Erasmus+
BLENDED INTENSIVE PROGRAMME

DRUG DEVELOPMENT: FROM DISCOVERY TO MARKET

Organized by Department of Drug and Health Sciences (DSFS)

-University of Catania (Italy)-

Physical Mobility June 22-26 2026

Virtual Mobility July 13-17 2026

FROM MOLECULES TOMEDICINE IN A CONNECTED WORLD

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POZNAN UNIVERSITY OF TECHNOLOGY

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Local Organizers

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Drug Development: From Discovery to Market is an intensive programme designed to provide participants with a comprehensive and integrated understanding of the entire drug development pathway, from the initial concept to market access and product commercialization. Drug development is a complex, multidisciplinary, and highly regulated process that requires coordinated expertise across scientific, regulatory, and business domains.

The programme offers advanced scientific training covering all key stages of the pipeline, including hit identification, lead optimization, formulation development, and clinical trial design. In addition, specific attention is given to **regulatory strategies, approval processes, market access, and pharmaceutical marketing**, highlighting the critical steps required to bring a drug successfully to patients.

The course builds on the strong multidisciplinary expertise of the Department of Drug and Health Sciences (DSFS), enriched by the contribution of internationally recognized experts from academia, industry, and regulatory agencies. This combination ensures that participants gain both solid theoretical foundations and real-world perspectives on modern drug development.

Participants will be exposed to a wide spectrum of disciplines, including medicinal chemistry, pharmaceutical technology, pharmacology, biochemistry, bioinformatics, genetics, preclinical and clinical research, as well as regulatory affairs and drug commercialization.

The multidisciplinary nature of the programme ensures an intellectually stimulating learning environment, where modules are delivered through intensive teaching formats by leading experts in their respective fields.

Overall, the programme provides a unique opportunity to understand, critically evaluate, and actively engage with the full lifecycle of drug development, including the scientific, regulatory, and market-driven components necessary for successful innovation.

The course functions as a “one-stop-shop” outlining the major scientific and strategic tools involved in drug discovery and development, illustrating how these contributions are phased over time and integrated to generate a drug suitable for clinical trials and eventual market entry.

Based on real-world experience, participants will follow the typical development pathway step by step:
Initiating Idea → Target Selection → Lead Identification → Clinical Candidate → Drug Delivery → Regulatory Approval → Market Access

Without this integrated, multidisciplinary approach including regulatory and commercial considerations it would not be possible for drugs to successfully reach the market.

Although the drug development process typically spans approximately 15 years, this programme condenses its key elements into an intensive 5-day experience. Participants will work in teams,

simulating a drug discovery environment and stepping beyond their individual areas of expertise to gain a holistic understanding of the process.

FROM MOLECULES TO DRUGS IN A CONNECTED WORD

PROGRAMME

Monday 22 June 2026

Aula Magna 'Jannaccone', via Valdisavoia 5, Catania **https://maps.app.goo.gl/aSfbDJZydRnNNrYs6**

8:45 a.m.-9:15 a.m. REGISTRATION&FIRST DAY WELCOME

9:15 a.m.-9:30 a.m. Prof. Rosario Pignatello (Director, Department of Drug and Health Sciences, University of Catania). *Introduction to the course*.

9:30 a.m.-10:00 a.m. Prof. Alessandra Ragusa - Prof. Mattia Frasca (Deputy Rectors for Internationalization). *Blended Intensive Program Erasmus+*

10:00 a.m.-11:30 a.m. Prof. Luca Vanella (Department of Drug and Health Sciences, University of Catania).

Biochemical strategies for translational research. Part 1 (Theory)

11:30 a.m.-12:00 p.m. Coffee-Break

12:00 p.m-1:00 p.m. Dr. Barbara Tomasello (Department of Drug and Health Sciences, University of Catania).

Biochemical strategies for translational research. Part 2 (Introduction to the Hands-on Laboratory Session)

1:00 p.m.-2:00 p.m. *Lunch Break*

Department of Drug and Health Sciences, University of Catania, viale Andrea Doria 6. Laboratory of Biochemistry and Advanced Biology **https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8**

3:00 p.m.-6:00 p.m. Dr. Barbara Tomasello (Department of Drug and Health Sciences, University of Catania) *Biochemical strategies for translational research* (Hands-on Laboratory Session).

Tuesday 23 June 2026 Department of Drug and Health Sciences Classroom G https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8

9:00 a,m.-11:00 a.m. **Prof. Giuseppe Grasso** (Department of Chemical Sciences, University of Catania) *Surface Plasmon Resonance in Drug Discovery.* Part 1 (Theory)

11:00 a.m-11:30 a.m Coffee Break

11:30 a.m.-1:00 p.m. **Dr. Alessia Di Stefano** (Department of Chemical Sciences, University of Catania). S*urface Plasmon Resonance in Drug Discovery***.** Part 2 (Introduction to the Hands-on Laboratory Session)

1:00 p.m.-3:00 p.m. Lunch Break ***CANTEEN Cittadella*** *located on "via (street) Santa Sofia 107-109", on campus* **https://maps.app.goo.gl/zrSqPEMEYK3wJw2a9**

Department of Chemical Sciences, v.le Andrea Doria 6, Bldg.1(the building next to the Department of Pharmaceutical and Health Sciences). **https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8**

3:30 p.m.-5:30 p.m. **Dr. Alessia Di Stefano** (Department of Chemical Sciences, University of Catania)

S*urface Plasmon Resonance in drug discoovery***.** Part 2 (Laboratory Hands-on Session)

Department of Drug and Health Sciences Classroom G

5:30 p.m. -6:30 p.m. POSTER AND ORAL COMMUNICATIONS (15 minutes)

5:30 p.m.-5:45 p.m. Natalia Stach (Faculty of Chemistry, Vibrational Spectroscopy Group, Jagiellonian University, Kraków, Poland) **OC1**

Lymphocytes in infectious mononucleosis analyzed by Raman microspectroscopy

5:45 p.m.-6:00 p.m. Ryskeldi Koichubekov (Poznan University of Technology, Faculty of Chemical Technology, Poland) **OC2**

Clinical Trials: Why Are They Important in Drug Development?

6:00 p.m.-6:15 p.m. **Elif Ayda Arkan** (Istanbul University-Cerrahpaşa, Faculty of Pharmacy)

Preparation and Characterization of Orange Oil-Loaded Chitosan Microcapsules Using Different Surfactants **OC3**

5:30 p.m.-6:30 p.m Beata Sikora (Faculty of Chemical Technology, Poznań University of Technology, Poland) **PO1**

Choline-Based Monomers for the Preparation of Transdermal Drug Delivery Systems via Photopolymerization

Wednesday 24 June 2026 Department of Drug and Health Sciences University Campus, v.le Andrea Doria 6, Bldg.2 Classroom F https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8

9:00 a.m.-11:00 a.m. Prof. Giuseppe Forte (Department of Drug and Health Sciences, University of Catania).

Designing Functional Nanomaterials: From Electronic Structure to Applications

11:00 a.m.-11:30 a.m. Coffee Break

11:30 a.m.-12:30 p.m. Dr. Antonino Mazzaglia (1 CNR-ISMN URT of Messina, Supramolecular Nanomaterials for Health, Optoelectronics and Sensing (SuNforHeOS) Lab, at Dept. ChiBioFarAm, University of Messina, Italy).

Supramolecular magnetic materials: from design to application in therapy and biomarkers detection

12.30 p.m.-2:30 p.m. ***CANTEEN Cittadella*** *located on "via (street) Santa Sofia 107-109", on campus* **https://maps.app.goo.gl/zrSqPEMEYK3wJw2a9**

Department of Drug and Health Sciences (site via Valdisavoia 5 Catania) **https://maps.app.goo.gl/aSfbDJZydRnNNrYs6**

3:00 p.m.-5:30 p.m. Prof. Claudia Carbone and **Prof. Teresa Musumeci** (Department of Drug and Health Sciences, University of Catania).

Laboratory activity for the preparation and characterization of nanomedicines.

Thursday 25 June 2026 Department of Drug and Health Sciences University Campus, v.le Andrea Doria 6, Bldg.2 Classroom G https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8

9:00 a.m.-10:00 a.m. Dr. Maria Di Chiara (Department of Drug and Health Sciences, University of Catania).

Radioligand Binding Assays in Drug Discovery.Part 1 (Theory).

10:00 a.m.-11:00 a.m. Dr. Maria Di Chiara (Department of Drug and Health Sciences, University of Catania)

Radioligand Binding Assays in Drug Discovery. Part 2 (Hands-on Session).

11:00 a.m.-11:30 a.m. Coffee Break

11:30 a.m.-1:30 p.m. Dr. Maria Di Chiara (Department of Drug and Health Sciences, University of Catania).

Radioligand Binding Assays in Drug Discovery. Part 2 (Hands-on Session *continued*).

1:30 p.m.-2,30 p.m. ***CANTEEN Cittadella*** *located on "via (street)Santa Sofia 107-109", on campus* **https://maps.app.goo.gl/zrSqPEMEYK3wJw2a9**

Department of Drug and Health Sciences University Campus, v.le Andrea Doria 6, Bldg.2 Classroom I

https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8

3:30 p.m.-4:30 p.m. Dr. Rosalia Maria Cristina Pellitteri (Institute for Biomedical Research and Innovation, National Research Council, (IRIB-CNR)

Neuroprotective and anti-inflammatory activity of natural compounds: therapeutic implications for neurodegenerative diseases.

4:30 p.m.-5:30 p.m. Dr. Sara Merlo (Department of Drug and Health Sciences, University of Catania)

Neuroinflammation: a unifying mechanism in brain disorders

Friday, 26 June 2026 University Campus, v.le Andrea Doria 6, Bldg.2 Classroom F https://maps.app.goo.gl/PPwLUrgnmt1zJuLi8

09:00 a.m.-10:00 a.m. Prof. Roberto Di Marco (Department of Drug and Health Sciences, University of Catania)**.**

Updates on microbial extracellular vesicles: just tools for intercellular communication and virulence factors, or also potential innovative therapeutic targets?

10:00 a.m.-11:00 a.m. Dr. Ezgi Balkan (Department of Biochemistry, Faculty of Pharmacy, Istanbul University, Cerrahpasa, Türkiye).

Cancer Immunotherapy: From Molecular Mechanisms to Clinical Applications

11:00 a.m.-11:30 a.m.: Coffee Break

11:30 a.m.-12:30 p.m. Dr. Agata Kryczyk-Poporawa (Department of Inorganic Chemistry and Pharmaceutical Analytics, Faculty of Pharmacy, Jagiellonian University, Medical College, Kraków, Poland)

Stability in Drug Development: Ensuring Quality and Efficacy

12:30 p.m.-1:30 p.m. Dr Eng. Emilia Konował (Institute of Chemistry and Technical Electrochemistry, Faculty of Chemical Technology-Poznan University of Technology).

Fundamentals of toxicology: factors affecting xenobiotic toxicity

1:30 p.m.-2:00 p.m. CLOSING REMARKS & PHOTO

1:30 p.m.-2:30 p.m. Lunch ***CANTEEN Cittadella*** "via Santa Sofia 107-109" **https://maps.app.goo.gl/zrSqPEMEYK3wJw2a9**

e-LEARNING

(Monday, 13 July – Friday, 17 July 2026)

Monday, 13 July 2026

09:00 a.m.-11:00 a.m. Prof. Dr. Thierry Langer (University of Vienna Department of Pharmaceutical Sciences.Pharmaceutical Chemistry Division).

Research towards next generation pharmacophore modeling

11:00 a.m. – 12:00 p.m. Dr. Ifat Shub (CTO AGREMATCH, Rehovot, Israel).

From Data to Molecules: How Agentic AI is Transforming Small Molecule Discovery and Development

Tuesday 14 July 2026

09:00 a.m.-11:00 a.m. Dr. Roy Chun-Laam Ng (Division of Neuroscience, School of Biological sciences, Faculty of Biology, Medicine and Health, University of Manchester, UK).

Pharmacological inhibition of NLRP3 inflammasome pathway for treating neuroinflammatory diseases

11:00 a.m.-1:00 p.m. Univ.-Prof. Dr. h.c. Pharmaceutical and Medicinal Chemistry Holger Stark (Heinrich Heine University Duesseldorf Institut fuer Pharmazeutische und Medizinische Chemie)

From Bench to Bedside to Bench: Histamine H3 Receptor Antagonists in Orphan Diseases

Wednesday 15 July 2026

09:00 a.m.-10:00 a.m. Prof. Rosalía Rodríguez (Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, International University of Catalunya).

Targeting Hypothalamic Neurons and Microglia in Obesity: Emerging Nanomedicine Strategies

10:00 a.m.-11:00 a.m. Dr. Christos Tapeinos (Division of Pharmacy & Optometry, School of Health Sciences, Faculty of Biology, Medicine and Health, University of Manchester, UK).

Pharmaceutical Nanotechnology and Nanomedicines

11:00 a.m.-12:00 p.m. Prof. Lucia Montenegro (Department of Drug and Health Sciences, University of Catania).

Advantages and limits of lipid nanoparticles as carriers for delivery of pharmaceutical and cosmetic ingredients.

Thursday July 16 2026

9:00 a.m.-10:00 a.m. Dr. Giulio Petronio PhD (Clinical Microbiology Laboratory , Department of Medicine and Health Sciences "V. Tiberio" , University of Molise, Campobasso (Italy).

Bridging Traditional Botanicals and Modern Microbiology: Laboratory Standards and the Galleria mellonella In Vivo Pre-Screening Model

10:00 a.m.-12:00 p.m. Prof. Johan Wouters (Department of Chemistry Université de Namur)

Crystal engineering to modulated pharmaceutical properties of solids

Friday July 17 2026

10:00 a.m.-11:00 a.m. Dr. Lucilia Saraiva (Faculty of Pharmacy, REQUIMTE, University of Porto, Porto, Portugal)

Beating hard -to-threat cancers with a first-in-class inhibitor of DNA damage response.

11:00 a.m.-12:00 p.m. Dr. Alexandre Cruz (Pharm.D., RA, PV & Quality Manager, QPPV at CROFAR, Lda.: https://crofar.com/en/)

Pharmacovigilance – the obligations of the Marketing Authorisation Holder (MAH) from the submission process of the Marketing Authorisation Application (MAA) onwards.

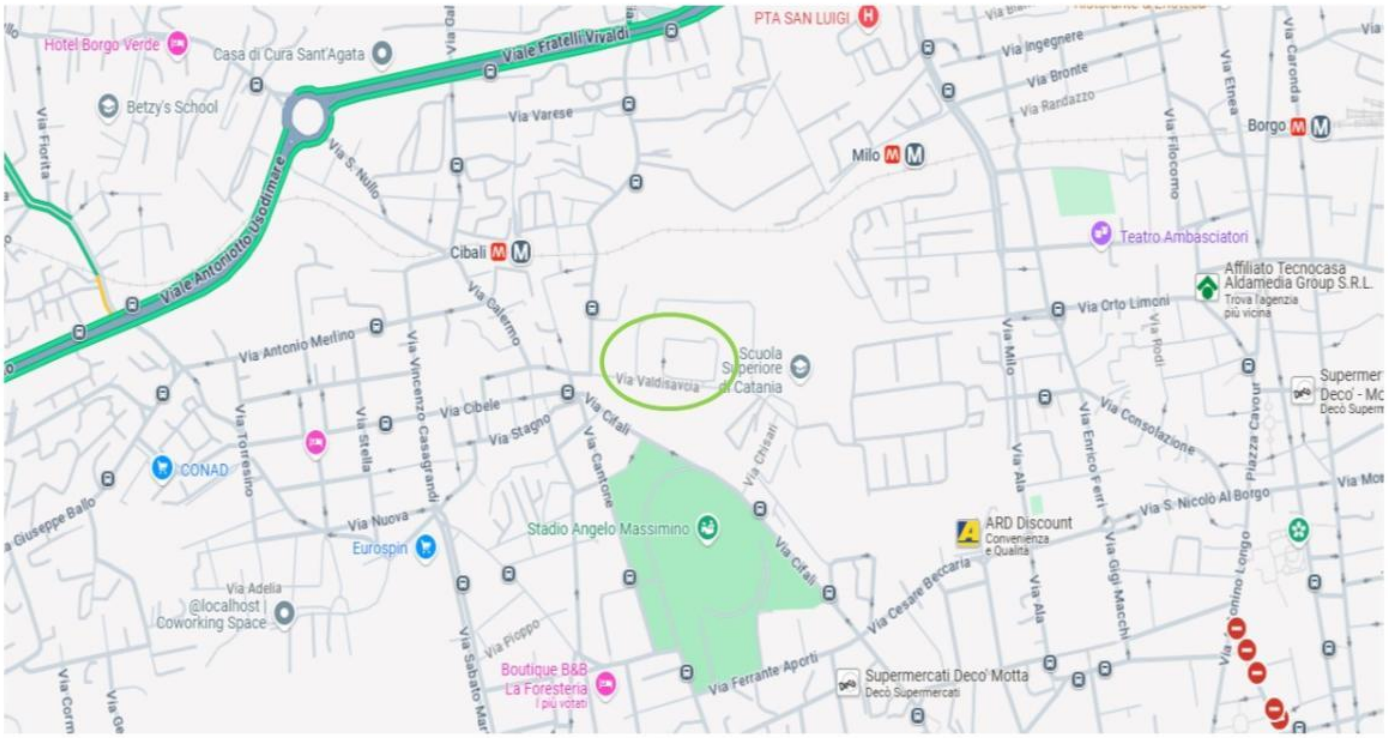
HOW TO GET….

JUNE 22 2026 morning and June 24 2026 afternoon: DEPARTMENT OF DRUG AND HEALTH SCIENCES VIA VALDISAVOIA, 5 – I-95123Catania.

<u>BY AMTS BUS LINE No. 702 OR METRO (CIBALI STATION).</u>

GPS: N 37° 31' 5.178" / E 15° 4' 15.585

Telephone +39 095 4783333

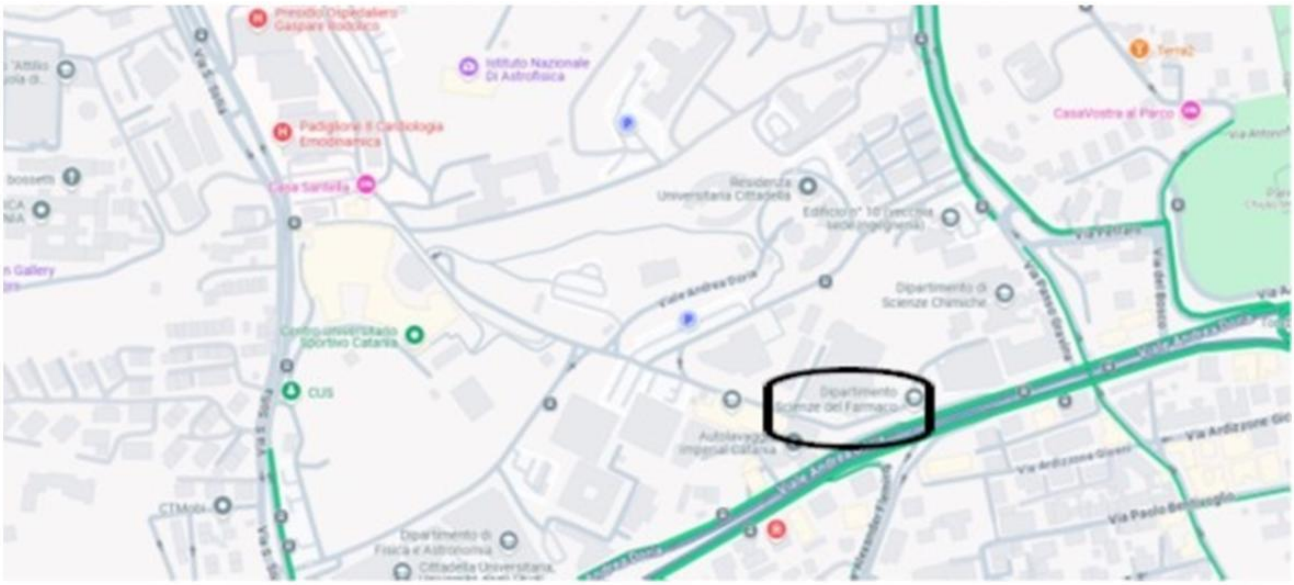


June 22, 2026 (afternoon) and every day thereafter: DEPARTMENT OF DRUG AND HEALTH SCIENCES VIALE ANDREA DORIA 6 Bldg. 2, I-95125 Catania.

GPS: 37°31'36.5"N 15°04'28.8"E

BY AMTS BUS LINE 'BRT 1' (STOP @ VIALE ANDREA DORIA)

Telephone. +39 095 738-4



DEPARTMENT OF DRUG AND HEALTH SCIENCES

ABSTRACTS

Prof. Luca Vanella (Department of Drug and Health Sciences, University of Catania.)**.**

Dr. Barbara Tomasello (Department of Drug and Health Sciences, University of Catania.)**.**

Biochemical strategies for translational research

The laboratory activity focused on "Biochemical strategies for translational research" provides an in-depth overview of selected biochemical approaches central to translational research, with an emphasis on redox biology and cellular response mechanisms. Participants will be introduced to the analysis of antioxidant activity of natural extracts through both cell-free and cellular models. In particular, the DPPH (2,2-diphenyl-1-picrylhydrazyl) assay will be presented as a widely used spectrophotometric method to evaluate radical scavenging capacity, based on the reduction of the stable DPPH radical, which results in a measurable color change.

Complementary in vitro studies will include the assessment of oxidative stress modulation in cultured cell lines via cytofluorimetric analysis. In addition, participants will examine various cell lines under standard culture conditions, and evaluate cell viability through the Trypan Blue exclusion method, based on the principle that intact, viable cells exclude the dye, while compromised cells take it up.

Overall, the experience aims to familiarize students with core experimental techniques used to explore biomolecular responses and therapeutic potential in translational settings.

Prof. Giuseppe Grasso (Department of Chemical Sciences, University of Catania, Italy).

Exploring Molecular Interactions by SPR: Principles and Experimental Demonstration in Drug Discovery.

The principles at the base of the surface plasmon resonance (SPR) experiments aimed at characterising the kinetic parameters of biomolecular interactions will be introduced. Particularly, after a brief introduction of the SPR principles, some details will be given regarding: surface immobilization of biomolecules; evaluation of kinetic parameters from SPR curves; SPR imaging (SPRI) and microfluidic strategies for SPRI. Finally, an introduction to the recently developed SPR based technique to measure the diffusion coefficient of various biomolecules will be given, together with experimental examples of application.

Dr. Alessia Di Stefano (Department of Chemical Sciences, University of Catania)

*Exploring Molecular Interactions by SPR: Principles and Experimental Demonstration in Drug Discovery***.** Part 2 (Introduction to the afternoon Hands-on Laboratory Session)

The surface plasmon resonance (SPR) technique is increasingly used as an experimental approach complementary to virtual screening studies, aimed at identifying novel drug candidates or repurposing approved drugs for new therapeutic applications. In this laboratory session, the design of a complete SPR experiment will be addressed, focusing on two main phases: ligand immobilization and analyte interaction. The ligand, usually a protein, will be immobilized onto a functionalized gold sensor surface through EDC/NHS amine coupling. For this purpose, bovine serum albumin (BSA) will be used, as it is one of the most widely employed proteins for investigating drug–protein interactions. In addition, the optimization of key experimental parameters, including buffer choice and analyte concentration range, will be discussed. Finally, selected drugs will be tested against the immobilized ligand to acquire sensorgrams, response curves over time that describe the kinetics of the analyte–ligand interaction. From these curves, kinetic parameters and affinity constants can be extracted, providing a quantitative description of the interaction.

Prof. Giuseppe Forte (Department of Drug and Health Sciences, University of Catania, Italy).

Design Functional Nanomaterials: From Electronic Structure to Applications

The lecture will focus on how computational chemistry can support the rational design of functional nanomaterials by
linking molecular structure, electronic properties, dynamic behaviour and final applications.

I plan to introduce key computational approaches, mainly DFT, TD-DFT and molecular dynamics, highlighting how descriptors such as HOMO/LUMO levels, electronic transitions, charge transfer, adsorption energies, intermolecular interactions and conformational dynamics can guide materials design.

Selected examples will include photoactive materials, organic dyes, carbon-based nanomaterials, thermoresponsive polymers, graphene oxide interfaces and nanostructured systems for energy, biomedical and environmental applications.

I would also like to make the lecture interactive. After a short theoretical introduction, students will be asked to work on simple design problems, such as choosing a computational strategy for a light-responsive nanocarrier, a dye for solar cells, or a graphene-oxide-based system for sensing or metal-ion capture.

The aim is to encourage students to connect a target application with the appropriate material, computational method and molecular descriptors.

Dr. Antonino Mazzaglia (1 CNR-ISMN URT of Messina, Supramolecular Nanomaterials for Health, Optoelectronics and Sensing (SuNforHeOS) Lab, at Dept. ChiBioFarAm, University of Messina, Italy).

Supramolecular magnetic materials: from design to application in therapy and biomarkers detection

In recent years, considerable efforts have been spent in the development of magnetic multifunctional nanoparticles (MNPs), the understanding of their behavior, and the improvement of their applicability in many different areas. Within the biomedical research, different research groups have developed magnetic nanoparticles stabilized by polymeric coatings in which it is possible to install targeting agents, photo-functional moieties, anticancer drugs and so on for drug delivery purpose [1]. In this contribution, last results from our Lab (SuNforHeOS) on supramolecular magnetic materials made with amphiphilic cyclodextrins for anticancer drugs and morphogens delivery [2] as well as capture and sensing of biomarkers of high-burden diseases will be reported. In this context, we recently developed magnetic nanoparticles coated with amphiphilic CDs for the selective recognition of beta-amyloid [3] and magnetoplasmonic cyclodextrins nanoassemblies for early detection of cell circulating melanoma cells. Altogether, these supramolecular cyclodextrin materials with high biocompatibility could find promising applications in personalized medicine treatments and be relocated as biomarkers monitoring and sensing.

References

[1] M. Trapani, A. Cordaro, R. Zagami, A. Mazzaglia. In: Supramolecular Nanotechnology: Advanced Design of Self-Assembled Functional Materials, First Edition. Edited by O. Azzaroni and M. Conda-Sheridan., 2023 Wiley-VCH GmbH., Chapter 29, p. 795-819.

[2] A. Mazzaglia, G, Di Natale, R. Tosto, A. Scala, G. Sortino, A. Piperno, M.P. Casaletto, A.Riminucci, M.L. Giuffrida, P.G. Mineo, V. Villari, N. Micali, G. Pappalardo, KLVFF oligopeptide decorated amphiphilic cyclodextrin nanomagnets for selective amyloid beta recognition and fishing, Journal of Colloid and Interface Science, 2022, 613, 814-816.

[3] A. Surpi, R. Zagami, M. Barbalinardo, N. Burduja, G. Nocito, R. Di Corato, M. P. Casaletto, F. Valle, A. Nicosia, P. G. Mineo, V. A, Dediu and A. Mazzaglia, Amphiphilic Cyclodextrin-based Nanocarriers for Magnetic Delivery of a Morphogen in Microfluidic Environments, Mater. Adv., 2025, 6, 6775-6786.

Prof. Claudia Carbone and **Prof. Teresa Musumeci** (Department of Drug and Health Sciences, University of Catania, Italy).
Laboratory activity for the preparation and characterization of nanomedicines.

Laboratory activity for the preparation and characterization of nanomedicines Prof. Claudia Carbone and Prof. Teresa Musumeci Department of Drug and Health Sciences, University of Catania, Italy Via Valdisavoia 5, Wednesday 24th June 2026, h 14:30-17:00 Nanotechnology serves as a cornerstone of modern scientific innovation, offering transformative methodologies to address complex biomedical challenges. Within this technological framework, nanomedicine represents a highly sophisticated discipline that modulates the physicochemical properties of encapsulated active molecules to redefine pharmaceutical delivery and clinical practices. By engineering precise nanoparticle architectures as cargo carriers, nanomedicine enables the development of advanced drug delivery systems, marking a significant paradigm shift in the treatment of diverse pathologies. To date, several nanomaterials have successfully transitioned to commercial availability as pharmaceutical delivery agents, demonstrating substantial efficacy in clinical settings. Recent advancements in the field have led to the development of innovative platforms, including nanomedicines based on dendrimers, liposomes, micelles, as well as lipid, polymeric, and inorganic nanoparticles. Each vehicle exhibits distinct structural properties that enhance targeting precision, bioavailability, and overall therapeutic efficacy. This laboratory session provides a practical application of these theoretical principles. The academic activity focuses specifically on the formulation and technological characterization of lipid nanoparticles, evaluating their viability as potential delivery systems for natural bioactive compounds.

Dr. Maria Di Chiara (Department of Drug and Health Sciences, University of Catania, Italy).

Radioligand Binding Assays in Drug Discovery

The course offers an integrated theoretical and practical introduction to binding assays, with particular emphasis on radioligand binding techniques and their role in drug discovery. These methods use radioactively labeled molecules to investigate interactions between drugs and biological targets, providing information on binding affinity, receptor density, and molecular mechanisms of interaction.

Key topics include the basic principles of radioactivity, experimental design, saturation and competition assays, data analysis, and critical interpretation of results. The course also addresses methodological strengths and limitations of radiolabeled approaches compared with alternative techniques.

Through a combination of lectures and laboratory sessions, students will gain both conceptual understanding and practical experience, developing the skills necessary to design, perform, and critically evaluate radioligand-based experiments in academic and applied research contexts

Dr. Rosalia Maria Cristina Pellitteri (Institute for Biomedical Research and Innovation, National Research Council, (IRIB-CNR).

Neuroprotective and anti-inflammatory activity of natural compounds: therapeutic implications for neurodegenerative diseases

Recent studies report the protective effect exerted by natural antioxidants (NAs) on the health of the nervous system, since many compounds are characterized by antioxidant and anti-inflammatory activities. Alzheimer Disease (AD) is characterized by an aberrant accumulation of amyloid-β (Aβ) responsible of neurotoxicity. Our research focuses on the interaction between some NAs and tissue transglutaminase (TG2) levels, in the absence and in the presence of amyloid-β (Aβ) in Olfactory Ensheathing Cells (OECs), a glial cell type of olfactory system. It is known that TG2 is an ubiquitarian calcium-dependent protein, involved in AD. We demonstrate that pretreatment of OECs with Nas counteracted the Aβ-induced upregulation of TG2, restoring its expression to control levels. Furthermore, antioxidant pretreatment reinstated cell viability, normalized the expression of some markers, reduced intracellular ROS accumulation, and prevented activation of the apoptotic cascade.
The computational data were in quite agreement with biological results. These findings highlight that NAs are able to exert a protective effect against Aβ toxicity in OECs, and represent a promising tool for neural regeneration and for potential therapy slowing or preventing the progression of AD

Dr. Sara Merlo (Department of Drug and Health Sciences, University of Catania) .

Neuroinflammation: a unifying mechanism in brain disorders

Neuroinflammation is a protective innate immune response mediated mainly by microglia and astrocytes, which is essential to contrast harmful challenges to the nervous system and restore homeostasis. Failure in the resolution processes can lead to chronicization of pro-inflammatory signaling, giving rise to a vicious cycle where neuroinflammation promotes neuronal injury, which in turn fuels inflammatory responses. Concurrent disruption in the integrity of the blood–brain barrier can further exacerbate damage and even allow peripheral immune cells to reach the central nervous system. On these bases, it is not surprising that neuroinflammation has been increasingly recognized as a shared feature across a variety of brain disorders even with very different pathogenetic mechanisms and symptoms, from Alzheimer's and Parkinson's disease, to multiple sclerosis, epilepsy, schizophrenia or major depressive disorder. Neuroinflammation therefore provides a unifying basis for understanding brain pathology and opens to a paradigm shift, from conventional anti-inflammatory strategies to resolution-enhancing approaches.

Prof. Roberto Di Marco

Prof. Daria Nicolosi (Department of Drug and Health Sciences, University of Catania)**.**

Updates on microbial extracellular vesicles: just tools for intercellular communication and virulence factors, or also potential innovative therapeutic targets?

Microbial extracellular vesicles (MEVs) have emerged as pivotal mediators of intercellular and interkingdom communication, playing a crucial role in the complex interplay between microorganisms and their hosts. Released by bacteria, fungi, and other microbial species, these nanosized membrane-bound structures transport a diverse repertoire of bioactive molecules, including proteins, lipids, nucleic acids, and metabolites, capable of modulating microbial physiology, host immune responses, and disease outcomes. Increasing evidence indicates that MEVs contribute to the maintenance of host–microbiota homeostasis, regulate immune signaling pathways, and participate in long-distance communication processes such as the gut–brain axis. Furthermore, they are increasingly recognized as key players in microbial adaptation and antimicrobial resistance through the dissemination of resistance determinants, enzymatic antibiotic inactivation, and vesicle-mediated protective mechanisms. Beyond their biological functions, MEVs have attracted considerable attention as versatile platforms for biomedical applications, including vaccine development, targeted drug delivery, regenerative medicine, and cancer therapy. Their intrinsic biocompatibility, engineering flexibility, and ability to overcome biological barriers position microbial vesicles among the most promising tools in translational microbiology and precision medicine, opening new perspectives for the diagnosis, prevention, and treatment of infectious diseases.

Dr. Ezgi Balkan (Department of Biochemistry, Faculty of Pharmacy, Istanbul University Cerrahpasa, Istanbul Türkiye)

Cancer Immunotherapy: From Molecular Mechanisms to Clinical Applications

Cancer immunotherapy has emerged as a transformative approach in oncology, aiming to harness and enhance the patient's immune system to recognize and eliminate malignant cells. This lecture will provide a overview of the major immunotherapeutic strategies currently used in clinical practice and under development. Key modalities to be discussed include monoclonal antibodies, CAR T-cell therapy, cytokine-based treatments, cancer vaccines, immune checkpoint inhibitors, and oncolytic virus therapies. The session will begin with the fundamental principles of tumor immunology, including tumor immune evasion mechanisms. Subsequently, each immunotherapeutic class will be explored in terms of mechanism of pharmacological properties, clinical indications, and therapeutic limitations. In addition, the lecture will address adverse effects such as immune-related toxicities and current challenges in patient selection and treatment optimization. Recent advances and future perspectives will also be highlighted. This lecture aims to provide pharmacy students with a solid understanding of cancer immunotherapy from both mechanistic and clinical perspectives, enabling them to better interpret emerging therapies and contribute to multidisciplinary oncology care.

Dr. Agata Kryczyk-Poporawa (Department of Inorganic Chemistry and Pharmaceutical Analytics, Faculty of Pharmacy, Jagiellonian University, Medical College, Kraków, Poland)

Stability in Drug Development: Ensuring Quality and Efficacy

Photostability is a critical yet often underestimated aspect of drug development, particularly for medicinal products exposed to environmental conditions such as ultraviolet (UV) radiation. This issue is especially relevant for dermatological formulations, where direct exposure to sunlight may significantly affect the stability, efficacy, and safety profile of active pharmaceutical ingredients. UV-induced degradation can lead not only to a loss of therapeutic activity but also to the formation of reactive or potentially toxic transformation products.

This lecture addresses the role of photostability testing as an essential element of pharmaceutical development and quality assurance. Key regulatory aspects, including current guidelines and requirements for stability assessment, will be discussed. Particular emphasis will be placed on the mechanisms of photodegradation and the influence of external factors such as formulation composition, excipients, and co-applied cosmetic products. Selected experimental studies will be presented, including the photodegradation of retinoids, antifungal agents, and UV filters, together with the identification of degradation pathways using advanced analytical techniques such as UPLC–MS/MS. Particular attention will be paid to real-life exposure conditions and the impact of formulation design on the behavior of pharmaceutical compounds.

The lecture aims to highlight the importance of photostability evaluation in ensuring the safety, quality, and therapeutic effectiveness of medicinal products, bridging experimental research with practical implications for pharmaceutical development and patient care.

Dr Eng. Emilia Konował (Institute of Chemistry and Technical Electrochemistry, Faculty of Chemical Technology-Poznan University of Technology).

Fundamentals of toxicology: factors affecting xenobiotic toxicity

Toxicology plays an important role in the evaluation of the safety of pharmaceuticals and other chemical substances. The lecture will present the basic principles of toxicology with particular emphasis on the factors influencing xenobiotic toxicity. Xenobiotics are substances foreign to the human body, and their effects depend on many chemical, biological, and environmental factors.

The lecture will discuss the relationship between chemical structure and toxicity, as well as the role of absorption, distribution, metabolism, and elimination processes in determining toxic effects. Particular attention will be paid to biological factors such as age, sex, health condition, and individual susceptibility. Environmental influences and interactions between xenobiotics, including synergistic and antagonistic effects, will also be presented.

Selected examples of toxic effects and mechanisms of xenobiotic action will be discussed in the context of toxicological evaluation and health risk assessment. The lecture is intended to provide participants with fundamental knowledge useful for understanding the principles of safety assessment in modern drug development.

ORAL AND POSTER COMMUNICATIONS

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Lymphocytes in infectious mononucleosis analyzed by Raman microspectroscopy **(OC1)**

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Raman spectroscopy is a powerful analytical tool for biological macromolecules [1]. This study evaluates its capability to distinguish healthy lymphocytes from those infected with the highly prevalent Epstein-Barr virus (EBV, HHV-4) [2-4]. Blood samples from mononucleosis patients (University Hospital in Krakow) and healthy volunteers were analyzed using 514.5 nm and 785 nm excitation wavelengths.
Data analysis employed 2D correlation spectroscopy [5,6] and Principal Component Analysis (PCA). Asynchronous 2D correlation maps revealed distinct differences between healthy and infected cells across both wavelengths; for instance, peaks at 514.5 nm indicated tyrosine phosphorylation, reflecting lymphocyte activation [2]. Furthermore, PCA demonstrated clear statistical separation between the two groups. Specifically, in the CH stretching region (514.5 nm), the I_{2930}/I_{2850} intensity ratio was 4.07 for EBV-infected cells, compared to 1.53 for healthy controls.
Detecting these specific biochemical alterations highlights the potential of Raman spectroscopy as a non-invasive diagnostic tool for viral infections.

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Ryskeldi Koichubekov (Poznan University of Technology, Faculty of Chemical Technology, Poland)

Clinical Trials: Why Are They Important in Drug Development? **(OC2)**

Clinical trials are one of the most important stages in the development of a new medicine. Before a drug can reach the market, it must be tested in humans to confirm its safety, efficacy, appropriate dosage, and possible side effects. This presentation explains the role of clinical trials in the drug development process, from early testing in small groups of volunteers to large studies involving patients. Special attention is given to the main phases of clinical trials, including Phase I, Phase II, Phase III, and post-marketing studies. The presentation also highlights the importance of ethical principles, informed consent, patient protection, and regulatory approval. Overall, the aim is to show why clinical trials are essential for transforming a promising drug candidate into a safe and effective medicine that can be used by patients.

Elif Ayda Arkan (Istanbul University-Cerrahpaşa, Faculty of Pharmacy)

Preparation and Characterization of Orange Oil-Loaded Chitosan Microcapsules Using Different Surfactants

This study investigates the preparation and characterization of chitosan-based microcapsules incorporating orange essential oil, with a focus on evaluating the effects of different surfactants on microcapsule properties. The primary objective was to develop a biocompatible encapsulation system and to assess how surfactant variation influences encapsulation efficiency, stability, and morphology.

Microcapsules were prepared using ionic gelation and emulsion-based techniques. Chitosan was selected as the polymer matrix due to its biodegradability and favorable physicochemical properties. During the encapsulation process, different surfactants.

Span 80 (sorbitan monooleate), Tween 20 (polysorbate 20), and Tween 80 (polysorbate 80) were utilized to evaluate their effects on particle formation. The resulting microcapsules were characterized in terms of morphology, dispersion stability, and structural integrity.

The findings indicated that surfactant type plays a critical role in microcapsule formation and performance. Differences in hydrophilic-lipophilic balance (HLB) among the surfactants significantly influenced emulsion stability and encapsulation behavior, leading to observable variations in particle structure and stability.

This project was selected as a finalist in the Istanbul European Regional Finals of TÜBİTAK(The Scientific and Technological Research Council of Türkiye) High School Research Projects Competition, demonstrating its scientific merit and competitive value.

In conclusion, this study highlights the potential of chitosan-based systems for essential oil encapsulation and emphasizes the importance of surfactant selection in optimizing microencapsulation processes for pharmaceutical and nanotechnology applications.

Beata Sikora[1], Veronika Fedorova[1], Wiktoria Patz[1], Piotr Gajewski[1], Agnieszka Marcinkowska[1]

Choline-Based Monomers for the Preparation of Transdermal Drug Delivery Systems via Photopolymerization **(PO1)**

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Transdermal Drug Delivery Systems (TDDS) constitute an advanced approach for the administration of active pharmaceutical ingredients (APIs) through the skin, enabling avoidance of first-pass metabolism and improving drug bioavailability. In this study, photopolymerized polymer gels were developed as transdermal drug delivery platforms, and the effects of polymer matrix composition and API incorporation on their functional properties were investigated. Polymer-based gels were synthesized via radical photopolymerization, a technique characterized by rapid reaction kinetics, precise process control, and solvent-free conditions. Ketoprofen was selected as the model active pharmaceutical ingredient. The obtained TDDS formulations were assessed in terms of adhesion, cohesion, structural stability, swelling behavior, and drug-release performance. The results indicated that the incorporation of ketoprofen generally reduced the mechanical stability and cohesion of the polymer matrix. However, appropriate optimization of the polymer composition enabled the development of systems with favorable physicochemical and functional characteristics, including controlled and sustained drug release. The findings demonstrate that the composition and structure of the polymer matrix play a crucial role in determining TDDS performance by directly influencing adhesion, cohesion, and release kinetics. Overall, the developed photopolymerized polymer gels exhibited considerable potential as transdermal drug delivery platforms. These results highlight the importance of rational polymer matrix selection and formulation design for achieving effective, reliable, and patient-friendly transdermal delivery of ketoprofen and other active compounds.

This research was funded by the Ministry of Science and Higher Education of the Republic of Poland through a subsidy to Poznan University of Technology (0912/SBAD/2603).

VIRTUAL MOBILITY

Prof. Dr. Thierry Langer (University of Vienna Department of Pharmaceutical Sciences.Pharmaceutical Chemistry Division).
Research towards next generation pharmacophore modeling

Pharmacophore models have long served as essential tools for successful virtual screening and lead optimization. However, traditional static models often fail to capture the complex flexibility of biological targets. We address these limitations by introducing dynamic, ensemble-based pharmacophore approaches. By integrating molecular dynamics simulations, these new models better represent target conformational space. Furthermore, the presentation highlights the synergistic integration of artificial intelligence with pharmacophore concepts, as implemented in the new software LigandScout XT. [1] Machine learning algorithms are now being utilized to refine feature definitions and improve scoring functions. This hybrid approach significantly enhances both the accuracy and the predictive power of virtual screening campaigns. The talk also showcases innovative methodologies for modeling complex protein-protein interactions. These next-generation tools enable the identification of highly selective compounds with reduced off-target effects. Case studies from recent drug discovery projects are presented to validate these advanced computational workflows. The results demonstrate a marked increase in hit rates across challenging therapeutic targets. Ultimately, these innovations promise to accelerate the transition from early discovery to clinical candidates.

[1] https://www.inteligand.com/products/ligandscout-xt/

Prof. Rosalía Rodríguez (Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, International University of Catalunya).

Targeting Hypothalamic Neurons and Microglia in Obesity: Emerging Nanomedicine Strategies

Obesity is a chronic disease associated with major metabolic complications, and it is a brain-regulating disease. Although current pharmacological strategies have substantially improved obesity management, most therapeutic approaches primarily act on peripheral or systemic pathways; and patient lack alternatives. In the regulation of energy balance, the hypothalamus plays a central role in the regulation of energy balance, integrating hormonal, nutritional and inflammatory signals to coordinate feeding behaviour, energy expenditure and metabolic homeostasis. In obesity, hypothalamic neuronal circuits become functionally impaired and are accompanied by glial activation, , which contributes to neuroinflammation and metabolic dysregulation. This lecture will provide an overview of the hypothalamic mechanisms involved in obesity, with a particular focus on neuronal dysfunction, microglial responses and neuroimmune interactions. It will then discuss the therapeutic potential of nanomedicine-based strategies to target hypothalamic cells and overcome key limitations in brain drug delivery. Special attention will be given to the opportunities and challenges of developing brain-targeted nanosystems for metabolic diseases, including delivery barriers, cellular specificity, translational feasibility and safety considerations.

Dr. Roy Chun-Laam Ng (Division of Neuroscience, School of Biological sciences, Faculty of Biology, Medicine and Health, University of Manchester, UK).

Pharmacological inhibition of NLRP3 inflammasome pathway for treating neuroinflammatory diseases

This lecture will focus on the pharmacological inhibition of the NLRP3 inflammasome pathway as an emerging therapeutic strategy for Alzheimer's disease and ischemic stroke. The NLRP3 inflammasome is a central mediator of neuroinflammation, and its dysregulation contributes to neuronal damage and cognitive decline. We will review the mechanistic basis of NLRP3 activation in neurodegeneration and discuss recent advances in identifying effective inhibitors. In addition to the selective NLRP3 inhibitor MCC950, special emphasis will be placed on the development of non-steroidal anti-inflammatory drug (NSAID) derivatives through chemical and pharmacological screening. These efforts aim to identify compounds that retain anti-inflammatory efficacy through NLRP3 inhibition without targeting cyclooxygenase (COX) enzymes, thus reducing typical NSAID-related side effects. The lecture will also highlight new small-molecule candidates and screening approaches, offering insight into the translational potential of these compounds in modulating neuroinflammation for therapeutic benefit in CNS disorders.

Prof. Univ.-Prof. Dr. Dr. h.c. Pharmaceutical and Medicinal Chemistry Holger Stark (Heinrich Heine University Duesseldorf Institut fuer Pharmazeutische und Medizinische Chemie)

From Bench to Bedside to Bench: Histamine H3 Receptor Antagonists in Orphan Diseases

The developmet of pitolisant, the fiirst and so far only histamine H3 receptor ligand on market, will be told: From the early development starting with the endeogeneous liagnd, to second generation non-imidazole compounds. The way to the therapeutic indication of narcolepsy with and without cataplexy (Wakix®), an orphan disease, and ist extension to obstructuve sleep apnea (Ozawade®). Furthermore, we will give insights into a new therapeutic indication of pitolisant, the Prader-Willy syndrom, which even mire rare and investigating pitolisant in clinical phase III. These new indications led to new led structures and new compound developments.

Thereby, different aspects of optimization in medicinal chemistry with strong influences of clinical trials will be discussed on the example of histamine H3 receptor antagonists with focus on pitolisant, which propably become a blockbuster drug in 2026.

Dr. Ifat Shub (CTO AGREMATCH, Rehovot, Israel).

From Data to Molecules: How Agentic AI is Transforming Small Molecule Discovery and Development

This presentation will introduce SimpleAI, an agentic AI platform designed to accelerate small molecule discovery beyond traditional target-based approaches. By integrating diverse data sources with automated model generation, the platform supports the entire workflow – from hit identification to early validation – enabling more efficient discovery and optimization of novel compounds, while reducing timelines and improving success rates.

Dr. Christos Tapeinos. (Division of Pharmacy & Optometry, School of Health Sciences, Faculty of Biology, Medicine and Health, University of Manchester, UK).

Pharmaceutical Nanotechnology and Nanomedicines

This lecture introduces the foundations of pharmaceutical nanotechnology and nanomedicines, focusing on how nanoscale formulations can change pharmacokinetics, improve targeting, and enhance therapeutic outcomes. You can expect to explore different classes of nanomedicines (lipid, polymeric, inorganic, protein-based), their advantages and limitations, and real examples of licensed products used in the clinic. The session also covers key design parameters (size, surface, fabrication methods) and links concepts to real-world translation and patient impact.

Prof. Lucia Montenegro (Department of Drug and Health Sciences, University of Catania).

Advantages and limits of lipid nanoparticles as carriers for delivery of pharmaceutical and cosmetic ingredients.

In the last decades, lipid nanoparticles (LNP) have emerged as promising delivery systems to improve safety and efficacy of active compounds for pharmaceutical and cosmetic use. Features including biodegradability, improved stability of the incorporated active ingredient, controlled release and possibility of using different administration routes make these nanocarriers a promising tool to design and develop innovative formulations to meet the constantly increasing demand for new therapies and more effective and safer cosmetic treatments. In addition, the possibility of using a great variety of GRAS (Generally Regarded As Safe) status lipids to prepare LNP allows tailoring the physico-chemical and technological properties of such nanocarriers to meet specific requirements depending on the therapeutic or cosmetic targets.

Among different types of LNP, many researchers have focused their attention on solid lipid nanoparticles (SLN) and nanostructured lipid carriers (NLC) because of their advantages compared with other colloidal nanocarriers. SLN and NLC share similar structures but strongly differ in their ability to incorporate active ingredients and long-term stability. Advantages and limits of SLN and NLC will be discussed along with the most widely used preparation and characterization methods and current and prospective applications in pharmaceutical and cosmetic field.

Dr. Giulio Petronio PhD (Clinical Microbiology Laboratory , Department of Medicine and Health Sciences "V. Tiberio" , University of Molise, Campobasso (Italy).

Bridging Traditional Botanicals and Modern Microbiology: Laboratory Standards and the Galleria mellonella In Vivo Pre-Screening Model

The scientific validation of botanical extracts requires robust and reproducible experimental approaches capable of linking traditional knowledge with modern biomedical research. This lecture will present an integrated workflow for the evaluation of plant-derived products, including extract characterization, microbiological testing, toxicity assessment, and host-response analysis. Particular attention will be given to the use of the *Galleria mellonella* model as an intermediate in vivo screening platform between in vitro assays and mammalian studies. Through selected case studies on botanical extracts and essential oils, the lecture will highlight how combined microbiological, toxicological, and immunological data can support the identification of promising candidates for future therapeutic and translational applications.

Prof. Johan Wouters (Department of Chemistry Université de Namur).

Crystal engineering to modulated pharmaceutical properties of solids.

The solid-state properties of pharmaceutical compounds are critically important, influencing everything from drug stability and solubility to bioavailability and manufacturing efficiency. This lesson will highlight the significant roles of **crystal engineering** and **crystallography** in understanding, predicting, and manipulating these properties.

Crystallography, particularly X-ray diffraction, provides atomic-level insights into the molecular packing arrangements within a crystal lattice. This fundamental information is crucial for identifying different polymorphic forms, solvates, salts and co-crystals of an active pharmaceutical ingredient (API). Each of these solid forms can exhibit distinct physical and chemical properties, including melting point, dissolution rate, hygroscopicity, and mechanical behavior.

Crystal engineering, on the other hand, is the deliberate design and synthesis of crystalline materials with desired properties through the understanding and control of intermolecular interactions, primarily hydrogen bonding and π–π stacking. By applying crystal engineering principles, researchers can strategically modify the solid form of a pharmaceutical compound to enhance its therapeutic efficacy or overcome formulation challenges. This includes developing novel co-crystals to improve solubility and bioavailability, designing stable anhydrous forms to prevent hydration issues, or creating salts with optimized dissolution profiles.

Together, crystallography and crystal engineering offer powerful tools for pharmaceutical scientists. They enable a rational approach to drug development, moving beyond trial-and-error methods. By leveraging these disciplines, it is possible to optimize the solid-state properties of pharmaceutical compounds, leading to improved drug performance, enhanced patient outcomes, and more robust manufacturing processes.

Dr. Lucilia Saraiva (Faculty of Pharmacy, REQUIMTE, University of Porto, Porto, Portugal)

Beating hard -to-threat cancers with a first-in-class inhibitor of DNA damage response.

Our team developed, characterized, and patented a new class of anticancer agents, with BBIT20 as the lead compound. BBIT20 is a first-in-class disruptor of the BRCA1/BARD1 interaction, promoting BRCA1 degradation and impairing both homologous recombination and non-homologous end joining DNA repair pathways. This induces profound genomic instability and selective cancer cell death independently of BRCA mutational status, representing a major advance over PARP inhibitors, whose activity is largely restricted to BRCA-mutated tumors.

Beyond DNA repair inhibition, BBIT20 triggers multiple therapeutic effects, including suppression of multidrug resistance, activation of antitumor immune responses, and induction of metabolic stress in cancer cells. In advanced preclinical models, including patient-derived organoids and xenografts, BBIT20 demonstrated strong antitumor and anti-metastatic activity together with a favorable toxicological profile. Importantly, BBIT20 shows marked synergy with current standard-of-care therapies, including chemotherapy, radiotherapy, PARP inhibitors, and immunotherapy, enhancing efficacy while enabling dose reduction and potentially lowering toxicity.

BEAT Therapeutics aims to advance BBIT20 toward clinical application as a novel therapeutic enhancer in combination regimens, with the goal of improving treatment outcomes, reducing adverse effects and metastatic progression, and ultimately increasing survival and quality of life for patients with aggressive cancers.

Dr. Alexandre Cruz (Pharm.D., RA, PV & Quality Manager, QPPV at CROFAR : https://crofar.com/en/)

Pharmacovigilance – the obligations of the Marketing Authorisation Holder (MAH) from the submission process of the Marketing Authorisation Application (MAA) onwards.

This lecture explores the critical role of the Marketing Authorization Holder (MAH) in ensuring drug safety and regulatory compliance within the EU. Pharmacovigilance (PV), established globally following historical drug tragedies like Thalidomide and Practolol, focuses on monitoring the long-term risks, benefits, and adverse drug reactions (ADRs) of medications. In this presentation we will focus on the post-marketing phase.
The MAH holds ultimate accountability for patient safety. Key responsibilities include:

- Maintaining a Pharmacovigilance System Master File (PSMF).
- Processing valid Individual Case Safety Reports (ICSRs).
- Conducting global and local literature monitoring.
- Appointing a Qualified Person Responsible for Pharmacovigilance (QPPV).
  While certain operational PV activities can be subcontracted, the MAH retains final legal responsibility under Good Pharmacovigilance Practices (GVP), the most important set of guidelines used in Europe for PV purposes

The abstract book can be downloaded from the BIP website or from the folder in the Teams classroom (condiviso>materiale del corso).

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