Project Final Conference

Enhancing Cancer Vaccine Science for New Therapy Pathways

Conference book

10-11 March 2026

International Centre for Cancer Vaccine Science

University of Gdańsk

Kładki 24 street, Gdańsk, Poland

Funded by the European Union

CANVAS (Enhancing Cancer Vaccine Science for New Therapy Pathways) has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement no 101079510.

The conference materials were prepared on the basis of information submitted by conference participants and publicly available information. Abstracts submitted for the poster session were reviewed by selected members of the Scientific Committee and approved as consistent with the conference theme.
The organisers are not responsible for their content.

Conference website:

https://canvas.ug.edu.pl/project-canvas-final-conference-10-11-march-2026/

Scientific Committee:

prof. Natalia Marek-Trzonkowska

dr Christophe Battail

prof. Carla Montesano

dr Marcin Krzykawski

dr Justyna Kocik-Król

Organisation:

Research Support Team of the International Centre for Cancer Vaccine Science, University of Gdańsk

The conference is organized within the EU-funded project: "Enhancing Cancer Vaccine Science for New Therapy Pathways" (CANVAS) conducted during 2022-2026 under coordination of the International Centre for Cancer Vaccine Science at the Unviersity of Gdańsk in partnership with the Interdisciplinary Institute of the FRENCH ALTERNATIVE ENERGIES AND ATOMIC ENERGY COMMISSION (CEA-IRIG), University of Rome Tor Vergata, and Real Research.

Project outline

The CANVAS project, *Enhancing Cancer Vaccine Science for New Therapy Pathways*, aims to elevate the scientific profile, networking capabilities, and research management expertise of the International Centre for Cancer Vaccine Science (ICCVS) at the University of Gdańsk (UG) in Poland. Its primary goal is to enhance research excellence in cancer vaccine science while addressing disparities in research and innovation across Europe. This is achieved through collaboration with top-class European partners: the University of Rome Tor Vergata (UNITOV) in Italy and the Alternative Energies and Atomic Energy Commission (CEA) in France. Additionally, the partnership includes Real Research, a Polish biotech start-up, to facilitate intersectoral knowledge exchange and promote innovative approaches to translational research.

A key focus of the CANVAS as Twinning project is strengthening grant-writing and research management skills to boost long-term competitiveness in securing funding. The initiative also includes a joint pilot study aimed at developing a groundbreaking personalized therapy for non-small cell lung cancer. Beyond its scientific contributions, CANVAS is expected to generate innovations with translational potential, ultimately improving cancer patient therapies. This gives the project a significant societal and economic impact, ensuring its relevance both in the scientific community and beyond.

Day 1

10.03.2026

08:30 - 9:00 Registration and welcome coffee

09:00 - 09:15 Welcome address
prof. Piotr Stepnowski

Rector of the University of Gdańsk

09:15 - 09:30 Introduction to CANVAS project
prof. Natalia Marek-Trzonkowska

Director of the International Centre for Cancer Vaccine Science, University of Gdańsk

Session I: Cancer Models

09:30 - 10:00 Transcriptomic evaluation of immune-infiltrated patient-derived tumor organoids as preclinical models in renal cell carcinoma
dr Christophe Battail

Genetics & Chemogenomics team, IRIG - CEA Grenoble

10:00 - 10:30 Improving tumor models, so the apple does not fall far from the tree – take-home messages from CANVAS project
Martyna Siewiera

International Centre for Cancer Vaccine Science, University of Gdańsk

10:30 - 11:00 Networking coffee break

11:00 - 11:30 3D cell models for pancreatic cancer initiation studies
dr. Flora Clement

University Grenoble Alpes, CEA, INSERM UA13, IRIG, BGE, Biomics

11:30 - 12:00 Predicting Real-World Drug Response with LifeGel-Based 3D Tumoroid Models
dr. Marcin Krzykawski

Real Research

12:00 - 12:30 Modelling in vitro cancer inflammation
prof. Lina Ghibelli

Department of Biology, University of Roma Tor Vergata

12:30 - 12:40 Official conference joint photo

12:40 - 13:40 Networking lunch break

13:40 - 14:30 Poster Session part I

Session II: Cancer Immunology

14:30 - 15:00 Inversing cancer immunotherapy to cure autoimmune disease
prof. Bart O. Roep

Department of Internal Medicine, Leiden University Medical Centre

15:00 - 15:30 Identifying heterogeneity and vulnerabilities in breast cancer circulating tumour cells
dr. hab. Aleksandra Markiewicz

Division of Translational Oncology, Medical University of Gdańsk

15:30 - 16:00 Networking coffee break

16:00 - 16:30 CD4+T cells induce dormancy of HER2 positive breast cancer
dr. Irena Paczkowska

Department of Experimental Oncology, Laboratory of Experimental Immunotherapy, Maria Skłodowska-Curie National Research Institute of Oncology

16:30 - 17:00 Challenges for cancer immunotherapy-putting the puzzles together
prof. Natalia Marek-Trzonkowska

Director of the International Centre for Cancer Vaccine Science, University of Gdańsk

17:00 - 20:00 Networking Reception

Day 2

11.03.2026

09:00 - 09:15 Registration and welcome coffee

09:15 - 09:30 Welcome address
prof. Natalia Marek-Trzonkowska

Director of the International Centre for Cancer Vaccine Science, University of Gdańsk

Session III: Cancer Biology and Microenvironment

09:30 - 10:00 Cisplatin Sensitivity of HPV-Positive and HPV-Negative Head and Neck Cancer Cell Lines In Different Cell Culture Models
prof. Beata Biesaga

Collegium Medicum, Andrzej Frycz Modrzewski Krakow University

10:00 - 10:30 Tertiary Lymphoid Structures Are Associated with Progression-Free Survival of Peripheral Neuroblastic Tumor Patients
dr Rebecca Rothe

National Center for Tumor Diseases (NCT), NCT/UCC Dresden and Institute of Immunology, Faculty of Medicine Carl Gustav Carus, TUD Dresden University of Technology

10:30 - 11:00 Networking coffee break

11:00 - 11:30 Small Extracellular Vesicles as Carriers of HPV DNA: Mechanisms and Clinical Implications
prof. Monika Pietrowska

Maria Skłodowska-Curie National Research Institute of Oncology, Department of Experimental Oncology, Experimental Immunotherapy Laboratory

11:30 - 12:00 Nuclear Envelope Composition Links Cellular Mechanics to Innate Immune Signalling in Prostate Cancer
dr. Paulina Nastały

Division of Translational Oncology, Medical University of Gdańsk

12:00 - 13:00 **Networking lunch break**

13:00 - 14:00 Poster Session part II

Session IV: Open Science

14:00 - 14:30 Decoding clinical research: a cross-disciplinary conversation
prof. Betty Polikar

MaCRO Lifescience Ltd.

14:30 - 15:00
dr Łukasz Rąbalski

Vaxican Sp. z o.o.
Intercollegiate Faculty of Biotechnology, University of Gdańsk, Poland

15:00 - 15:30 Poster Awards and Event Wrap-up
prof. Natalia Marek-Trzonkowska

Director of the International Centre for Cancer Vaccine Science, University of Gdańsk

15:30 - 16:00 **Farewell coffee break**

CONTENTS

SESSION III: CANCER BIOLOGY AND MICROENVIRONMENT

SESSION IV: OPEN SCIENCE

SESSION I: CANCER MODELS

dr Christophe Battail

Genetics & Chemogenomics team, IRIG - CEA Grenoble

TALK: Transcriptomic evaluation of immune-infiltrated patient-derived tumor organoids as preclinical models in renal cell carcinoma

Dr Christophe Battail is researcher director at the French Alternative Energies and Atomic Energy Commission (CEA). He works at the Interdisciplinary Research Institute of Grenoble (IRIG) where he is deputy director of the Genetics and Chemogenomics Team and has developed expertise in bioinformatics, pharmacogenomics, and precision oncology. Dr. Battail's research focuses on integrating multi-omics data (genomics, transcriptomics, epigenomics and proteomics) within computational methods to better understand disease mechanisms, assess the relevance of novel cancer models and predict patient responses to therapies..

https://fr.linkedin.com/in/christophe-battail-93861840/en

SESSION I: CANCER MODELS

MSc Martyna Siewiera

International Centre for Cancer Vaccine Science,
University of Gdańsk

TALK: Improving tumor models, so the apple does not fall far from the tree - take-home messages from CANVAS project

During my studies at West-Pomeranian University of Technology I became deeply interested in novel cancer therapies, which led me to work at Mabion S.A. as a technician of rhituximab production downstream processes. The pursuit for knowledge motivated me to start PhD studies at ICCVS in 2021 under guidance of prof. Natalia Marek-Trzonkowska. My project is connected to bench to bed translation of pre-clinical drug testing, which key elements are cancer models. Together with Cancer Immunology and Clinical Peptidomics Groups we aim to characterize non-small cell lung cancer (NSCLC) patient-derived models in the context of proteins modulating immune response, mainly HLA class I complexes presenting self-antigens. This approach will help gain better understanding of differences between pre-clinical models and in situ tumour they derive from, which may drive poor translation to clinical success of many promising immunotherapies.

During my presentation I will talk through utility and challenges of different cancer models and novel approaches in the area. Moreover, keeping to the subject, preliminary results of CANVAS research project will be presented. The study aims to select a non-small cell lung cancer (NSCLC) model that best mimics the parental tumour with a special focus on antigen presentation and neoantigens - aberrant peptides specific to cancer cells - components on which many novel immunotherapies rely on, be it vaccine- or cell-based therapy. The tested models are: traditional 2D culture (monolayer), scaffold-free 3D culture and patient-derived xenografts in NSG mice (PDX). This part will concentrate on experiment optimization and preliminary results discussion

www.linkedin.com/in/martyna-siewiera-69961b186

SESSION I: CANCER MODELS

dr Flora Clement

University Grenoble Alpes, CEA, INSERM UA13,
IRIG, BGE, Biomics

TALK: 3D cell models for pancreatic cancer initiation studies

As a specialist in 3D cancer modeling, I investigate tumor initiation mechanisms by integrating cellular biology with bioengineered tissue systems. My research began with breast and prostate cancers, focusing on the role of environmental toxins (e.g., bisphenol A, benzo[a]pyrene) in early carcinogenesis, before shifting to chronic inflammatory bowel diseases, where I contributed to developing an RNA interference-based therapy. Since 2021, I've led a project at CEA Grenoble on pancreatic cancer initiation, supervising a team of 3 PhD students and 1 postdoc. My work aims to uncover the earliest stages of tumorigenesis to identify novel therapeutic targets.

My talk will explore three cutting-edge 3D culture platforms we use to dissect the earliest stages of tumorigenesis: patient-derived organoids (capturing interpatient heterogeneity), bioengineered hydrogels (mimicking human tissue mechanics with unprecedented fidelity), and microfluidic devices (enabling dynamic microenvironment control). I'll present unpublished data from our lab demonstrating how these models reveal novel mechanisms of tumor initiation. By bridging *in vitro* complexity with clinical relevance, these approaches are paving the way for earlier detection strategies and targeted interventions in pancreatic and other aggressive cancers.

https://www.linkedin.com/in/flora-cl%C3%A9ment/

SESSION I: CANCER MODELS

dr Marcin Krzykawski

Real Research

TALK: Predicting real-world drug response with LifeGel-Based 3D tumoroid models

Founder and CEO of Real Research, he is recognized for pioneering work in biomedical technologies and 3D cell culture systems. As the creator of LifeGel, an innovative platform for 3D cell cultures, he has made significant contributions toward developing solutions that bridge the gap between fundamental research and practical biomedical applications. With extensive experience in research and development management, he has successfully established and led interdisciplinary teams, driving impactful scientific projects and fostering technological innovation. Under his leadership, Real Research has evolved into a prominent biotechnology company, building strategic partnerships and expanding its influence within the life sciences sector.

His research interests focus on biomedical engineering, tissue modeling technologies, and the translation of laboratory discoveries into clinical and industrial solutions. Emphasizing innovation-driven growth, he combines scientific expertise with strategic business development to deliver pioneering advancements for both researchers and industry. Actively participating in scientific conferences, industry forums, and business events, he regularly delivers lectures and presentations that highlight emerging trends, novel methodologies, and future directions in biomedical research. Through these activities, he fosters collaboration, inspires knowledge exchange, and engages the next generation of scientists and innovators.

https://pl.linkedin.com/in/marcin-krzykawski

SESSION I: CANCER MODELS

prof. Lina Ghibelli

Department of Biology, University of Roma Tor Vergata

TALK: Modeling in vitro cancer inflammation

Prof. Lina Ghibelli from 1991 is leading a research group studying the process of cell death by apoptosis, intrinsic pathway, with emphasis on oxidative stress, survival pathways, the biological roles of magnetic fields and the homeostatic role of melatonin. More recently, focus on the biological exploitation of cerium oxide nanoparticles, with special attention to interaction with cells and the resulting signal transduction and apoptosis. Presently involved in the biological aspects of cancer cell reprogramming (anakoinosis), focusing on apoptosis-dependent post-therapy cancer repopulation.

https://it.linkedin.com/in/lina-ghibelli-8964701b

SESSION II: CANCER IMMUNOLOGY

prof. Bart O. Roep

Department of Internal Medicine,
Leiden University Medical Centre

TALK: Inversing cancer immunotherapy to cure autoimmune disease

Bart O. Roep is Professor of Diabetology, Immunopathology & Intervention at LUMC and an internationally recognized expert in type 1 diabetes. He studied Medical Biology in Amsterdam and obtained his PhD in Medicine in Leiden for his research on T cells in diabetes. Since then, he has focused on unraveling the role of the immune system and developing new therapies, ranging from immunotherapy to stem cell and gene therapy. He discovered how T1D develops, that it is not an inherited disease, that many patients continue to produce insulin, and that it is therefore urgent to intervene in the disease process—even years after diagnosis. In addition to his work in Leiden, he is a Visiting Professor at the Danish Diabetes Academy. For his pioneering research, he has received prestigious awards such as the Minkowski Prize, a VICI grant, a Fellowship from the Royal Netherlands Academy of Arts and Sciences (KNAW), and an ERC Advanced Grant.

https://nl.linkedin.com/in/bart-roep-37826434

SESSION II: CANCER IMMUNOLOGY

dr hab. Aleksandra Markiewicz

Division of Translational Oncology,
Medical University of Gdańsk

TALK: Identifying heterogeneity and vulnerabilities in breast cancer circulating tumour cells

Aleksandra Markiewicz, PhD, is an Assistant Professor at the Laboratory of Translational Oncology, Intercollegiate Faculty of Biotechnology, University of Gdańsk and Medical University of Gdańsk. She conducts translational cancer research integrating analyses of clinical patient samples with in vitro cell line models and mouse models to investigate cancer metastasis. Her research focuses on the molecular mechanisms of breast cancer aggressiveness and dissemination, with particular emphasis on the role of epithelial–mesenchymal transition process, studied at primary, metastatic sites and in circulating tumor cells at the single cell level using genomic and transcriptomic methods.

The presentation will address molecular heterogeneity and functional vulnerabilities of breast cancer circulating tumor (CTCs) cells using single-cell transcriptomic profiling. It will present recent data demonstrating how mitochondrial transcripts, platelet- and erythroid-associated signatures contribute to the complexity of CTCs transcriptomes and influence their biological interpretation. Particular emphasis will be placed on identifying transcriptional programs linked to oxidative phosphorylation, epithelial identity, and metastatic potential. These findings provide a framework for defining biologically relevant CTC subsets that may represent actionable therapeutic vulnerabilities.

www.linkedin.com/in/aleksandra-markiewicz-84a6412ab

SESSION II: CANCER IMMUNOLOGY

dr Irena Paczkowska

Department of Experimental Oncology,
Laboratory of Experimental Immunotherapy,
Maria Skłodowska-Curie National Research Institute of Oncolog

TALK: CD4+T cells induce dormancy of HER2 positive breast cancer

Dr Irena Paczkowska works in the Department of Experimental Immunotherapy, where her research focuses on cancer immunology, immune responses to tumors, and the development of novel immunotherapeutic strategies. Her work investigates how the immune system interacts with cancer cells, including studies on T-cell exhaustion, tumor antigens, and innovative antibody-based approaches that could improve cancer treatment. Dr. Paczkowska contributes to multidisciplinary oncology projects aimed at developing new biomarkers and therapeutic models for immunotherapy.

Dr Paczkowska's research focuses in particular on the interaction between cancer cells and CD4+ lymphocytes.

SESSION II: CANCER IMMUNOLOGY

prof. Natalia Marek-Trzonkowska

International Centre for Cancer Vaccine Science,
University of Gdańsk

TALK: Challenges for cancer immunotherapy-putting the puzzles together

Prof. Natalia Marek-Trzonkowska, is director of the International Centre for Cancer Vaccine Sciences (ICCVS) at the University of Gdansk. Her research focuses on the clinical application of immune cells. Among other things, she is the co-inventor of the first use of regulatory T cells (Treg) in the treatment of type 1 diabetes in children, co-founder of PolTREG S.A. and author of international patents on ways to produce cells for therapeutic purposes. She is currently working on personalized cell therapy for non-small cell lung cancer. She is a recipient of the Kosciuszko Foundation and the Scholarship of the Minister of Science and Higher Education for Outstanding Young Scientists. Her research has received numerous national and international awards, including from the Polish-American Medical Society, the Polish Academy of Sciences, the International Society of Pediatric and Adolescent Diabetes, the European Federation of Immunological Societies and the International Islet and Pancreas Transplantation Association.

https://pl.linkedin.com/in/natalia-maria-marek-trzonkowska-220570262

SESSION III: CANCER BIOLOGY AND MICROENVIRONMENT

prof. Beata Biesaga

Andrzej Frycz Modrzewski Krakow University,
Collegium Medicum

TALK: Cisplatin Sensitivity of HPV-Positive and HPV-Negative Head and Neck Cancer Cell Lines In Different Cell Culture Models

Prof. Beata Biesaga is a Polish medical scientist specializing in oncology and pathology. She works at Andrzej Frycz Modrzewski Krakow University and is also affiliated with the Maria Skłodowska-Curie National Research Institute of Oncology. Her research focuses on molecular markers of cancer, especially in breast cancer and head-and-neck tumors. She has authored 60 scientific publications on cancer biology and prognostic factors in oncology.

The aim of the study , she is going to present, was to determine whether the presence of HPV16 and the number of viral copies within cells affects the sensitivity of cancer cells to a commonly used anticancer drug, cisplatin. In addition, two different models of cells culture were compared: conventional two-dimensional (2D) and more advanced three-dimensional (3D) culture, which better mimic the conditions present in the human body.

SESSION III: CANCER BIOLOGY AND MICROENVIRONMENT

dr Rebecca Rothe

NCT/UCC Dresden and Institute of Immunology,
National Center for Tumor Diseases (NCT),
Faculty of Medicine Carl Gustav Carus, TUD Dresden
University of Technology

TALK: Tertiary Lymphoid Structures Are Associated with Progression-Free Survival of Peripheral Neuroblastic Tumor Patients

Dr Rebecca Rothe studied biochemistry with focus on biomedicine and completed her doctoral thesis about hydrogel-based local tumor therapy of malignant melanoma at the Helmholtz-Zentrum Dresden-Rossendorf, Institute of Radiopharmaceutical Cancer Research. During her postdoctoral studies at the National Center for Tumor Diseases, Immune Monitoring Unit and Institute of Immunology, Faculty of Medicine Carl Gustav Carus, TU Dresden since 2022, she specialized in immuno-oncology. Her recent research addresses the characterization of frequency, phenotype, and functional properties of various immune cell subsets in tumor patient-derived blood and tissue samples for the identification of novel predictive/prognostic biomarkers and treatment-associated modes of action or resistance.

The tumor immune microenvironment, more precisely the spatial organization, density, and functional properties of tumor-infiltrating immune cells, plays an essential role for the clinical outcome of cancer patients. Moreover, detailed insights into therapy effects on various components of the immunological tumor microenvironment are limited. Besides diffuse immune cell infiltrates of tumor tissues, mature tertiary lymphoid structures (TLS) consist of organzied T cell and B cell zones, activated dendritic cells, high endothelial venules, and a germinal center. TLS effectively orchestrate adaptive antitumor immune responses. Especially in pediatric tumors, TLS have been rarely studied so far and little is known about their maturation. The talk will highlight the contexture of TLS analysed by multiplex immunohistochemistry as well as the correlation of TLS occurrence in adult colon cancer, pancreatic ductal adenocarcinoma, and pediatric peripheral neuroblastic tumors with patient outcome.

https://orcid.org/0000-0002-0615-1112

SESSION III: CANCER BIOLOGY AND MICROENVIRONMENT

prof. Monika Pietrowska

Department of Experimental Oncology,
Experimental Immunotherapy Laboratory,
Maria Skłodowska-Curie National Research Institute of Oncology

TALK: Small Extracellular Vesicles as Carriers of HPV DNA: Mechanisms and Clinical Implications

Prof. Monika Pietrowska graduated from the Faculty of Biology and Environmental Protection of the University of Silesia in Katowice, in the field of biology in 1998. She received her doctorate in 2005, habilitation in 2014. She completed research internships at the Department of Immunology, Roswell Park Cancer Institute, Buffalo (2005), Quantitative Proteomics Medizinisches Proteom Center, Ruhr-Universitat Bochum (2012), Charité – Universitätsmedizin Berlin, (2013), UT Southwestern Medical Center in Dallas (2015). Since 2000, Dr. Pietrowska has been working at Maria Skłodowska-Curie National Research Institute of Oncology (Gliwice Branch). Her research interests concern clinical applications of proteomics tools.

Since 2022, Monika Pietrowska has been the leader of the Clinical Proteomics Group at the Center for Translational Research and Molecular Biology of Cancer. In her research, she utilizes high-resolution mass spectrometry techniques for proteome analysis and is a recognized expert in this field. For several years, her research priorities have also included the analysis of small extracellular vesicles (exosomes) released by cancer cells. Together with Professor Theresa Whiteside (University of Pittsburgh, USA) and Professor Joanna Polańska (Silesian University of Technology, Gliwice), she has been a multidisciplinary team of experts with complementary knowledge and expertise, conducting research on the function of small extracellular vesicles and their potential practical application as a so-called liquid cancer biopsy. Her most important professional achievements include the creation of a unique, nationally and internationally recognized proteomics laboratory based on mass spectrometry techniques, which uses the created infrastructure for innovative research on the molecular composition of exosomes and their role in cancer progression.

https://pl.linkedin.com/in/monika-pietrowska-03285388

SESSION III: CANCER BIOLOGY AND MICROENVIRONMENT

dr Paulina Nastały

Division of Translational Oncology,
Medical University of Gdańsk

TALK: Nuclear Envelope Composition Links Cellular Mechanics to Innate Immune Signalling in Prostate Cancer

I completed my PhD in the laboratory of Prof. Klaus Pantel at the University Medical Center Hamburg-Eppendorf (Germany), where I worked on the ERC-funded DISSECT project focused on liquid biopsy approaches in urological cancers. Following my doctoral training, I was awarded two competitive postdoctoral fellowships from the Umberto Veronesi Foundation and the Italian Association for Cancer Research (AIRC), which enabled me to continue my research at the IFOM-FIRC Institute of Molecular Oncology in Milan, Italy. At IFOM, I was part of the research program "Spatiotemporal Organization of the Nucleus", directed by Prof. Paolo Maiuri, where I investigated nuclear polarity and its role in cellular organization and function. Currently, at Gdańsk Medical University (GUMed), I lead the Laboratory of Nuclear Mechano-Oncology, supported by NCN SONATA, NCN OPUS, and FIRST TEAM FENG grants. I have also received an EMBO Scientific Exchange Grant to establish international collaboration at the International Centre for Genetic Engineering and Biotechnology (ICGEB, Trieste, Italy) with Prof. Giannino Del Sal, investigating mechanical cues that drive tumor progression. My research explores how physical and mechanical forces acting on the cell nucleus influence cancer development and progression, with a strong emphasis on advanced microscopy techniques. In particular, I aim to understand how cancer cells respond to stress during disease progression and how these adaptive responses contribute to invasion, metastasis, and resistance to therapy. My work integrates fundamental cell biology with translational oncology, with the long-term goal of identifying new mechanisms and potential biomarkers relevant to cancer diagnosis and treatment.

Emerin is a protein located at the inner surface of the nucleus, where it helps maintain the structural stability of the nuclear envelope—the protective barrier that separates the cell's genetic material from the rest of the cell. We found that when emerin is reduced or absent, the nuclear envelope becomes less stable and more prone to rupture, especially under mechanical stress generated by the cell's own contractile machinery. These rupture events are associated with the formation of cGAS foci, markers nuclear envelope rupture and innate immune activation. Emerin-deficient cells also show alterations in the composition of nuclear blebs and impaired regulation of the cGAS–STING1 pathway. Importantly, drugs that reduce cellular contractility significantly decrease nuclear envelope rupture events, highlighting a mechanical basis for the defect. In prostate cancer, tumors with lower levels of emerin display increased nuclear rupture markers, and advanced castration-resistant tumors show reduced emerin expression that correlates with elevated cGAS foci. Together, our findings suggest that emerin acts as a mechanical shield for the nucleus, and its loss may contribute to cancer progression by promoting nuclear instability and abnormal immune signaling.

https://www.linkedin.com/in/paulina-nasta%C5%82y-6a5466223/
https://nastalylab.gumed.edu.pl/

SESSION IV: OPEN SCIENCE

prof. Betty Polikar

Ma. BRO Life Science Ltd.

TALK: Decoding clinical research: a cross-disciplinary conversation

Prof. Betty Polikar has a solid experience in innovative drug development and a professional path characterized by early-onset Pharma environment where she developed skills and proficiency in all aspects of Research and Development area. Expert in international-global Team management (direct line and mentoring).
She was also involved in global Quality Compliance programs, leading to a specific experience in GCPs and all other applicable guidelines and regulations related to clinical trials (such as, but not limited to, GLP, GMP, GXPs, etc.).

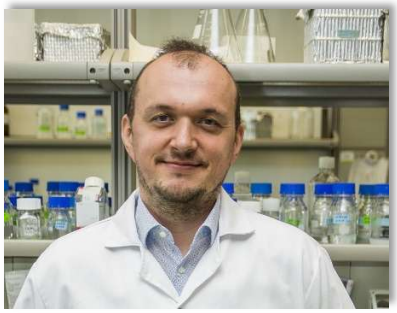
She had the opportunity to run and coordinate Clinical Development programs not only in Western Europe but also in almost all Eastern Europe countries, as well as in MENA, Africa, Switzerland, and the United States.

She dealt with international Regulatory Authorities, as well as with the European Regulatory Authorities and National Regulatory Authorities, both to manage inspections and Scientific Advices and/or Hearings.

She has had the opportunity to manage different types of Vendors (international and local CROs, Central Laboratories, International Transport/Logistics Companies, Radiopharmacies, CMOs, etc.) and therefore she had also experienced the management of external teams, when allocated to each study/project. This enabled the ability to interact with different types of organizations, technical backgrounds, and different cultural profiles, having the necessity to integrate such groups in the actual organization working with.

https://it.linkedin.com/in/betty-polikar-60a92b31/it

SESSION IV: OPEN SCIENCE



Dr Łukasz Rąbalski

Vaxican Sp. z o.o.
Intercollegiate Faculty of Biotechnology, University of Gdańsk

TALK: Development of an enveloped virus-like particle platform for therapeutic cancer immunovaccines: production scale-up and preclinical characterization of an HER2-targeting candidate

Dr Łukasz Rąbalski is the founder, CEO, and Chief Scientific Officer of Vaxican Sp. z o.o., a biotechnology company based in Gdańsk, Poland, focused on the development of enveloped virus-like particle (eVLP)-based therapeutic cancer vaccines. He holds a PhD in biotechnology from the University of Gdańsk, where he also serves as Assistant Professor at the Intercollegiate Faculty of Biotechnology. His research centres on the rational design of paramyxovirus-derived eVLPs as immunotherapy platforms for solid tumours, with current programs targeting HER2-positive breast cancer and GD2-expressing neuroblastoma. Dr Rąbalski has extensive expertise in viral genomics, next-generation sequencing, and bioprocess development for recombinant biologics. He was the first researcher in Poland to obtain a full-length SARS-CoV-2 genome sequence from a patient sample (2020), and has since contributed to national pathogen surveillance programmes. Vaxican, founded in 2019 as a spin-off from the University of Gdańsk, currently leads a consortium with Łukasiewicz – PORT (Wrocław) developing scalable manufacturing and preclinical characterization pipelines for its eVLP vaccine candidates, funded under the Polish National Recovery Plan (KPO) through the Medical Research Agency (ABM).

https://pl.linkedin.com/in/%C5%82ukasz-r%C4%85balski-667b97a2

POSTER SESSION part I

POSTER SESSION part II

Small-molecule heterocyclic compounds as potential mitochondria disruptive agents

Julia Neumann, Sławomir Makowiec

Gdańsk University of Technology, Department of Organic Chemistry, 80-233 Gdańsk, Poland

e-mail: julia.neumann@pg.edu.pl

Keywords: Cancer, Tetrahydrocarbazole, DNA damage

Background / Objective:

This research aims to develop novel 3,6-disubstituted-2,3,4,9-tetrahydro-1H-carbazole (THCz) derivatives as the selective mitochondria disruptive agents of cancer cells. Biological evaluation of the compounds synthesized thus far by my supervisor's team showed that two thioamide derivatives selectively inhibited cell viability and one of them exhibited exceptionally low IC50 on cancer cell lines.

Materials and Methods:

Optimization of known method was tried and eventually new route of the synthesis was evaluated. Separation methods used to obtain products are Flash Liquid Chromatography and Thin Layer Chromatography (TLC), whereas identification is based on spectroscopy (1H and 13C NMR) as well as spectrometry (MS). Purity was confirmed using HPLC. Cytotoxicity tests are in progress.

Results:

Planned pathway of the synthesis was modified and eventually I managed to develop new route still including Fisher indolization. Ten new products were obtained containing nine amide and one thioamide derivative with purity above 98% in most of them. The crude THCz were purified using Flash Chromatography and crystallization to obtain such purity. NMR and MS confirmed the structures and its massess. Best yield was about 40%. Cytotoxicity tests on various cancer cell lines are in progress. Due to the fact these compounds contain halogen there is a high probability of low IC50 values against these cell lines based on previous research. If so further tests will be conducted to confirm information about cell growth inhibition that may indicate on DNA damage and mitochondrial disruption.

Conclusions:

Synthesized products have potential to become promising therapeutic agents based on previous research. They were obtained with average yields but high purity which is more important for biological evaluation. Cytotoxicity is in progress but it is expected that at least one compound will possess significant activity against proposed cell lines.

Beyond the “Undruggable” Protein: Targeting the c-MYC Promoter DNA G-quadruplex

Julia Pakuła, Tomasz Laskowski

Department of Pharmaceutical Technology and Biochemistry, Faculty of Chemistry, Gdańsk University of Technology, Gabriela Narutowicza Str. 11/12, 80-233 Gdańsk

e-mail: julia.pakula@pg.edu.pl

Keywords: G-quadruplex, NMR Spectroscopy, Oncogene

Background / Objective:

The c-MYC oncogene is a key regulator of cell proliferation. Despite its clinical relevance, the c-MYC protein has long been considered an “undruggable” target due to the lack of a defined small molecule binding pocket. Therefore, targeting genomic DNA that regulates c-MYC expression specifically, the G-quadruplex structure formed in the promoter region can be an attractive anticancer strategy.

Materials and Methods:

Compound synthesis and purification, ^{1}HNMR titration, G4/Ligand complex formation, 2D NMR Spectroscopy, MD Simulations, Ligand-based Drug Design; Materials: Triazoloacridinone, Pu22 sequence (Metabion GmbH), Cacodylate buffer, pH=5.0, Potassium chloride

Results:

Although many small molecules are known to interact with double-stranded DNA (dsDNA), their potential as G4 stabilizers often remains unexplored or poorly characterized. In this study, we investigated a well-characterized dsDNA intercalator for its ability to target and stabilize the c-MYC G-quadruplex. Using nuclear magnetic resonance (NMR) spectroscopy and molecular dynamics (MD) simulations, we were able to resolve the structure of the DNA-ligand complex, determining its binding mode and stoichiometry. Our results show that this compound significantly increases the thermal stability of Pu22 G4. Although the ligand maintains its known affinity for DNA duplexes, its potent activity in several cancer cell lines exceeding that of cisplatin highlights its clinical potential.

Conclusions:

This study provides detailed structural information for the development of more selective G4-targeted compounds. By identifying a specific pharmacophore responsible for interactions, we can design and synthesize new compounds with improved selectivity.

Comparison of circulating tumor cells between tumor-draining and peripheral blood in renal cancer patients – a pilot study

Aleksandra Parteka[1], Anna Muchlińska[1], Robert Wenta[1], Anna Żaczek[1], Kevin Miszewski[2], Marcin Matuszewski[2], Natalia Bednarz-Knoll [1]

[1] Laboratory of Translational Oncology, Intercollegiate Faculty of Biotechnology, Medical University of Gdańsk, Poland

[2] Department of Urology, Medical University of Gdańsk, Poland

e-mail: aparteka@gumed.edu.pl, nbk@gumed.edu.pl

Keywords: renal cancer, liquid biopsy, biomarkers

Background / Objective:

Renal (RCa) cancer is a prevalent, lethal urological malignancy with aggressive metastasis. Despite therapeutic advances, stratification relies on tumor stage/grade, limiting personalized medicine. Liquid biopsy via circulating tumor cells (CTCs) and DNA enables non-invasive detection and monitoring. We analyzed CTC phenotypes, morphology, and blood cell interactions for RCa metastasis insights.

Materials and Methods:

Tumor-draining vein blood (TDVB) and peripheral blood (PB) samples were collected intra- and preoperatively from 51 RCa patients. CTCs were isolated via density-gradient centrifugation, enumerated, and phenotyped by immunofluorescence (pan-keratins(K)/vimentin(V)/DAPI/CD45/CD31/aSMA/CD29) and imaging flow cytometry. CTC morphology was assessed using QuPAth. Statistical analysis used SPSS.

Results:

In total, 1343 and 112 CTCs were detected in 41,18% of TDVB and 15,69% of PB samples, respectively, from RCa patients, with significantly higher yields in TDVB. Homotypic clusters of CTCs were detected in 7,84% of TDVB and not detected in PB samples. Significant shift of CTCs phenotype was observed between K+V-/K+V+ in TDVB and K+V+/K-V+ in PB ($p<0.001$), followed by 41,59% of CTCs interacting with platelets in PB ($p<0.001$). Some CTCs interacted also with leukocytes and erythrocytes. Protrusions were detected rarely and only in CTCs in TDVB, while no micronuclei were found.

Conclusions:

Higher CTC yields in TDVB highlight its value for studying tumor dissemination biology. We observed phenotypic shifts between TDVB and PB, especially CTC-platelet interactions, warranting further research. Clinical relevance of detected CTC features requires systematic evaluation in larger cohorts.

Synthesis of carbazole derivatives with mitochondria-targeted anticancer activity

Natalia Podczarska, Sławomir Makowiec

Gdańsk University of Technology, Gdańsk, Poland

e-mail: nat.podczarska@gmail.com

Keywords: Carbazole, Cancer, Organic synthesis

Background / Objective:

Synthesis of several fluorinated derivatives of tetrahydrocarbazole. Optimization of the synthetic process. Preparation of chromatographically pure samples. Spectroscopic characterization of the synthesized compounds.

Materials and Methods:

Thin layer chromatography (TLC) on aluminum silica gel plates SiliaPlate SILICYCLE UltraPure was examined under UV light at 254. Products were purified by flash chromatography (BUCHI Pure C-815, FlashPure ID cartridges). 1H NMR spectra were recorded on a Varian INOVA 500 at 500 MHz.

Results:

Three carbazole derivatives were synthesized using two approaches. In the first, the carbazole core was formed via the Fischer indolization, followed by acylation to generate the amide bond, affording N-(6-fluoro-2,3,4,9-tetrahydro-1H-carbazol-3-yl)acetamide. The second strategy involved prior acylation of 4-aminocyclohexanone and subsequent ring closure using the same method, yielding N-(7-fluoro-1,2,3,4-tetrahydrocyclopenta[b]indol-2-yl)cyclobutanecarboxamide and N-(7-fluoro-1,2,3,4-tetrahydrocyclopenta[b]indol-2-yl)benzamide. All structures were confirmed by NMR spectroscopy.

Conclusions:

Two synthetic strategies enabled the successful preparation of three carbazole-based derivatives. The alternative acylation–cyclization sequence proved more versatile, allowing access to structurally diverse analogues. All compounds were structurally confirmed by NMR analysis and will be further evaluated for their potential mitochondrial anticancer activity.

Effects of Moringa oleifera Lam. extracellular vesicles on endogenous miRNAs involved in tumorigenesis in HeLa cell line

Marina Potestà[1,2,*], Valentina Roglia[1,*], Alessandra Minchella[1], Federico Iacovelli[1], Marco Ciotti[3], Anna Criscuolo[4], Angelo Gismondi[1], Antonella Minutolo[5] and Carla Montesano[1,2]

[1] Department of Biology University of Rome "Tor Vergata" Via della Ricerca Scientifica, 1 00133 Rome, Italy
[2] UNESCO Interdisciplinary Chair in Biotechnology and Bioethics
[3] Virology Unit, Polyclinic Tor Vergata, 00133 Rome, Italy
[4] Department of Gynecology, Tor Vergata University, Rome, Italy
[5] Department of Experimental Medicine, University of Rome Tor Vergata, Rome, Italy
* These authors contributed equally to this work

e-mail: alessandra.minchella11@gmail.com

Keywords: Evs, Cervical Cancer, miRNAs, TGF-β1

Background / Objective:

Cervical cancer is a common malignancy in women. EMT and TGF-β1 promote tumorigenesis, while human miRNAs act as markers and therapeutic targets. Plant-derived extracellular vesicles (EVs) can transfer bioactive molecules, like miRNAs, across species. We investigated EVs from Moringa oleifera seeds (MOES-EVs) and their ability to modulate tumor-associated hsa-miRs in HeLa cervical cancer cells.

Materials and Methods:

EVs from MOES were purified and characterized by flow cytometry. Phenols and flavonoids were analyzed by HPLC-DAD and spectrophotometry. EV uptake in HeLa cells was assessed via SYTO RNA staining. Eighty-four h-miRs were profiled using the Human Cancer Pathway PCR Array. Effects on cell migration and TGF-β1 were evaluated by scratch assay and ELISA.

Results:

MOES-EVs size was included among 100–900 nm showing a heterogenic size pattern. Phytochemical profiling by HPLC-DAD identified 18 phenolic compounds, including high levels of gallic acid and several flavonoids, suggesting antioxidant and bioactive potential. MOES-EVs were effectively internalized by HeLa cells. After 72 hours of treatment, real-time PCR revealed a significant modulation of 53 out of 84 tested human miRs—29 Onco-suppressor miRs (all upregulated) and 24 Onco-miRs (20 upregulated, 4 downregulated). Functional analysis linked these miRs to key cancer-related processes: 47 to proliferation, 36 to invasion/metastasis, and 11 to apoptosis. Additionally, MOES-EVs significantly reduced HeLa cell migration and TGF-β1 secretion, suggesting EMT inhibition.

Conclusions:

In conclusion, MOES-EVs exert miRs-mediated antitumor effects in cervical cancer cells, highlighting their potential as naturally derived epigenetic modulators for future integrative cancer therapies.

c-Myc and HER2 status in breast cancer cells determines their sensitivity to the proapoptotic effects of C 2028.

Marta Ryś, Monika Pawłowska, Ewa Augustin

Department of Pharmaceutical Technology and Biochemistry, Faculty of Chemistry, Gdańsk University of Technology, Gdańsk, Poland

e-mail: marta.rys@pg.edu.pl

Keywords: breast cancer, apoptosis, C-2028

Background / Objective:

Breast cancer is the most commonly diagnosed malignancy in women and includes luminal A/B, HER2-positive and triple-negative subtypes defined by ER, PR and HER2 expression. Due to limited efficacy of current therapies, new strategies are needed. C-2028, an unsymmetrical bisacridine, shows high activity in many cancer models. Its mechanism involves G-quadruplex stabilization in oncogene promoters.

Materials and Methods:

Studies were conducted on: MDA-MB-231, MDA-MB-453, MCF-7 and BT-474 cell lines. Cytotoxicity of C-2028 and doxorubicin was measured by MTT. Effects on cell cycle and membrane integrity were analysed by flow cytometry. ER, PR, HER2, c Myc BRCA1 and EGFR levels were evaluated by Western blot. Nuclear morphology was imaged by fluorescence microscopy, nuclei and actin filaments by confocal microscopy.

Results:

Compound C-2028 showed high cytotoxicity against breast cancer cells (IC50 0.015–0.1 μM), with lower IC50 values in HER2-negative cells, while the IC50 of the reference drug ranged from 0.1 to 0.3 μM. The cellular response to C-2028 showed apoptosis, most prominently in MDA-MB-453 and MDA-MB-231 cells and to a lesser extent in MCF-7 and BT-474. C-2028 induced death in over 50% of MDA-MB-453 cells after 120 h, compared with 30% for doxorubicin. Apoptosis was confirmed by Hoechst 33258 staining in fluorescence microscopy and by additional double staining with Phalloidin in confocal microscopy. Furthermore, C-2028 modulated ER, PR and HER2 levels, with ER and PR limiting, and HER2 enhancing, its activity, consistently with changes in c-Myc, its molecular target.

Conclusions:

The expression profile of key breast cancer receptors had a marked impact on C-2028 activity. This compound was most effective and most potent in disrupting c-Myc function in HER2-positive/ER- and PR-negative cells, leading to greater sensitivity to apoptosis than in cells co-expressing HER2 with ER and PR or expressing only PR and ER. In contrast, doxorubicin activity was receptor-independent.

Untargeted Plasma Metabolomics of Non-small Cell Lung Cancer (NSCLC)

Babasaheb Sonwane, Jakub Faktor, Natalia Marek-Trzonkowska, Sachin Kote

International Centre for Cancer Vaccine Science, University of Gdańsk, Gdańsk, Poland

e-mail: babasaheb.sonwane@ug.edu.pl

Keywords: NSCLC, Plasma metabolomics, Biomarkers

Background / Objective:

Non-small cell lung cancer (NSCLC) accounts for ~85% of lung cancers and lacks reliable non-invasive biomarkers for early detection. Metabolic reprogramming is a hallmark of cancer and reflected in plasma. This study aimed to investigate plasma metabolomic alterations in NSCLC patients compared to healthy donors using high-resolution mass spectrometry–based untargeted profiling.

Materials and Methods:

Plasma samples from NSCLC subjects and healthy donors were used to extract metabolites using MeOH:Water:ACN:IPA (40:20:20:20). Untargeted metabolomics was performed on an Orbitrap MS using DDA (35-min method). Data were processed in MS-Dial and MetaboAnalyst software. Statistical, pathway enrichment, network, and ROC analyses were conducted to identify significant and discriminatory metabolites.

Results:

A total of 27,623 MS features were detected, with 3,286 annotated metabolites retained after filtering. Among these, 801 metabolites were statistically significant ($p < 0.05$), including 353 upregulated and 429 downregulated in NSCLC compared to healthy donors. Pathway analysis revealed significant alterations in amino acid metabolism (glycine, serine, threonine; arginine and proline; tryptophan), lipid metabolism (arachidonic acid, sphingolipid, glycerophospholipid), TCA cycle, glutathione metabolism, and drug metabolism–cytochrome P450 pathways. Network analysis indicated strong biological interconnections among metabolic processes. ROC curve analysis suggested several metabolites with promising diagnostic potential.

Conclusions:

Plasma metabolomic profiling revealed distinct metabolic reprogramming in NSCLC subjects, particularly affecting amino acid, lipid, redox, and energy metabolism pathways. Identified metabolites demonstrate potential as non-invasive biomarkers; however, validation in larger cohorts is required to confirm their clinical utility.

β4-integrin affects prostate cancer progression by regulating the properties of nuclear envelope

Rong Wei[1], Annette Schmidt[2], Paulina Nastaly[3], Crescenzo Frascogna[4], Carlo F. Natale[4], Aki Manninen[2], Tomasz Wenta[1]

[1] Department of General and Medical Biochemistry, Faculty of Biology, University of Gdansk, Poland
[2] Disease Networks Research Unit, Faculty of Biochemistry and Molecular Medicine, Biocenter Oulu, University of Oulu, Oulu, Finland
[3] Laboratory of Translational Oncology, Intercollegiate Faculty of Biotechnology, University of Gdansk and Medical University of Gdansk, Gdansk, Poland
[4] Department of Chemical, Materials and Industrial Production Engineering, University of Naples Federico II, Naples, Italy

e-mail: rong.wei@phdstud.ug.edu.pl

Keywords: β4-integrin, hemidesmosomes, prostate

Background / Objective:

Hemidesmosomes (HDs) are α6β4-integrins mediated structures that anchor epithelial cells to the basement membrane. Loss of HDs, associated with basal-to-luminal transition is among the most frequent events during prostate cancer initiation and progression. Given that β4-integrin binds via plectin to the IF network, this molecule can be involved in the regulation of internal mechanical stress.

Materials and Methods:

β4-integrin–deficient cells were generated by CRISPR-Cas9 and analyzed by RNA-Seq. Nuclear morphology and pore organization were examined by advanced microscopy and quantified during migration in a 3D confinement device. The β4-integrin interactome was characterized by BioID proximity labeling with HDR-mediated CRISPR–Cas9 knock-in. Findings were validated in 232 patient tissues.

Results:

We found that β4-integrin functions to safeguard nuclear mechanical integrity. Loss of β4 expression shifts the balance from lamin A/C toward a lamin B–rich NE, accompanied by ruffling of the nuclear membrane and nuclear softening, typical for aggressive cancers. β4-integrin was also found to interact with nuclear pores proteins (NUP107, NUP98 and TPR), suggesting an HD-independent function associated with nuclear mechanics and possibly nuclear pores organization.

Conclusions:

Our data indicate that loss of β4-integrins destabilizes nuclear architecture through changes in lamin composition, aberrant nuclear pore structure/function and IF–NE connectivity providing a new conceptual link between integrin biology, nuclear mechanics, and PCa pathogenesis.

Association of epithelial-mesenchymal transition with proliferation, genomic instability and radioresistance scores in breast cancer

Wiktor Grudniewski, Piotr Bartosz, Agnieszka Stankiewicz, Marta Popęda, Alicja Staśczak, Aleksandra Markiewicz

Laboratory of Translational Oncology, Intercollegiate Faculty of Biotechnology University of Gdansk and Medical University of Gdansk, Gdańsk, Poland

e-mail: w.grudniewski.479@studms.ug.edu.pl

Keywords: Genomic instability, EMT, Breast cancer

Background / Objective:

Epithelial-mesenchymal transition (EMT) is a biological process involved in breast cancer (BC) progression and therapy resistance. The objective of the study was to determine relationship between EMT and proliferation, genomic instability, as well as radioresistance scores in the context of BC molecular subtypes. This would provide deeper insight into the mechanisms of EMT-linked aggressiveness.

Materials and Methods:

RNA-Seq profiles of BC cell lines (N=56) were used for calculation of EMT scores (MLR, KS, 76GS, 16GS), Radiosensitivity Index (RSI), Large-Scale Transition (LST), Loss of Heterozygosity (LOH), Telomeric Allelic Imbalance (TAI), and proliferation (PS110, PI31). Associations between the scores were assessed using Spearman's rank correlation in the entire group and separately for each BC subtype.

Results:

According to all EMT scores, basal BC were more mesenchymal and showed the largest spectrum of phenotypes than luminal and HER2-positive tumours. When analysed in the whole group, cancers with mesenchymal phenotype showed decreased genomic instability according to LST and TAI, but increased LOH and RSI indices (indicating higher resistance to radiotherapy), though substantial differences were observed depending on the used EMT metrics. 16GS EMT score showed the smallest association with cells' proliferation or genomic instability metrics. BC subtype-specific analysis highlighted marked differences. Mesenchymal phenotype had decreased proliferation, LST, TAI scores, but showed higher RSI in basal tumours; whereas in luminal and HER2-positive tumours minimal correlations were observed.

Conclusions:

This study demonstrates that EMT phenotype is differentially associated with proliferation, radioresistance, and genomic instability scores depending on BC subtype and the EMT metrics used. Stronger EMT-related correlation observed in basal subtypes may highlight the particular biological relevance of the EMT program in driving basal subtype aggressiveness.

Cross-talk between FGF/FGFR and the Hippo signalling pathways mediates tamoxifen resistance in luminal BCa cells

Agata Grzybowska, Zuzanna Polakiewicz, Kamila Kitowska, Rafal Sadej, Dominika Piasecka

Laboratory of Molecular Enzymology and Oncology, Department of Medical Biotechnology, Intercollegiate Faculty of Biotechnology, University of Gdansk and Medical University of Gdansk, Poland

e-mail: agata.grzybowska@gumed.edu.pl

Keywords: breast cancer, TME, therapy resistance

Background / Objective:

Tamoxifen resistance limits luminal breast cancer treatment efficacy. FGF/FGFR signalling may non-canonically activate ER and interplay with Hippo signalling pathway effector proteins YAP and TEAD. Recent discovery of ER/YAP/TEAD interaction points to a new regulatory axis. Here, we investigate the interplay between FGF/FGFR signalling, YAP/TEAD and ER activation in luminal BCa tamoxifen resistance.

Materials and Methods:

Experiments were performed on MCF7 and T47D cell lines. Western blotting revealed protein levels. Fractionation and immunofluorescence revealed proteins localisation. PLA revealed protein complexes formation. Proteins transcriptional activity were examined by RNA-seq and CHIP-seq. Colony formation assays were used for functional validation. Kaplan-Meier analysis was performed via KM-plotter.

Results:

FGF/FGFR signalling increased total YAP protein levels and modulated its activity by reducing the levels of phosphorylated YAP at S127,which is required for cytosolic retention, while increasing the levels of active (non-phosphorylated at S127) YAP. This led to nuclear enrichment of YAP.FGF/FGFR signalling enhanced ER/YAP and YAP/TEAD complex formation but did not influence ER/TEAD complex formation. FGF/FGFR signalling redirected ER binding towards new regions enriched in ERE and TEAD motifs.YAP1 was also identified within the gene cluster associated with FGF-driven tamoxifen resistance. Inhibition of YAP/TEAD abolished FGFR-mediated protective effect against tamoxifen treatment. Higher YAP1/FGFR2 expression ratio was associated with shorter relapse-free survival in patients with luminal BCa.

Conclusions:

We show that FGF/FGFR signalling activates Hippo signalling pathway effector protein YAP, promotes its nuclear translocation and changes ER-dependent transcriptional programme. We demonstrate for the first time that FGF/FGFR-YAP-ER axis may contribute to tamoxifen resistance in luminal BCa cells.

Characteristics and Applications of 3D Cell Culture (3DCC) Using LifeGel® in Drug Efficacy Testing, Immuno-Oncology, and Biomedical Research

Justyna Kocik-Krol[1], David Earnshaw[1], Michal Mikula[2], Malgorzata Statkiewicz[2], Katarzyna Unrug-Bielawska[2], Magdalena Cybulska-Lubak[2], Jaroslaw Skokowski[3], Natalia Marek-Trzonkowska[4], Tomasz Sitar[5], Przemyslaw Bielski[5], Anna O'Leary[6], Carlos Farkas[6], Anna Czarna[7], Marcin Krzykawski[1]

[1] Real Research, Poland,
[2] Maria Skłodowska-Curie National Research Institute of Oncology, Poland
[3] St. Adalbert's Hospital, COPERNICUS, Poland
[4] International Centre for Cancer Vaccine Science, University of Gdansk, Poland
[5] Recepton, Poland [6] Arcella, Netherland
[7] Malopolska Centre of Biotechnology, Jagiellonian University, Poland

e-mail: justyna.kocik-krol@real-research.com

Keywords: 3D Cell Culture, Oncology, Drug Testing

Background / Objective:

In the ever-evolving landscape of biomedical research, 3DCC systems have emerged as pivotal tools for mimicking in vivo environments and fostering more physiologically relevant cellular responses. It is widely known that 3DCC models may play a crucial role in preclinical studies thus reducing costs of drug testing and avoiding the excessive need for animal models.

Materials and Methods:

3DCCs were established using protein-based hydrogel LifeGel. iPSC-derived organoids, PDX colorectal cancer cells, NSCLC samples, and pancreatic cancer cells were cultured under optimized stiffness conditions. Drug efficacy was evaluated in 2D and 3D models (IC_{50}/GR_{50}). Immuno-oncology studies involved 3D co-culture with PBMCs and checkpoint inhibitors.

Results:

LifeGel-based 3D cultures enabled robust formation of 3D cell structures with physiologically relevant architecture. Hydrogel stiffness modulated morphology and growth dynamics of patient-derived and cancer cell line models. Drug responses differed markedly between 2D and 3D systems, with GR_{50} analysis revealing altered compound potency and improved predictive relevance in 3D conditions. PDX-derived colorectal cancer cultures reflected in vivo drug response patterns. In immuno-oncology models, 3D co-culture with PBMCs allowed functional assessment of checkpoint inhibitors targeting PD-L1, VISTA, and CTLA-4. Treatment-dependent reductions in viability and significant differences between groups were observed.

Conclusions:

In cancer research, 3DCC models demonstrate predictive power comparable to traditional in vivo systems for evaluating anticancer therapies. We present diverse 3D structures generated on LifeGel®, supporting advanced organoid development, drug efficacy testing, immuno-oncology applications, and a broad range of translational biomedical research applications.

Impact of Unsymmetrical Bisacridine C-2028 on Immune Gene Expression and Macrophage-Mediated Tumor Cell Viability

Bożena Pezała and Ewa Augustin

Department of Pharmaceutical Technology and Biochemistry, Faculty of Chemistry, Gdańsk University of Technology, Gdańsk, Poland

e-mail: bozpezal@pg.edu.pl

Keywords: pancreatic cancer, macrophages, C-2028

Background / Objective:

Tumor-associated macrophages (TAMs) shape the tumor microenvironment, promoting tumor growth (M2-like) or antitumor immunity (M1-like). Strategies to eliminate or reprogram TAMs toward an M1 phenotype are needed. This study assessed how the unsymmetrical bisacridine C-2028 affects macrophage polarization and whether macrophages co-cultured with AsPC-1 cells alter its anticancer activity.

Materials and Methods:

M1 and M2 macrophages were differentiated from THP-1 cells using PMA followed by LPS/IFN-γ or IL-4/IL-13. They were co-cultured with AsPC-1 cells either in direct contact or using transwell inserts, and co-cultures were treated with C-2028. AsPC-1 viability was assessed by MTT assay, while macrophage phenotype after indirect co-culture and C-2028 treatment during polarization was analyzed by qPCR.

Results:

C-2028 modulated the expression of key inflammatory and immune-related genes during macrophage polarization, including CXCL10 and TNFα. In macrophages derived from co-culture with AsPC-1 cells, C-2028 altered the expression of CXCL10, TNFα, and TGFβ. Furthermore, both M1 and M2 macrophages decreased AsPC-1 cell viability in indirect co-cultures, in which the two cell types were physically separated using transwell inserts, allowing only paracrine interactions. A similar reduction was observed in direct co-cultures, where macrophages and AsPC-1 cells were cultured together in the same well, enabling direct cell–cell contact. Interestingly, only the presence of M2 macrophages in high density (30,000 cells per well; 10:1 macrophage-to-cancer cell ratio) increased IC50 of C-2028.

Conclusions:

Unsymmetrical bisacridine C-2028 modulates macrophage polarization by altering the expression of key immunomodulatory genes associated with immune responses. Both M1 and M2 macrophages reduce pancreatic AsPC-1 cells' viability. Notably, high-density of M2 cells increases C-2028 IC50, suggesting that this type of macrophage may partially protect tumor cells and influence the drug's efficacy.

Organ-specific preoperative blood profiles are associated with tumour necrosis in liver and lung metastases of colorectal cancer

Marta Popęda[1], Bartłomiej Tomasik[2], Rafał Pęksa[1], Wojciech Biernat[1], Michał Bieńkowski[1]

[1] Department of Pathomorphology, Medical University of Gdańsk, Gdańsk, Poland
[2] Department of Oncology and Radiotherapy, Medical University of Gdańsk, Gdańsk, Poland

e-mail: marta.popeda@gumed.edu.pl

Keywords: colorectal cancer, metastasis, CBC

Background / Objective:

Tumour necrosis in metastatic colorectal cancer (mCRC) reflects aggressive biology and may result from hypoxia, impaired perfusion, or immune-mediated injury. Systemic hematologic parameters may reflect the associated host-related conditions. We hypothesised that preoperative CBC parameters relate to metastatic tumour necrosis and that this association may vary by organ and time to metastasis.

Materials and Methods:

This retrospective single-centre study (University Clinical Centre in Gdańsk, Poland) included patients undergoing first liver (n=159) or lung (n=63) metastasectomy between 2004 and 2024. Preoperative CBC was available for 154 liver and 62 lung cases. High necrosis was defined as ≥50% of the tumour area. Associations between necrosis, time to metastasis, and hematologic parameters were analysed.

Results:

Necrosis distribution did not differ across time-to-metastasis categories in either organ. In liver metastases, high necrosis was associated with higher haematocrit (41.4 vs 39.3%, p=0.029) and RBC count (4.65 vs 4.48 x 10^12/L, p=0.037), with a similar trend for haemoglobin (14.0 vs 13.3 g/dL, p=0.061), independent of timing. In lung metastases, high necrosis showed trends toward higher eosinophil counts (0.13 vs 0.08 x 10^9/L, p=0.088) and lower platelet-to-lymphocyte ratio (137 vs 181, p=0.057). Time to metastasis had no independent effect on haematologic parameters.

Conclusions:

Preoperative erythroid indices were associated with high tumour necrosis in liver metastases, supporting a potential link between systemic oxygen-transport capacity and hypoxia-related processes within the hepatic metastatic niche. No consistent associations were observed in lung metastases, underscoring organ-specific differences in haematologic correlates of metastatic tumour biology.

Interferon Gamma Transcriptional Memory is Sex-Dependent, Precision-Based, and Regulated by a Dual-Function Transcription Factor

Justyna Topa[1], Wojciech Snoch[1], Mateusz Modzelewski[1], Sohaib Khan[1], Elzbieta Chrusciel[1], Robert E. Kingston[2], Wojciech Siwek[1,2]

[1] International Centre for Cancer Vaccine Science, University of Gdansk, Gdansk, Poland
[2] Department of Molecular Biology, Massachusetts General Hospital Research Institute, Massachusetts General Hospital, Boston, USA; Department of Genetics, Harvard Medical School, Boston, USA

e-mail: justyna.topa@ug.edu.pl

Keywords: transcriptional memory, interferon gamma, immune response

Background / Objective:

The innate immune system exhibits trained immunity, a functional memory where stimuli induce stable cellular reprogramming for enhanced responsiveness. This occurs via priming, sensitizing cells to triggers. Transcriptional memory, a form of priming with identical signals, remains mechanistically elusive. We use IFNγ signaling to investigate the regulatory mechanisms and human variability.

Results:

Using primary human macrophages, we unveil novel principles of IFNγ transcriptional memory. First, we establish that IFNγ memory is a sex-selective process defined by a reduction in gene expression variability upon second stimulation, identifying recall as a function of transcriptional precision. We characterize a new family of memory genes and show the effect is highly dependent on cytokine concentration.

Furthermore, memory depends on cellular phenotype, requiring monocyte-to-macrophage differentiation for recall. Critically, we discovered a dual, opposing role for a key transcription factor: it acts as an inhibitor of basal gene expression while remaining essential for maintaining the memory state. These findings provide a systems-level context for immune heterogeneity.

Conclusions:

Our findings redefine IFNγ transcriptional memory, establishing it as a sex-dependent phenomenon of gene expression precision. We reveal a novel regulatory network governed by differentiation and a transcription factor's dual function. These insights provide systems-level context for immune heterogeneity, crucial for designing personalized therapies that safely harness innate memory.

Design and synthesis of novel UPF1 Inhibitors as potential modulators of the Nonsense-Mediated mRNA Decay (NMD) pathway

Alicja Trocka[1], Anna Hromova[1,3], Monikaben Padariya[3], Umesh Kalathiya[3], Tedd R. Hupp[2,3], Sławomir Makowiec[1]

[1] Department of Organic Chemistry, Faculty of Chemistry, Gdańsk University of Technology, Gdańsk, Poland
[2] Edinburgh Cancer Research Centre, Institute of Genetics and Molecular Medicine, University of Edinburgh, Edinburgh, United Kingdom
[3] International Centre for Cancer Vaccine Science, University of Gdańsk, Gdańsk, Poland

e-mail: alicja.trocka@pg.edu.pl

Keywords: NMD UPF1 heterocycles anticancer therapy

Background / Objective:

The aim of this study is to design and synthesize small-molecule inhibitors of UPF1 and to understand the mechanistic aspects of the NMD pathway, which can contribute to the development of novel anticancer therapies.

Materials and Methods:

Potential UPF1 inhibitors were selected using molecular modeling techniques. Organic synthesis was performed to obtain heterocyclic compounds based on carbazole scaffolds (via Fischer indole reaction), as well as 1,2,4-triazole and dichloroaminophenol derivatives. The synthesized compounds were structurally characterized using standard analytical methods.

Results:

A series of structurally diverse aromatic heterocycles were successfully synthesized, including 2,3,4,9-tetrahydro-1H-carbazole derivatives, 1,2,4-triazoles and modified dichloroaminophenol analogues. Molecular modeling suggested favorable interactions of selected compounds with the UPF1 active site. The applied synthetic strategies enabled efficient access to the desired scaffolds and structural modifications. The obtained compounds constitute a focused library of potential UPF1 inhibitors suitable for further biological evaluation.

Conclusions:

The study presents the rational design and synthesis of novel heterocyclic compounds as potential UPF1 inhibitors. These molecules can serve as tools for modulating the NMD pathway and contribute to a better understanding of its mechanistic aspects, supporting future development of anticancer therapeutic strategies.