

Corso di dottorato in SVILUPPO SOSTENIBILE: AMBIENTE, ALIMENTI E SALUTE

Attività formative

Anno 2024/2025

Numero	Titolo del corso	Coordinatore del corso/Docenti	Contatto del Coordinatore	Numero di ore	Periodo atteso	Date confermate	Lingua	Descrizione del corso	Modalità di erogazione
1	Biosensori: applicazioni tecnologiche	Maria Staiano Antonio Varriale Alessia Calabrese Alessandro Capo Angela Pennacchio Concetta Montagnese	maria.staiano@isa.cnr.it	5	Luglio 2025		ITA	Il corso sarà suddiviso in più moduli introduzione a cura di Maria Staiano. Proseguirà poi con: <u>Angela Pennacchio</u> Applicazione dei biosensori nel settore alimentare <u>Alessia Calabrese</u> Progettazione e sviluppo di biosensori per la sicurezza e la qualità degli alimenti <u>Alessandro Capo</u> Applicazione dei biosensori in uno scenario reale <u>Concetta Montagnese</u> Applicazione di innovativi biosensori per la salute umana <u>Antonio Varriale</u> Protocolli per la validazione di biosensori	on-line
2	Criteri di sostenibilità ambientale e sociale dei processi produttivi	Marcello De Falco Domenico Monci Marco Facchino Mauro Capocelli Matteo Benozzo Mario Di Giulio	m.defalco@unicampus.it	12	Settembre 2025	12-9 ore 16-16 Benozzo 15-9 ore 14-16 Monci 16- 9 ore 14-16 Di Giulio 17-9 ore 14-16 De Falco Facchino 18-9 ore 14-16 Capocelli	ITA	Il corso prevederà tre distinte sezioni, la prima dedicata alla metodologia del Life Cycle Assessment (LCA), valutandone criteri di applicazione, potenzialità e finalità, anche attraverso case studies di processi produttivi reali allo scopo di valutarne l'impronta ambientale e definire i criteri di ottimizzazione e sviluppo finalizzati alla riduzione dell'impatto ambientale. La seconda parte vedrà l'estensione della metodologia sopra descritta ad aspetti sociali (SLCA), in particolare all'effetto che nuovi processi produttivi o modifiche sostanziali di quelli esistenti possono avere su abitudini e comportamenti sociali dei dipendenti dell'azienda e più delle comunità a cui i	In presenza

								nuovi prodotti saranno destinati. L'ultima parte verrà dedicata allo studio degli aspetti regolatori in ambito di tutela ambientale.	
3	Dalle molecole bioattive agli alimenti funzionali	Laura Dugo Vittoria Locato Eugenio Benvenuto Elisa De Arcangelis	l.dugo@unicampus.it	12	Febbraio-giugno 2025		ITA	Il corso prevede una prima fase di introduzione agli alimenti funzionali con riferimenti a definizioni, caratteristiche e normativa vigente (UE/extra-UE). Una seconda fase sarà dedicata allo studio delle classi di molecole bioattive di interesse per la produzione di alimenti funzionali, con riferimento alla loro distribuzione nelle materie prime e nei prodotti dell'industria agro-alimentare, caratteristiche molecolari e documentati effetti benefici sulla salute. La terza sezione, con il supporto di casi pratici ed esempi, si focalizzerà su formulazioni, tecnologie e processi impiegati per l'ottenimento di materie prime arricchite in composti bioattivi, e per la produzione di alimenti innovativi ad alto valore nutrizionale, evidenziando altresì le modalità per la definizione dell'accettabilità sensoriale dei prodotti da parte del consumatore.	In presenza
4	La seconda vita degli scarti	Chiara Fanali Susanna Della Posta Leone Mazzeo Alberto Giaconia	c.fanali@unicampus.it	18	Luglio - ottobre 2025		ITA	Il corso prevedrà tre distinte sezioni, la prima riguarderà le tecniche di pretrattamento, estrazione e purificazione di macromolecole ad alto valore aggiunto contenute in matrici di scarto derivanti da processi industriali di vario tipo, nonché le tecniche analitiche per una loro quantificazione. La seconda parte avrà come focus i criteri di progettazione, ottimizzazione e industrializzazione dei processi produttivi descritti nella prima parte e all'ulteriore utilizzo delle matrici	In presenza

								esauste per produzione di energia green e biocombustibili. La terza parte del corso sarà dedicata all'analisi di fattibilità tecnico-economica dei processi analizzati.	
5	One health e biotecnologie per la salute	De Gara Laura Locato Vittoria Benvenuto Eugenio Giannitelli Sara Maria	l.degara@unicampus.it	14	Giugno-luglio 2025		ITA	Introduzione al concetto di One health: nascita ed evoluzione del paradigma One Health. One health a UCBM. Introduzione sull'uso delle colture cellulari, organo/tessuto, illustrando tecniche di micropropagazione, vantaggi e metodi per implementare la produzione di molecole bioattive in vitro (es elicitazione, immobilizzazione...etc...). Utilizzo di sistemi in vitro 2D e 3D per la valutazione dell'attività biologica di molecole.	In presenza
6	Sicurezza in laboratorio	Trombetta Marcella Paolo Capriani Franca Abbruzzese	m.trombetta@unicampus.it P. Capriani: cultura della sicurezza ore 2 P.Capriani: DPI e protocolli d'uso -80°C, ore 1 Abbruzzese: smaltimento rifiuti solidi e liquidi ore 1 Trombetta: Normative, REACH, MSDS, pittogrammi gestione dello sversamento e prova pratica, scelta del DPI adeguato alle manipolazioni. Cancerogeni e teratogeni. Gli incidenti che hanno fatto la storia	18	Giugno 2025		ITA	Obiettivo specifico è la formazione di un professionista capace di lavorare in un laboratorio di ricerca responsabilmente e in sicurezza per se stesso, per i Colleghi e per l'ambiente poiché un laboratorio di ricerca può prevedere un rischio fisico, o chimico o biologico o una loro combinazione.	In presenza
7	Fisiopatologia delle infezioni e infiammazioni, alimentazione e integrazione	Spoto Silvia Di Rosa Claudia		12		19 giugno 2025 ore 15-18 3 luglio 2025 ore 15-18	ITA	I moduli comprendono una panoramica approfondita dei meccanismi fisiopatologici che determinano infiammazione con disfunzione della barriera endoteliale fino all'instaurarsi del danno d'organo dovuto a malattie	

						10 luglio 2025 ore 15-18 17 luglio 2025 ore 15-18		infettive (gravi infezioni virali e batteriche -COVID-19, infezione da CMV, ulcere infette, sepsi-) o infiammatorie (artrite reumatoide, lupus eritematoso sistemico) e il ruolo della nutrizione e della supplementazione nella prevenzione e management delle stesse. Verrà evidenziato il ruolo della nutrizione nelle sindromi CARS (Compensatory Anti-inflammatory Response Syndrome) e PICS (Persistent inflammation, Immunosuppression and Catabolism Syndrome), LONG COVID, sulla sopravvivenza, sul recupero e sulla limitazione di ulteriori infezioni secondarie, comprese quelle sostenute da germi opportunisti. Il modulo tratterà anche il modo in cui l'alimentazione e gli integratori possono contribuire alla decolonizzazione da MDRO.	
8	Circular Economy of Waste Materials	Leone Mazzeo Luisa di Paola	v.piemonte@unicampus.it	16	Settembre - Ottobre 2025		ITA	The modules will include two sections based each on one frontal lecture followed by practical lesson of experimental activity. The first section will concern the use of waste materials for water treatment and purification. Design and Optimization of Adsorption unit will be also carried out. The second one will concern the extraction of molecules from waste matrix using extraction column and studying chemico-physical extraction parameters. Design and Optimization of Extraction unit will be also carried out.	phygital
9	Microrganismi funzionali e strategie bio-tecnologiche per	Emanuele Marconi Gianfranco Pannella	e.marconi@unicampus.it	8	Giugno – luglio 2025		ITA	L'insegnamento di "Microrganismi funzionali e strategie bio-tecnologiche per la produzione di alimenti salutistici" sarà suddiviso in due sezioni. Nella	

	la produzione di alimenti salutistici							prima parte saranno trattati i temi riguardanti i probiotici, prebiotici e post-biotici, con particolare riferimento alle strategie di selezione. Quest'ultimo aspetto sarà affrontato anche dal punto di vista dell'impiego di approcci bioinformatici. Per quanto riguarda la seconda parte dell'insegnamento, l'attenzione sarà focalizzata sullo studio di strategie bio-tecnologiche innovative per la produzione di alimenti ad elevato impatto salutistico.	
10	Barriera intestinale, alimentazione e processi fisiopatogenetici gastrointestinali	Annamaria Altomare	A.Altomare@policlinicocampus.it	16		17 febbraio 2025 14:00-16:00 Aula professori CUBO 17 marzo 2025 14:00-16:00 7 aprile 2025 12:00-14:00 19 maggio 14:00-16:00 29 maggio 2025 17:00-19:00 16 giugno 2025 14:00-16:00 7 luglio 2025 14:00-16:00	ITA	The course aims to explore the role of the intestinal barrier in the pathophysiological mechanisms of chronic gastrointestinal disorders and the interaction with foods. Current gold standard techniques for studying mucosal permeability and intestinal microbiota will be analyzed. The interaction of foods with the modification of the intestinal mucosal barrier will also be explored and how this interaction can play a role in the genesis of chronic gastrointestinal disorders. Finally, the role of prebiotics, probiotics and postbiotics in the modulation of the intestinal mucosal barrier and the most current frontiers of research in this area will be addressed.	In presenza
11	Tecniche innovative e sostenibili per la	Susanna Della Posta Chiara Fanali	s.dellaposta@unicampus.it	12		Settembre-ottobre 2025	ITA	The modules will include two sections based each on one frontal lecture followed by practical lesson of	Phygital

	produzione di estratti ricchi in molecole nutraceutiche							experimental activity. During the first section, students will learn about possible extraction techniques to apply in order to produce extract rich in bioactive molecules such as solid-liquid extraction (SLE), Matrix Solid-Phase Dispersion Extraction (MSPD) and Ultrasound assisted extraction (UAE). Solid-liquid extractions are based on the addition of an extraction solvent to the solid sample, followed by the homogenization of the mixture using a vortex, and the recovery of the extract that could be concentrated evaporating the solvent using specific instrument. Usually these extraction procedures are performed using organic solvents as methanol, acetonitrile, or mixture of organic solvents with water. During this first section of the course innovative strategies to recover bioactive molecules from different matrices will be explained. Specifically the preparation and use of deep eutectic solvents (DESs) will be presented and successively performed during the experimental activity. DESs will apply as extraction solvents in different extraction techniques and an optimization of the extraction procedure will be performed considering factors that mainly affect the extraction yield. The second part of the course will concern the explanation of analytical methods to define qualitative and quantitative profile of the bioactive molecules extracts. Specifically spectrophotometric test to determine concentrations of some classes of bioactive molecules, such as phenolic	
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								compounds and anthocyanins, will be presented. Students will learn also assay protocols to determine the antioxidant power of the extract.	
12	Come scrivere le Linee Guida/How to write Guidelines	Elena Biagini	f.grigioni@unicampus.it	8				The modules will include three distinct sections. The first will focus on “classes for recommendations” and “levels of evidence”. The second part will concern on multidisciplinary, systematic reviews of the literature, appropriateness of the study design used, rigour and quality of conduct and analysis of the studies, monitoring indicators. The third part of the course will be dedicated to the possible conflict between the recommendations derived from the Guidelines with the freedom of care claimed by the patient on the one hand, and the symmetric freedom of therapy invoked by the same Code of Ethics of doctors. The representation of all specialist actors (GPs, nurses, patient associations, administrators) in the drafting of Guidelines will be also discussed.	On-line

Language:

ITALIANO

Number of hours for teaching activities:

4

Lecturer/Professor:

MARIA STAIANO-ANTONIO VARRIALE-ALESSIA CALABRESE

Specific Learning objectives:

PROPRIETA' E CARATTERISTICHE DELLE PROTEINE, FLUORESCENZA, IMPEDENZIOMETRIA, CONTAMINAZIONE ALIMENTARE

Specific learning outcomes:

PROGETTAZIONE DI BIOSENSORI

Contents and program:

IL PRIMO MODULO INTRODURRA' I BIOSENSORI (composizione, elementi di riconoscimento molecolare utilizzati ecc).

IL SECONDO MODULO RIGUARDERA' LA TECNOLOGIA UTILIZZATA per la progettazione di biosensori ottici per la sicurezza alimentare.

IL TERZO MODULO RIGUARDERA' UN CASO STUDIO sulla realizzazione di un biosensore impedenziometrico per la detection dell'irrancidimento degli alimenti.

Educational activities and teaching methods:

Knowledge assessment methods and criteria:

Prerequisites

Teaching material:

DIAPOSITIVE

Language:

Italian

Number of hours for teaching activities:

12

Lecturer/Professor:

Marcello De Falco, Francesco Bruno, Marco Facchino, Mauro Capocelli, Matteo Benozzo, Mario Di Giulio

Specific Learning objectives:

The Module is divided into two parts (one engineering and one legal) and into 6 dissections. The first three pertain to the technical-engineering part. The first will concern the criteria and methodology of the Life Cycle Assessment (LCA), the definition of the procedure and of the main outcomes. In the second section, the LCA is applied in energy, food and hospital sectors, with the description of operative case studies. The third section is focused on the Social Life Cycle Assessment (S-LCA) methodology and the holistic application of Life Cycle Thinking (LCT) for sustainability assessment.

In the legal section the focus is on the rules at the international, European, and national levels related to sustainability, climate change, environmental preservation, and human safety. In the fourth section, will be introduced the general legal framework related to environmental issues and climate change. The fifth section will delve into topics related to the remediation of contaminated sites and waste management, and the sixth section it will be analyzed the requirements of Environmental, Social, and Governance (ESG) on a financial level.

Specific learning outcomes:

At the end of the module, students will be able:

- to define the main criteria for sustainability analysis
- to apply LCA in their projects
- to interpret LCA and S-LCA results
- to figure out the legal framework of the sustainability
- to know the legislation on remediation activities and waste management
- to apply ESG on financial level

Contents and program:**1st lesson**

- Introduction
- LCA criteria and methodology

2nd lesson

- LCA application in energy sector
- LCA application in food sector
- LCA application in hospital sector

3rd lesson

- S-LCA criteria and applications

4th lesson

- general legal framework of Environmental Law

5th lesson

- Remediation and waste management

6rd lesson

- ESG

Educational activities and teaching methods:

Lectures presenting the topics of the course and groupworks.

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations. Selected scientific articles and book chapters.

Language:

Italian

Number of hours for teaching activities:

12

Lecturer/Professor:

- *Laura Dugo*
- *Vittoria Locato*
- *Eugenio Benvenuto*
- *Elisa De Arcangelis*

Specific Learning objectives:

The course includes three sections. The first section will deal with the introduction to functional foods with reference to definitions, characteristics and current legislation (EU/non-EU).

A second section will be dedicated to the study of the classes of bioactive molecules of interest for the production of functional foods, with reference to their distribution in raw materials and products of the agri-food industry, molecular characteristics and documented beneficial effects on human health.

The third section, will focus on formulations, technologies and processes used to obtain raw materials enriched in bioactive compounds, and for the production of innovative foods with high nutritional value and sensorial acceptability.

Specific learning outcomes:

- Knowing the main classes of bioactive molecules in food matrices
- Identification/definition of health outcomes related to bioactive molecules/functional foods
- knowledge of the technological strategies to formulate functional foods
- The future of novel foods

Contents and program:

Current legislation on functional foods and outline on novel foods

Plant, as source of bioactive molecules

Bioactive molecules in food matrices: chemistry, bioavailability and metabolism

"Biofortified" plants: engineering food for the future

Innovative foods development and consumer acceptability

Educational activities and teaching methods:

Lectures presenting the topics and case studies

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations and selected scientific articles

Period: February-June 2024

Nota: I campi in rosso sono obbligatori

Language:

Italian

Number of hours for teaching activities:

18

Lecturer/Professor:

Susanna Della Posta, Chiara Fanali, Leone Mazzeo, Alberto Giaconia

Specific Learning objectives:

The modules will include three distinct sections, the first will concern the techniques of pre-treatment, extraction and purification of molecules with high added value contained in waste matrices deriving from various types of industrial processes, as well as the analytical techniques for their quantification. The second part will focus on the design, optimization and industrialization criteria of the production processes described in the first part and on the further use of exhausted matrices for the production of green energy and biofuels. The third part of the course will be dedicated to the technical-economic feasibility analysis of the analyzed processes and on the sustainable integration of processes with renewable sources and new development perspectives.

Specific learning outcomes:

At the end of the module, students will be able:

- to explain and select extraction and analytical techniques for molecules analysis in waste matrices
- to apply the learned techniques and criteria to their PhD project
- to interpret analysis results of their PhD project
- to demonstrate the capability to discuss research articles on the module topics
- to understand management of waste products

Contents and program:

May 2024

1st lesson

- Introduction
- Definition and type of waste products

2nd lesson

- Bioactive molecules extraction methods
- Green extraction methods

3rd lesson

- Analytical methods for bioactive molecules

4th lesson

- Modeling and design of industrial extraction units

5th lesson

- Processes for waste conversion into green energy and biofuels

6th lesson

- Energy assessment of biowaste-to-fuels conversion processes

Educational activities and teaching methods:

Lectures presenting the topics of the course and groupworks.

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations. Selected scientific articles and book chapters.

Nota: I campi in rosso sono obbligatori

Language:

Italian

Number of hours for teaching activities:

14

Lecturer/Professor:

Laura De Gara, Locato Vittoria, Eugenio Benvenuto, Sara Maria Giannitelli

Specific Learning objectives:

The course will introduce the concept of "One Health", illustrating some biotechnological approaches underlying sustainable development relating to the the agri-food and human health systems.

Specific learning outcomes:

Understanding of the relevance of "One-health" paradigm for environment, society and integrated health.

Knowledge of climate change effects on food security.

Knowledge of the methodology to establish and optimise the production of "bioactive" molecules derived from plant cells.

Knowledge on novel herbal medicines: engineering biopharmaceuticals in plants

Understanding of the potential of microfluidic technologies in the age of One-Health.

Knowledge of the methodology to fabricate microfluidic devices for biotechnological applications.

Knowledge of the organ-on-a-chip paradigm: from health to climate/environment care.

Contents and program:

The "One Health" paradigm from an anthropocentric vision to an ecosystemic vision

Climate changes consequences in food yield, security and safety

Plant cultures as sustainable bio-factories of bioactive compounds

Plant molecular farming: a sustainable approach for pharming health-related biomolecules

Microfluidics roadmap: recent trends in the One-Health perspective

Microfluidic technologies for the synthesis of custom-made nanomedicines

Organs-on-a-chip: the "next generation" of predictive models

Educational activities and teaching methods:

Lectures presenting the topics and case studies

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations and selected scientific articles

Period: February-June 2024

Nota: I campi in rosso sono obbligatori

Language:

Italian

Number of hours for teaching activities:

18

Lecturer/Professor:

Trombetta Marcella, Paolo Capriani, Franca Abbruzzese

Specific Learning objectives:

Obiettivo specifico è la formazione di un professionista capace di lavorare in un laboratorio di ricerca responsabilmente e in sicurezza per se stesso, per i Colleghi e per l'ambiente poiché un laboratorio di ricerca può prevedere un rischio fisico, o chimico o biologico o una loro combinazione.

ENG

Specific objective is the training of a professional capable of working in a research laboratory responsibly and safely for himself, for his colleagues and for the environment since a research laboratory can foresee a physical, chemical or biological risk or their combination.

Specific learning outcomes:

Alla fine del Corso:

- si conosceranno i rischi ai quali si è esposti e ai quali si espongono i colleghi durante lo svolgimento della propria attività di ricerca
- si sapranno scegliere i dispositivi di protezione individuale corretti e adeguati alla tipologia d'attività che s'intende svolgere ai sensi della normativa vigente
- si saprà come gestire un rischio fisico
- si sapranno leggere le schede di sicurezza dei prodotti chimici e interpretarne i pittogrammi di pericolo che li caratterizzano ai sensi delle normative vigenti
- si saprà leggere l'etichetta dei reagenti chimici per un corretto uso e smaltimento
- si saprà come detenere, gestire, impiegare, manipolare e smaltire un reagente chimico
- si saprà come intervenire in caso di sversamento
- si saprà come intervenire in caso di una contaminazione o di un avvelenamento
- si saprà come gestire il rischio biologico
- si conoscerà cos'è l'inquinamento, cosa e quali sono le matrici ambientali soggette a inquinamento e si avrà conoscenza del testo unico ambientale
- si conoscerà il rischio all'esposizione alle sostanze radioattive e ionizzanti e le normative di riferimento.

ENG

At the end of the Course:

- the Ph.D. Student will know the risks to which she/he is exposed and to which their colleagues are exposed while carrying out she/he research activity
- the Ph.D. Student will be able to choose the correct and appropriate Personal Protective Equipment for the type of activity she/he intends to carry out in accordance with current legislation
- the Ph.D. Student will know how to manage a physical risk
- the Ph.D. Student will be able to read the safety data sheets of chemical products and interpret the danger pictograms that characterize them in accordance with current regulations
- the Ph.D. Student will be able to read the label of chemical reagents for correct use and disposal
- the Ph.D. Student will know how to possess, handle, use, handle and dispose of a chemical reagent
- the Ph.D. Student will know how to intervene in the event of a spill
- the Ph.D. Student will know how to intervene in the event of contamination or poisoning
- the Ph.D. Student will know how to manage a biological risk
- the Ph.D. Student will know what pollution is, what and what are the environmental matrices subject to pollution and she/he will have knowledge of the Consolidated Environmental Law
- the Ph.D. Student will know the risk of exposure to radioactive and ionizing substances and the current relevant regulations.

Contents and program:

La sicurezza in un Laboratorio di Ricerca: tutela della salute, dell'ambiente e sicurezza sul lavoro

- L'incidente: l'errore diretto e l'errore indiretto

- Sicurezza sul lavoro e responsabilità professionale, il D.Lgs. 81/08
- I rischi fisici, chimici e biologici
- La scelta dei corretti Dispositivi di Protezione Individuale in relazione alla categoria di rischio
- La gestione del rischio fisico
- Cosa sono le sostanze pericolose: le schede MSDS, il Regolamento (CE) n. 1907/2006 (REACH) e il Regolamento (UE) n. 453/2010
 - o Come leggere l'etichetta dei reagenti chimici per un corretto uso e smaltimento
 - o Detenzione, gestione, impiego, manipolazione e smaltimento delle sostanze chimiche
 - o La gestione di uno sversamento
 - o La gestione di una contaminazione o di un avvelenamento
- La gestione del rischio biologico
- Le tipologie d'inquinamento e le matrici ambientali, il Testo Unico Ambientale D.Lgs. n. 152 del 03/04/2006 e s.m.i.
- Sostanze radioattive e radiazioni ionizzanti, i D.Lgs. n. 101 del 31/07/2020 e D.Lgs. n. 203 del 25/12/2022

ENG

Security and Safety in a Laboratory of Research: protection of the health, of the environment and safety at work

- The incident and the accident: Active failure and latent failure
- Safety at work and professional responsibility, the D.Lgs. 81/08
- Physical, chemical and biological risks
- The choice of the correct Personal Protective Equipment in relation to the risk category
- Physical risk management
- What dangerous substances are: the MSDS sheets, the Regulation (EC) n. 1907/2006 (REACH) and the Regulation (UE) n. 453/2010
 - o How to read the label of chemical reagents for correct use and disposal
 - o Possession, management, use, manipulation and disposal of chemical substances.
 - o Management of a spill
 - o The management of a contamination or poisoning
- Biological risk management
- The types of pollution and the environmental matrices, the Consolidated Environmental Law D.Lgs. n. 152 del 03/04/2006 e s.m.i.
- Radioactive substances and ionizing radiations, D.Lgs. n. 101 del 31/07/2020 e D.Lgs. n. 203 del 25/12/2022

Educational activities and teaching methods:

Lectures presenting the topics of the course, groupworks and laboratory activities.

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations, MSDS and D.Lgs. schedules

Language:

Italian

Number of hours for teaching activities:

12

Lecturer/Professor:

Claudia Di Rosa, Silvia Spoto

Specific Learning objectives:

Modules include an in-depth overview of the pathophysiological mechanisms leading to inflammation with endothelial barrier dysfunction to the establishment of organ damage due to infectious disease (severe viral and bacterial infections-COVID-19, CMV infection, infected ulcers, sepsis-) or inflammatory disease (rheumatoid arthritis, systemic lupus erythematosus) and the role of nutrition and supplementation in their prevention and management.

The role of nutrition in CARS (Compensatory Anti-inflammatory Response Syndrome) and PICS (Persistent inflammation, Immunosuppression and Catabolism Syndrome) Syndromes, LONG COVID on survival, recovery and limitation of further secondary infections, including those sustained by opportunistic germs, will be highlighted.

How nutrition and supplements can contribute to decolonization from multidrug-resistant germs will also be the subject of the module.

Specific learning outcomes:

Upon completion of the module, students will be able to:

- know the pathophysiological principles that predispose humans to infections and how knowledge of nutritional principles can prevent or counteract the occurrence of such infections, limit their severity or extent, and improve their outcome.
- to apply the learned knowledge and criteria to their PhD project
- to demonstrate the capability to discuss research articles on the module topics
- To understand management of infectious and inflammatory diseases

Contents and program:

May 2024

1st lecture

Introduction

-Definition and pathophysiological mechanisms leading to inflammation with endothelial barrier breakdown and organ damage due to infectious diseases (severe viral and bacterial infections-COVID-19, CMV infection, infected ulcers, sepsis-).

-Nutrition and supplementation in prevention and management of infectious diseases.

2nd lecture

- Role of nutrition in CARS (Compensatory Anti-inflammatory Response Syndrome) and PICS (Persistent inflammation, Immunosuppression and Catabolism Syndrome), LONG COVID on survival, recovery and limitation of further secondary or opportunistic infections.

-Pathophysiological implications from the state of colonization by multidrug-resistant organisms (MDRO) to the development of infections caused by the same pathogens;

-Role of nutrition and experimental therapies in decolonization.

3rd lecture

-Definition and pathophysiological mechanisms leading to inflammation with endothelial barrier breakdown and organ damage due to Rheumatoid Arthritis.

-Nutrition and supplementation in its prevention and management.

Lecture ^{4a}

-Definition and pathophysiological mechanisms leading to inflammation with endothelial barrier breakdown and organ damage due to Systemic Lupus Erythematosus.

-Nutrition and supplementation in its prevention and management.

Educational activities and teaching methods:

Lectures presenting the topics of the course and groupworks.

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations. Selected scientific articles and book chapters.

Nota: I campi in rosso sono obbligatori

Microrganismi funzionali e strategie bio-tecnologiche per la produzione di alimenti salutistici

Language:

Italian

Number of hours for teaching activities:

8

Lecturer/Professor:

Gianfranco Pannella

Specific Learning objectives:

L'insegnamento di "Microrganismi funzionali e strategie bio-tecnologiche per la produzione di alimenti salutistici" sarà suddiviso in due sezioni. Nella prima parte saranno trattati i temi riguardanti i probiotici, prebiotici e post-biotici, con particolare riferimento alle strategie di selezione. Quest'ultimo aspetto sarà affrontato anche dal punto di vista dell'impiego di approcci bioinformatici. Per quanto riguarda la seconda parte dell'insegnamento, l'attenzione sarà focalizzata sullo studio di strategie bio-tecnologiche innovative per la produzione di alimenti ad elevato impatto salutistico.

Specific learning outcomes:

Alla fine del modulo gli studenti saranno in grado di:

- Conoscere le tecniche per la selezione e la produzione di microrganismi probiotici
- Conoscere le tecniche per la selezione e la produzione di post-biotici
- Comprendere l'impatto dei microrganismi sulle proprietà funzionali di alimenti fermentati
- Applicare le conoscenze acquisite in un contesto multidisciplinare
- Integrare le conoscenze acquisite con le attività di ricerca svolte nell'ambito del proprio progetto di dottorato

Contents and program:

Giugno-luglio 2025

Lezione 1

- Introduzione ai probiotici e prebiotici
- Strategie di impiego nel settore alimentare

Lezione 2

- Processo di selezione di probiotici e di post-biotici
- Utilizzo di risorse bioinformatiche per la selezione di probiotici

Lezione 3

- Alimenti funzionali fermentati

Lezione 4

- Effetto salutistico dei prodotti ottenuti dalla fermentazione degli alimenti

Educational activities and teaching methods:

Lezioni frontali

Knowledge assessment methods and criteria:

Nessuno

Prerequisites:

Nessuno

Teaching material:

Presentazione degli argomenti con powerpoint e articoli scientifici.

Tools bioinformatici.

Nota: I campi in rosso sono obbligatori

Language:

Italian

Number of hours for teaching activities:

16

Lecturer/Professor:

Annamaria Altomare

Specific Learning objectives:

The course aims to explore the role of the intestinal barrier in the pathophysiological mechanisms of chronic gastrointestinal disorders and their interaction with foods. Current gold standard techniques for studying mucosal permeability and intestinal microbiota will be analyzed. The interaction of foods with modifying the intestinal mucosal barrier will also be explored and how this interaction can play a role in the genesis of chronic gastrointestinal disorders. Finally, the role of prebiotics, probiotics, and postbiotics in modulating the intestinal mucosal barrier and the most current research frontiers in this area will be addressed.

Specific learning outcomes:

At the end of the module, students will be able:

- to know the current gold standard techniques for studying the gastrointestinal barrier, with a focus on the intestinal microbiota
- to better understand the role of food in the modulation of the intestinal mucosal barrier
- to better understand and interpret the Literature about the course topics
- to develop a research project regarding the main factors involved in the modulation of the intestinal mucosal barrier

Contents and program:

January-July 2025

1st lesson (January): 17 febbraio 2024 ore 14:00-16:00

- Introduction
- Intestinal mucosal barrier: definition and histological techniques for studying intestinal mucosal permeability
- Ussing chambers system: current applications in translational research

2nd lesson (February) 17 marzo 2024 14.00-16.00

- Gastrointestinal microbiota and mucosal barrier: current evidence and perspectives
- microbiome, virome and intestinal mycoma: exploring the role in human health

3th lesson (april) 7 aprile 2024 ore 12:00-14:00

- Intestinal mucosal barrier and involvement in chronic gastrointestinal disorders
- Modulation of the intestinal barrier: role of butyric acid.
- Prebiotics and probiotics: current evidence in Gastroenterology

3rd lesson (march) 19 maggio 2024 ore 14:00-16:00

- Role of the intestinal microbiota in the genesis of chronic intestinal disorders
- Intestinal microbiota analysis tests and clinical implications in gastroenterology

5th lesson (may) 29 maggio 2024 17:00-19:00

Conference about the interaction between intestinal microbiota, environment, lifestyle and health promotion

6th lesson (june) 16 giugno 2024 14:00-16:00

- Interaction between foods and the intestinal mucosal barrier
- Eating habits and modulation of intestinal mucosal permeability

7th lesson (July) **7 luglio 2024 14:00-16:00**

- presentation of a multidisciplinary project developed by each participant starting from the course contents

Educational activities and teaching methods:

Lectures presenting the course topics. Experts on some of the topics will be involved in tandem talks. Some nutraceutical companies, and leaders in this field, will be invited to illustrate the current directions in the development of new products capable of modulating the intestinal mucosal barrier.

Knowledge assessment methods and criteria:

During the course, all participants will be encouraged to develop a proposal for an interdisciplinary research project that explores a theme of the course. The projects will be presented by the participants during the last meeting.

Prerequisites:

None

Teaching material:

Powerpoint presentations. Selected scientific articles and book chapters.

Language:

Italian

Number of hours for teaching activities:

8

Lecturer/Professor:

Susanna Della Posta

Specific Learning objectives:

The modules will include two sections based each on one frontal lecture followed by practical lesson of experimental activity. During the first section, students will learn about possible extraction techniques to apply in order to produce extract rich in bioactive molecules such as solid-liquid extraction (SLE), Matrix Solid-Phase Dispersion Extraction (MSPD) and Ultrasound assisted extraction (UAE).

Solid-liquid extractions are based on the addition of an extraction solvent to the solid sample, followed by the homogenization of the mixture using a vortex, and the recovery of the extract that could be concentrated evaporating the solvent using specific instrument.

Usually these extraction procedures are performed using organic solvents as methanol, acetonitrile, or mixture of organic solvents with water. During this first section of the course innovative strategies to recover bioactive molecules from different matrices will be explained.

Specifically the preparation and use of deep eutectic solvents (DESs) will be presented and successively performed during the experimental activity.

DESs will apply as extraction solvents in different extraction techniques and an optimization of the extraction procedure will be performed considering factors that mainly affect the extraction yield.

The second part of the course will concern the explanation of analytical methods to define qualitative and quantitative profile of the bioactive molecules extracts. Specifically spectrophotometric test to determine concentrations of some classes of bioactive molecules, such as phenolic compounds and anthocyanins, will be presented.

Students will learn also assay protocols to determine the antioxidant power of the extract.

Specific learning outcomes:

- To learn theoretical aspects about new innovative extraction techniques and how to apply them in the laboratory.
- To prepare and apply innovative green extraction solvents
- Learn different analytical methods for characterizing the obtained extracts

Contents and program:

May 2025

1st lesson

- Introduction
- Green extraction methods and deep eutectic solvents

2nd Practical lesson

- Practical experience on the theoretical notions of the previous lesson.

3rd lesson

- Analytical methods for bioactive molecules determination in the extract

4th Practical lesson

- Practical experience on the theoretical notions of the previous lesson.

Educational activities and teaching methods:

Lectures presenting the topics of the course and practical lesson

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations. Selected scientific articles and book chapters.

Nota: I campi in rosso sono obbligatori

Language:

Italian

Number of hours for teaching activities:

8

Lecturer/Professor:

Elena Biagini

Specific Learning objectives:

The modules will include three distinct sections. The first will focus on “classes for recommendations” and “levels of evidence”. The second part will concern on multidisciplinary, systematic reviews of the literature, appropriateness of the study design used, rigour and quality of conduct and analysis of the studies, monitoring indicators. The third part of the course will be dedicated to the possible conflict between the recommendations derived from the Guidelines with the freedom of care claimed by the patient on the one hand, and the symmetric freedom of therapy invoked by the same Code of Ethics of doctors. The representation of all specialist actors (GPs, nurses, patient associations, administrators) in the drafting of Guidelines will be also discussed.

Specific learning outcomes:

At the end of the module, students will be able to have knowledge about:

- identification of the recipients of the LG;
- definition of the objectives;
- definition of the working methods;
- formalization and organization of the working group;
- definition and sharing of the methodologies to be followed (search for primary and secondary sources, criteria for systematic reviews, sharing of the grading scheme chosen), if necessary also through a short training process for the members of the group;
- analysis of the available evidence on the topic (primary research or systematic review)
- search in databases of existing evidence-based guidelines;
- drafting of a draft GL containing recommendations and indicators;
- sending the draft to external referees;
- preparation of the final document.

Educational activities and teaching methods:

Lectures presenting the topics of the course and groupworks.

Knowledge assessment methods and criteria:

None

Prerequisites:

None

Teaching material:

Powerpoint presentations. Selected scientific articles and guidelines.