



Silesian
University
of Technology



RESEARCH
UNIVERSITY
EXCELLENCE INITIATIVE
Ministry of Science
and Higher Education



BIOTECHNOLOGY CENTRE
Silesian University of Technology

Biotechnology Centre

January 2026

About us

The Biotechnology Centre's main goal is to conduct comprehensive basic research in the areas of medical, environmental, and industrial biotechnology, as well as bioinformatics, interdisciplinary research, and applied research in collaboration with organizational units of the Silesian University of Technology and external centers. Other responsibilities of the Centre include:

- integrating the community and initiating the formation of **interdisciplinary research teams** in the field of biotechnology,
- developing research **infrastructure**,
- **collaborating** with faculties and other units of the Silesian University of Technology, including the implementation of habilitation, doctoral, and diploma theses in accordance with applicable rules,
- **organizing conferences, seminars, workshops**, thematic meetings, and events,
- **obtaining funding** from domestic and foreign sources for research,
- establishing **collaborations** with other research units and enterprises, both domestic and foreign, to implement joint research projects,
- generating **know-how** and intellectual property,
- and **popularizing** knowledge about biotechnology.



Silesian University
of Technology



RESEARCH
UNIVERSITY
EXCELLENCE INITIATIVE

Biotechnology Centre

More information about Faculty

- The Silesian Science Award 2022 in the "Employee" category for the Director of the Biotechnology Centre, Dr. Sebastian Student, DSc, Eng., prof. of the Silesian University of Technology.
- The "Brand - Silesia" Award (2023) in the Science category for the Biotechnology Centre.
- Scholarship named after Professor Mieczysław Choraży during the XXVIII Gliwice Scientific Meetings for dr Marcelina Jureczko (2024)
- The award in the Research and Development Institution category and the Special Award of the President of the Management Board of the Upper Silesian Market Entrepreneurship Accelerator sp. z o.o. – Biotechnology Centre (2024)
- The Silesian University of Technology Social Council Award (2024) in the Employees category, the team consisted of: prof. Sebastian Student, prof. Ilona Wandzik, prof. Ziemowit Ostrowski, dr Małgorzata Milewska, dr Kazimierz Gut, dr Maria Gracka.
- Silver Medal INTARG® 2025 for the Biotechnology Centre for the invention: Laser system for manufacturing microfluidic systems
- Research Star 2025 – dr Małgorzata Włodarczyk-Biegun, PhD, DSc, Eng



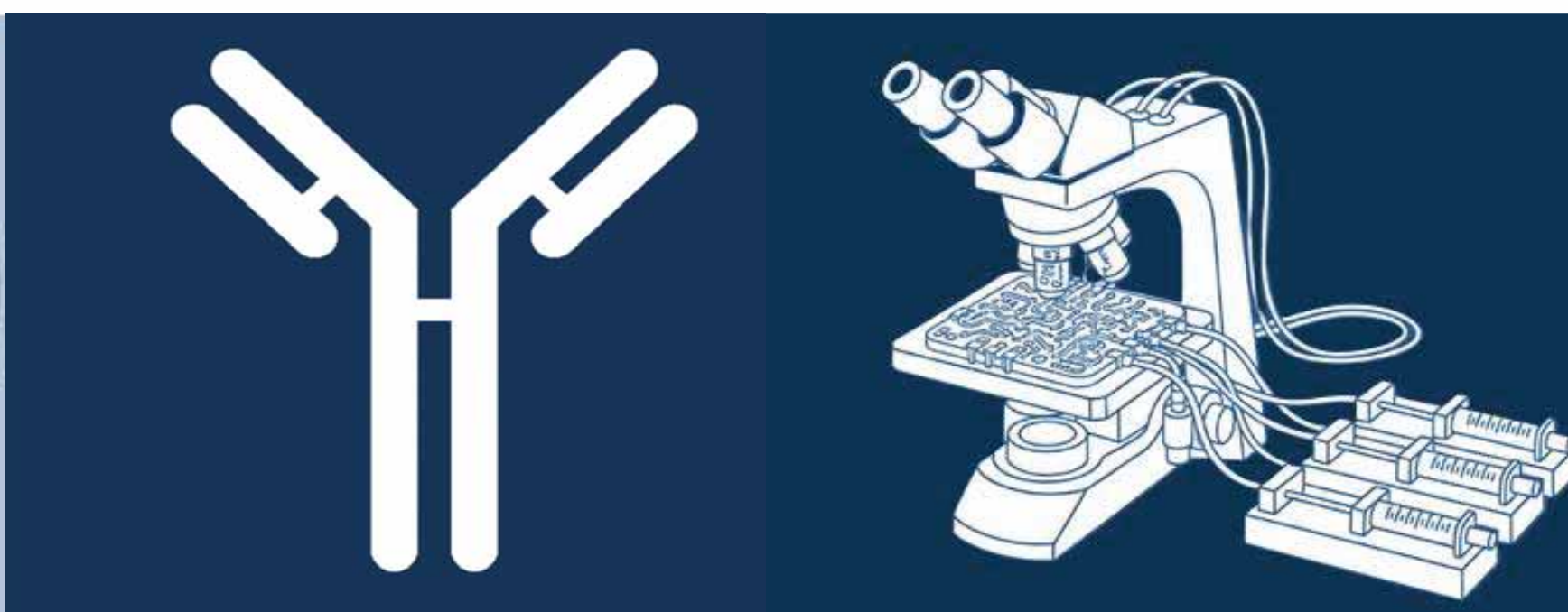
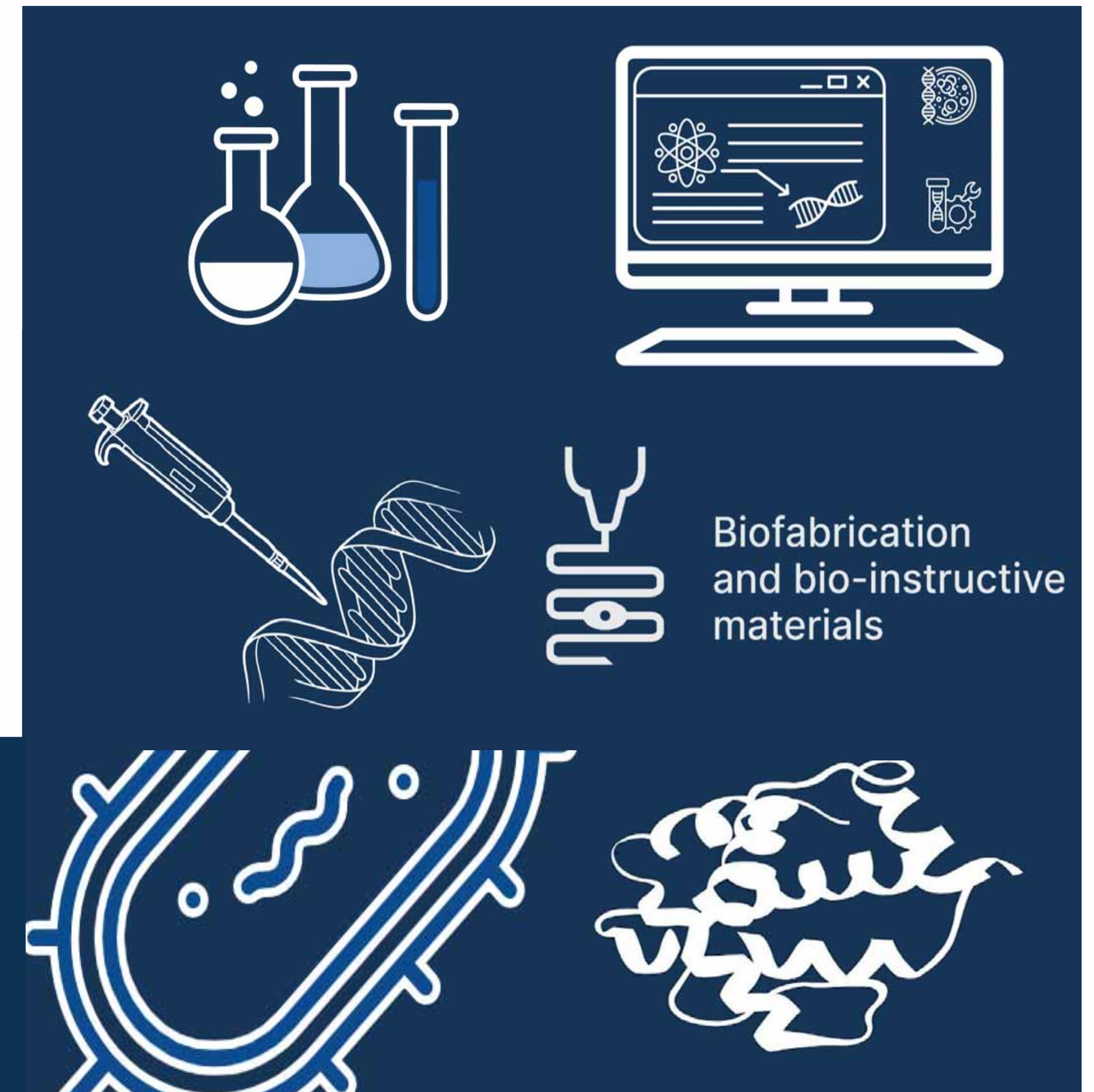
Silesian University
of Technology



Biotechnology Centre

Research offer

- Biofabrication and Bio-Instructive Materials
- Bioinformatics and Computational Biology
- Chemical Synthesis and Analysis, Drug design
- Design, engineering, application of proteins
- Environmental Engineering
- Genetic Engineering
- Immuno-metabolic
- Medical Biotechnology
- Microfluidics and confocal microscopy



Silesian University
of Technology



Biotechnology Centre

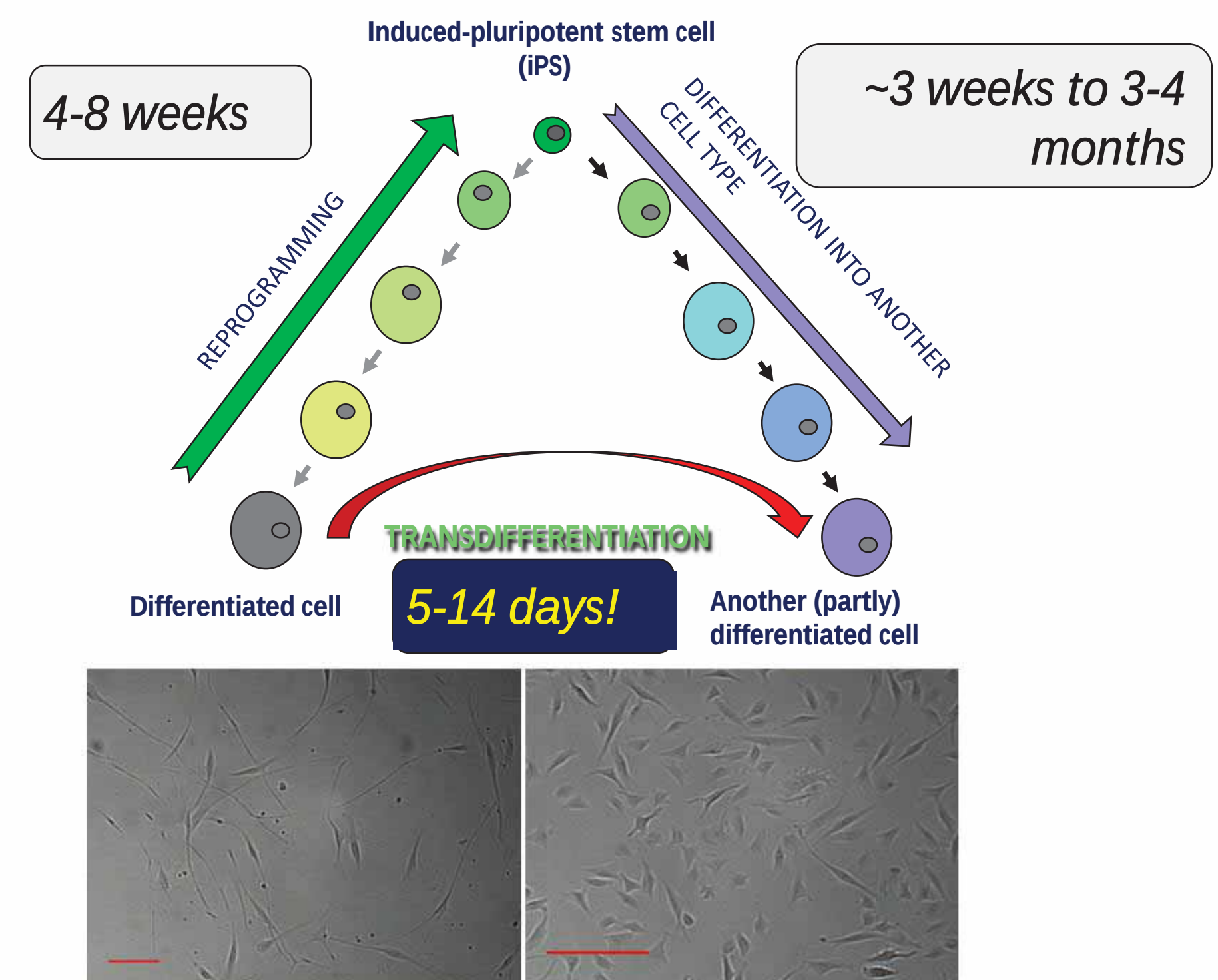
Fields for collaboration

Tissue engineering: transdifferentiation-based cell sourcing

- typically requires genetic manipulations
- non-differentiated cells may cause teratoma
- very expensive, some steps require BSL-II lab
- currently, typically requires genetic manipulations
- much faster and much more efficient process (if it works)
- potential for clinical applications
- potential for direct in vivo-applications
- much safer, because it does not require transition through the stem cell stage

GOAL: DEVELOPMENT OF TRANSDIFFERENTIATION TECHNOLOGY BASED ON NON-GENETIC METHODS IN ORDER TO PROVIDE SAFE AND ABUNDANT SOURCE OF CELLS FOR CLINICAL APPLICATIONS

Medical Biotechnology
Leader: Prof. Marek Łos
Marek.Łos@polsl.pl



Silesian University
of Technology



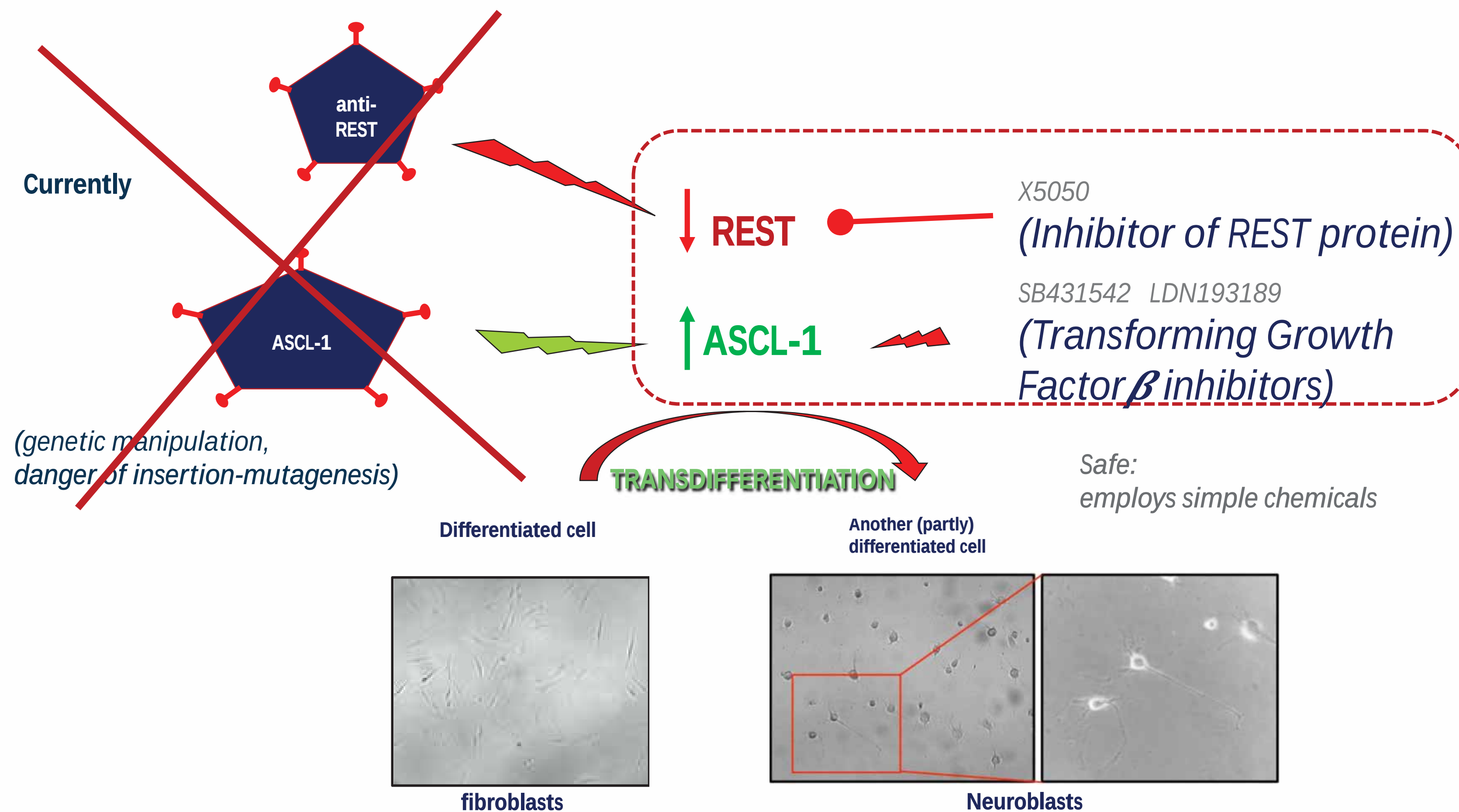
Biotechnology Centre

Fields for collaboration

Medical Biotechnology
Leader: Prof. Marek Łos
Marek.Łos@polsl.pl

Tissue engineering: transdifferentiation-based cell sourcing

Example



Silesian University
of Technology

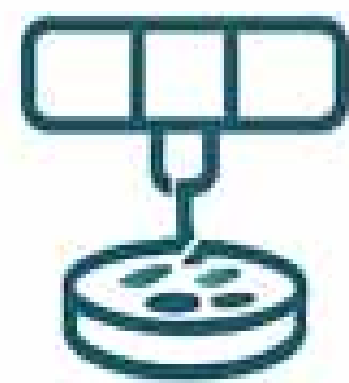


Biotechnology Centre

Fields for collaboration

Biofabrication and bio-instructive materials

Leader: prof. Małgorzata Włodarczyk-Biegun
malgorzata.wlodarczyk-biegun@polsl.pl
<https://biofabrication.group/>



3D Bioprinting

Development of novel bioinks and printable biomaterials optimised for tissue engineering



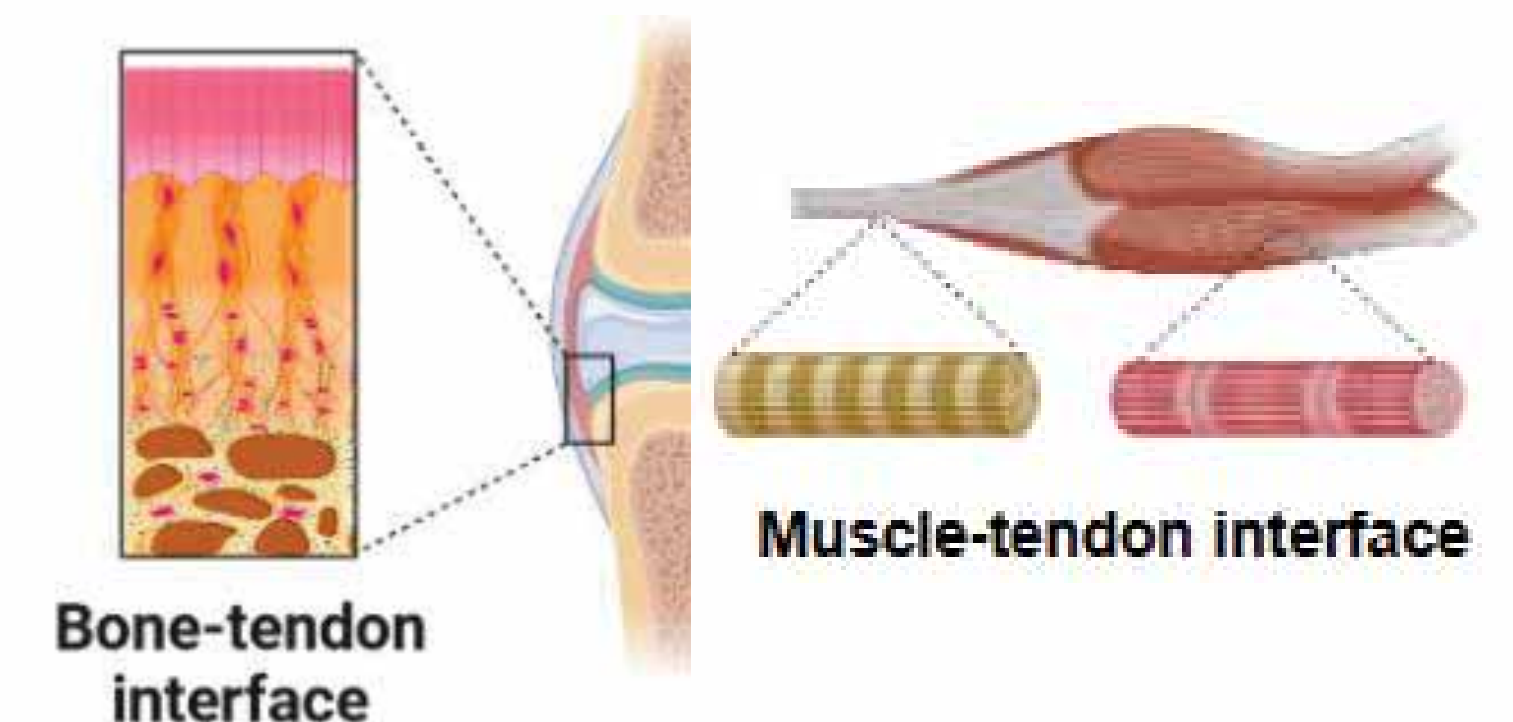
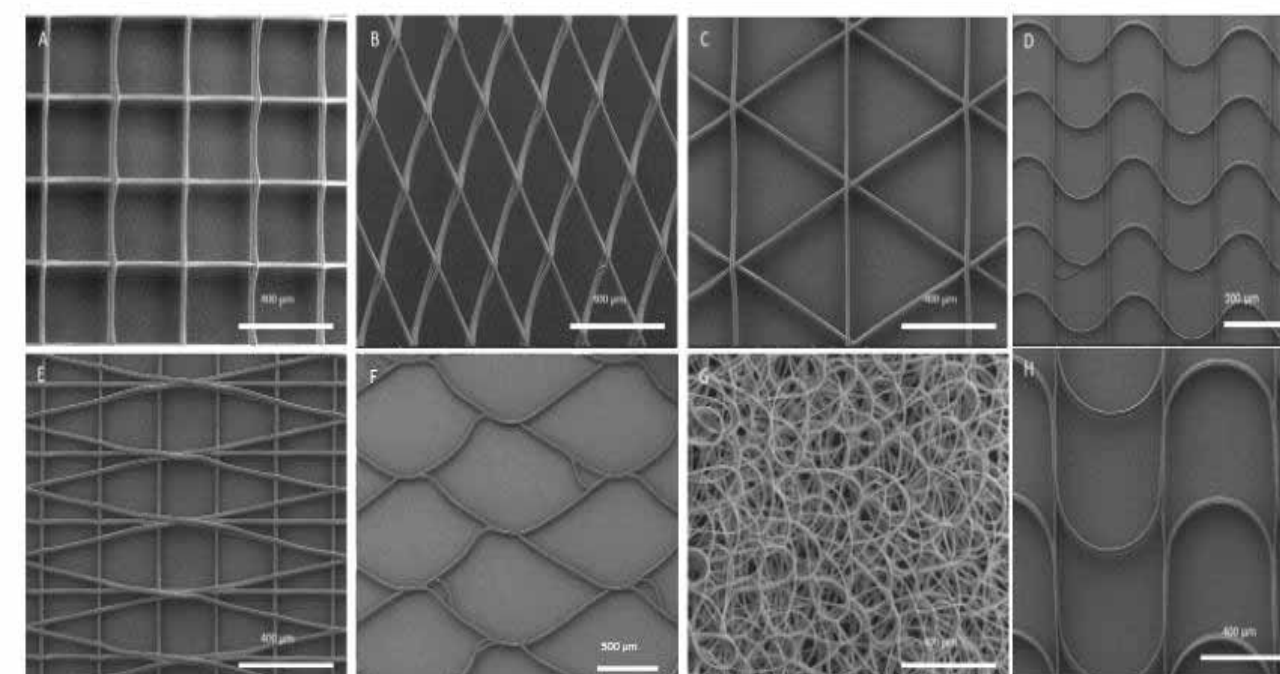
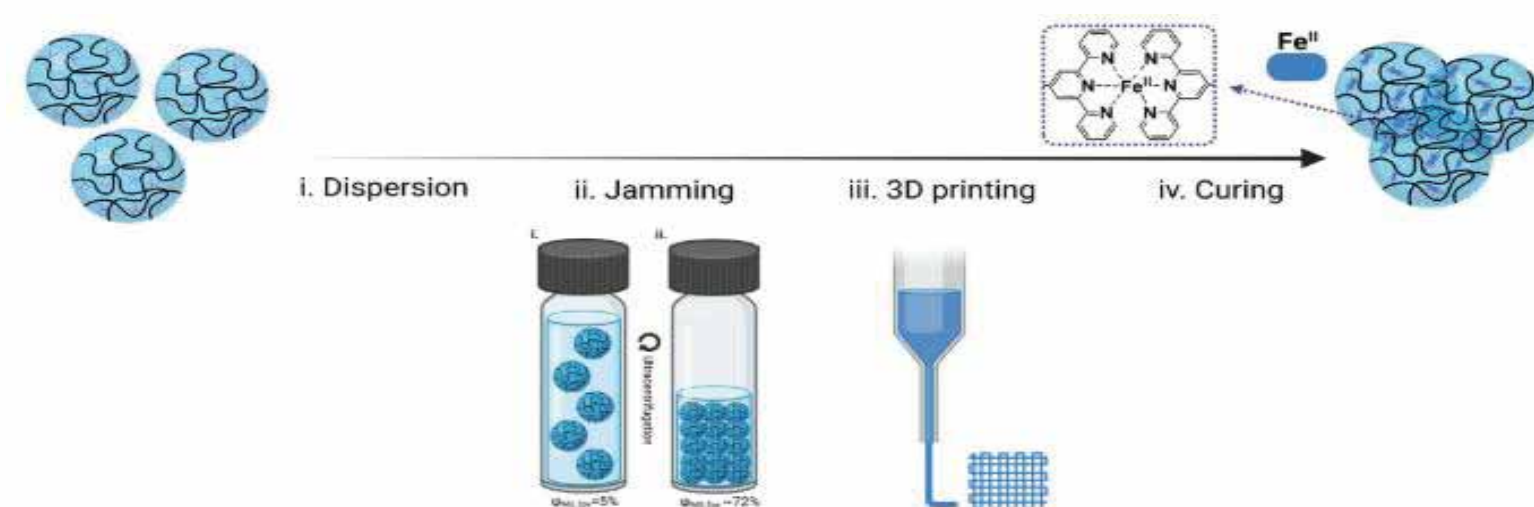
Melt Electrowriting (MEW)

Investigation of cell-material interactions on highly controlled, micro-structured scaffolds of various architectural design produced by MEW



Bio-Instructive Materials

Creation of customised, bio-instructive scaffolds for *in vitro* models as well as customised implants



Silesian University
of Technology



Biotechnology Centre

Fields for collaboration

Biofabrication and bio-instructive materials

Leader: prof. Małgorzata Włodarczyk-Biegun
malgorzata.wlodarczyk-biegun@polsl.pl
<https://biofabrication.group/>



Development of next-generation, scalable biofabrication platforms for:

- regenerative medicine and tissue repair
- in vitro disease and organ models
- drug screening and personalized medicine platforms



**Silesian University
of Technology**

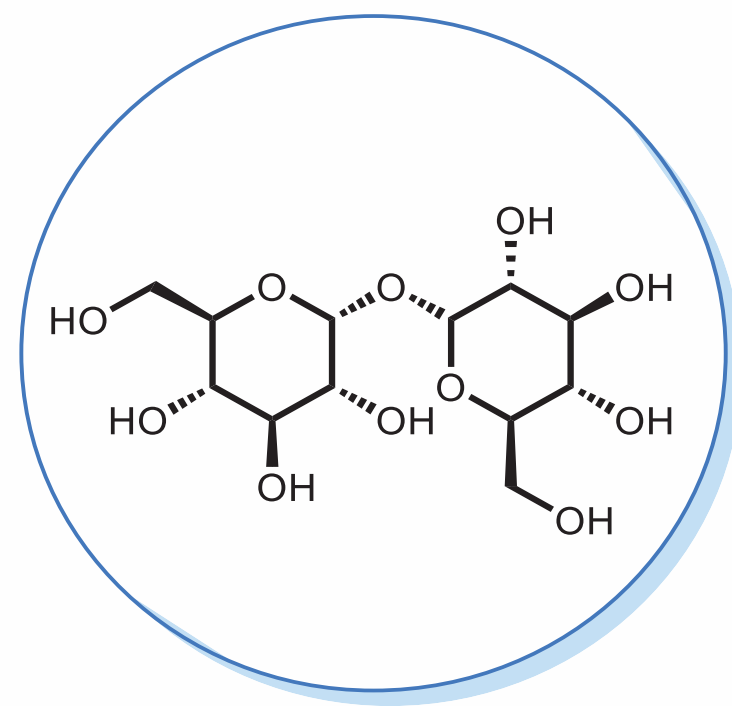


Biotechnology Centre

Fields for collaboration

Leader: prof. Ilona Wandzik
Ilona.Wandzik@polsl.pl

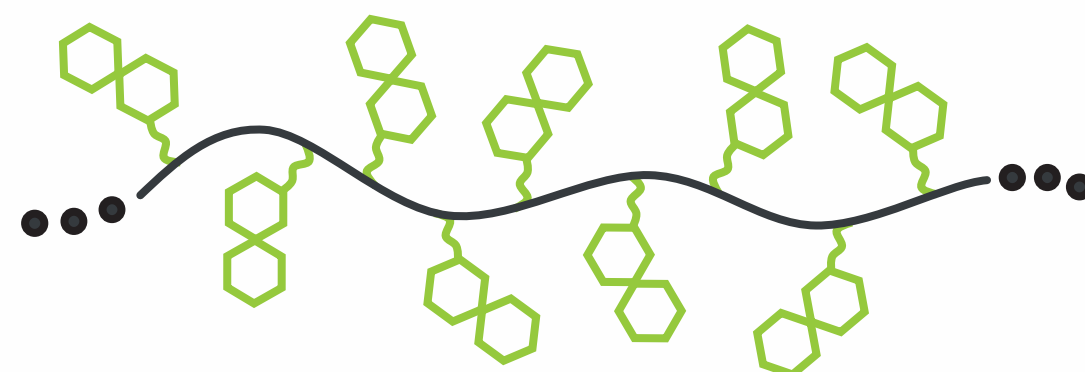
TREHALOSE-CONTAINING (NANO/MICRO)SIZED HYDROGELS AND GLYCOPOLYMERS FOR BIOMEDICINAL APPLICATIONS



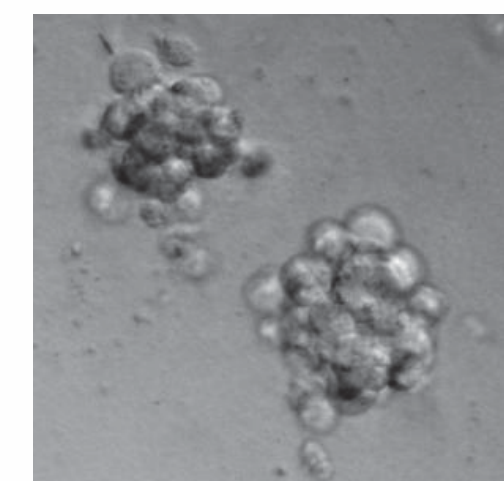
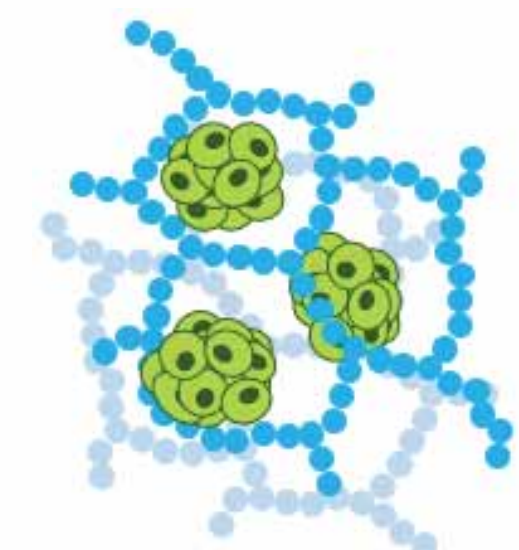
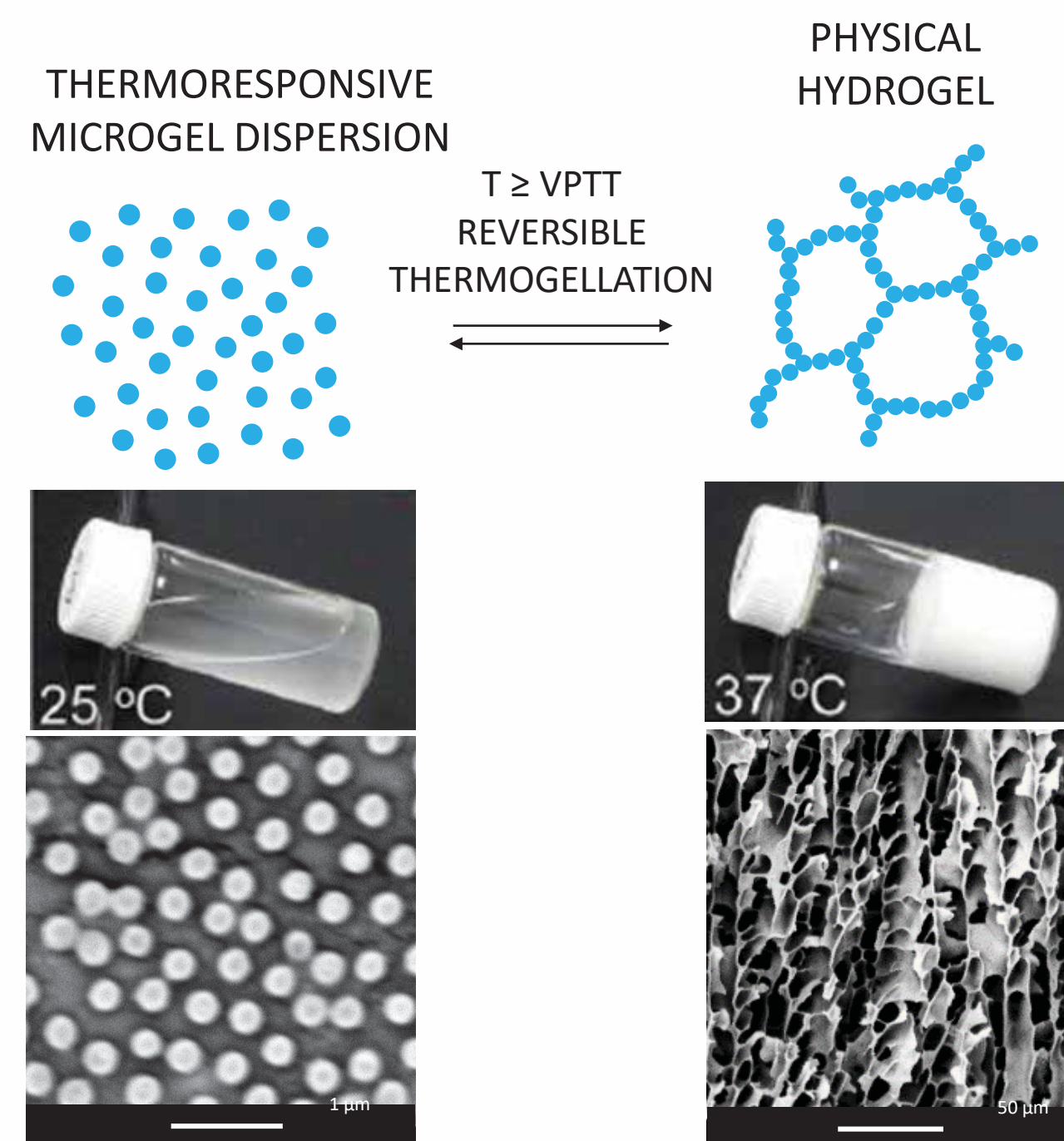
Trehalose

- Ability to protect proteins from inactivation or denaturation
- Autophagy stimulator/modulator

GLYCOPOLYMERS for inhibiting protein aggregation



MICROsized hydrogels as thermogellable matrices for 3D cell culture



Silesian University
of Technology



M. Milewska, A. Milewski, I. Wandzik, M. Stenzel, *Polymer Chemistry* 13 (2022) 1831
S. Student, M. Milewska, Z. Ostrowski, K. Gut, I. Wandzik, *Materials Science and Engineering: C* 119 (2021) 111647
M. Burek, S. Waśkiewicz, A. Lalik, S. Student, T. Bieg, I. Wandzik *Biomaterials Science* (2017) 234-246

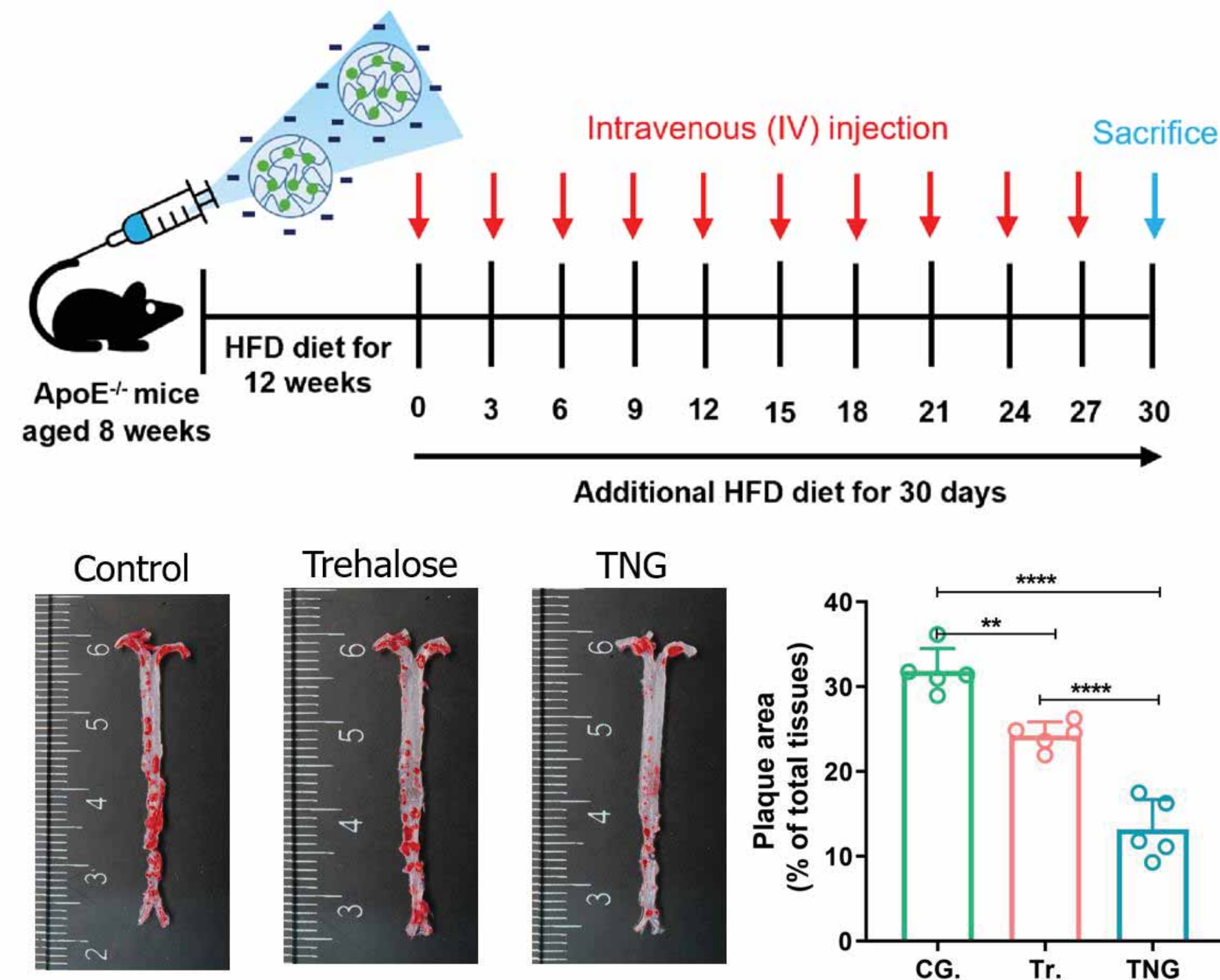
Biotechnology Centre

Fields for collaboration

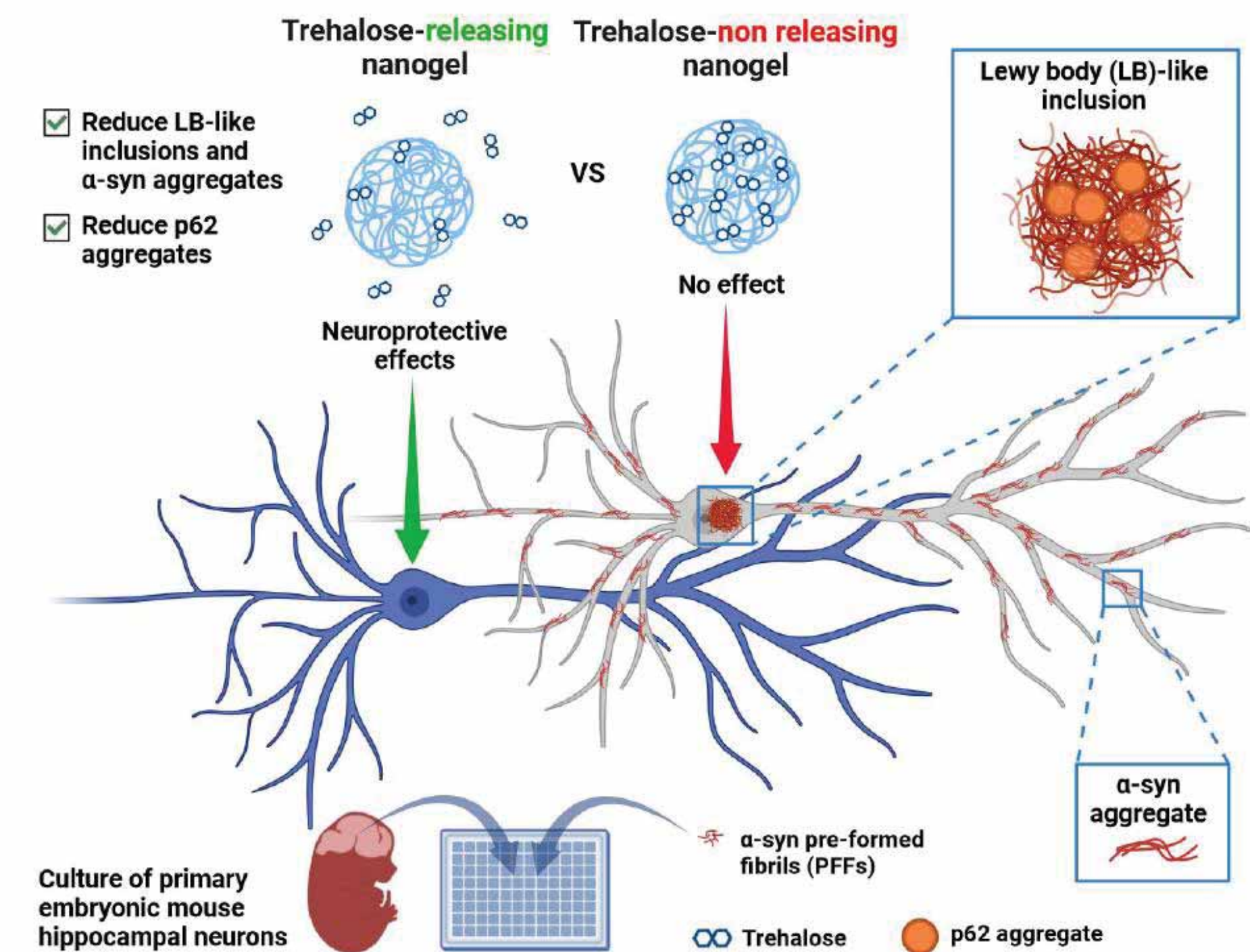
Leader: prof. Ilona Wandzik
Ilona.Wandzik@polsl.pl

TREHALOSE-RELEASING NANOGELS AS DRUG CARRIERS

Autophagy stimulation in atherosclerosis in mice model



Lewy body-like inclusions reduction in primary mouse hippocampal neurons



Silesian University
of Technology



Y. Zhong, A. Maruf, K. Qu, M. Milewska, I. Wandzik, N. Mou, Y. Cao, W. Wu, *Journal of Nanobiotechnology* 21 (2023) 472
A. Maruf, D. Gerasymchuk, I. Hlushchuk, S. Er, M. Milewska, P. Chmielarz, A. Domanskyi, M. Airavaara, I. Wandzik, *J. Mat. Chem. B*, 13 (2025)

Biotechnology Centre

Fields for collaboration

Leader: prof. Sebastian Student
Sebastian.Student@polsl.pl

MICROFLUIDIC AND CONFOCAL MICROSCOPY SOLUTION

Microfluidic system for drugs testing

- 📦 Precise control of the cellular microenvironment
- 🔬 Dedicated software

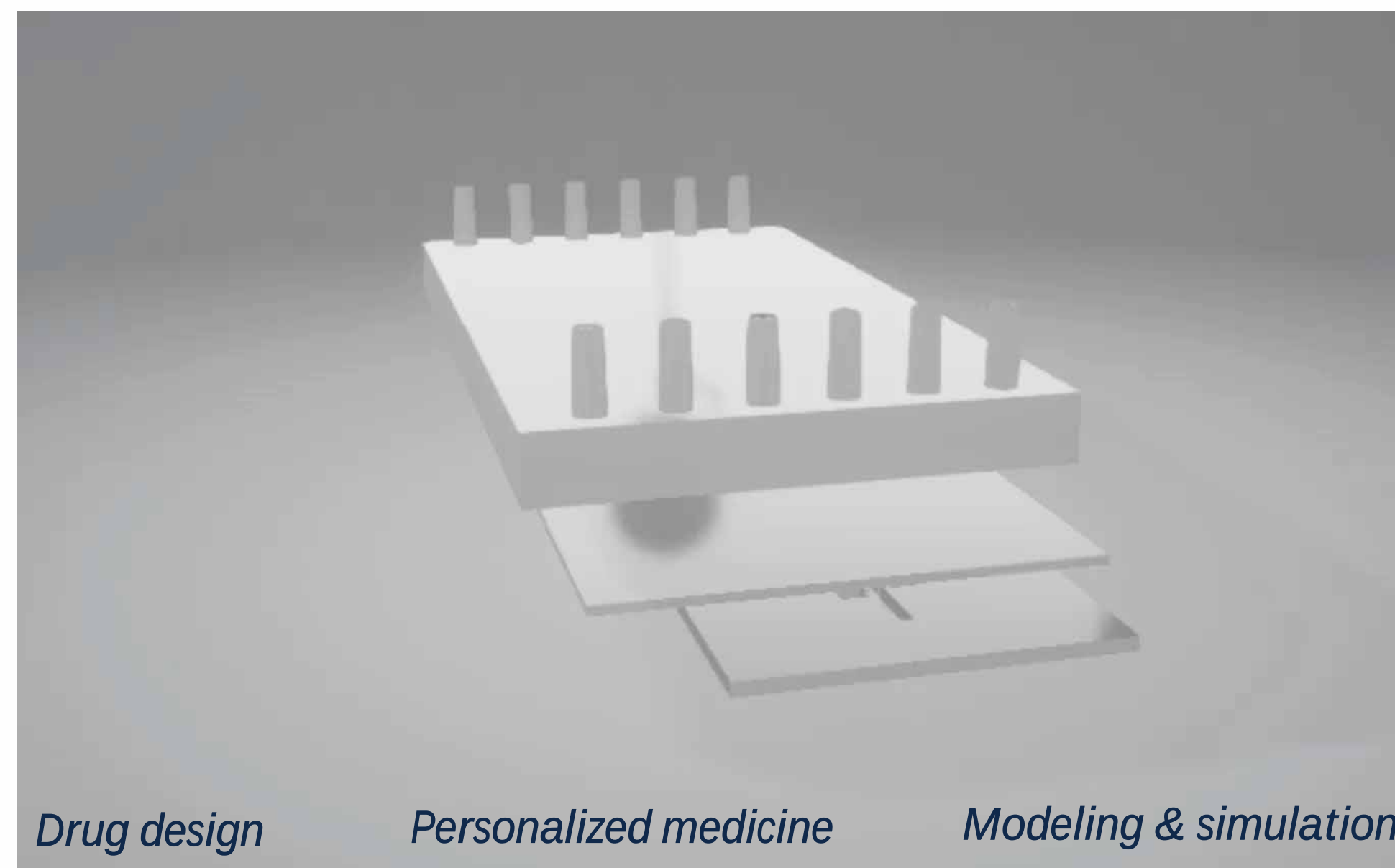
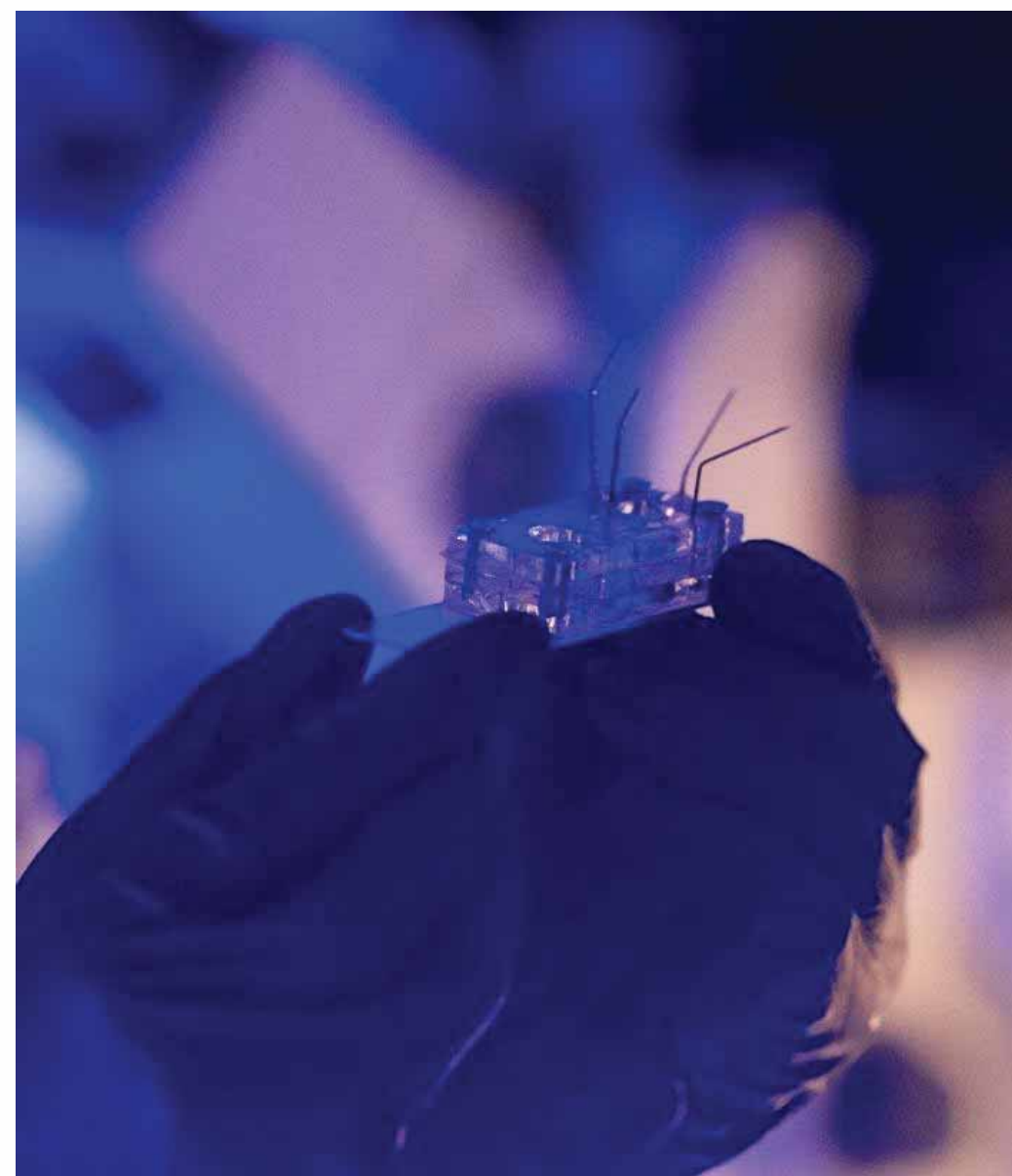


Republic
of Poland

Co-funded by the
European Union



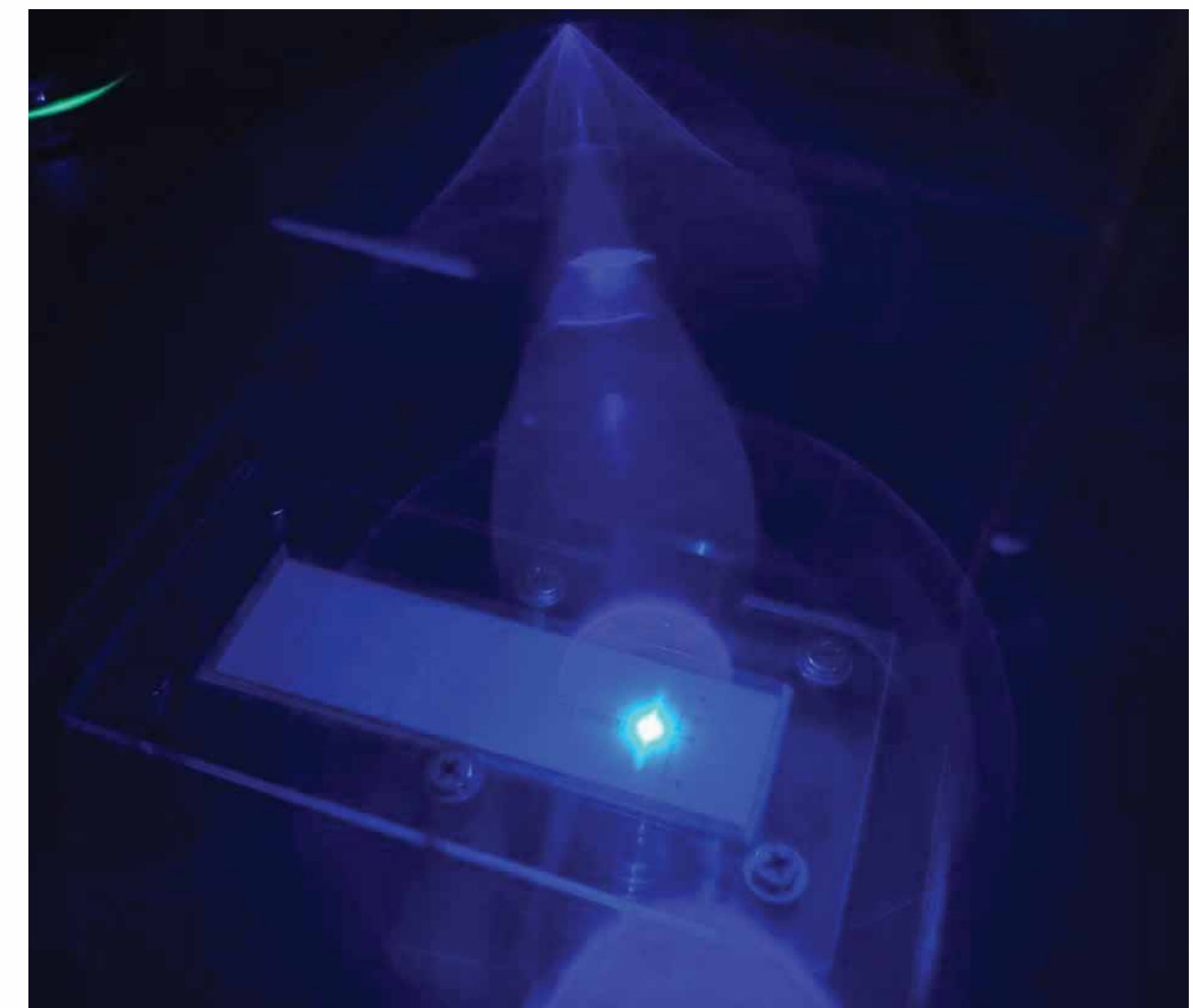
- ⚡ Faster testing of multiple compounds simultaneously
- 🎯 Better replication of the body's natural conditions



Drug design

Personalized medicine

Modeling & simulation



Sebastian Student, Ilona Wandzik, Małgorzata Milewska, Maria Gracka, Alicja Stańczak, Weronika Losa, Marta Prochota, Maciej Stefanek



**Silesian University
of Technology**



Y. Zhong, A. Maruf, K. Qu, M. Milewska, I. Wandzik, N. Mou, Y. Cao, W. Wu, *Journal of Nanobiotechnology* 21 (2023) 472

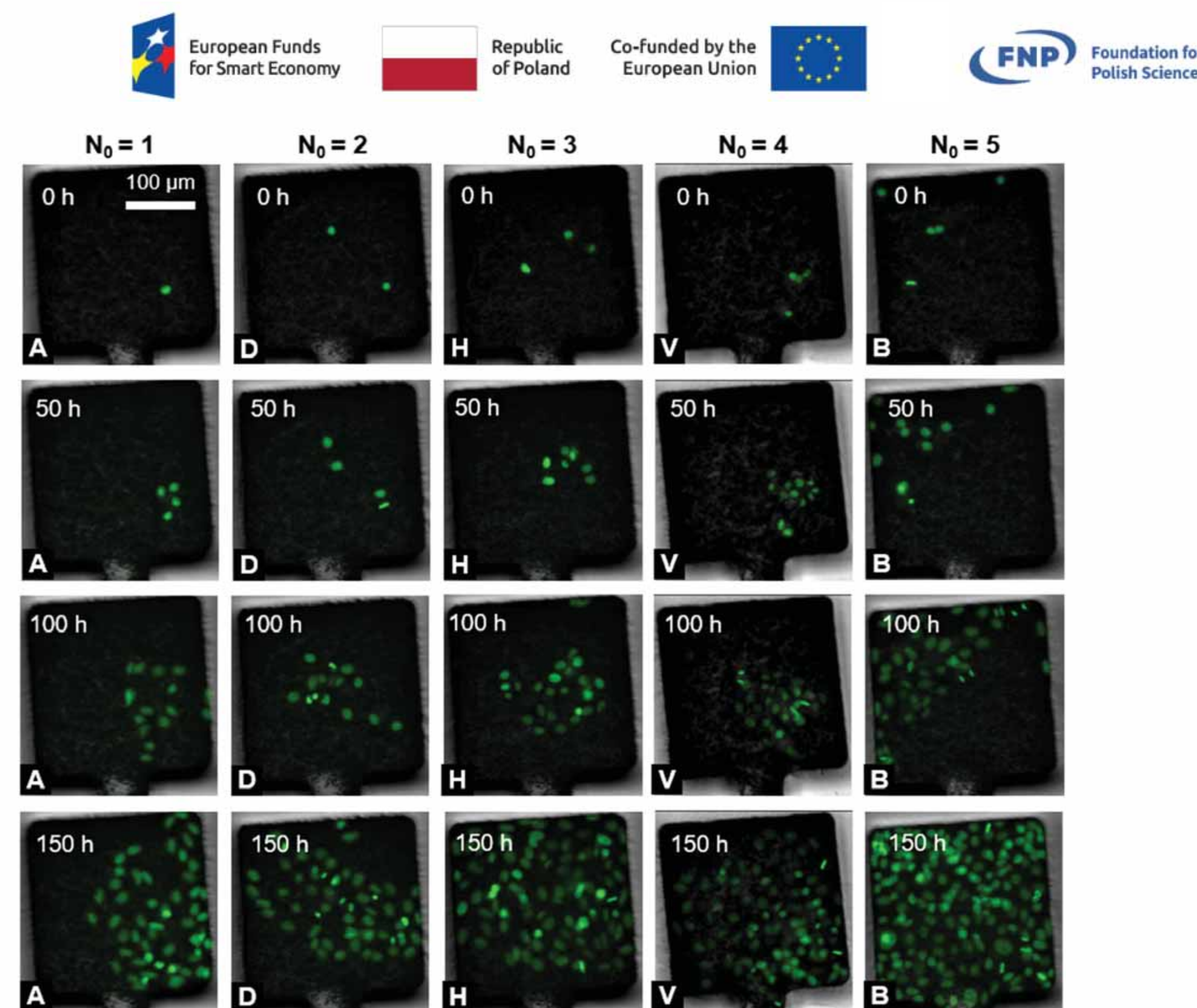
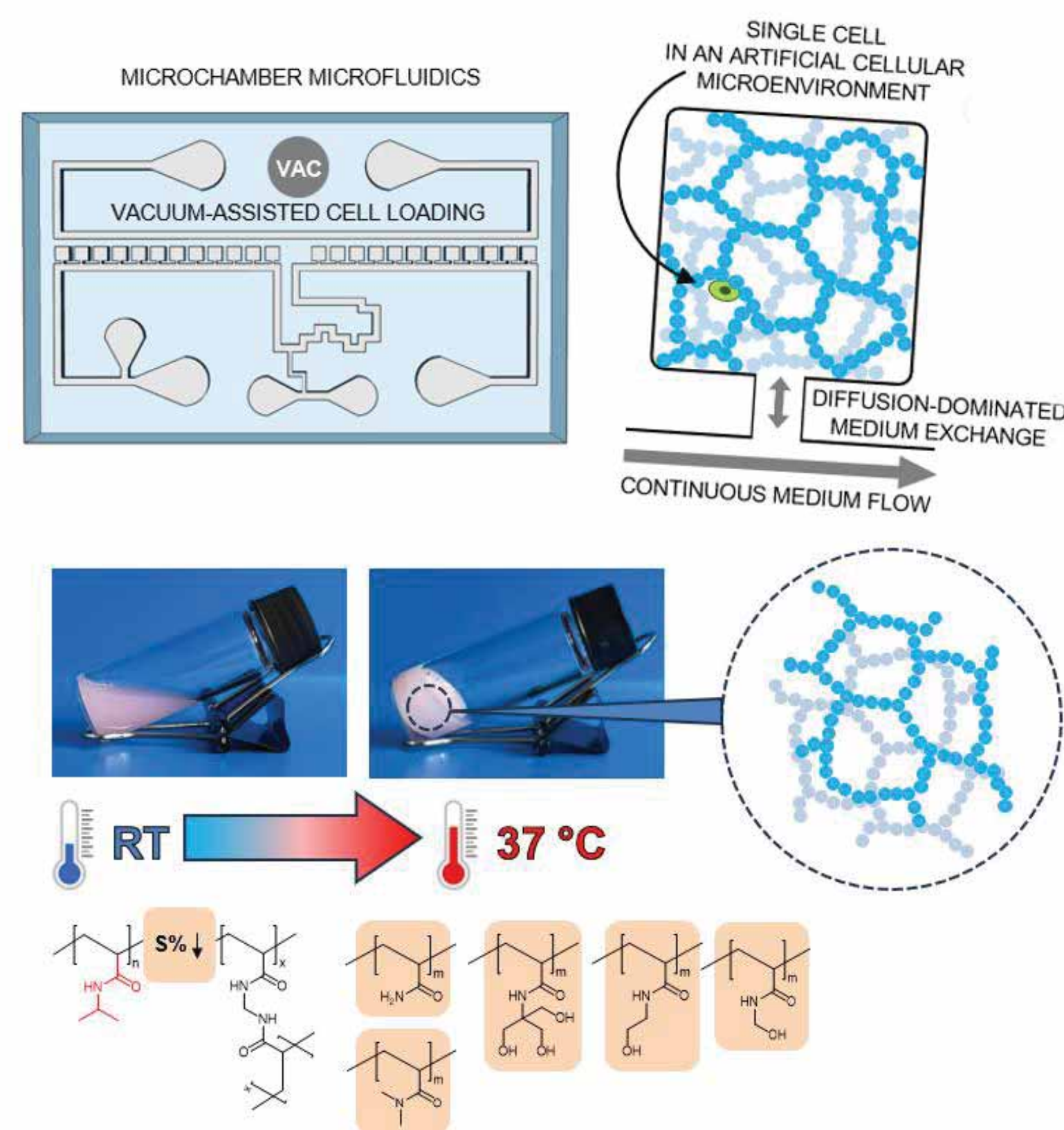
Biotechnology Centre

Fields for collaboration

Leader: prof. Sebastian Student
Sebastian.Student@polsl.pl

MICROFLUIDIC AND CONFOCAL MICROSCOPY SOLUTION

Microfluidic system for 3D cell cultures



Sebastian Student, Ilona Wandzik, Małgorzata Milewska, Maria Gracka, Alicja Stańczak, Weronika Losa, Marta Prochota, Maciej Stefanek



Silesian University
of Technology



Y. Zhong, A. Maruf, K. Qu, M. Milewska, I. Wandzik, N. Mou, Y. Cao, W. Wu, *Journal of Nanobiotechnology* 21 (2023) 472

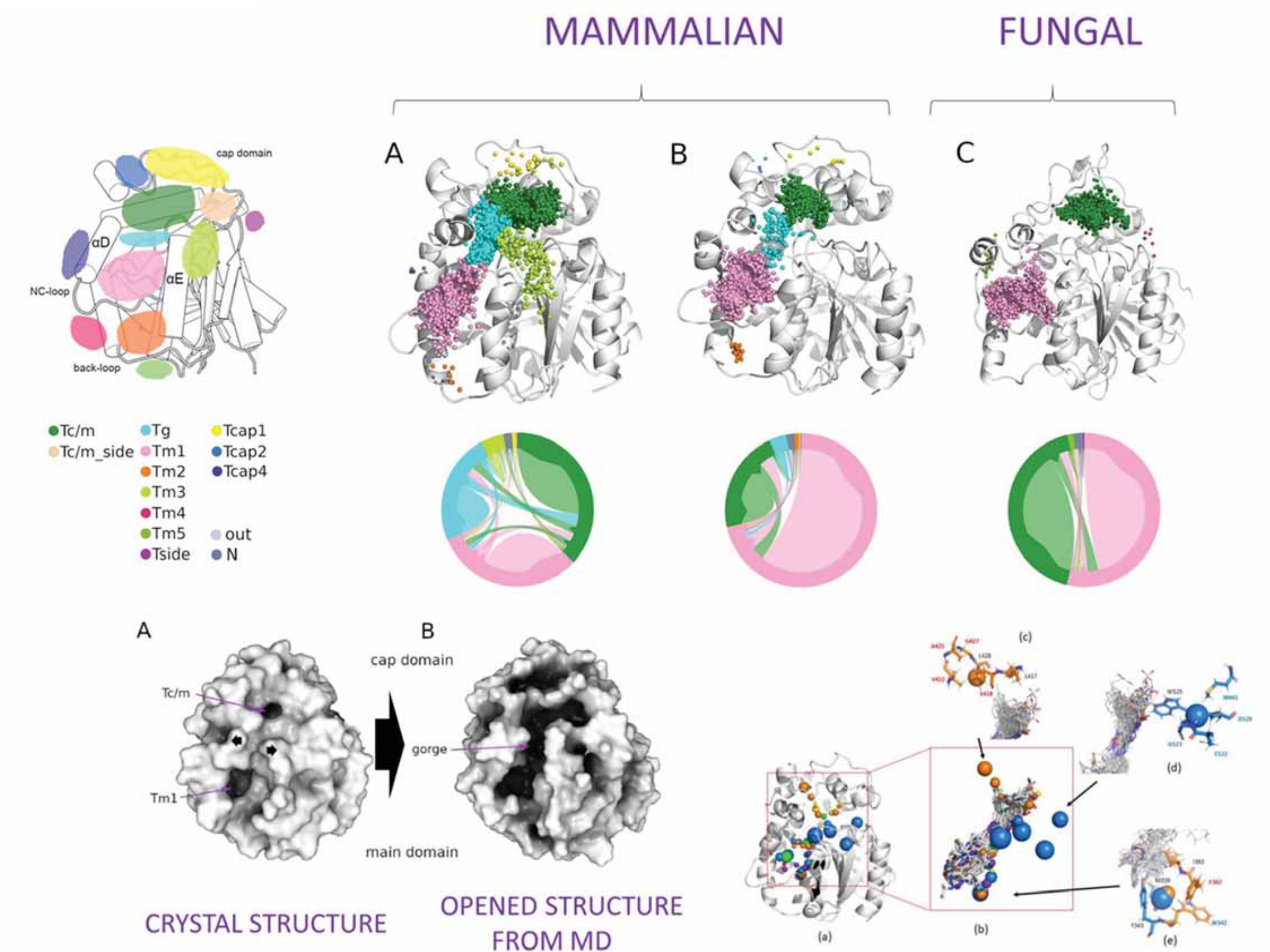
Biotechnology Centre

Fields for collaboration



- ENZYMES ENGINEERING AND DESIGN, HYBRID- CATALYSIS
- ROLE OF WATER IN CATALYSIS
- DRUG DESIGN (CARDIO, NEURODEGENERATIVE DISEASES)
- PESTICIDES DESIGN
- ANTIMICROBIAL, ANTIFUNGAL PEPTIDES DISCOVERY
- NATURE BASED SOLUTIONS FOR ENVIRONMENT PROTECTION AND CIRCULAR ECONOMY (POLYMERS DEGRADATION AND RECYCLING)
- DEVELOPMENT OF COMPUTATIONAL TOOLS FOR PROTEIN ANALYSIS AND DRUG DISCOVERY

Leader: Prof. Artur Góra
Artur.Gora@polsl.pl



Silesian University
of Technology



Mitusińska et al. CSBJ, 20 (2022) 193–205
Bzówka M et al. PLOS Comp. Biol. 2022, 18 (5), e1010119

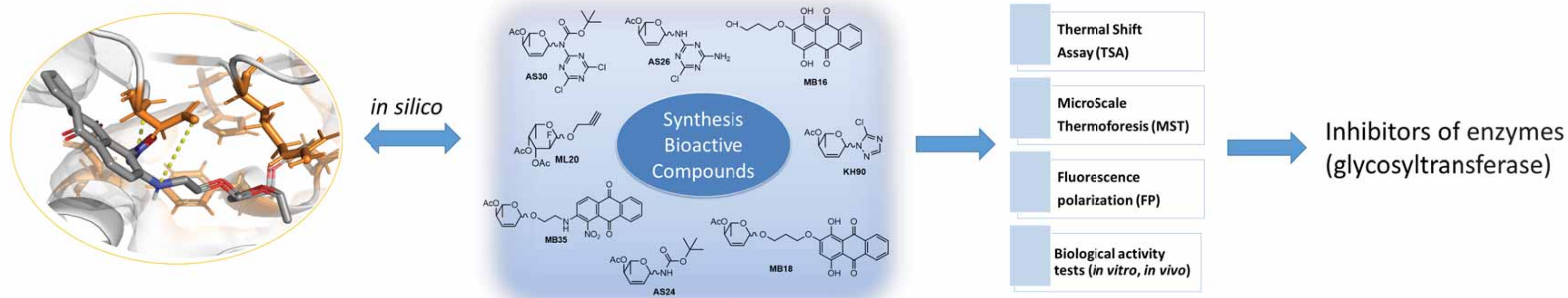
Biotechnology Centre

Fields for collaboration



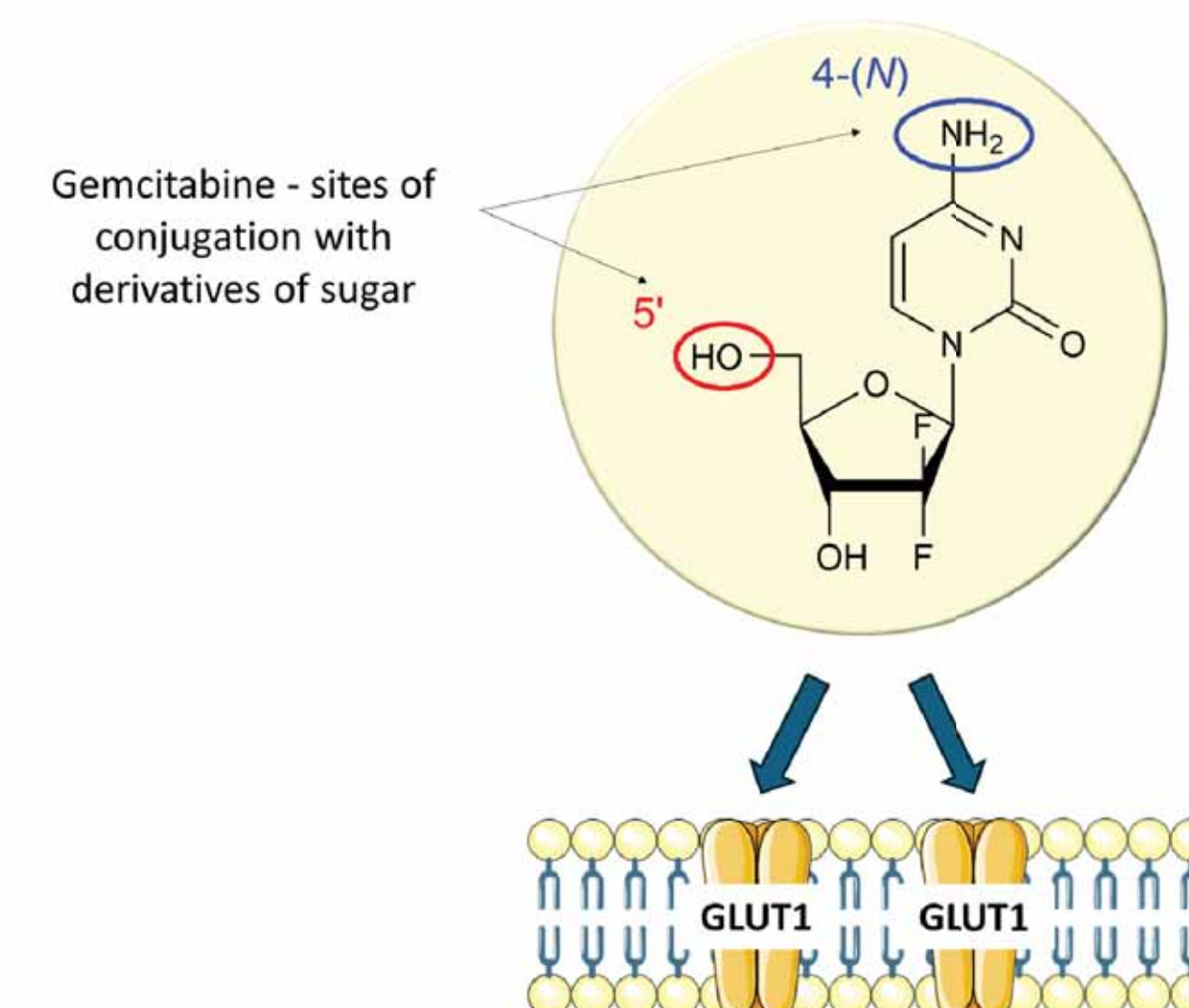
Leader: Prof. Artur Góra
Artur.Gora@polsl.pl

- DESIGN AND SYNTHESIS OF BIOLOGICALLY ACTIVE COMPOUNDS (ENZYME INHIBITORS)
- OBTAINING THE PRODRUG FORM OF DRUGS USED IN CLINICAL THERAPIES
- TARGETED TRANSPORT TO CANCER CELLS
- CHEMISTRY OF SUGARS, SYNTHESIS OF SUGAR DERIVATIVES (GLYCOCONJUGATES)
- SYNTHESIS OF ORGANOSULFUR COMPOUNDS
- SYNTHESIS OF TERPENOID DERIVATIVES
- STUDY OF ANTICANCER AND ANTIMICROBIAL ACTIVITY



A. Byczek-Wyrostek, R. Kitel, K. Rumak, M. Skonieczna, A. Kasprzycka, K. Walczak, *European Journal of Medicinal Chemistry* 2018, 150, 687, A. Minecka, E. Kamińska, M. Tarnacka, K. Jurkiewicz, A. Talik, K. Wolnica, M. Dulski, A. Kasprzycka, P. Spychalska, G. Garbacz, K. Kamiński, M. Paluch, *European Journal of Pharmaceutical Sciences*, 2020, 141, 105091, K. Papaj, A. Kasprzycka, A. Góra, A. Grajoszek, G. Rzepecka, J. Stojko, J.-J. Barski, W. Szeja, A. Rusin, *Journal of Pharmaceutical and Biomedical Analysis*, 2020, 185, 113216.

GEMCITABINE PRODRUGS



- increase bioavailability,
- reduce systemic cytotoxicity,
- GLUT receptor-mediated targeted transport.

Patent PL (granted decision of 18.03.2025)

Prodrug - Gemcitabine-derived glycoconjugate as a new compound with anticancer activity, method of preparation and application, A. Kasprzycka, W. Szeja, K. Żurawska, M. Woźniak, S. Makuch, J. Wiśniewski, T. Cichoń, E. Piłny, Patent application P.442924 23.11.2022.



Silesian University
of Technology



Biotechnology Centre

Fields for collaboration

Leader: Prof. Prof. Gabriela Pastuch-Gawołek
Gabriela.Pastuch-Gawolek@polsl.pl

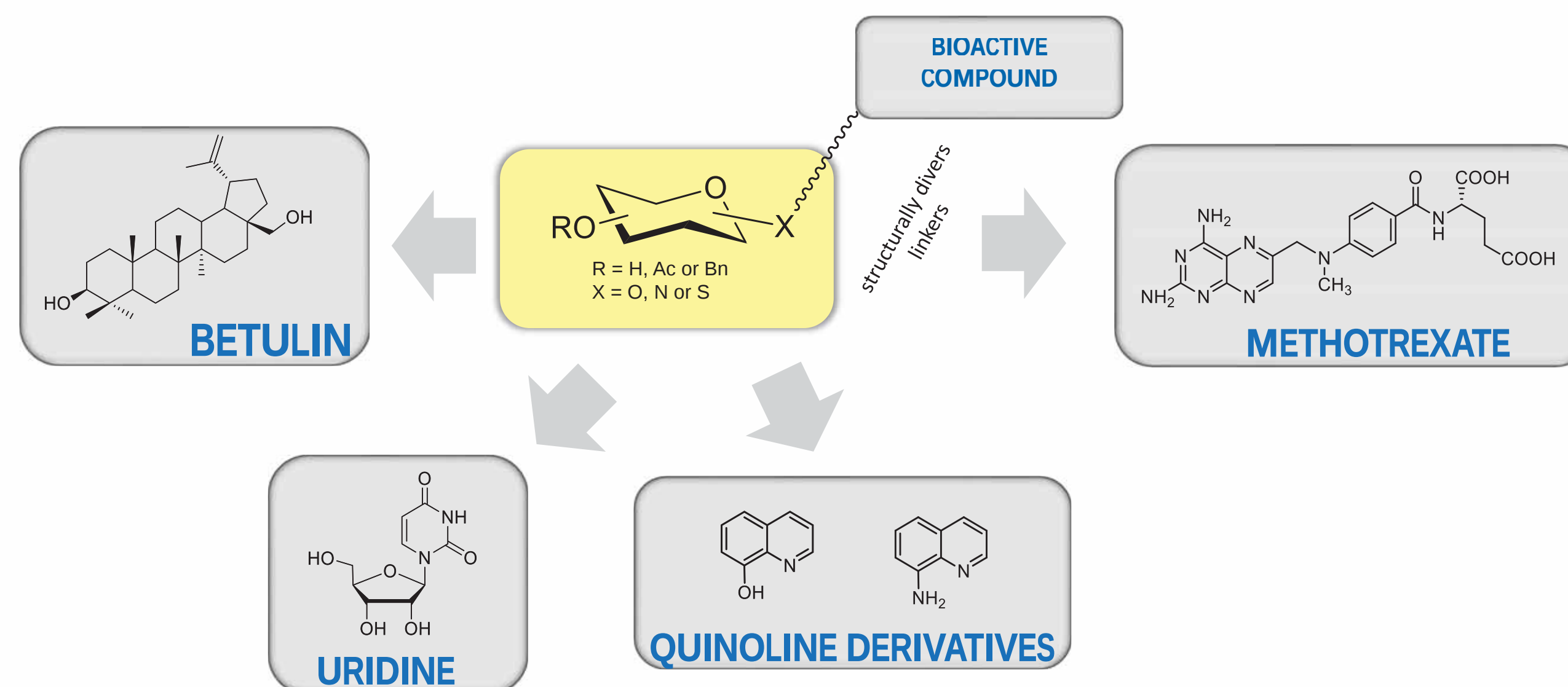
GLYCOCONJUGATION OF BIOLOGICAL ACTIVE COMPOUNDS
as a way for improving their bioavailability and selectivity

GTS INHIBITORS

ANTIVIRAL ACTIVITY

METAL CHELATORS

ANTICANCER ACTIVITY



Silesian University
of Technology



Biotechnology Centre

Fields for collaboration



organophosphorus.team@polsl.pl

MEET OUR TEAM:

- ✓ dr hab. inż. Jakub Adamek, prof. PŚ (Head)
- ✓ dr inż. Mirosława Grymel
- ✓ dr inż. Anna Kuźnik
- ✓ dr inż. Agnieszka Październiak-Holewa
- ✓ mgr inż. Dominika Kozicka

SCIENTIFIC ACTIVITIES AND SKILLS:

- synthesis and characterization of organophosphorus compounds using modern, eco-friendly methods (e.g. electroorganic synthesis);
- structural modifications (including conjugation) of bioactive systems using P-compounds;
- isolation of compounds with documented biological properties from plant material along with their characterization;
- use of spectroscopic methods (NMR, IR, MS) in the analysis of samples of various origins.

TEAM ACHIEVEMENTS:

- participation in dozens of national and international projects (Horizon, NCN, NCBiR, NB, etc.);
- organization of the scientific conference *Kosmotrend* (cosmetic chemistry, cosmetic formulation, biomedicine);
- editing special issues of international journals;
- co-organization of *European 36Org-Chem Challenge*.



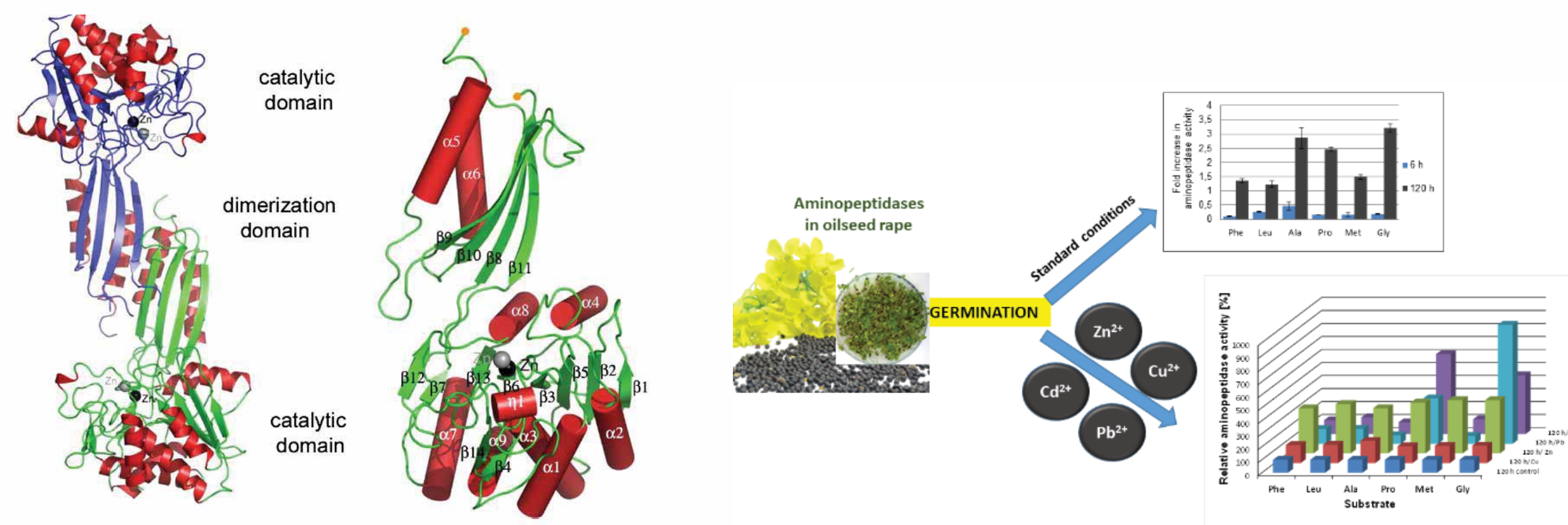
Silesian University
of Technology



Biotechnology Centre

Fields for collaboration

Danuta Gillner - Research group
Danuta.Gillner@polsl.pl

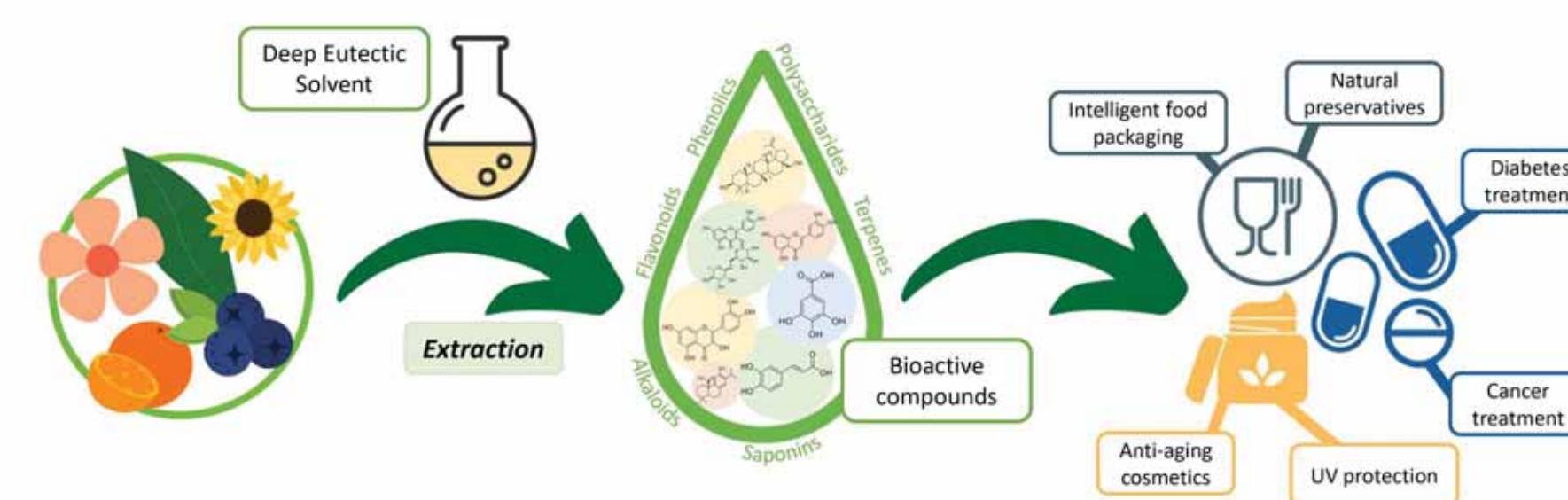


Identification and characteristics of new molecular targets for novel antimicrobials

Plant enzymes identification, *in vivo* and *in vitro* activity under stress conditions

Valorization of waste biomass and production of added value products

Natural antimicrobials from plants - „green” extraction and application



B. P. Nocek., D. M. Gillner, Y. Fan, R. C. Holz, A. Joachimiak, J. Mol. Biol. 2010, 397(3), 617-626
J. Kania, T. Krawczyk, D. Gillner, J Sci Food Agric 2021, 101(15), 6533-6541. doi: 10.1002/jsfa.11325
Wawoczny, A., Gillner, D. J. Agric. Food Chem. 2023, 71, 29, 10877–10900. doi: 10.1021/acs.jafc.3c01656
Wawoczny A. et. al. Food Chemistry, 2025, 472, 142884; doi.org/10.1016/j.foodchem.2025.142884



Silesian University
of Technology

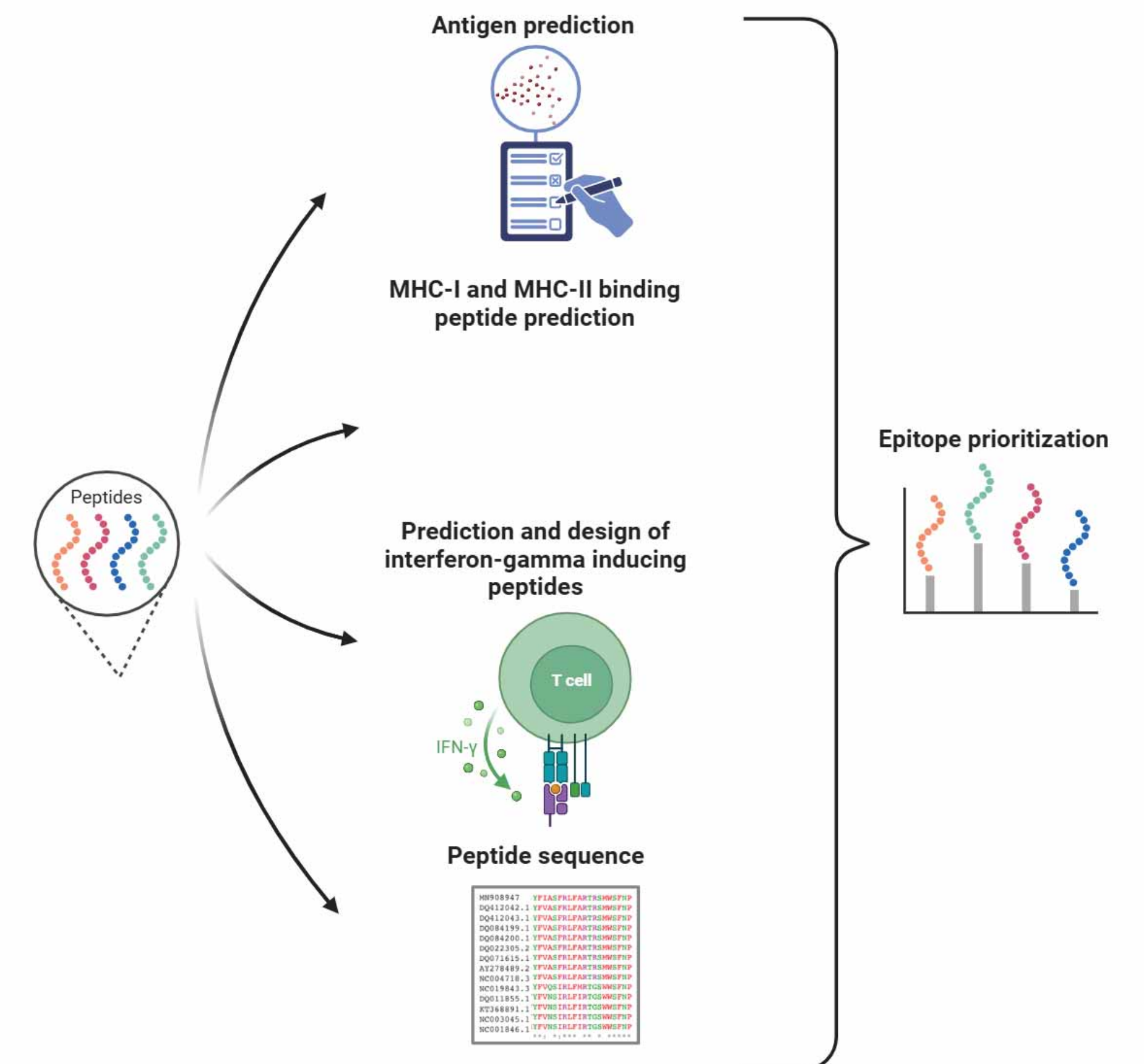


Biotechnology Centre

Fields for collaboration

Shima Mahmoudi - Research group
Shima.Mahmoudi@polsl.pl

- Identification of *Mycobacterium tuberculosis*-specific peptides using bioinformatics
- In silico epitope prediction and optimization for multi-epitope diagnostics
- Recruitment of cohorts for evaluation of different peptide pools
- Immune response analysis using whole-blood assays and cytokine measurement
- Selection of validated biomarkers for point-of-care applications
- Design and development of electrochemical biosensor-based point-of-care tests
- Validation for improved TB detection, staging, and progression prediction



Silesian University
of Technology



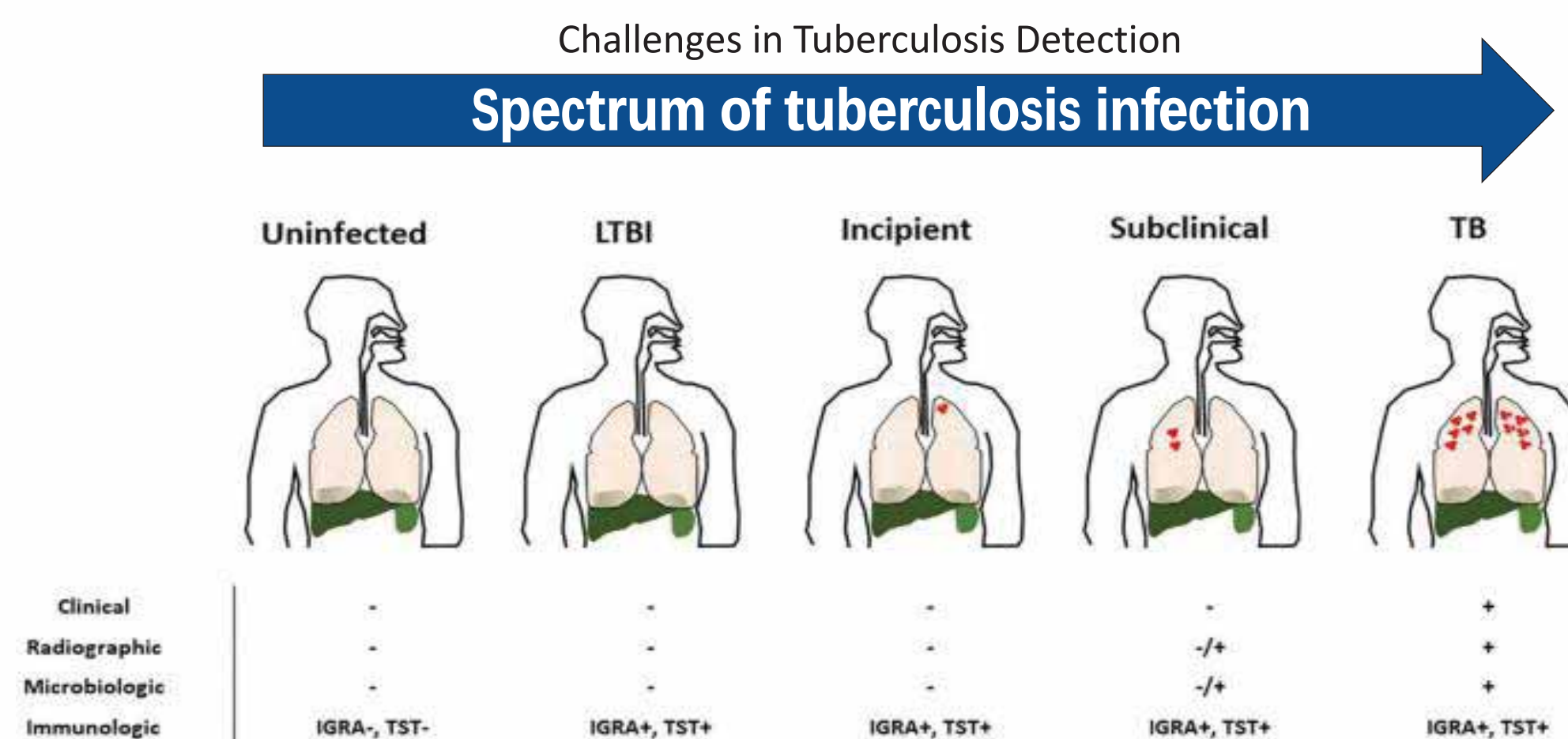
Biotechnology Centre

Fields for collaboration

Shima Mahmoudi - Research group
Shima.Mahmoudi@polsl.pl

TEAM Achievements

- Awarded prestigious postdoctoral fellowships, HORIZON MSCA, supporting advanced research in TB immunology and diagnostics
- OPUS (NCN) research grant, supporting high-impact TB research project
- Active member of ADVANCE-TB COST Action (CA21164), contributing to a Europe-wide network addressing TB management complexity
- International collaborations, including medical and research partners across Europe (e.g., Croatia) and South Africa



We aim to develop novel diagnostic tools based to accurately differentiate TB infection stages and predict progression to active disease. This is essential because current Interferon-Gamma Release Assays (IGRAs) cannot distinguish latent from active TB or identify individuals at highest risk of developing active TB.



Silesian University
of Technology

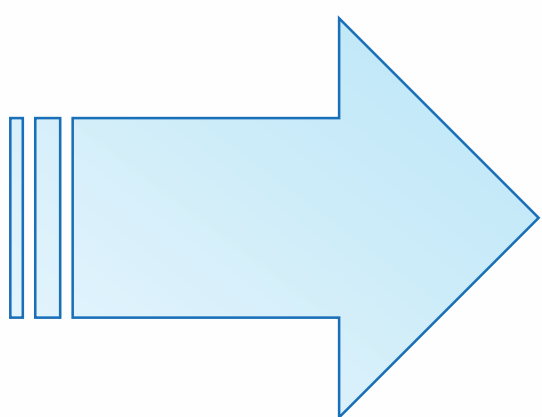
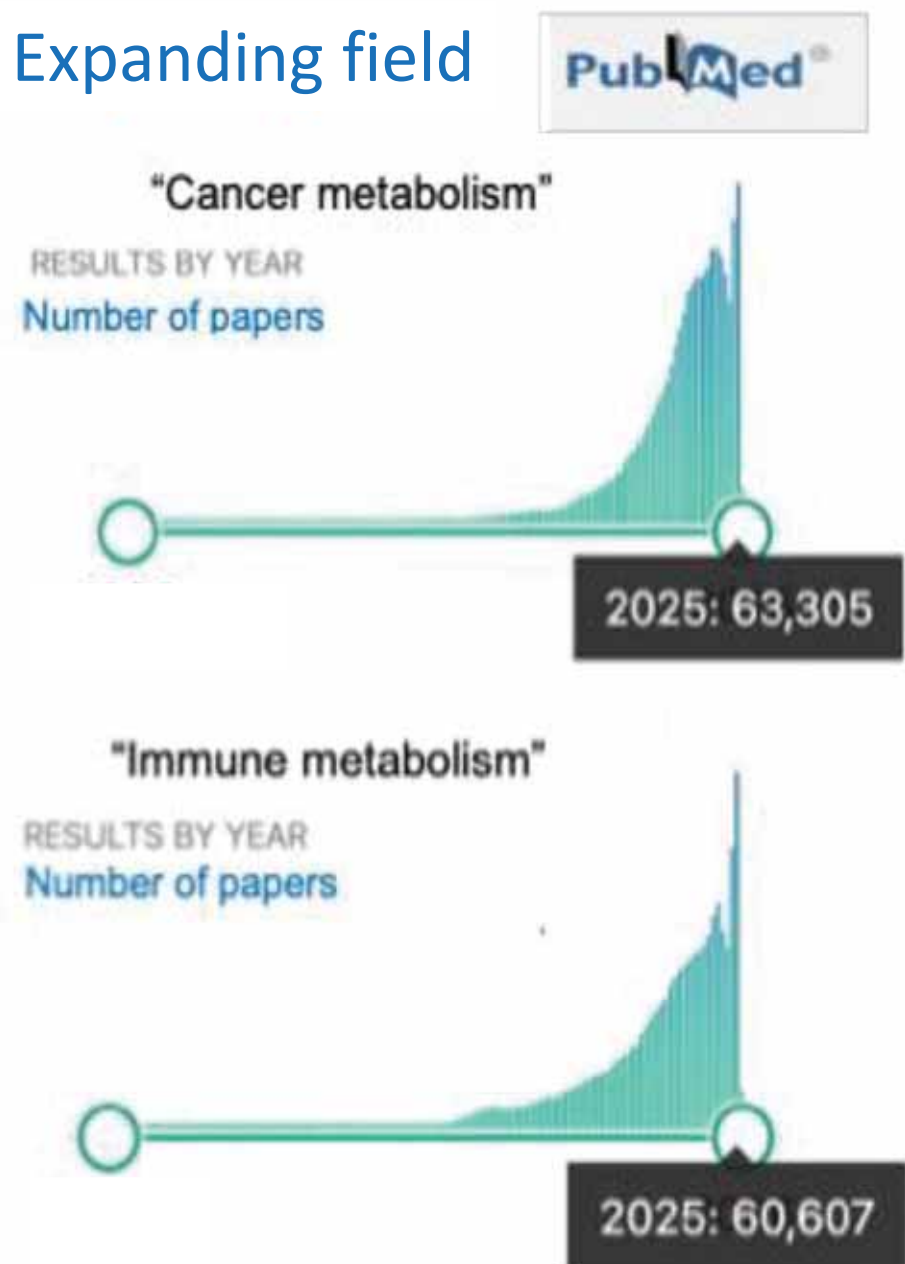
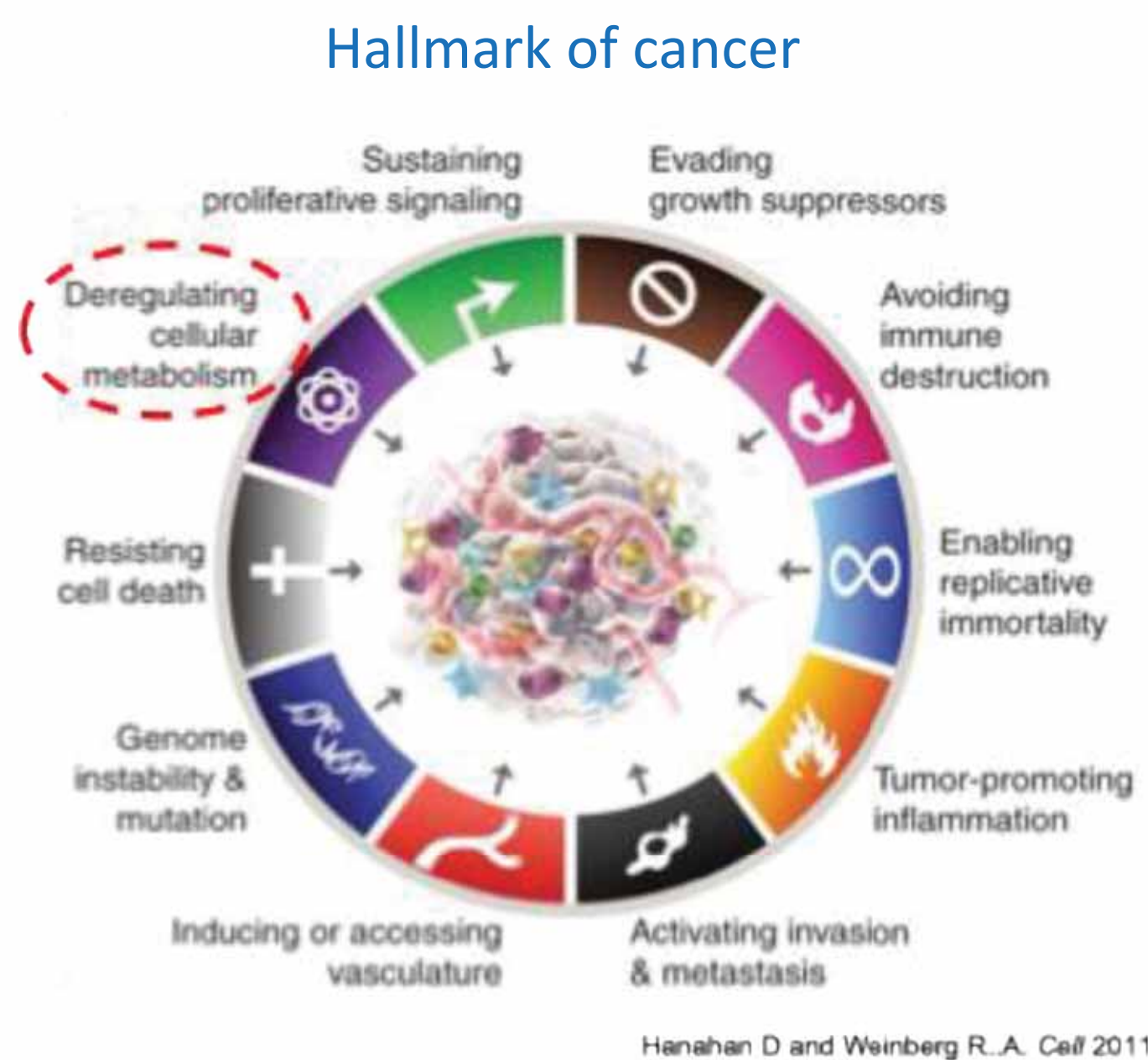


Biotechnology Centre

Fields for collaboration

Leader: Prof. Marcin Kamiński
Marcin.Kaminski@polsl.pl

Immuno-metabolic signaling – Research Group



To answer the question:

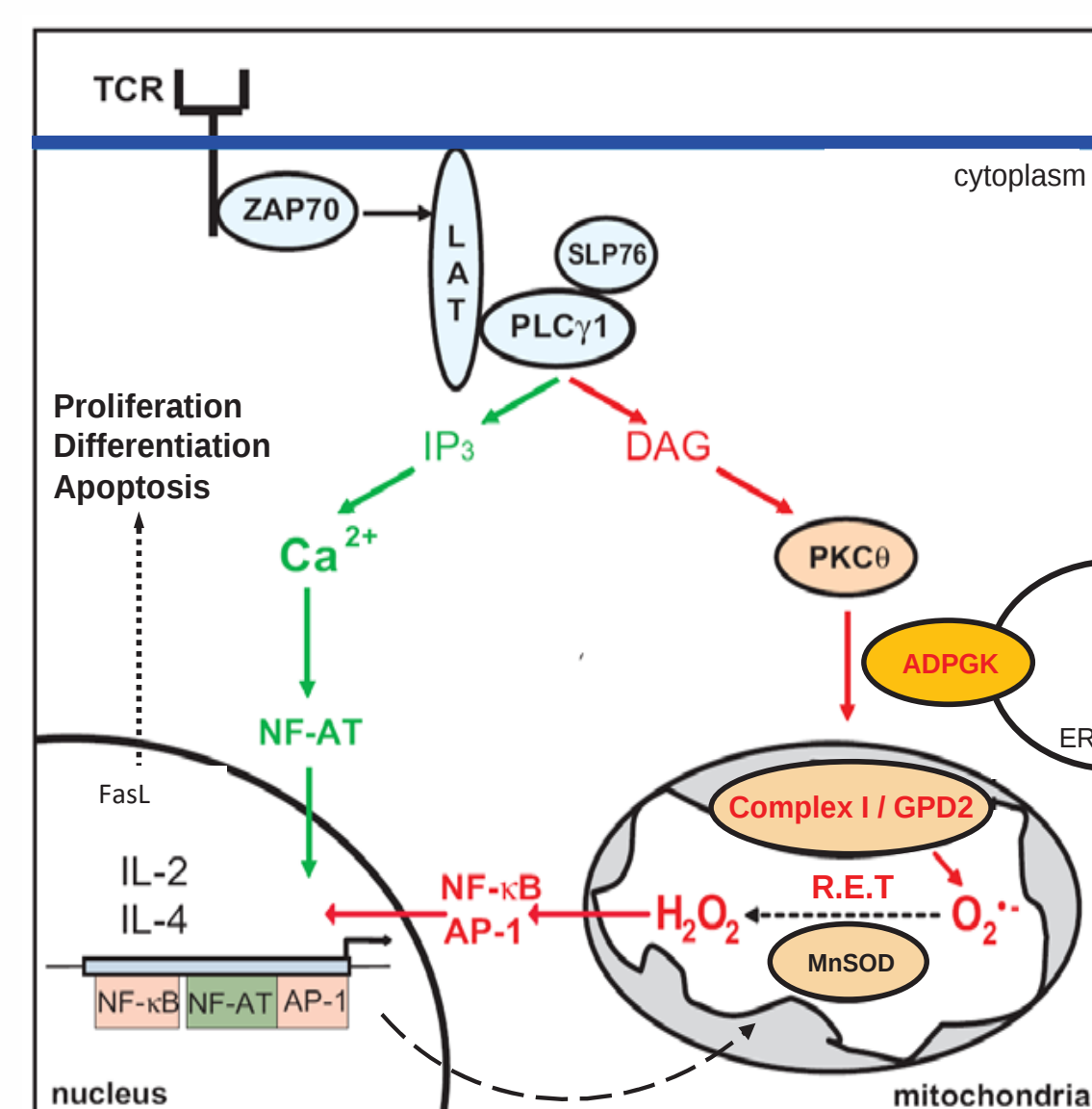
*How metabolism
controls the function
of immune and cancer cells?*

Leader: Prof. Marcin Kamiński
Marcin.Kaminski@polsl.pl

Fields for collaboration

Immuno-metabolic signaling – Research Group

Mitochondrial oxidative signal controls T cell activation



Kamiński M. et al., MCB, 2007

Kamiński M. et al., J. Immunol. 2010

Kamiński M. et al., BBA, 2012

Kamiński M. et al., Cell Reports 2012

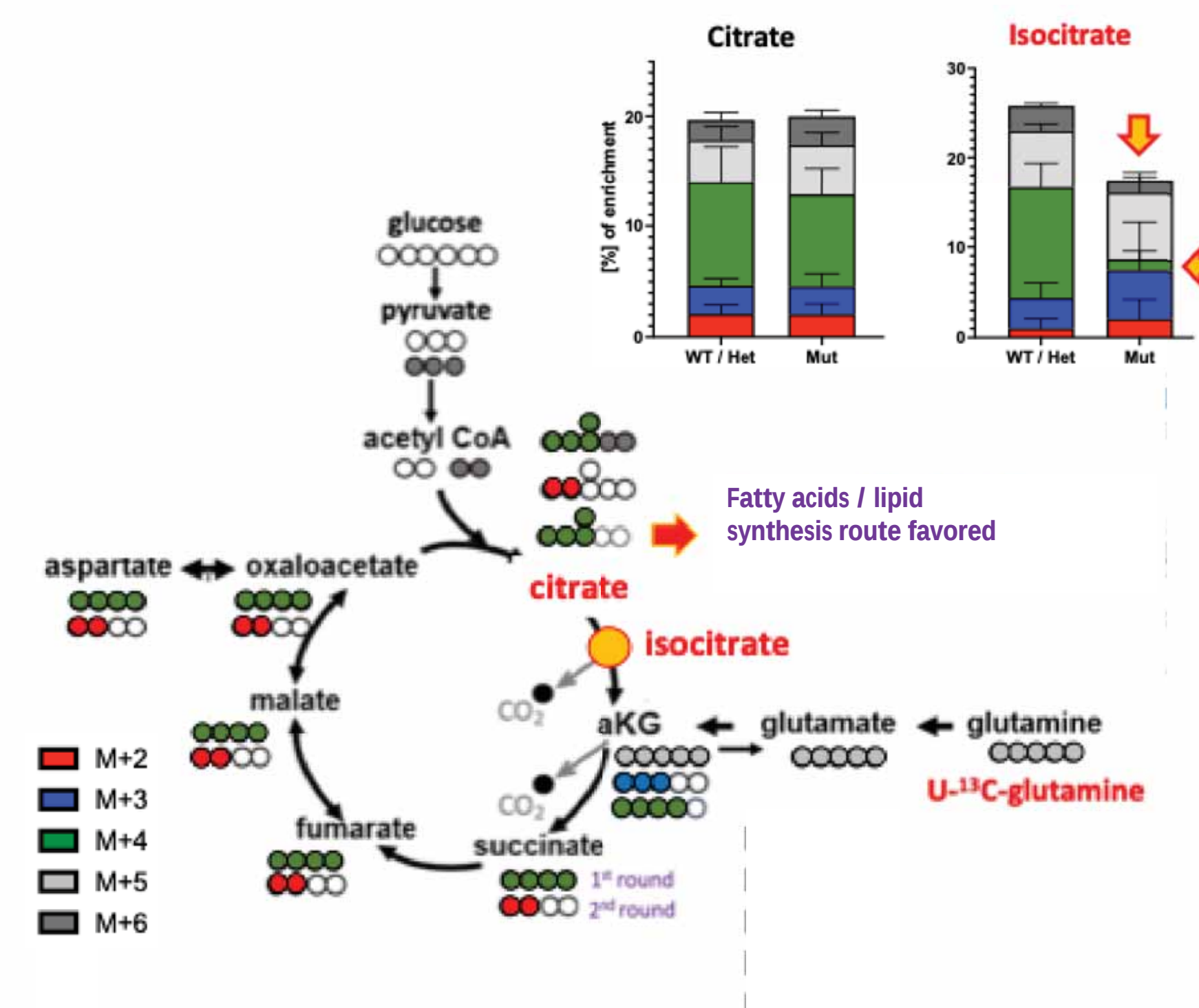
Kamiński M. et al., AITE 2013

Kamiński M., Med. Mil. Research 2024

How lipid metabolism controls T cell activation in obesity – induced inflammation?

Experimental methods of choice:

- ¹³C Metabolic tracing (GC-MS)
- Cellular assays *in vitro*
- Murine genetic *in vivo* models



Biotechnology Centre



Silesian University
of Technology



CONTACT



BIOTECHNOLOGY CENTRE

Silesian University of Technology

dr Sebastian Student, PhD, DSc, Eng

Director

Biotechnology Centre

8 Bolesława Krzywoustego Street

44-100 Gliwice, Poland



Phone

+48 32 237 29 06



E-mail

cb@polsl.pl



Follow us:

<https://www.polsl.pl/rjo11-cb/en/>



**Silesian University
of Technology**



Biotechnology Centre