organizational support from HR in the adaptation to the new environment and the personal assistance to help in understanding the organization. HR will assist in relocating, setting of formalities in Polish offices, banks and other institutions, finding accommodation and leisure activities.
- c) Support in selection and supervision of other team members, in line with the profiles needed to conduct the research and in accordance with Code of Conduct for the Recruitment of Researchers HR excellence rules and institution management practices;
- d) Organization of international science and business oriented conferences as well as science promoting events.
- e) The organization support in obtaining the international grants from Horizon Europe as well as from Polish funding programs. Support in submitting applications, building scientific collaborations and relations with Hi-Tech SMEs. e.g. SensDx, Nanopure, Merck KGaA, Dr Irena Eris, Mabion, Biotts, Polpharma Biologics, Ardigen S.A.
- f) Project management; financial reporting, project administration according the implemented methodology (PRINCE2 modified with the institution's own solutions) at every stage of a project. The support includes also documentation of the progress (milestones and expenses), the risks management, contingency plans, and application of the adequate financial procedures.
- g) Commercialization of research results, building the IPR portfolio of complementary projects and creating a foundation for innovative application solutions, long-term investment based on demonstrators and cooperation with big companies, e.g. Roche Poland, Pfizer, Amgen biotechnology Ltd, Selvita, B Braun. Joint ventures according to the concept of an industrial partner.

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

Internal scientific seminars and invited lecture seminars are presented in English weekly. They cover topics of the life sciences and biotechnology. Most of scientific groups leaders and laboratory heads used to work abroad worldwide for a few years, before joining Łukasiewicz – PORT. At the moment, the institute employs: 2 experienced scientists who returned to Poland in 2019 from the University of Strasbourg and in 2020 from the Max Planck Institute in Munich - new group leader is conducting basic research in understanding the molecular mechanisms underlying depression, development of new therapies of depression and other psychiatric diseases, which can be further developed in the interdisciplinary environment. Other researchers worked at Rutgers, The State University of New Jersey, Newark, NJ, USA, Radboud University Medical Center, Nijmegen, the Netherlands, La Jolla Institute for Allergy and Immunology (LJI), La Jolla, California, USA, University of Alberta, Edmonton, Canada, the Institute of Immunology at the National University of Ireland in Maynooth. Moreover, the Institute employs 8 foreigners from the following countries: 2 from India, 2 from France, 2 from Ukraine and Belarus under the Solidarity with Belarus Program.

Since 2021 Łukasiewicz – PORT has become an associated partner in **EIT Health** initiative. The participation is providing for:

- displaying the solutions of the Łukasiewicz Network to other countries,
- becoming partner of choice for biotech and pharma R&D groups in development programs,
- building international network of partners for scientific challenges in providing modern solutions in medicine,
- creating spin off new enterprises in life science / med area,
- following the trends in life sciences, research on requirements of medicine (esp. Oncology & CNS),
- taking part in the European endeavours to improve the quality of life for the patents, we all are.

Since 2012 Łukasiewicz - PORT is a member of the biggest European Network of Biobanks **BBMRI-ERIC**. The ERIC status allows pulling together biobanks and biomolecular resources into a pan-European facility. The national node **BBMRI.pl** is funded by the Ministry of Science and Higher Education, total budget: € 9,5 mil for years 2017-2021. Verification of SOPs that exist in Polish biobanking institutions, implementation of common solutions.

Łukasiewicz – PORT participates in the international scientific project focusing on pathogenesis of inflammation of the nervous system induced by HSV-1 and 2 infection with the Swedish partner University of Gothenburg, Department of Rheumatology and Inflammation Research.

Łukasiewicz – PORT Collaborates with the international pharmaceutical companies:

- Since 2018 has cooperated with Roche Poland, a leader among companies providing innovative solutions in the field of healthcare. As a part of the agreement, the partners declared cooperation for the development of biotechnology and genomic profiling in Poland. Cooperation between Łukasiewicz – PORT and Roche Poland is the first step in starting work on creating genomic databases of people suffering from cancer open to Polish scientists.
- In October 2019 Łukasiewicz – PORT signed with Amgen Biotechnology a letter of intent regarding a cooperation in projects in the field of personalized medicine. Łukasiewicz – PORT and Amgen in Poland plan to prepare a joint project in the field of personalized medicine, covering the collection and processing of large amounts of epidemiological data. These data are to be collected in Biobank at Łukasiewicz – PORT.