BALTIC CONFERENCE CHEMISTRY

27-28.MAY.2023

ONLINE

Event report

www.bcc.ug.edu.pl

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PROLOGUE

Dear Colleagues,

On behalf of Student's Science Club for Chemistry at the University of Gdańsk, the Student's Science Club for Chemistry, the Students' Self-Government Council of the Faculty of Chemistry and the Doctoral Council of the Doctoral School of Natural Sciences of the University of Gdansk I extend my heartfelt appreciation to everyone who attended the Baltic Chemistry Conference.

Our esteemed event united bright minds from across the globe in the fields of chemistry, biomedical chemistry, biochemistry, environmental protection, and ecology. The insightful lectures delivered by Prof. Elżbieta Jankowska from the University of Gdańsk and Dr Chiara Da Pieve from the Institute of Cancer Research, UK, set a high bar for the scientific exchange and created a vibrant atmosphere of innovation.

We express our gratitude to our patrons for their generosity and support, which was instrumental in creating an enriching platform for all our participants.

The conference not only facilitated the presentation of ground breaking research but also fostered international collaborations and professional relationships. It is our hope that the insights gained and connections made during this conference will continue to inspire and influence your work.

As we reflect on the success of the Baltic Chemistry Conference, let's revisit the abstracts enclosed in this book and continue the discussions that were started. Each one represents the dedication, passion, and innovation of our global scientific community.

Thank you once again for your engagement and contributions to the success of this event. Here's to the advancement of science and to future collaborations.

Until we meet again at the next Baltic Chemistry Conference!

On behalf of the organisers of Baltic Chemistry Conference

MSc Mateusz A. Baluk

President of the Doctoral Council
of the School of Natural Sciences of the University of Gdansk

THE BALTIC SEA: EUROPE'S UNIQUE BODY OF WATER

The Baltic Sea, also commonly referred to as the Baltic, is a unique body of water possessing an array of distinctive features and environmental conditions. This sea is located in Northern Europe, stretching from the western shores of Denmark to the eastern fringes of Russia, and cradled by nine different countries: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, and Sweden.

At approximately 1,600 kilometers (990 miles) long, the Baltic Sea covers an area of about 377,000 square kilometers (146,000 square miles), making it one of the largest brackish inland seas by area in the world. Its mean depth is 55 meters, with its deepest point being the Landsort Deep near Sweden, measuring 459 meters (1,506 feet).One of the most intriguing characteristics of the Baltic Sea is its brackish nature. Unlike most marine environments, the Baltic Sea has a low salinity level. This results from its semi-enclosed nature, with limited water exchange with the North Sea, and a significant influx of freshwater from numerous rivers that discharge into it. The salinity level varies across the Baltic, but on average, it stands at about 0.8% at the surface, significantly lower than the average salinity of oceanic waters, which is typically around 3.5%.

The low salinity, combined with the colder climate of Northern Europe, gives rise to a unique ecosystem. A variety of species adapted to these specific conditions inhabit the Baltic Sea. The most emblematic ones are perhaps the Baltic herring and the cod, which have been vital to the region's fishing industry for centuries. The sea also serves as an important resting and breeding ground for many species of birds, while its coastal regions host diverse flora and fauna. Another significant aspect of the Baltic Sea is its importance to the surrounding countries' economies. It has been an essential trading route for hundreds of years, connecting major ports like Kiel, Riga, Stockholm, and Gdansk. The sea also provides a wealth of resources such as fish, and more recently, offshore wind energy.

Moreover, the Baltic Sea is a significant focus of scientific research. Its unique properties make it a fascinating subject for studying marine biology, oceanography, and environmental science. Its sensitivity to environmental changes also makes it a crucial barometer for climate change. Issues like eutrophication, plastic pollution, and the impact of human activity on marine ecosystems are critical research topics in the Baltic region.

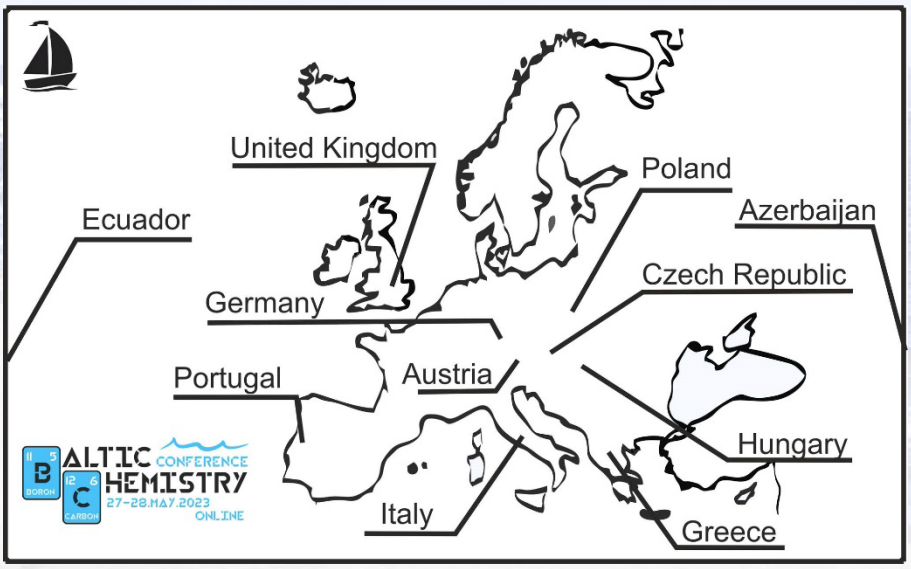
However, the Baltic Sea also faces considerable environmental challenges. Its limited water exchange with other bodies of water, combined with industrial and agricultural runoffs, has led to severe problems of eutrophication. This process is characterized by an excess of nutrients that cause harmful algal blooms and subsequent oxygen depletion in the water, endangering marine life.

In conclusion, the Baltic Sea is a uniquely brackish marine environment with rich ecological diversity and significant economic and scientific value. Its unique characteristics make it an interesting subject for various scientific studies. At the same time, it is a body of water under significant environmental stress, highlighting the importance of sustainable practices and ongoing research to understand and mitigate these challenges.

Author: Mateusz A. Baluk

ABOUT THE CONFERENCE

The Baltic Chemistry Conference held on the 27th and 28th of May 2023, was a remarkable gathering that united distinguished participants in a virtual setting. The conference was truly international, featuring attendees from 11 different countries, including Poland, Austria, Hungary, the Czech Republic, Greece, Italy, Germany, Azerbaijan, Portugal, Ecuador, and the United Kingdom. In total, we were honored to welcome 110 delegates representing 26 unique scientific institutions from around the world.



Over the two-day conference, 32 insightful presentations and 41 intriguing poster communication were delivered. These were spread across six sessions, each providing a platform for the exchange of groundbreaking ideas and fostering international collaborations in the fields of chemistry, biomedical chemistry, biochemistry, environmental protection, and ecology. The presentation sessions occurred in an online meeting, enabling speakers to either share a pre-recorded video or present a live lecture. Following each presentation, a live discussion was held, allowing further engagement and detailed exploration of the presented topics. Poster announcements, on the other hand, were divided into two parts: a five-minute video presentation showcasing the poster and a two-hour live discussion providing an avenue for deeper understanding and queries.

Among the 26 scientific institutions represented, there were both universities and research institutions, including but not limited to the University of Gdańsk, University of Vienna, Georg-August-University Göttingen, University of Camerino, Universidade NOVA de Lisboa, and the Institute of Cancer Research. Each institution brought its unique insights and contributions to the event, thus enriching the scientific discourse.

We extend our heartfelt gratitude to everyone who made the conference a success, especially the attendees and presenters who offered their innovative research and enriched the scientific discussions. Your active participation and invaluable contributions played a crucial role in making this conference a hub for intellectual exchange and innovation. The insights and connections fostered during the Baltic Chemistry Conference have undoubtedly spurred future research and collaborations. We hope the knowledge gained and shared at this conference will prove useful in your future endeavors.

Once again, thank you for making the Baltic Chemistry Conference a remarkable success. We look forward to welcoming you at our next event

ORGANISING COMMITTEE

The Baltic Chemistry Conference was organised by an agreement of three organisations from the University of Gdansk - the Student's Science Club for Chemistry, the Students' Self-Government Council of the Faculty of Chemistry and the Doctoral Council of the Doctoral School of Natural Sciences of the University of Gdansk.

The Organising Committee is composed of:

Graphic and Scientific Group

MSc Mateusz A. Baluk as chairman of graphic & advertising & logistics

Jakub Donat as graphic designer and social media agent

MSc BEng Daniel Górzyński as scientific agent

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BSc Agnieszka Manikowska as chairwoman of techniques and support

BSc Emilia Mykowska as conference platform agent

EBSc Dawid Falkowski as video-presentation manager

SCIENTIFIC COMMITTEE

Prof. Henry Pinto (Yachay Tech University, ECUA)

Henry Pinto obtained his PhD in Physics in the field of Condensed Matter Physics and Quantum Mechanical simulations at the Department of Physics at the National University of Ireland in Cork and Tyndall National Institute, Ireland, in 2006. During his PhD studies he was the winner of the BOC Postgraduate Bursary Award for his research. Through his scientific career, Dr. Pinto has been doing research in world class centers like: Aalto University, Finland; Nagoya University, Japan and Liverpool University, UK. From 2010 until 2016 Dr. Pinto was a Research Professor in the Interdisciplinary Center for Nanotoxicity at Jackson State University, USA. From 2016 Dr. Pinto is a professor at the School of Physical Sciences and Nanotechnology at Yachay Tech University and the head of the CompNano Group. Dr. Pinto's main scientific interests are in Condensed Matter Physics and Computational Materials Science applying cutting-edge theoretical and computational methods together with the best available computing resources. He has special interest in the understanding of the nanoworld phenomena from a theoretical perspective in close collaboration with experimentalists. His main research topics include: electronic structure calculations, magnetism and strong correlated systems, mineral and metal-oxide surfaces and interfaces, polymers and metal/polymer interfaces, scanning tunneling microscopy simulations, nanomanipulation, molecular electronics, point defects and high performance computing

Dr Elżbieta Adamska (University of Gdansk, PL)

Dr Elżbieta Adamska is part of the Department of Analytical Chemistry of the Faculty of Chemistry at the University of Gdansk. Her scientific interests concern the synthesis of nanoparticles with optical properties that have potential application in percutaneous permeability studies. She is the author and co-author of 19 scientific and popular science publications and about 80 national and international conference presentations. She obtained her bachelor's degree in 2015 and in 2017 a master's degree. She graduated as PhD in 2022 at the Faculty of Chemistry of the University of Gdańsk. She also completed foreign scientific internships at the Beijing Institute of Technology (China), University of Belgrade (Serbia) and Helmholtz-Zentrum Hereon (Germany).

Dr Aamod Desai (University of St. Andrews, UK)

Dr Aamod Desai completed his PhD from IISER, Pune (India) and is currently working as a postdoctoral research fellow at the University of St Andrews (UK). Apart from the core training as material chemist in metal-organic frameworks (MOFs), he has worked in the field of electrode materials for rechargeable battery technologies, such as Li-ion and Na-ion batteries.

Dr Maria Madej (Jagiellonian University, PL)

Maria Madej is a PhD researcher in Department of Analytical Chemistry at the Faculty of Chemistry, Jagiellonian University in Kraków, Poland. She received her PhD degree in 2021. Her research is related to the development of voltammetric (bio)sensors intended for the determination of antidepressants in environmental and biological samples. She focuses especially on searching of new materials for the modification of solid electrodes, including zeolites, metal-organic frameworks or polymers deposited in cold plasma reactors.

Dr Daria Grzywacz (University of Gdansk, PL)

Daria Grzywacz is an assistant professor at the Department of Organic Chemistry, at the University of Gdansk. She conducts scientific research in the fields of organic chemistry and biology, with a particular focus on glycochemistry, as well as heterocyclic compounds that exhibit OLED emitter properties and act as photosensitizers/photocatalysts in the hydrogen production reaction. Her research interests encompass the chemistry of carbohydrates, especially their combination with triterpenoid and spirostan saponins that demonstrate biological activity, such as diosgenin and betulin. Additionally, her research interests include synthesizing and evaluating glycosylated antimicrobial peptides (gAMP) for their antifungal, antibacterial, and hemolytic activity.

Dr Daria Krefft (University of Gdansk, PL)

Dr Daria Krefft is an assistant professor at the Department of Molecular Biotechnology at the Faculty of Chemistry of the University of Gdańsk. As part of her research, she dealt with gene cloning, as well as overproduction, purification and testing the properties of many proteins, including fluorescent proteins and luciferase, thermostable restriction endonucleases, and polyepitopic proteins with potential pro-regenerative properties.

Dr Catarina S. Lobo (Institute of Cancer Research, UK)

Catarina S. Lobo is a postdoctoral research fellow working at The Institute of Cancer Research in London and her work is focused on photoimmunotherapy and PET imaging of neuroblastoma. Catarina completed her PhD in Medicinal Chemistry at University of Coimbra, Portugal, in 2021. Her PhD thesis was focused on photodynamic therapy, immunotherapy, and imaging techniques. Before joining ICR, Catarina worked as a researcher at LaserLeap Technologies. Catarina is a co-founder of Molecular Junior Enterprise.

Dr Eng Aleksandra Pieczyńska (University Of Gdansk, PL)

Assistant professor at the Department of Environmental Technology, Faculty of Chemistry, University of Gdańsk. Scientific interests include the synthesis and characterization of new nanomaterials and their application for the degradation of resistant micropollutants and the generation of useful chemicals by photocatalytic and photoelectrocatalytic processes.

Dr Karolina Piecyk (Warsaw University, PL)

Adiunct at the University of Warsaw, Chemistry Department. My work is focused on organic chemistry with elements of biophisics and biochemistry. My main research is based on synthesis of mRNA 5' cap analogs and their application in biochemical and physicochemical studies on the mechanisms of translation initiation, splicing, intracellular transport and mRNA stability in eukaryotic cells; Synthesis and biochemical studies of nucleotide inhibitors of protein biosynthesis of potential therapeutic importance in neoplastic diseases and synthesis of cap analogs improving RNA properties for therapeutic and biotechnological applications

Dr Joanna Żebrowska (University Of Gdansk, PL)

Ph.D. from the Faculty of Chemistry, University of Gdansk, graduated LiSMIDoS at the Faculty of Biotechnology University of Gdansk-Medical University of Gdansk. Assistant Professor at the Department of Molecular Biotechnology, Faculty of Chemistry at the University of Gdansk. Research area: purification of polyepitopic proteins with therapeutic and regenerative proteins, design and cloning synthetic genes, bacteriophage proteins, chemical synthesis cofactor analogues for Thermus family enzymes, engineering DNA-recognition specificity of enzymes, biochemical and physico-chemical properties of the enzymes.

SPECIAL GUESTS

Prof. Dr Hab. Elżbieta Jankowska (University Of Gdansk, PL)

Elżbieta Jankowska is an employee of the Department of Biomedical Chemistry, Faculty of Chemistry, University of Gdańsk. She received her PhD degree in 2001, and in 2013 she was awarded with a habilitation degree in chemical sciences. In 2015, she was promoted to the position of Associate Professor at the University of Gdańsk. Her scientific interests include primarily peptides, polypeptides and proteins. She deals with the study of their structure, in particular conformational changes that accompany the processes of oligomerization and aggregation of these biomolecules. Since her postdoctoral internship in 2003-2004, at the University of Texas Health Science Center in San Antonio, USA, the focus of her interest has been the proteasome, a multiprotease responsible for the degradation of most cellular proteins, including damaged ones, which are precursors of toxic oligomeric forms. The current research focuses on the design of modulators capable of accelerating the degradation of oligomers by the proteasome. Dr. hab. Elżbieta Jankowska managed 4 projects awarded by the National Science Center and worked in 3 other research projects. She is the co-author of 54 scientific articles, her papers have been cited 999 times, and the Hirsch index is 18.

Dr Chiara Da Pieve (Institute of Cancer Research, UK)

I am a senior radiochemist in the Preclinical Molecular Imaging group, Division of Radiotherapy and Imaging at the Institute of Cancer Research, London, UK. I received my PhD degree in 2005 from the Inorganic Chemistry department, University of Zuerich (Switzerland). From my master's degree at the University of Padua (Italy), through my PhD and to my postdoctoral position at the Open University (UK), I worked with metal and radiometal ions, and biomolecules (DNA aptamers, peptides and proteins) focusing on the preparation of coordination compounds for medical applications.

Currently I am involved in the development and production of targeted radioactive probes for the imaging and therapy of cancer. My scientific interests include peptides, small proteins, full size antibodies, chelators (for radiometals) and bioconjugation techniques. I spend my working days preparing, analysing, and purifying various protein-chelator conjugates which are then radiolabelled with the most suitable radioactive label for preclinical assessment.

Opening lecture by Prof. Dr Hab. Elżbieta Jankowska

Title: "Can amyloidogenic forms of proteins be removed from our body?"

Abstract: Human 20S proteasome provides cells with a cleaning system, removing mutated, misfolded, and oxidatively damaged proteins. During aging, the effectiveness of the proteasome system gradually declines. Impaired proteasome function leads to the accumulation of abnormal proteins and their aggregation, which in turn contributes to the development of aging symptoms, such as cataracts or changes in skin pigmentation, as well as severe illnesses, for instance, amyotrophic lateral sclerosis and Alzheimer's and Parkinson's diseases. A promising therapeutic strategy to delay the onset of age-related disorders could be proteasome activation. This approach is growing in popularity, but so far little is known about the mechanism of 20S stimulation by small molecules, hence the lack of good leading structures for the design of activators.

A few years ago, we had our first success in developing proteasome activators. We obtained a compound named Blm-pep and a dozen of its analogs, which turned out to be effective in

stimulating human proteasome. These peptides enhanced degradation not only of small fluorogenic substrates but also of model proteins, including those involved in neurodegeneration, such as α-synuclein and Tau protein. However, the compounds had negligible resistance to proteolytic enzymes. In order to increase their stability in human serum, we transformed them into peptidomimetics by replacing natural amino acids with their N-methylated versions or introducing a peptoid bond. In addition, to ensure cell permeability, peptidomimetics were grafted with a cell penetrating moiety. These modifications turned out to be effective, allowing to obtain very promising, effective, proteolytically stable and cell-permeable compounds. They can become leading structures in the design of therapeutics that are a response to aesthetic and medical problems related to aging process.

Opening lecture by Dr Chiara Da Pieve

Title: "PET imaging is a non-invasive technique that uses radioactive probes for the detection of various diseases and the evaluation of organ functionality"

Abstract: In the last years, following the fast development of immunotherapy and to meet the need of personalized medicine, protein-based PET probes design and use is in its fastest-growing phase. Such radioactive agents contain radioactive metals and the most suitable chelators and are prepared by applying conjugation techniques.

Before translation to the clinical setting, each radioactive agent is preclinically tested (in vitro and in vivo) to assess the pharmacokinetics and biodistribution properties. The talk is covering the basic principles and steps followed for the preparation of PET probes and their assessment.

PATRONS OF THE CONFERENCE

We would like to thank our patrons sincerely, thanks to their support our conference has become known in the international scientific world.

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