



IMMC13

13th International Medicinal
Mushrooms Conference

— 22 - 25 September 2026 | Bragança, Portugal —

BOOK OF ABSTRACTS

MEDICINAL MUSHROOMS FOR A
SUSTAINABLE FUTURE IN FOOD & HEALTH



Universidade
Politécnica
Bragança



Centro de
Investigação
de Montanha



Associate
Laboratory for
Sustainability
and Technology
in Inland Regions

TECHNICAL DATA

Title

13th International Medicinal Mushrooms Conference – *Medicinal Mushrooms for a Sustainable Future in Food & Health*

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WELCOME TO THE IMMC13



IMMC13

13th International Medicinal Mushrooms Conference

———— 22 - 25 September 2026 | Bragança, Portugal ————

The **International Medicinal Mushrooms Conference (IMMC)** is widely recognized as the leading global scientific event dedicated exclusively to medicinal mushrooms. Since its first edition in Kyiv, Ukraine, in 2001, the conference has travelled across Europe, Asia, North America, and South America, reflecting the remarkable international growth of medicinal mushroom research.

What makes **IMMC** unique is its ability to bring together diverse communities around a common interest. Researchers working in fungal biology, biotechnology, nutrition, medicine, pharmacology, ecology, food science, and public health meet alongside industry leaders, mushroom growers, healthcare professionals, entrepreneurs, and policy makers. Few scientific conferences successfully bridge science, industry, and society in such a comprehensive way.

Over the past 25 years, medicinal mushrooms have evolved from a niche research topic into one of the most dynamic areas of functional foods, nutraceuticals, biotechnology, microbiome science, and sustainable health solutions. Scientific publications have increased exponentially, while global consumer interest in species such as Lion's Mane, Reishi, Cordyceps, and Turkey Tail continues to grow.

The **13th International Medicinal Mushrooms Conference (IMMC13)**, to be held in **Bragança, Portugal**, from **22–25 September 2026**, arrives at a particularly exciting moment for the field. Emerging topics such as precision nutrition, artificial intelligence-assisted discovery, microbiome interactions, circular bioeconomy, sustainable food systems, and the therapeutic potential of psychedelic mushrooms are reshaping both research and industry.

Under the theme *Medicinal Mushrooms for a Sustainable Future in Food & Health*, **IMMC13** will explore how fungi can contribute to healthier populations, more resilient food systems, innovative biotechnological solutions, and a more sustainable future.

Bragança was selected not only as a conference destination but also as a symbolic location. Situated in one of Europe's most biodiverse mountain regions, Northeast Portugal combines rich mycological traditions, extensive natural ecosystems, and internationally recognized scientific expertise through the **Mountain Research Centre (CIMO)** and the **Bragança Polytechnic University (UPB)**. The region is well known for its wild mushroom diversity and its long-standing cultural connection with forest resources.

The **IMMC13** is structured around ten core topics:

- Sustainable Innovation in Mushrooms
- Personalized Nutrition & Precision Medicine
- Agro-food Systems & Circular Integration
- AI & Omics in Medicinal Mushroom Research
- Climate Resilience via Ecosystem Services
- Cultural Heritage & Biocultural Conservation
- Ethics, Safety & Regulatory Foresight
- Public Health & Policy Applications
- Therapeutic Potential of Psychedelic Mushrooms
- Microbiome-Mycotherapy Interactions

IMMC13 Executive Chair, Lillian Barros:

Medicinal mushrooms represent one of the most fascinating intersections between traditional knowledge and modern science. They connect health, nutrition, biotechnology, sustainability, and biodiversity in a way that very few natural resources can.

For many years, medicinal mushrooms were considered a niche topic. Today, they are at the center of discussions on functional foods, precision nutrition, microbiome research, and sustainable health solutions. IMMC13 will showcase how rapidly this field is evolving and where the next scientific breakthroughs may emerge.

One of our main goals is to strengthen dialogue between scientists, industry leaders, healthcare professionals, and policy makers. The future impact of medicinal mushrooms will depend on our ability to work together across disciplines and transform scientific knowledge into real-world solutions.

Bragança is the perfect place to host this conversation. It is a region where biodiversity, traditional knowledge, and scientific innovation naturally coexist, offering an inspiring setting for international collaboration.

We hope participants leave IMMC13 not only with new scientific knowledge, but also with new collaborations, new ideas, and a renewed vision of how fungi can contribute to a healthier and more sustainable future.

For the first time, **Portugal** will host the **IMMC**, bringing one of the world's most influential scientific events on medicinal mushrooms to a region internationally recognized for its fungal biodiversity, mushroom traditions, and commitment to sustainability. At a time when mushrooms are increasingly attracting attention from researchers, healthcare professionals, food innovators, and investors worldwide, **IMMC13** provides a timely platform to discuss how fungi can help address some of society's most pressing challenges, from human health and nutrition to climate resilience, circular bioeconomy, and sustainable development.

All the information contained in this Book of Abstracts is accurate at the time of its publication. The Conference Organizers reserve the right to make modifications.

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Portugal*

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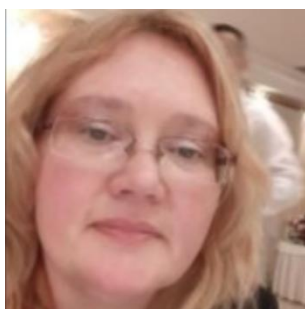
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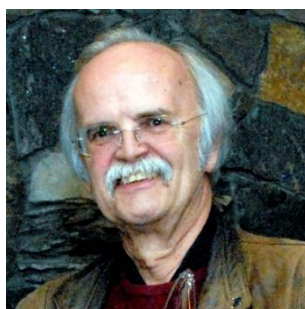
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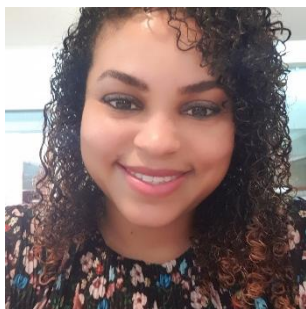
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GENERAL INFORMATION

Conference venue

The IMMC13 will take place across two distinctive venues in Bragança, Portugal, combining the city's cultural heritage with a modern and welcoming setting for scientific exchange.

The first day of the conference, including the Opening Session and Scientific Program, will be held at the **Teatro Municipal de Bragança**, located in the heart of the city's historic center. One of Bragança's most prominent cultural and architectural landmarks, the theatre provides a unique and inspiring setting for the beginning of IMMC13, bringing together science, culture, and the distinctive character of the city.

Day 1

Tuesday

22nd September

14:00 – 18:00

Bragança Municipal Theatre

Praça Professor Cavaleiro Ferreira

5300-252

Bragança, Portugal



The remaining conference program will take place at the **Exe São Lázaro Hotel**, where participants will find a modern, comfortable, and welcoming environment designed to encourage scientific exchange, networking, and collaboration. Conveniently located approximately 2 km from the historic center of Bragança, the hotel offers an ideal setting for bringing together the international medicinal mushroom community while remaining close to the city's rich cultural heritage.

Day 2-4

Wednesday – Friday

23rd to 25th September

09:00 – 18:00

Exe São Lázaro Hotel

Avenida do Sabor, N° 2

5300-367

Bragança, Portugal



Getting to and from the venue

You can use private transportation (taxi) to get to the congress venue.

Registration and information desk

The Registration Desk will be available throughout the conference, with its location changing according to the conference program.

On the morning of 22 September, registration and information services will be available at the Armindo Correia Room, Exe São Lázaro Hotel.

In the afternoon of 22 September, the Registration Desk will move to the entrance hall of the Bragança Municipal Theatre, where it will welcome participants attending the opening program.

From 23 to 25 September, the Registration Desk will be located at the Armindo Correia Room, Exe São Lázaro Hotel, and will remain available throughout the conference to assist participants with registration and general information.

All attendees must be registered for the conference.

Please proceed to the Registration Desk to collect your badge and conference materials. Admission to the conference is permitted only to those wearing the official conference badge. If a badge is lost or misplaced, please contact the Registration Desk.

Internet access

A wireless network will be available at Exe São Lázaro Hotel. Please contact the Information Desk to obtain the username and password, if needed.

Smoking policy

As of 1 January 2008, Portuguese legislation prohibits smoking in all public places, including cafés, bars, and restaurants (except in designated smoking areas). Smoking is permitted only outside the conference venue.

Electricity supply

The standard voltage in Portugal is 220 V. If you need a plug or power adapter, you can purchase one at electronics stores.

Transportation

In Bragança, a city bus service is available for travel around the city center. Bus tickets start from 2.50 €. For more route options, please visit:

<https://bus.cm-braganca.pt/routes>

Taxis operate 24 hours a day and can be ordered from the conference venue or your hotel. Taxis can also be hailed on the streets if they display a green light with the word "TAXI". Please avoid using unlicensed taxis, which are ordinary cars operated by drivers soliciting fares on the street.

Renting a car can be a convenient option if you plan to stay in areas farther from the city center. Car rentals are generally affordable, and having a car allows you to take longer trips. However, to fully experience the city, it is best to explore the city center on foot, as many of its charming streets are accessible only by walking.

Emergencies

For police, ambulance, or fire services, dial 112.

Weather

For up-to-date weather information, please visit the Portuguese Meteorology Institute website:

<https://www.ipma.pt/pt/index.html>

Tourism and leisure

The conference venue is located just 2 km from the historical center of Bragança. Step outside and enjoy the city! For more information, please visit:

<https://turismo.cm-braganca.pt/>

Currency

Portugal uses the Euro (€). Traveler's cheques can be exchanged for cash at banks and currency exchange offices.

Liability

The IMMC13 Organizing Committee of the conference accepts no liability for personal injuries or loss/damage to personal property incurred during, or as a result of, the conference or its social events. The IMMC13 Organizing Committee reserves the right to make any changes, modifications, or omissions to the information published in this book.

Insurance

The IMMC13 Organizers cannot accept any responsibility for personal accidents and damage to the private property of Conference and Exhibition Delegates.

CONFERENCE PARTICIPATION

Certificate of Attendance

All registered participants will receive a Certificate of Attendance for the IMMC13 via email within a few days following the conclusion of the conference.

Certificate of Presentation

Participants who delivered a presentation at the IMMC13 will receive a Certificate of Presentation via email within a few days following the conclusion of the conference.

Photography policy

Recording and photographing conference presentations is permitted. Participants are kindly encouraged to share their conference experience on social media and, when doing so, to use the official hashtag **#IMMC13**.

SCIENTIFIC INFORMATION

Reflective lecture

One Reflective Lecture will take place, with a duration of 45 minutes.

Plenary lecture

A total of **eight** Plenary Lectures will be held, each lasting 40 minutes.

Keynote lecture

A total of **eight** Keynote Lectures will be held, each lasting 25 minutes.

Industrial lecture

A total of **four** Industrial Lectures will be held, each lasting 15 minutes.

Oral presentation

A total of **forty-three** Oral Presentations will be held, each lasting 10 minutes.

Please check your Oral Presentation code in the Oral Presentation List included in this book.

Roundtable

One roundtable will be held during the IMMC13, addressing key aspects of the current scientific and industrial landscape of medicinal mushroom research and innovation.

This 1-hour session will bring together scientific and industrial perspectives on the challenges and opportunities shaping medicinal mushroom research and innovation. It will explore how scientific advances can be translated into innovative applications and products, while fostering stronger connections between academia and industry. The discussion will address emerging trends, innovation pathways, and future opportunities to advance the field and strengthen the impact of medicinal mushroom research.

Thought exchange

At the conclusion of each presentation, a dedicated Q&A session will provide an opportunity for discussion and interaction with the speaker.

Presentations upload

All conference presentations will all take place in the Armindo Correia Room at Exe São Lázaro Hotel. Personal computers will not be allowed for presentations; speakers may use their personal USB drives. Accepted formats are PowerPoint (.pptx) or PDF.

An IT Desk will be available on-site. All speakers must upload their presentations at least **two hours** before the start of their respective session.

E-Poster presentation

A total of **thirty-eight** Poster Presentations will be held will be displayed on LCD monitors in the hall of the Armindo Correia Room at Exe São Lázaro Hotel throughout the three days of the conference as part of the scientific program.

The poster should be prepared in the official IMMC13 template saved in PowerPoint (.pptx).

Please check your Poster code in the Poster List included in this book.

Poster presentations will take place during the coffee breaks and lunches on each conference day. Presenters are expected to be on their posters during these breaks to engage with attendees and answer questions.

Awards

To recognize excellence in scientific research and presentation, IMMC13 will present awards for the best oral and poster presentations.

All presentations will be evaluated by an expert panel appointed by the IMMC13 Scientific Committee. The highest-scoring contributions will receive the IMMC13 Awards, which will be presented during the Closing Ceremony.

Student Awards

Student Awards are open exclusively to Master's and PhD students.

Best Oral Communication

#	DESCRIPTION	SPONSOR
First Award	€ 900 in scientific editing and publication support services	ReadyToPub – Author Services Provider
Second Award	€ 200 voucher in products	Enzymatic SA

Best Poster Communication

#	DESCRIPTION	SPONSOR
First Award	€ 600 in scientific editing and publication support services	ReadyToPub – Author Services Provider

Researcher Awards

Researcher Awards are open to all other participants.

Best Oral Communication

#	DESCRIPTION	SPONSOR
First Award	€ 300 voucher	Food & Function (Royal Society of Chemistry)
Second Award	100% APC waiver for publication	Pharmaceuticals (MDPI)
Third Award	50% APC waiver for publication	Pharmaceuticals (MDPI)

Best Poster Communication

#	DESCRIPTION	SPONSOR
First Award	100% APC waiver for publication	Pharmaceuticals (MDPI)
Second Award	50% APC waiver for publication	Pharmaceuticals (MDPI)

Conference Awards & APC Benefits

To recognize outstanding contributions, the IMMC13 Scientific Committee will evaluate and select the winners for the Best Oral Communication and Best Poster Communication. The APC benefits for these awards are generously sponsored by Pharmaceuticals (MDPI). Authors whose award-winning research is published as an extended version in this Special Issue will receive the following exclusive publication support. APC benefits will be applied upon acceptance and verification of the award status.

Innovation Awards

Innovation Awards are open to all participants.

Best Oral and Poster Communication

Type	DESCRIPTION	SPONSOR
Cordyceps Products	€ 300 for the winning study on Cordyceps products containing 10,000 ppm cordycepin	C&G
Beauty Products	€ 300 for the winning study on K-beauty products	KNS Uncles
Bioinformatics	€ 500 for the winning bioinformatics study	In Silico BioSolutions

Awards Supported by



Special Issue

We are pleased to announce that IMMC13 has partnered with *Nutrients* and *Pharmaceuticals* to host a dedicated Special Issue for extended versions of conference papers. This collaboration provides a high-quality, open-access publication pathway for our research community to share complete and refined versions of our proceedings.

Nutrients

Title	Medicinal Mushrooms as Sustainable Sources of Functional Foods and Nutraceuticals
Guest Editors	Dr. Lillian Barros, Bragança Polytechnic University, Portugal Dr. Ewa Zapora, Bialystok University of Technology, Poland Dr. Marina Soković, University of Belgrade, Serbia
Submission Deadline	30 September 2027
Editorial Inquiries	amelia.wang@mdpi.com

Pharmaceuticals

Title	Mushroom-Derived Bioactives: From Discovery to Therapeutic Application
Guest Editors	Dr. Lillian Barros, Bragança Polytechnic University, Portugal Dr. Giuseppe Venturella, University of Palermo, Italy Dr. Sara Vieira, Bragança Polytechnic University, Portugal
Submission Deadline	31 December 2026
Editorial Inquiries	galen.chen@mdpi.com

Extended Submissions Open to All

All conference presenters and attendees are warmly invited to submit extended versions of their work to both Special Issue. We encourage you to build upon your conference presentations with additional experiments, comprehensive analyses, or detailed discussions, and share your complete findings with the global academic community. We look forward to supporting your research journey and celebrating outstanding work at IMMC13!

SOCIAL EVENTS

Different activities have been planned to give participants the opportunity to explore the city, its culture, and traditions.

Typical Portuguese dishes with a contemporary twist, accompanied by a selection of Portuguese wines, will be served.

The social events will also feature dynamic performances, including traditional cultural presentations, ensuring an unforgettable experience!

Please inform the IMMC13 Organizing Committee of any dietary requirements.

Social events are open to participants who have confirmed their attendance. Transportation to and from the venues will be provided by the IMMC13 Organizing Committee.

Coffee breaks & lunches

Coffee breaks and lunches during the conference are free for registered participants who have confirmed their attendance.

Coffee Breaks - served in the hall of the conference room:

- Day 2, Wednesday, 23rd: 11:10 – 11:35 and 15:50 – 16:20
- Day 3, Thursday, 24th: 11:00 – 11:30
- Day 4, Friday, 25th: 10:20 – 11:00

Lunches - served at Lázaro's Restaurant, at the Exe São Lázaro Hotel.

- Day 2, Wednesday, 23rd: 12:35 – 14:30
- Day 3, Thursday, 24th: 12:45 – 14:30

On Day 4, Friday, 25th, a specially prepared lunch box will be available to participants by 12:30.

The science is only part of the experience

Our Social Program is filled with surprises!

Beyond the Scientific Program, we will take you into the history, culture, gastronomy, and traditions of Bragança and showcase the very best of Trás-os-Montes.

BRAGANÇA WITH HISTORY

Sunset at the Castle

22nd | 19:30 – 21:30

Our Social Program will begin with an evening at **Bragança Castle**, in a setting that combines history, heritage, and the beautiful atmosphere of sunset.

This event will have the spirit of a Welcome Cocktail, with food and drinks, offering the perfect opportunity to meet fellow participants, enjoy the surroundings, and officially begin the IMMC13 experience.

BRAGANÇA WITH CULTURE

*Bread & Wine at the
Museum*

23rd | 19:30 – 22:00

On the second evening, we will gather at the **Abade de Baçal Museum** for an experience celebrating local culture and gastronomy.

Food, wine and tradition will come together in a unique setting, offering participants the opportunity to discover some of the cultural and gastronomic heritage of the region.

TRADITIONAL VILLAGE VISIT

Rio de Onor

24th | 16:30 – 19:30

We will visit **Rio de Onor**, a traditional village in the Bragança region that is shared between Portugal and Spain. On one side is Rio de Onor, while on the other side of the border is Rihonor de Castilla, which is why it is often described as *one village, two countries!*

During the visit, participants will have the opportunity to explore this unique cross-border community and enjoy a small traditional afternoon snack.

BRAGANÇA WITH ELEGANCE

Gala Dinner

24th | 19:30 – 22:30

Following our visit to Rio de Onor, we will continue to **Quinta da Carvalhinha** for the IMM13 Gala Dinner.

An evening of good food and celebration, providing the perfect opportunity to come together and celebrate the connections, ideas and experiences created throughout the conference.

BRAGANÇA WITH FLAVOR

Wine Masterclass

22nd | 10:00 – 12:00

25th | 14:00 – 16:00

Altitude & Old Vines – The Unique Terroir of Trás-os-Montes

We invite you to discover the unique identity of Trás-os-Montes, exploring how altitude, native grape varieties, and old vines come together to create wines of elegance, freshness, and character.

Getting around

All activities are part of the IMMC13 Social Program and have been carefully scheduled so that they will not overlap any scientific sessions, allowing participants to enjoy the IMMC13 Social Program without missing any part of the Scientific Program.

Transportation to and from the activities will be provided by the IMMC13 Organizing Committee according to the scheduled departure and return times.

We hope you will join us in discovering Bragança beyond the conference rooms - through its history, culture, flavors, landscapes and traditions!

Come for science. Stay for the connections. And discover Bragança with us.

AGENDA

Day 1 | Tuesday, 22 September

Registration & Welcome

09:00 Registration

10:00 Wines of Trás-os-Montes
Masterclass

Vinhos de Trás-os-Montes

Welcome Ceremony

14:00 Prelude to IMMC13

Trio Majestoso

14:15 Welcome Ceremony

Lillian Barros (IMMC13 Executive
Chair)

Orlando Rodrigues (UPB)

Isabel Ferreira (CMB)

Session 1 | Sustainable Innovation in Mushrooms

15:00 Reflective Lecture

Giuseppe Venturella (UNIPA)

15:45 Plenary Lecture

Paul Stamets (Fungi Perfect)

16:30 Plenary Lecture

Marin Berovič (Academy of
Engineering)

17:15 Harmony Beyond Science

Trio Majestoso

19:30 Bragança with History - Sunset at
the Castle

Bragança Castle

Day 2 | Wednesday, 23 September

Session 2 | Personalized Nutrition & Precision Medicine

- 09:00 Plenary Lecture**
J. Alfredo Martínez (IMDEA Nutrition)
- 09:40 Keynote Lecture**
Liudmila Kalitukha (Good Feeling Products)
- 10:05 Industrial Lecture**
Eric Puro (KÄÄPÄ Biotech)
- 10:20 Industrial Lecture**
Chris Fields (Applied Food Sciences)
- 10:35 Industrial Lecture**
Rojison Koshy (Ujala Life Sciences)
- 10:50 Industrial Lecture**
Per Björk (100% Natural)
- 11:05 Journal Launch**
Omon Isikhuemhen (N. C. A&T) & Ayman Turk (In Silico Bio-Solutions)
- 11:10 Coffee Break | E-Poster Session**
- 11:35 Oral Presentation Session**
- 12:35 Lunch | E-Poster Session**

Session 3 | Agro-food Systems & Circular Integration

- 14:30 Plenary Lecture**
Manuela Pintado (UCPorto)
- 15:10 Plenary Lecture**
John Holliday (Highland Mushrooms)
- 15:50 Coffee Break | E-Poster Session**
- 16:20 Keynote Lecture**
Georgios I. Zervakis (AUA)
- 16:20 Keynote Lecture**
Omon Isikhuemhen (N. C. A&T)
- 16:45 Oral Presentation Session**
- 19:30 Bragança with Culture – Bread & Wine at the Museum**
Abade de Baçal Museum

Day 3 | Thursday, 24 September

Session 4 | AI & Omics in Medicinal Mushroom Research

09:00 Plenary Lecture
Boris Jakopović (Dr Myko San)

09:40 Keynote Lecture
Eva Tejedor-Calvo (CITA)

10:05 Oral Presentation Session

Session 5 | Climate Resilience via Ecosystem Services

09:40 Keynote Lecture
José-Antonio Bonet (Agrotecnio)

10:05 Oral Presentation Session

Session 6 | Cultural Heritage & Biocultural Conservation

10:35 Keynote Lecture
Dennis Walker (Mycopreneur)

11:00 Coffee Break | E-Poster Session

Session 7 | Ethics, Safety & Regulatory Foresight

11:30 Keynote Lecture
Ayman Daba (Doctor's Data)

11:55 Oral Presentation Session

12:35 Lunch | E-Poster Session

Session 8 | Public Health & Policy Applications

14:30 Plenary Lecture
Ulrike Lindequist (UG)

15:10 Keynote Lecture
Ángel R. Trigos (UV)

15:35 Oral Presentation Session

17:30 Traditional Village Visit
Rio de Onor

19:30 Bragança with Elegance - Gala Dinner
Quinta da Carvalhinha

Day 4 | Friday, 25 September

Session 9 | Therapeutic Potential of Psychedelic Mushrooms

09:00 Plenary Lecture

Albino Oliveira-Maia (Champalimaud Foundation)

14:00 Wines of Trás-os-Montes Masterclass

Vinhos de Trás-os-Montes

09:40 Oral Presentation Session

10:20 Coffee Break | E-Poster Session

11:00 Roundtable

Moderator: Eric Puro (KÄÄPÄ Biotech)

100% Natural (Per Björk, ES)

Highland Mushrooms (John Holliday, USA)

Mycology Research Laboratories (David Law, UK)

Ujala Life Sciences (Rojison Koshy, IN)

12:00 Awards

12:15 Final Remarks

Lillian Barros (IMMC13 Executive Chair)

12:30 Lunch Boxes | E-Poster Session

SCIENTIFIC PROGRAM

Day 1 | Tuesday, 22 September

Session Registration & Welcome

Venue Rio de Onor Room, Exe São Lázaro Hotel

09:00 – 12:00 Registration

10:00 – 11:30 Wines of Trás-os-Montes Masterclass

Trás-os-Montes Altitude & Old Vines – The Unique Terroir of Trás-os-Montes
Vinhos de Trás-os-Montes

13:00 – 14:00 Transfer by Bus

Exe São Lázaro Hotel → Bragança Municipal Theatre

Session Welcome Ceremony

Venue Bragança Municipal Theatre

14:00 – 14:15 Prelude to IMMC13

Léo Delibes – The Nightingale
Trio Majestoso

14:15 – 15:00 Welcome Ceremony

Lillian Barros
Universidade Politécnica de Bragança, IMMC13 Executive Chair
Orlando Rodrigues
Universidade Politécnica de Bragança
Isabel Ferreira
Câmara Municipal de Bragança

Session 1 | Sustainable Innovation in Mushrooms

Venue Bragança Municipal Theatre
Chair João Barreira

15:00 – 15:45 Reflective Lecture

RL1.1 | Medicinal Mushrooms: Multidisciplinary Approaches to Studying
Therapeutic Potential
Giuseppe Venturella
University of Palermo

15:45 – 16:30 Plenary Lecture

PL1.1 | Can Polypore Mycelium be Useful in Defending Against Viral Storms?

Paul Stamets

Fungi Perfect

16:30 – 17:15 Plenary Lecture

PL1.2 | Redox Potential Scale-up of *Ganoderma lucidum* Submerged Cultivation from Laboratory to Higher Pilot Scale

Marin Berovič

Academy of Engineering

17:15 – 17:30 Harmony Beyond Science

Dimitri Cervo – A Voice

Adolphe Adam – Bravour-Variationen - "Ah! Vous dirais je Maman!"

Trio Majestoso

Social Activities

Venue	Bragança Castle
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18:30 – 19:30 Transfer by Tourist Train

Bragança Municipal Theatre → Bragança Castle

19:30 – 21:30 Bragança with History - Sunset at the Castle

Bragança Castle

21:30 – 22:30 Transfer by Tourist Train

Bragança Castle → Exe São Lázaro Hotel

Day 2 | Wednesday, 23 September

Session 2 | Personalized Nutrition & Precision Medicine

Venue	Armando Correia Room, Exe São Lázaro Hotel
Chairs	Carmenza Jaramillo & Ulrike Lindequist

09:00 – 09:40 Plenary Lecture

PL2.1 | Individualized Nutrition, Health, and Artificial Intelligence: Opportunities for Precision Metabolomic Dietary Intake Assessment

J. Alfredo Martínez

IMDEA Nutrition

09:40 – 10:05 Keynote Lecture

KN2.1 | Fungal Wisdom Meets Omic-Tech

Liudmila Kalitukha

Good Feeling Products

10:05 – 10:20 Industrial Lecture

IL2.1 | From Market Signals to Meaningful Science: Aligning Functional Mushroom Research with Consumer Needs

Eric Puro

KÄÄPÄ Biotech

10:20 – 10:35 Industrial Lecture

IL2.2 | Methodology for Testing the Efficacy of Chaga for Support of Stem Cell Surveillance and Mitochondrial Resilience; Additional Insights to Chaga's Role in Immune Health and Cellular Integrity

Chris Fields

Applied Food Sciences

10:35 – 10:50 Industrial Lecture

IL2.3 | Exploring the Nootropic Potential of *Herichium erinaceus* Extract in Murine Models

Rojison Koshy

Ujala Life Sciences

10:50 – 11:05 Industrial Lecture

IL2.4 | *Ophiocordyceps sinensis*: An Adaptogenic Medical Mushroom from a Network Pharmacology Perspective

Per Björk

100% Natural

11:05 – 11:10 Journal Launch

Journal of Edible and Medicinal Fungi

Omon Isikhuemhen & Ayman Turk

North Carolina A&T State University & In Silico Bio-Solutions

11:10 – 11:35 Coffee Break | E-Poster Session**Session 2 | Personalized Nutrition & Precision Medicine**

Venue	Armando Correia Room, Exe São Lázaro Hotel	Rio de Onor Room, Exe São Lázaro Hotel
Chairs	Ayman Daba & Jaime Carrasco	Cristina Caleja & Eliana Pereira

11:35 – 11:45 Oral Presentation

OP2.1 | From Academic Discovery to Industrial Innovation: *Cordyceps* as a Bioconversion Factory and CordyScan AI-TLC Platform for High-value Cordycepin Applications

Ayman Turk

In Silico Bio-Solutions

Oral Presentation

OP2.2 | Full-Spectrum Standardization of *Herichium erinaceus*: A Multi-Component Cultivation Approach to Clinically Relevant Bioactive Delivery

William Goss

Monterey Nutra/Amycel

11:45 – 11:55 Oral Presentation

OP2.3 | Linking Fungal Biodiversity and Bioactive Potential of Indigenous Serbian Mushrooms from the Balkan Region: The ProFungi Group Perspective

Maja Karaman

University of Novi Sad

Oral Presentation

OP2.4 | Personalized Mycotherapy and Precision Medicine: Diagnosis to Dispensary

Sayen Scantlebury

Integrative Health

11:55 – 12:05 Oral Presentation

OP2.5 | LENTICHOL Study: Effects of Shiitake Mushroom (*Lentinula edodes*) Consumption on Lipid Metabolism in Adults with Borderline Elevated LDL-Cholesterol – A Placebo-Controlled Study

Sara Meiss

Charité – Universitätsmedizin Berlin

Oral Presentation

OP2.6 | Lions mane (*Herichium erinaceus*) Recent Research in Human Health; Linking Actives to Outcome

Chris Fields

Applied Food Sciences

12:05 – 12:15 Oral Presentation

OP2.7 | Linking Metabolomic Complexity to Clinically Significant Cognitive Outcomes in U.S.-Grown Functional Mushrooms: Analytical Method Development and Human Dietary Intervention Validation

Julie Daoust

M2 Ingredients

Oral Presentation

OP2.8 | A Multicriteria Strategy for Selecting Amazonian Mushroom-Derived Functional Ingredients for Sustainable Plant-Fungi-Based Food Development

Ceci Sales-Campos

Instituto Nacional de Pesquisas da Amazônia

12:15 – 12:25 Oral Presentation

OP2.9 | Influence of the Digestion Process on the Anti-Inflammatory Compounds of *Hericium erinaceus*

Paula García-Ponsoda

Universidad Autónoma de Madrid

Oral Presentation

OP2.10 | Rapid Minimal Residual Disease Clearance and Durable Remission in Pediatric Common B-Cell Acute Lymphoblastic Leukemia During Standard Therapy with an Exploratory Adjunct Proprietary Mycotherapy Protocol: A Case Report

Boris Jakopović

Dr Myko San - Health from Mushrooms

12:25 – 12:35 Oral Presentation

OP2.11 | Preliminary in vitro Results on the Use of the Culinary-Medicinal Mushroom *Pleurotus eryngii* var. *Eryngii* as Potential Secondary Starter in the Cheese Aging Process

Fortunato Cirlincione

University of Bari

Oral Presentation

OP2.12 | Valorization of *Agaricus bisporus* By-Products Through Lactic Fermentation for Functional Penne Pasta Development

Ana Saldanha

MORE CoLAB

12:35 – 14:30 Lunch | E-Poster Session**Session 3 | Agro-food Systems & Circular Integration**

Venue Armino Correia Room, Exe São Lázaro Hotel
Chairs Ewa Zapora & Maria Letizia Gargano

14:30 – 15:10 Plenary Lecture

PL3.1 | Medicinal Mushroom Biomass: From Bioactive Characterization and Bioaccessibility to Gut Microbiota Modulation and Neuroprotection

Manuela Pintado

Universidade Católica Portuguesa

15:10 – 15:50 Plenary Lecture

PL3.2 | *Hericium erinaceus* as a Neuroregenerative Medicinal Mushroom: Bioactive Compounds, Clinical Evidence and Emerging Production Technologies

John Holliday

Highland Mushrooms

15:50 – 16:20 Coffee Break | E-Poster Session

Session	3 Agro-food Systems & Circular Integration	
Venue	Armando Correia Room, Exe São Lázaro Hotel	Rio de Onor Room, Exe São Lázaro Hotel
Chairs	Liudmila Kalitukha & Marin Berovič	Filipa Mandim & Sara Vieira
16:20 – 16:45	Keynote Lecture KN3.1 An Update of the Worldwide Diversity of the Genus <i>Pleurotus</i> Georgios I. Zervakis Agricultural University of Athens	Keynote Lecture KN3.2 Medicinal Mushrooms as Functional Additives in Animal Health and Production Omon Isikhuemhen North Carolina A&T State University
16:45 – 16:55	Oral Presentation OP3.1 Biodegradable Nursery Containers Produced from Agricultural Residues and Macromycetes Alejandro Echeverri Jaramillo Reishi Colombia	Oral Presentation OP3.2 Sustainable Innovation in Mushroom - Effect of Extraction Solvents on the Selected Bioactive Compounds in Submerged-Cultivated Mycelial Biomass of <i>Ganoderma lucidum</i> and <i>Leatiporus sulphureus</i> Vanja Grahovac University of Belgrade
16:55 – 17:05	Oral Presentation OP3.3 Characterization and Biotechnological Valorization of Spent Mushroom Compost (SMC) Manuela Rollini University of Milano	Oral Presentation OP3.4 Strain-Specific Growth and Reproductive Responses Among Conspecific <i>Inonotus obliquus</i> Strains in Dual Culture Karin Kütt Estonian University of Life Sciences
17:05 – 17:15	Oral Presentation OP3.5 Scaling Full-Spectrum Medicinal Mushroom Production: Lessons from Vertically Integrated Industrial Cultivation at Monterey Mushrooms William Goss Monterey Nutra/Amycel	Oral Presentation OP3.6 Spent Medicinal Mushroom Substrate as a Strategic Feed Resource for Sustainable Beef Cattle Production Felicia Anike North Carolina A&T State University
17:15 – 17:25	Oral Presentation OP3.7 The Influence of Substrate, Perforation Amount, and Perforation Size on the Mushroom Morphometrics of <i>Hericium erinaceus</i> Joel Kwon North Carolina Agricultural and Technical State University	Oral Presentation OP3.8 Circular, Sustainable Model of Mushroom Production Applied in Commercial Farm Ivanka Milenković Ekofungi

17:25 – 17:35 Oral Presentation

OP3.9 | Mushrooms from Farm to Fork, a Coordinated Approach to Develop the Entire Value Chain and Reshape the Position Mushrooms as a “Next-Generation Functional Food” for Metabolic and Environmental Health

Anabela Marisa Azul

University of Coimbra

Oral Presentation

OP3.10 | Breeding, Greenhouse Cultivation, and Nutritional Evaluation of Morel (*Morchella*) in Türkiye

Mustafa Kemal Soylu

Atatürk Horticultural Central Research Institute

Social Activities

Venue	Abade de Baçal Museum
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18:30 – 19:30 Transfer by Tourist Train

Exe São Lázaro Hotel → Abade de Baçal Museum

19:30 – 22:00 Bragança with Culture – Bread & Wine at the Museum

Abade de Baçal Museum

22:00 – 23:00 Transfer by Tourist Train

Abade de Baçal Museum → Exe São Lázaro Hotel

Day 3 | Thursday, 24 September

Session	4 AI & Omics in Medicinal Mushroom Research	5 Climate Resilience via Ecosystem Services
Venue	Armando Correia Room, Exe São Lázaro Hotel	Rio de Onor Room, Exe São Lázaro Hotel
Chairs	Giuseppe Venturella & Marina Soković	Ángel R. Trigos & Eneribholo Eno-Edobor

09:00 – 09:40 Plenary Lecture

PL4.1 | New Advances in Medicinal Mushroom Proteomics: From Complex Bioactives to Therapeutic Protein Networks

Boris Jakopović

Dr Myko San - Health from Mushrooms

09:40 – 10:05 Keynote Lecture

KN4.1 | Decoding Truffle Aroma, Bioactivity, and Quality Through Omics and Data-Driven Approaches

Eva Tejedor-Calvo

Agrifood Research and Technological Centre of Aragón

Keynote Lecture

KN5.1 | Can Mycosilviculture Optimize the Ecosystem Services Provided by Fungi in the Context of Climate Change?

José-Antonio Bonet

Center of Research in Agrotechnology

10:05 – 10:15 Oral Presentation

OP4.1 | Functional Impact of *Hericium erinaceus*-Derived Metabolites on Transcriptional Programs in Glial Cells

Idan Pereman

Migal Galilee Research Institute

Oral Presentation

OP5.1 | *Inonotus obliquus* in Finland: Use History, Cultural Significance, and Transatlantic Diffusion

Henri Vanhanen

Natural Resources Institute Finland

10:15 – 10:25 Oral Presentation

OP4.2 | Temporal Deployment of Lignocellulolytic Carbohydrate-Active Enzymes During Fungal Colonization of a Hardwood Sawdust-Corn Stover Substrate

Melvin Mensah-Bonsu

North Carolina A&T State University

Oral Presentation

OP5.2 | Unlocking the Potential of Thermotolerant Medicinal Mushroom Species and Strains for Climate Resilience and Circular Bioeconomy

Georgios Koutrotsios

Agricultural University of Athens

10:25 – 10:35 Oral Presentation

Oral Presentation

OP4.3 | From Fungi to Pharma:
Machine Learning and Molecular
Docking Reveal a Potent
Antidiabetic Steroid in *Cordyceps*
sinensis

Rui M. V. Abreu

Universidade Politécnica de Bragança

OP5.3 | Sustainability of Medicinal
and Edible Mushrooms Abundance
in the Soil Under Forest Thinning

Segula Masaphy

Tel Hai College and MIGAL- Galilee Research
Institute

Session 6 | Cultural Heritage & Biocultural Conservation

Venue Armindo Correia Room, Exe São Lázaro Hotel
Chairs Giuseppe Venturella & Marina Soković

10:35 – 11:00 Keynote Lecture

KN6.1 | Cultural Heritage &
Biocultural Conservation of
Mushrooms Around the World

Dennis Walker

Mycopreneur

11:00 – 11:30 Coffee Break | E-Poster Session

Session 7 | Ethics, Safety & Regulatory Foresight

Venue Armindo Correia Room, Exe São Lázaro Hotel
Chairs Georgios I. Zervakis & Lillian Barros

11:30 – 11:55 Keynote Lecture

KN7.1 | Mushroom-Derived Polysaccharides: Translational Challenges in
Efficacy, Safety, and Regulatory Standardization

Ayman Daba

Doctor's Data

11:55 – 12:05 Oral Presentation

OP7.1 | From Lab Scale to Market Application: Bottlenecks in Medicinal
Mushroom Product Development

Ewa Zapora

Bialystok University of Technology

12:05 – 12:15 Oral Presentation

OP7.5 | The Future of Mushroom Farming

John Holliday

Highland Mushroom

12:15 – 12:25 Oral Presentation

OP7.3 | Fungal Names and DNA-Based Authentication: Applied Research
and Policies

Alona Yu. Biketova

Royal Botanical Gardens, Kew

12:25 – 12:35 Oral Presentation

OP7.4 | The Mushroom Was More Alive and Vibrant: Patient Reports of Synthetic *versus* Organic Forms of Psilocybin

Pamela Kryskow

Psychedelic Association of Canada

12:35 – 14:30 Lunch | E-Poster Session

Session 8 | Public Health & Policy Applications

Venue Armindo Correia Room, Exe São Lázaro Hotel

Chairs Boris Jakopović & John Holliday

14:30 – 15:10 Plenary Lecture

PL8.1 | Safety Aspects of Medicinal Mushrooms

Ulrike Lindequist

University of Greifswald

15:10 – 15:35 Keynote Lecture

KN8.1 | Microsterols: Beyond their Function and Regulation in Membrane Fluidity and Structure

Ángel R. Trigos

University of Veracruz

15:35 – 15:45 Oral Presentation

OP8.1 | The Possibility of Reducing Stress Response in Humans Using Chitin/Chitosan-Glucan-Melanin-Complex from *Fomes fomentarius* (ChMGC)

Nataliia Kurochko

LLC «Mikoton-Original»

15:45 – 15:55 Oral Presentation

OP8.2 | The Ability of Chitin/Chitosan-Glucan-Melanin Complex from *Fomes fomentarius* (ChGMC) to Modify the Course of Cancer

Olga Seniuk

LLC «Mikoton-Original»

15:55 – 16:05 Oral Presentation

OP8.3 | Medicinal Mushrooms in Reproductive Medicine: Emerging Evidence, Orthodox Limitations, and Opportunities for Clinical Research in Nigeria

Eneribholo Clement Eno-Edobor

Vigor Hospital

16:05 – 16:15 Oral Presentation

OP8.4 | Protective Effects of a Polysaccharide-Rich *Hericium erinaceus* Extract Blend Against Fipronil-Induced Oxidative Stress in the *Galleria mellonella* Insect Model

Soumya Biswas

16:15 – 16:25 Oral Presentation

OP8.5 | Mushroom Polysaccharides as Cholesterol-Lowering Functional Ingredients

Helena Laronha

University of Aveiro

Social Activities

Venue	Rio de Onor & Quinta da Carvalhinha
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17:00 – 17:30 Transfer by Bus

Exe São Lázaro Hotel → Rio de Onor

17:30 – 19:00 Traditional Village Visit

Rio de Onor

19:00 – 19:30 Transfer by Bus

Rio de Onor → Quinta da Carvalhinha

19:30 – 22:30 Bragança with Elegance - Gala Dinner

Quinta da Carvalhinha

22:30 – 23:00 Transfer by Bus

Quinta da Carvalhinha → Exe São Lázaro Hotel

Day 4 | Friday, 25 September

Session 9 | Therapeutic Potential of Psychedelic Mushrooms

Venue Armino Correia Room, Exe São Lázaro Hotel
Chairs Maja Karaman & Miomir Nikšić

09:00 – 09:40 Plenary Lecture

PL9.1 | Beyond Trials in Psychedelic Medicine: Ethics, Implementation, and Equity

Albino Oliveira-Maia

Champalimaud Foundation

09:40 – 09:50 Oral Presentation

OP9.1 | Optimizing *Psilocybe cubensis* Bioactivity by Submerged Fermentation

Eyal Kurzbaum

University of Haifa

09:50 – 10:00 Oral Presentation

OP9.2 | From Molecule to Mushroom: Regulatory Futures of Psychedelic Psilocybin Therapies

Sofia Batista

SYLOR Health

10:00 – 10:10 Oral Presentation

OP9.3 | *Amanita muscaria* - Ancient Wisdom and Healing Properties of The Iconic Toadstool

Dominique Prevost

Mamanita.Love

10:10 – 10:20 Oral Presentation

OP9.4 | How the Mycophilous Poland Embraced the use of Fly Agaric (*Amanita muscaria*)

Łukasz Łuczaj

University of Rzeszów

10:20 – 11:00 Coffee Break | E-Poster Session

Roundtable	Scientific and Industrial Perspectives on Medicinal Mushroom Research and Innovation
Venue	Armindo Correia Room, Exe São Lázaro Hotel
Moderator	Eric Puro, KÄÄPÄ Biotech, FI

- 11:00 – 12:00 Roundtable**
- 100% Natural**
Per Björk, ES
- Highland Mushrooms**
John Holliday, USA
- Mycology Research Laboratories**
David Law, UK
- Ujala Life Sciences**
Rojison Koshy, IN

- 12:00 – 12:15 Awards**

- 12:15 – 12:30 Final Remarks**
- Lillian Barros**
IMMC13 Executive Chair, Universidade Politécnica de Bragança

12:30 – 14:00	Lunch Boxes E-Poster Session
	Social Activities
Venue	Rio de Onor Room, Exe São Lázaro Hotel

- 14:00 – 15:30 Wines of Trás-os-Montes Masterclass**
- Trás-os-Montes Altitude & Old Vines – The Unique Terroir of Trás-os-Montes
- Vinhos de Trás-os-Montes**

REFLECTIVE LECTURE

RL1.1 | Medicinal Mushrooms: Multidisciplinary Approaches to Studying Therapeutic Potential

[Giuseppe Venturella](#)^{1*}

¹Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze, Bldg. 5, 90128, Italy. *giuseppe.venturella@unipa.it

Scientific studies on medicinal mushrooms are gradually spreading throughout the world thanks to the growing awareness that mushrooms are a valuable resource for human health and for farm and domestic animals. Medicinal mushrooms are a rich source of bioactive compounds, including polysaccharides, terpenoids, phenolic compounds, and fatty acids, which have applications in a wide range of pharmacological activities. The study of their therapeutic potential requires a multidisciplinary approach that integrates different scientific fields, such as mycology, analytical chemistry, pharmacology, medicine, and food technology. The reflective talk begins with an overview of the popular traditions surrounding medicinal mushrooms across various continents, delves into the key points of their chemical complexity, and continues with an analysis of emerging trends in their applications, highlighting the current critical gap between promising *in vitro* results and their actual effectiveness in humans. Furthermore, it emphasizes the importance of conducting rigorous, large-scale, randomized, multicenter phase III clinical trials to confirm the effectiveness and safety of medicinal mushrooms. An analysis of the integration between biotechnology and circular agriculture highlights how medicinal mushrooms are now a pillar of the sustainable bioeconomy, but the real challenge for the future is multidisciplinary to promote medicinal mushrooms as nutraceuticals and adjuvants in conventional therapies. Future research, including bioinformatic approaches and the implementation of taxonomic studies to identify new species, is needed to develop innovative and sustainable healthcare solutions.

Keywords: Medicinal Mushrooms; Taxonomy; Food Technology; Clinical Trials, Bioinformatic.

Acknowledgments

This research received no external funding.



GIUSEPPE VENTURELLA

University of Palermo
Italy

Giuseppe Venturella is a Full Professor of Systematic Botany at the University of Palermo, Department of Agricultural, Food and Forest Sciences (SAAF). He holds a degree in Agricultural Science and a specialization in Food Science from the same institution.

With an academic career spanning over three decades, Professor Venturella is a renowned expert in mycology and plant conservation. His research focuses on fungal taxonomy, in situ and ex situ conservation strategies of *Pleurotus* taxa, and the identification, cultivation, and characterization of bioactive compounds from medicinal mushrooms. His expertise also extends to ornamental plants, riparian vegetation and biomonitoring.

He has authored over 200 scientific publications including several books and monographs. Beyond his research, he holds prestigious leadership positions, including Vice President of the Italian Botanical Society (SBI) and President of the Italian Society for Medicinal Mushrooms (SIMM). He is the Italian representative for the International Society for Medicinal Mushrooms (ISMM) and an active member of the IUCN Mediterranean Plant Specialist Group.

As a scientific coordinator, he manages major projects under the National Recovery and Resilience Plan (NRRP). He is also the curator of the SAAF Department Giuseppe Venturella Herbarium. Throughout his career, he has organized key national and international events, including the 9th and 12th International Medicinal Mushrooms Conferences, held in Palermo (2017) and Bari (2024).

PLENARY LECTURES

PL1.1 | Can Polypore Mycelium Be Useful in Defending Against Viral Storms?

[Paul Stamets](#)^{1*}

¹Fungi Perfecti, LLC, Shelton, Washington, USA. *paulstamets@gmail.com

Viral pandemics such as SARS-CoV-2 and emerging influenza strains (e.g., H5N1) continue to challenge global health systems, in part due to immune escape and variable vaccine durability. There is growing interest in rigorously evaluating natural products as potential adjuncts to vaccination and symptom management.

This study explored whether mycelial preparations of *Laricifomes* (*Fomitopsis*) *officinalis* (Agarikon) and *Trametes versicolor* (Turkey Tail), cultivated on rice, may modulate vaccine-related immune responses and COVID-19 symptom trajectories.

In a randomized, double-blind, placebo-controlled human study ($N = 90$), a 4-day regimen of myceliated rice administered concurrent with mRNA COVID-19 vaccination was assessed for safety, tolerability, and exploratory immune outcomes. Participants receiving the mycelial preparation showed trends toward fewer self-reported adverse effects and more sustained antibody levels at six months in specific strata, compared with those receiving uncolonized rice placebo. In a separate randomized, placebo-controlled outpatient study ($N = 50$), the same Agarikon–Turkey Tail formulation was associated with statistically significant reductions in overall COVID-19 symptom scores over 14 days ($p < 0.001$), independent of vaccination status, with earlier achievement of $\geq 50\%$ symptom reduction versus placebo. Reductions in cough frequency may have implications for transmission, although this remains to be confirmed in larger, dedicated studies.

These early-phase trials suggest that polypore mushroom mycelia grown on rice are safe under study conditions and may offer multifactorial benefits as an adjunct to COVID-19 vaccination and symptom management. Findings are exploratory and hypothesis-generating; larger, fully powered studies are needed to confirm efficacy, clarify mechanisms, and assess generalizability beyond COVID-19 to other viral pathogens.

Keywords: Polypores, Mycelium, Immunomodulation, COVID-19.

Acknowledgments

This research was funded in part by Fungi Perfecti, LLC.



PAUL STAMETS

Fungi Perfect

United States of America

Paul Stamets is an elder, author, and independent mycologist whose pioneering work has shaped modern fungal taxonomy, medicinal mycology, and public understanding of psychoactive fungi. He has authored eight books, most recently *Psilocybin Mushrooms in Their Natural Habitats* (June 2025), and has formally described numerous psilocybin-containing species. In 2023, the species *Psilocybe stametsii* was named in his honor.

An Invention Ambassador for the American Association for the Advancement of Science (AAAS) and a 2020 inductee of The Explorers Club, Stamets has received the National Mycologist Award (2013), the Gordon and Tina Wasson Award (2015), the NextMed Disruptor Award (2023), and the SynBioBeta Lifetime Achievement Award (2024). In 2025, the United Nations recognized him as one of the "100 Disruptors" advancing positive global change.

He founded Fungi Perfecti, LLC and created Host Defense® Mushrooms™, a line studied in multiple clinical trials reporting positive health outcomes. At IMMC13, Stamets brings decades of fieldwork, taxonomic insight, and advocacy for responsible, science-based engagement with psilocybin fungi – bridging traditional knowledge, conservation, and emerging therapeutic applications.

PL1.2 | Redox Potential Scale-Up of *Ganoderma lucidum* Submerged Cultivation from Laboratory to Higher Pilot Scale

[Marin Berovič¹*](#)

¹Faculty of Chemistry and Chemical Engineering, University of Ljubljana, Academy of Engineering Sciences, Slovenia. *marin.berovic@fkkt.uni-lj.si

Production of biomass and various kind of bio products in bioreactors represents fast, fully controlled and sterile production. Usual *scale-up* process from laboratory to pilot bioreactors is request of a complex engineering process based on chemical engineering criteria, as they are geometrical similarity, oxygen transfer or power input, classical engineering parameters that are not focused on any microbial request.

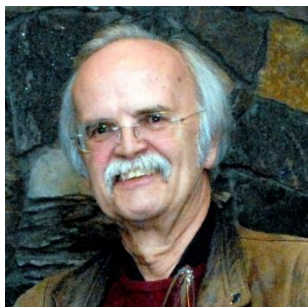
In our experience as a key physiology criterion, for a *scale-up* of *Ganoderma lucidum* submerged cultivation from laboratory to the pilot scale cultivation, redox potential was applied. In our previous number of experiments in the lab scale bioreactors, it was found that for biomass growth and polysaccharides production particular levels of the redox potential - maximum at 270 mV and minima at 190 mV are the levels of crucial importance. Oscillations in redox potential for ± 20 mV have a strong influence on further development of cultivation.

Considering this experience, redox potential was used as a main parameter for *scale-up* from 10 liters laboratory to 100 and 1000 liters pilot plant geometrically non-similar stirred tank reactors. Regulation of redox potential over aeration and agitation towards the optimized levels was successfully used in all scales. Comparable amounts of fungal biomass, internal and external polysaccharides were obtained in all laboratory and pilot scale.

Using this physiological scale-up criteria also the results in fungal biomass and polysaccharides production were comparable in all the scales. Oscillations were less than ± 8 %.

Following this experience, redox potential was found as a key parameter for very effective *scale-up* even in geometrically non-similar stirred tank reactors. Related to this, a special software for process control that simultaneously controls the aeration and agitation rates or each separately should be constructed.

Keywords: Redox Potential; *Ganoderma lucidum*; Submerged Cultivation; Scale-up; Key Physiology Criterion.



MARIN BEROVIČ

Academy of Engineering
Slovenia

Marin Berovič is a full-time Professor of Biotechnology and Bioengineering on Faculty of Chemistry and Chemical Technology, Department on Chemical, Biochemical and Environmental Engineering (1998-2016 Ph.D in Biochemical Engineering, on Faculty of Chemistry and Chemical Engineering, TU Graz and University of Ljubljana. Member Academy of Engineering Sciences of Slovenia.

Chairman of European Society on Biochemical Engineering Sciences and Executive Board of European Federation on Biotechnology 2005-2008. Vice-Chairman of International Organization on Biotechnology and Bioengineering. Founder of Doctoral / Post doctoral EU Bioprocess Engineering Course. Awarded several prizes for Innovations, Research and Development in Biochemical Engineering. Member of New York Academy of Sciences.

PL2.1 | Individualized Nutrition, Health, and Artificial Intelligence: Opportunities for Precision Metabolomic Dietary Intake Assessment

J. Alfredo Martínez¹, Teresa Cepeda-Vidal², João Tomé-Carneiro^{1*}

¹Precision Nutrition Program, IMDEA Nutrition, CEI UAM+CSIC. Carretera de Cantoblanco, 8. 28049 Madrid (Spain); ²Departamento de Química Analítica, Nutrición y Bromatología, Universidad de Santiago de Compostela, La Coruña (Spain). *joao.estevao@imdea.org

Dietary intake and body metabolite determinations are crucial for characterizing health status in precision nutrition, which involves the integration of food intake and phenotypical traits with (epi)genetic makeup and transcriptomics mapping plus biochemical and metabolomic profiles, and metagenomic signatures. This coordinated endeavor can be boosted by supervised and unsupervised AI strategies to deal with Bigdata sources. In nutrition practice and health research accurate dietary intake assessment remains an unresolved challenge, which is evolving towards a complementation of current methods of self-reported eating data with objective metabolomic precision nutrition strategies. This harmonization process offers an important opportunity to improve the specificity, sensitivity, and translational worth of validated dietary assessment tools. Indeed, a precise food consumption measurement based on metabolomics is pivotal to better understanding the nutrition-health axis, where sex and genetics may play a role in interpreting and preparing personalized diets. Diverse molecules and metabolites (xanthines, carnosine/anserine, AICAR, hippuric acid, hypaphorine, ...) and vitamins (folic acid, vitamin C, ...) have been suggested as intake markers of meat, fruits, vegetables, legumes, nuts, coffee, etc.. Within this broader scenario, a mushroom-related case study constitutes an example of food-specific biomarker validation. Mushroom intake recorded during three consecutive dietary recall days preceding urine collection was evaluated against urinary metabolomic signals. A priori, ergothioneine represented a biologically plausible candidate, but was not the most informative short-term marker under direct endorsement analyses. Subsequent focused analyses identified volemitol and mannitol as more useful candidates when recent mushroom intake was modeled using AI approaches. These findings illustrate a broader principle relevant to precision nutrition: the ability to accurately evaluate nutrient and food intake through the alignment between existing dietary capture methods, metabolomic approaches enabled by increasingly potent analytical platforms and AI integration strategies to advance biomarker development and applications.

Keywords: Precision Nutrition; Dietary Assessment; Biomarkers of Food Intake; Metabolomics; Artificial Intelligence.

Acknowledgments

The project "Dietary Assessment and Further Development of Biomarkers for AI" (DIETARY DEAL, ref. AC21/00038) was funded by the European Union Next Generation (EU) through the Instituto de Salud Carlos III, within the framework of the Recovery and Resilience Mechanism (RRM). We would also like to thank the Instituto de Salud Carlos III (ISCIII), through the Fondo de Investigación para la Salud (FIS): PI25/01985 and CIBEROBN for scientific support.



J. ALFREDO MARTÍNEZ

IMDEA Nutrition

Spain

Prof. J. Alfredo Martínez is currently Director of Precision Nutrition Programs at IMDEA Nutrition and visiting professor at University of Valladolid holding a BPharm degree, a NutrPhD (Doctorate in Physiology and Nutrition) by University of Navarra and a MD degree by University of Zaragoza. Also, he has developed academic responsibilities at Universidad de Santiago de Compostela, Universidad del País Vasco, Universidad de Valladolid and Universidad de Navarra in the areas of Physiology and Nutrition since 1982, being RANF “Fellow” since 2022.

Prof Martínez has addressed, in both Research and Professorship. The topic of Precision Personalized Nutrition and Pharmacy, including omics and machine learning tools, being involved in several EU landmark nutritional trials such as DIOGENES, SEAFOODplus, NUGENOB, FOOD4ME, STOP, PREVIEW, DIETARY DEALCLIMBOUT and SWEET, and belonging to national Consortia such as PREDIMED and CIBERObn, whose results and conceptual contributions have been published in the most relevant medical and scientific journals and editorials including NEJM, Lancet; Nature Endocrinology, BMJ, AJCN, Circulation, JAMA, Obesity Reviews etc Among publications (more than 950 in PUBMED) are 3 position papers from ISNN (International Society of Nutrigenetics & Nutrigenomics), which have been proposed as guides for the provision of personalized nutritional advice and the consolidation of knowledge in Nutrigenetics and applicability for personalized dietary advice in health and disease, which has generated an H index over 120 and six Positive Research 6-years approvals.

Prof. Martínez has supervised more than 96 PhD students in the areas of Obesity/cardiometabolic diseases and Nutrition, including precision nutritional omics and public health matters. During his scientific career, Prof. J. Alfredo Martínez has enjoyed training or invited stays at MIT, Nottingham, Berkeley, Harvard, Oxford and King’s College London. He is former President of the International Union of Nutritional Sciences (IUNS) and has been recipient of several important awards as well as current president of RINN22 (red Iberoamericana de Nutrición) and former AESAN (Agencia Española de Nutrición) member.

His investigations concerning the Nutritional knowledge and technologies in Communicable and Chronic diseases management and Precision Medicine and nutritional epidemiology have allowed to educate a great number of Nutrition and health professionals. To translate this knowledge in disease prevention and health maintenance to create a concept concerning sustainability, Prof. J. Alfredo Martínez has contributed to Nutritional Sciences

advancements by producing more than 1500 documents with more than 50.000 article citations as well as collaborations and participations in diverse Courses and Seminars at as well as important lectures at OMS, FANS, FANUS, FENS. IUNS, etc concerning nutrition and health interactions in personalized population and planetary dimensions and with translational purposes for the implementation of public health policies.

PL3.1 | Medicinal Mushroom Biomass: From Bioactive Characterization and Bioaccessibility to Gut Microbiota Modulation and Neuroprotection

Helena Araújo-Rodrigues^{1,2}, João Bettencourt Relvas^{1,2}, Freni. K. Tavaría¹, Ana R. Madureira¹, Celestino Santos-Buelga³, Ana M. González-Paramás³, Manuela Pintado^{1*}

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Mushrooms are increasingly recognized as next-generation foods due to their rich nutritional and bioactive composition, with applications in functional foods, nutraceuticals, and pharmaceuticals. Their biomolecules, including β -glucans, α -glucans, lectins, and ergosterol, exhibit diverse health-promoting properties, such as prebiotic, immunomodulatory, and antiviral activities.

While most studies focus on polysaccharide fractions from mushroom fruiting bodies (FBs), the potential synergistic effects of different macromolecules present in both mycelium and FBs remain largely unexplored. Mushroom biomasses (MBs) of *Trametes versicolor* (TV), *Hericium erinaceus* (HE), and *Pleurotus ostreatus* (PO), consisting of mycelium with primordia, were studied using a multidisciplinary approach. Chemical and bioactive characterization revealed that all three MBs are remarkably rich in glucans (76–80% DW), predominantly α -(1→4)- and β -(1→4)-glucans. Species-specific differences were observed in protein, lipid, mineral, and fatty acid composition. TV presented higher levels of proteins, minerals, γ -aminobutyric acid (GABA), ergosterol, ascorbic acid, carotenoids, and free phenolics. HE showed higher tocopherol and vanillic acid contents, whereas PO exhibited the highest zinc levels. HE and PO also contained significantly higher concentrations of bound phenolics, while selenium levels were comparable among species. LC-ESI-UHR-QqTOF-MS/MS metabolomic fingerprinting confirmed distinct species-specific biochemical profiles. All MBs exhibited antioxidant activity and reduced ROS production in HMC3 human microglial cells, supporting their potential to mitigate oxidative stress-related disorders.

Health-promoting and neuroprotective effects may arise from direct absorption of bioactive metabolites, gut microbiota modulation, or both. To investigate these mechanisms, INFOGEST 2.0 digestion followed by 3.5 kDa dialysis and in vitro fecal fermentation was used to assess bioaccessibility, bioavailability, and microbiota modulation potential. A comparative study of *P. ostreatus* FBs cultivated under biological and industrial conditions confirmed that cultivation methodology significantly influences biochemical composition, particularly glucan and protein profiles.

Glucans were the major constituents of colon-available fractions from both MBs and FBs, which also contained proteins and peptides (<75 kDa), amino acids (e.g., alanine and glutamic acid), and fatty acids (e.g., oleic and linoleic acids). *In vitro* fecal fermentation demonstrated that MBs modulate gut microbiota, increasing short-chain fatty acid (SCFA) production and the relative abundance of beneficial bacterial genera, including *Bifidobacterium* and *Faecalibacterium*. Serum-available fractions (<3.5 kDa),

enriched in low-molecular-weight α -(1→4)-glucans, peptides, amino acids, and phenolic compounds, significantly reduced ROS production in HMC3 cells and improved chemotaxis while delaying A β -induced paralysis in transgenic *Caenorhabditis elegans* models of Alzheimer's disease. In parallel, microbiota-derived metabolites enhanced by MB fermentation, particularly butyric acid and GABA, also exerted significant neuroprotective effects, reducing ROS levels in HMC3 cells and improving Tau- and A β -associated phenotypes in *C. elegans*.

Overall, these findings support a dual mechanism of action for MBs involving direct bioactivity of digestion-derived metabolites and indirect neuroprotection mediated through gut microbiota modulation. These results highlight medicinal mushroom biomass as a promising and sustainable source of functional ingredients for gut-brain axis-targeted nutritional strategies and neurodegenerative disease prevention.

Keywords: Mushroom Biomass and Fruiting Bodies; Chemical and Bioactive Characterization; Gastrointestinal Digestion; Gut Microbiota Modulation; Neuroprotective Potential.

Acknowledgments

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MANUELA PINTADO

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Maria Manuela Estevez Pintado is currently Full Professor with Habilitation of the College of Biotechnology of the Portuguese Catholic University (ESB-UCP), Associate Director of School of Biotechnology from Universidade Católica Portuguesa (ESB-UCP, Porto, Portugal) and the director of CBQF (Chemistry and Biotechnology Center – State Associate Laboratory), a research unit and Associate Laboratory, and President of EBRI - European Biotechnology Research Institute (EBRI) and Co-founder of INSURE.hub (INnovation in SUstainability and REgeneration Hub). In the research field, she is the Head of Bioactive and Bioproducts Research Laboratory.

Academically, she has a B.Sc. in Pharmacy (Clinical Analysis and Pharmacy options) from the Faculty of Pharmacy of the University of Porto (1991), she attended the curricular part of the Food Science and Engineering Masters from the Portuguese Catholic University (1993) and finished her Ph.D. in Biotechnology (in the field of Food Science and Engineering) from the Portuguese Catholic University in 1999.

Among other relevant activities some are highlighted: Coordinator of the partnership and Project Biorbis-UCP (since 2023), Elementis-UCP (since 2023), Amyris-UCP (2016-2024), Member of the Advisory Council of COTEC Portugal – Business Association for Innovation (since 2025), Member of UCP Quality Council (since 2024), Member of IBET advisory Member (since 2016), Member of Strategic Group for AgroFood, Forest and Biodiversity and Member of Strategic Group for Circular Economy nominated by Fundação para a Ciência e a Tecnologia (FCT), Vice-President of the Scientific Council for Natural and Environmental Sciences (CCCNA) of Fundação para a Ciência e a Tecnologia (FCT), one of the four Scientific Councils established by FCT (2013-2016), Coordinator of the Evaluation Committee of Final Reports of FCT projects for Biological Engineering and Biotechnology area (since 2013), Vice-President of European Chitin Society (since 2013-2017), Chair for SIG (Special Interest Group) – Bioactive Compounds of ISEKI Food Association (since 2014), member of several National and International Evaluation Committee for post-graduate studies and research projects. She has established strong interaction with industry and has been the Coordinator of the Department of Scientific Services for Industry (SETIF) (2013-2016). Additionally, she has been an invited professor at Paraíba Federal University (from 2012 to 2016).

The research can be summarized into (i) development, compositional characterization and validation of bioactivity of functional and bioactive ingredients (proteins and biopeptides, antioxidants, probiotics, prebiotics and antimicrobials) and study applications on the development of novel functional

foods and other added value applications; *(ii)* by-product and new resources valorization through bioprocesses and extraction processes aiming to obtain molecules/extracts fully characterized in terms of composition, bioactivities, functionalities and safety to be explored as high-added value bioproducts in different high-value fields; *(iii)* application of the above research developments to other Biotechnological fields.

During her scientific trajectory, she published several papers (ca.850 papers) in refereed international journals and authored 98 chapters in handbooks on these topics, and creator of 30 family patents. She has a *h*-index of 88 with ca. 33,500 citations.

She has participated in several professional meetings, international symposia and congresses, presenting 220 invited oral communications, ca. 300 selected oral communications and about 750 posters at National and International conferences. She supervises(ed) or co-supervises(ed) 80 MSc, 80 PhD thesis and 50 post-doc scholarships as well as 50 international training scholarships and 90 research grants. She has participated in 85 PhD evaluation panels and 70 MSc. evaluation panels. Additionally, she has been responsible for the coordination and co-coordination of more than 120 externally funded (through national and international funds) research and development projects and has been involved in collaborations with multiple Universities and Research Centers, companies and Associations/technology clusters. Given her overall curricular merit, she has been recognized by the *Ciência Viva* program as one of the female faces of the Portuguese science community in its book dedicated to Portuguese scientist women. Yet, she is one of the scientists in the World's Top Most Cited Researchers in the last 7 years (since 2019) in the area of Agriculture, Fisheries and Forest, according to the "World's Top 2% Scientists" ranking, prepared by Stanford University (USA) and also highlighted for their impact on science throughout their career.

PL3.2 | *Hericium erinaceus* as a Neuroregenerative Medicinal Mushroom: Bioactive Compounds, Clinical Evidence, and Emerging Production Technologies

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The last 20 years has seen a multitude of research published on the medicinal aspects of *Hericium erinaceus*, commonly known as the Lions Mane mushroom. In fact, during this time Lion's Mane has become one of the most published upon species of medicinal mushrooms. When the many unique medicinal properties of this mushroom are reviewed it is unsurprising Lion's Mane has garnered so much scientific interest. Like most mushrooms, Lion's Mane has shown wide ranging medicinal efficacy, such as anti-cancer, hypoglycemic and immune modulation properties. However, one of the unique features of Lion's Mane that is not seen in many other species are the neuro-regenerative properties of this mushroom. Several clinical trials on this species have been carried out showing lions mane has the ability not just to slow age-related neurodegeneration, but in many cases to actually reverse the damage done. This has been shown for many types of neurodegenerative conditions, including age related hearing loss, dementia, Alzheimer's disease, Parkinson's disease, diabetic neuropathy, and many others. In addition to these neuro-regeneration properties, Lion's Mane has also been shown to be a potent tool for the treatment of neuropathic pain, something even the various opiate medications do not ameliorate very well. When Lion's Mane is used adjunctively with opiate medications, it preferentially blocks the kappa opiate receptors, leading to greater perceived pain relief with the same dosage of opiate, while simultaneously reducing some of the opiate side effects. The compounds responsible for these effects have been identified to two broad classes of compounds, referred to as the *Erinacines* and the *Hericinones*. Modern production techniques have developed methods to enhance the production of these bioactive compounds, including the application of high frequency, high voltage pulses to the growing material, and exposure to strong pulsating magnetic fields through use of an MRI-type machine.

Keywords: *Hericium erinaceus*; Lion's Mane Mushroom; Neuroregeneration; Erinacines; Hericenones; Medicinal mushrooms.



JOHN HOLLIDAY

Highland Mushrooms

United States of America

Dr. John Holliday is an accomplished Senior Research Scientist with more than 40 years' experience across the dietary supplement and pharmaceutical industries, where he introduced 21st century biotechnology concepts to the agricultural sector for growing mushrooms.

Dr. Holliday is the 20-year past President and Chief Scientific Officer for Aloha Medicinals Inc., a company he founded in 1999. Dr. Holliday has been issued two U.S. Patents on this proprietary process for cultivating *Cordyceps*. Aloha Medicinals produces and distributes this immune system-enhancing and infection fighting mushroom and other medicinal mushroom raw materials to more than 700 drug and supplement companies across the globe, including the product that has proven effective in helping HIV/AIDS sufferers in Africa. He has designed and run a number of Human Clinical Trials, including using Aloha Medicinals formulations as an adjunct treatment for advanced stages of Cancer as well as Hepatitis and Alcoholic Liver Disease, and treatment of HIV infections. He has helped grow Aloha Medicinals to become the largest North American producer of organic medicinal mushrooms, in a global market estimated at \$25 billion.

His current board roles include Chief Scientific Officer for Early Morning Farms, the world's first successful indoor morel cultivation company, and Senior Mycology Consultant for the innovative mushroom biotechnology consulting firm, Mushroom Consulting, LLC. He is Chief Scientific Officer for Sempera Organics Inc, and Chief Scientific Office for Sabina Farms LLC. He is also the Mycology Consultant for the Government of Ghana, on the Editorial board for the International Journal of Medicinal Mushrooms, Vice President of the International Society for Medicinal Mushrooms and Vice President of the African Society for Edible and Medicinal Mushrooms. Lastly, he is one of the Scientific Advisory Board members at R2T Bio Pharma.

PL4.1 | New Advances in Medicinal Mushroom Proteomics: From Complex Bioactives to Therapeutic Protein Networks

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Medicinal mushrooms are increasingly studied as sources of bioactive polysaccharides, triterpenoids, proteins, peptides, sterols, and complex extract mixtures with potential therapeutic relevance. However, their biochemical complexity remains a major challenge for mechanistic interpretation, especially when their effects are evaluated only through isolated pathways or single molecular targets. Proteomics provides a particularly suitable framework for this field, as it enables the systematic investigation of disease-relevant protein networks, cellular stress responses, metabolic adaptations, immune regulation, and target engagement. This keynote lecture will review recent advances in proteomic research on the therapeutic properties of medicinal mushrooms, with an emphasis on studies investigating antitumor, immunomodulatory, metabolic, neurobiological, and aging-related effects. Particular attention will be given to quantitative liquid chromatography-mass spectrometry-based approaches applied to complex mushroom extracts and isolated bioactive compounds, including ganoderic acids, polysaccharides, and mushroom-derived peptides. Emerging findings indicate that medicinal mushroom interventions may modulate ribosomal biogenesis and translation, unfolded protein response, mitochondrial and lipid metabolism, glycolytic reprogramming, tumor microenvironment remodeling, intestinal immunometabolism, and synaptic or mitochondrial proteins in neurobiological models. These data suggest that medicinal mushrooms may be better understood as modulators of interconnected biological networks rather than as classical single-target agents. At the same time, the field remains largely preclinical and discovery-oriented, with limited targeted proteomic validation, post-translational modification profiling, clinical proteomics, and standardized extract characterization. The lecture will argue that future progress depends on moving from descriptive discovery proteomics toward pharmacoproteomic strategies based on standardized preparations, targeted protein panels, multi-omic integration, and clinically meaningful biomarkers. In this context, proteomics can transform the inherent complexity of medicinal mushrooms from a methodological obstacle into a mechanistic and translational strength.

Keywords: Medicinal Mushrooms; Proteomics; Pharmacoproteomics; Bioactive Compounds; Therapeutic Mechanisms.

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BORIS JAKOPOVIĆ

Dr Myko San

Croatia

Boris Jakopović, PhD, completed his undergraduate and graduate studies at the Department of Biology, Faculty of Science, University of Zagreb, and earned his PhD in 2021 at the Faculty of Biotechnology and Drug Development, University of Rijeka, defending his doctoral dissertation titled *Antitumor Mechanisms of Biologically Active Compounds from Medicinal Mushrooms in a Colorectal Cancer Model*.

He is the author of about fifteen original scientific papers published in leading international journals and has presented his work at numerous international scientific conferences. He also authored a chapter on proteomic research on the medicinal properties of mushrooms in the book *Mushrooms with Therapeutic Potentials: Recent Advances in Research and Development*, published in 2023 by Springer Nature.

His research interests include cancer biology and therapy, proteomics, and systems biology. Since January 2022, he has been a member of the editorial board of the International Journal of Medicinal Mushrooms (Begell House, USA) and a member of the International Scientific Committee of the International Medicinal Mushrooms Conference (IMMC).

In addition to his academic work, he is the R&D CEO of Dr Myko San Co., where he focuses on the translation of medicinal mushroom research into scientifically grounded products and applications. He is also a member of the Croatian Association for Cancer Research (HDIR).

PL8.1 | Safety Aspects of Medicinal Mushrooms

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Safety is one of the most important aspects of the quality of a medicine or dietary supplement. In general, side effects associated with the use of medicinal mushrooms are rarely reported, and when they are, they are mild. They can often be attributed to the difficulty sensitive individuals have in digesting fiber-rich mushrooms. Although there are some case reports of possible liver toxicity of *Ganoderma lucidum* or *Agaricus subrufescens*, it is unclear whether this is attributable to the mushrooms. Concomitant use of medication or alcohol may also be contributing factors. Recent toxicological studies of important medicinal mushroom species in rats show that the no observed adverse effect level (NOAEL) of some products of *Ganoderma lucidum*, *Cordyceps militaris*, *Trametes versicolor*, and *Hericium erinaceus* is so high that it cannot be exceeded under practical conditions.

Nevertheless, serious problems regarding safety can arise or must be taken into account. Such problems that can jeopardize the safe use of medicinal mushrooms include confusion with poisonous mushroom species, the content of potentially toxic substances, the triggering of allergies, and contamination, e.g., with heavy metals, microorganisms, mycotoxins, pesticides or radioactivity. Examples are the confusion of *Ganoderma lucidum* with the highly toxic fungus *Trichoderma cornudamae*, the content of agaritine in *Agaricus* species and of oxalic acid in *Inonotus obliquus*, or the so-called Shiitake dermatitis. Limits for possible contaminants are set by law in many countries and are therefore usually complied with.

It is also important for safe use to avoid conditional poisoning, i.e., poisoning caused by mushrooms that are too old or have been stored incorrectly, for example.

Keywords: Toxicity; Allergy; Dermatitis, Agaritine, Oxalic Acid.

Acknowledgments

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ULRIKE LINDEQUIST

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Ulrike Lindequist has studied pharmacy and received her PhD in pharmaceutical biology from the Ernst-Moritz-Arndt University Greifswald, Germany. Since 1992, she was Professor and head of the Department for Pharmaceutical Biology at the University Greifswald. She has been emeritus since 2016. Main focus of her scientific work were and are bioactive compounds from medicinal mushrooms, plants and marine microorganisms with a special focus on pharmacology, toxicology, analytics, and quality ensurement. She has published more than 300 scientific papers, several monographs, patents and books about *Biogenic Drugs* and *Biogenic Toxins*. In December 2025, volume 5 of the book series *Natural Poisons and Venoms*, which she co-edited, was published by De Gruyter Publisher, Berlin/Boston. It covers Fungal and Microbial Toxins. The former volumes 1-4 (published 2023 and 2024) were devoted to the toxins of plants and animals.

PL9.1 | Beyond Trials in Psychedelic Medicine: Ethics, Implementation and Equity

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The growing interest in psychedelic substances as potential treatments for mental disorders has generated significant scientific, clinical, and public attention. As research progresses and regulatory agencies begin defining pathways for approval, psychedelic medicine raises complex ethical, methodological, and regulatory challenges that must be addressed to ensure safe and equitable implementation. However, current regulatory discussions occur in a context where public expectations often outpace formal approval processes. Off-label use and unregulated provision of substances such as ketamine illustrate how a lack of clear regulatory oversight may lead to variability in dosing, administration settings, and clinical supervision, raising concerns about implementation, safety and misuse. Successful clinical translation of psychedelic treatments will require robust and carefully designed research capable of producing reliable and reproducible evidence. Clear definitions of professional roles, clinical oversight, and standards for psychological support will also be essential, likely involving collaboration between regulatory agencies, professional societies, and healthcare institutions. Importantly, regulatory approval alone will not guarantee meaningful clinical impact. Implementation strategies must consider real-world healthcare constraints to ensure equitable access and prevent new disparities in mental health care.

Keywords: Psychedelic Therapy; Regulation; Equity.

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ALBINO OLIVEIRA-MAIA

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Albino J. Oliveira Maia trained in medicine at the Faculty of Medicine of the University of Porto, and then did doctoral and post-doctoral work in Neuroscience at Duke University and the Champalimaud Foundation, and completed a master's degree in public health at Harvard University. After academic training, Albino specialized in Psychiatry and worked as a Psychiatrist in Lisbon. He is currently Director of the Neuropsychiatry Unit at the Champalimaud Clinical Center, Director of the Digital Neurotherapeutics Centre at the Centre for Restorative Neurotechnology, PI of the Neuroscience of Disease Programme, and professor of Psychiatry and Neuroscience at NOVA Medical School in Lisbon. Albino is also coordinator of the Psychiatry Working Group at the Office for the National Exam for Access to Specialty Training (Portugal), President-elect of the Portuguese Society of Psychiatry and Mental Health, President of the Scientific Council for the Portuguese OCD Foundation and President of the Ethics Committee at the Institute for Addictive Behaviors and Addictions.

KEYNOTE LECTURES

KN2.1 | Fungal Wisdom Meets Omics-Tech

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The goal of personalized nutrition and precision medicine is to move away from "one-size-fits-all" advice based on population averages towards diets and therapies tailored to an individual's biology, lifestyle, and environment. Multi-omics databases (genomics, transcriptomics, proteomics, metabolomics, etc.) and digital tools are continuously updated to improve predictive models of individual dietary responses, especially for outcomes such as weight management and cardiometabolic risk. The increasing consumer acceptance and the ability to make dynamic, customized dietary adjustments are enabled by user-friendly real-time monitoring, at-home testing kits, and app-based nutrition coaching. Despite persisting concerns such as data privacy and security, high costs, interpretation and utility of data, or poor regulatory guidance, the personalized nutrition market is growing rapidly worldwide. It is expected to reach \$30.9 billion by 2030, growing at an average annual rate of 14.4%. The focus is shifting towards a preventive model that emphasizes long-term wellness and avoiding chronic diseases rather than merely treating them. In this framework, medicinal and edible mushrooms are emerging as promising allies due to their high diversity, nutritional value, and variety of bioactive substances. Mushrooms offer a broad spectrum of therapeutic benefits and are particularly effective at restoring balance in complicated, chronic, multifactorial conditions, such as aging, weight management issues, neuropsychiatric disorders, metabolic syndrome, immunodeficiency, etc. The road ahead is still long and full of challenges, but it appears that macrofungi could fit into the "omics" approach of precision profiling. The future question won't be "Do I need mushrooms?" anymore but rather "Do I need more of them?".

Keywords: Personalized Nutrition; Precision Medicine; Macrofungi.

Acknowledgments

This research received no external funding.



LIUDMILA KALITUKHA

Good Feeling Products

Germany

Liudmila Kalitukha holds a PhD in biology and has developed an interdisciplinary scientific career spanning fundamental and applied life sciences. She conducted research and led projects at the National Academy of Sciences of Belarus and at several universities in Germany, where her work integrated plant physiology, biochemistry, biophysics, and molecular biology.

Building on this strong foundation in basic science, she later expanded her interdisciplinary competencies toward applied biomedical and regulatory fields by training as a clinical monitor in clinical research. She also obtained certification as a safety assessor for cosmetic products, further broadening her expertise at the interface of science, regulation, and industry.

Currently, she works in the industrial sector, where her activities encompass research, scientific publication, product development, manufacturing processes, and quality management of advanced fungal-based products.

Liudmila Kalitukha is a member of the editorial board of the International Journal of Medicinal Mushrooms (IJMM) and a council member of the International Society for Medicinal Mushrooms (ISMM).

KN3.1 | An Update on the Worldwide Diversity of the Genus *Pleurotus*

[Georgios I. Zervakis](#)^{1*}

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The genus *Pleurotus* (Fr.) P. Kumm. (Basidiomycota, Agaricales) comprises a few dozen species, many of which exhibit a cosmopolitan distribution and are of considerable economic importance. Indeed, the commercial production of *Pleurotus* (“oyster”) mushrooms is widely practiced worldwide by exploiting numerous agricultural, agro-industrial, and forestry by-products. Despite their significance, research and applications had often been hampered by ambiguous initial identifications of the respective biological material which were often due to environmentally influenced morphological traits. In addition, unclear or obsolete descriptions, misapplication of taxonomic names, and conclusions drawn from incomplete sets of data or insufficiently validated information further aggravated this problematic situation. Although significant progress has been made for certain groups – such as the *P. eryngii* complex, whose members are closely associated with Apiaceae plants and occur exclusively in the Old World, and the coremia-forming *Pleurotus* species (e.g., *P. cystidiosus* and related taxa distributed in various continents) – species boundaries remain uncertain in several other groups. These include monomitic species such as *P. ostreatus*, *P. pulmonarius*, *P. floridanus*, and *P. eous*, as well as dimitic taxa like *P. cornucopiae* and *P. euosmus*. Available evidence also points to substantial, yet largely unexplored, diversity among tropical and subtropical species, including the *P. djamor* complex (encompassing multiple morphotaxa) and *P. giganteus* sensu lato. Finally, phylogenetic data remain limited for species reported from the Neotropics, such as *P. albidus*, *P. magnificus*, *P. levis*, and *P. rickii*. This update also includes recently described species and highlights indicative cases of uncertain or ambiguous taxonomic identities in the genus.

Keywords: Global Biodiversity; Oyster Mushroom; Phylogeny; Taxonomy.



GEORGIOS I. ZERVAKIS

Agricultural University of Athens
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Georgios I. Zervakis (PhD) is Professor in Mycology, and Head at the Laboratory of General and Agricultural Microbiology in the Agricultural University of Athens, Greece. His main research interests could be summarized as follows: diversity, ecology, molecular systematics and phylogeny of fungi with emphasis on *Basidiomycota* and *Ascomycota*; mushroom breeding (development of new high-performing hybrid strains) and cultivation (optimization of production methodologies), evaluation of nutritional/dietetic/functional properties of fungal biomass; bioconversion/detoxification of agro-industrial wastes, synthetic polymers and other environmental pollutants, and biodegradation of lignocellulosic residues through the use of selected microorganisms (e.g., white-rot fungi). He has been the recipient of numerous competitive research grants (through open calls), serving either as project coordinator or scientific responsible for the partner involved. He is/was Editor (or member of the Editorial Board) in five international scientific journals, and he has authored/coauthored more than 130 papers published in international peer-reviewed scientific (SCI) journals (> 4800 citations, *h*-index: 43; Scopus).

KN3.2 | Medicinal Mushrooms as Functional Additives in Animal Production

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The phase-out of antibiotic growth promoters across global livestock systems has created an urgent need for feed additives that support performance without compromising antimicrobial stewardship. Medicinal mushrooms – and the mycelial biomass, myceliated grains, and processing residues derived from them – represent an underexploited class of candidates. Their fruiting bodies and mycelia accumulate β -glucans, heteropolysaccharides, glycoproteins, terpenoids, sterols, phenolics, and lectins with documented immunomodulatory, antioxidant, antimicrobial, and hypocholesterolemic activity. This presentation synthesizes evidence from poultry, swine, and small-ruminant systems. In broilers, mushroom preparations from *Lentinula edodes*, *Pleurotus* spp., *Ganoderma lucidum*, *Agaricus* spp., and *Flammulina velutipes* have improved feed conversion, elevated antibody titers and cytokine responses, increased villus height-to-crypt-depth ratios, enriched *Lactobacillus* and *Bifidobacterium* populations, suppressed *Salmonella* and *E. coli*, and reduced natural coccidiosis burden. In dairy ewes, diets supplemented with medicinal mushroom myceliated grains reduced intestinal parasite loads, tended to increase milk yield and casein content, and improved the oxidative stability of derived cheese – demonstrating that benefits extend beyond the animal into product quality and shelf life. In pigs, β -glucan-based supplementation improves gut barrier integrity, mucin expression, and post-weaning growth under enteric challenge. Solid-state fermentation of low-value lignocellulosic residues by cultivated fungi enables the production of these additives from agricultural waste streams, aligning animal health gains with circular bioeconomy objectives. Translation to commercial practice remains constrained by inconsistent bioactive standardization, species- and strain-dependent responses, undefined inclusion rates, and limited large-pen validation. Priorities for the field include chemotype-based quality control, dose-response mapping, and challenge-model trials that quantify economic return.

Keywords: Medicinal Mushrooms; Functional Additives; Animal Feed; Mycelial Biomass; Bioactive Standardization.

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Prof. Dr. Omon Isikhuemhen is Professor of Fungal Biology and Fungal Biotechnology at North Carolina Agricultural and Technical State University, USA, where he directs the Mushroom Biology and Fungal Biotechnology Laboratory. An internationally recognized mycologist, his research focuses on edible and medicinal mushroom cultivation, fungal biotechnology, mycoremediation, functional foods, and sustainable agriculture. He has pioneered innovative cultivation technologies, including advances in commercial truffle production in North America, and oversees one of the largest shiitake culture collections in the Americas. Prof. Isikhuemhen has authored more than 120 peer-reviewed publications and has played a leading role in advancing the application of fungi for human and animal health, environmental remediation, and food security. He serves on the Editorial Board of the International Journal of Medicinal Mushrooms and is widely recognized for bridging traditional knowledge, scientific innovation, and industrial application through his research, mentorship, and international collaborations.

KN4.1 | Decoding Truffle Aroma, Bioactivity, and Quality Through Omics and Data-Driven Approaches

[Eva Tejedor-Calvo](#)^{1*}

¹Plant Science Department, Agrifood and Technological Research Centre of Aragón, Avda Montañana 930, 50009, Zaragoza, Spain. *etejedor@cita-aragon.es

Truffles (mainly *Tuber* spp. and *Terfezia* spp.) are among the most valued gastronomic mushrooms, distinguished by their unique aroma, complex chemical composition, and notable bioactive potential. These attributes arise from intricate metabolic networks influenced by species, maturation stage, environmental conditions, and post-harvest handling. Recent advances in omics technologies, particularly metabolomics and volatilomics, have enabled a comprehensive characterization of truffle bioactive and aromatic profiles, as demonstrated in several studies by Tejedor-Calvo and collaborators, generating large and multidimensional datasets that require data-driven analysis.

This keynote lecture will present an integrative framework combining omics approaches with chemometrics, machine learning, and sensory analysis to decode the relationships between chemical composition, aroma perception, bioactivity, and quality in truffles. Case studies based on Tejedor-Calvo *et al.* will illustrate how metabolic and volatile fingerprints can be used to identify key quality markers, discriminate species and origins, and detect changes induced by processing or storage. The potential of predictive modelling to link omics data with sensory and functional attributes will also be discussed. Overall, this lecture highlights how data-driven strategies can support quality assessment, authenticity control, and innovation in truffle and medicinal mushroom research.

Keywords: Truffle Aroma; Metabolomics; Volatilomics; Authenticity; Quality.

Acknowledgments

The research leading to these results has received funding from the European Union under “Horizon 2020 – the Frame-work Programme for Research and Innovation (2014–2020). Grant Agreement of the Project “Innovation in truffle cultivation, preservation, processing and wild truffle resources management”, INTACT, Project number 101007623”. Eva Tejedor-Calvo acknowledges the grant RYC2024-048960-I funded by “MICIU/AEI/10.13039/501100011033” and the “FSE+”, and the grant JDC2022-048252-I by Spain Ministry of Science and Innovation.



EVA TEJEDOR-CALVO

Agrifood Research and Technological Centre
of Aragón

Spain

Eva Tejedor-Calvo is a food technologist with a PhD in Food Science and a Master degree in Novel Foods. She is currently a researcher at Plant Science department of the Agrifood Research and Technology Centre of Aragón (CITA, Spain). Her work addresses aroma profiling, bioactive compounds, quality assessment, and authenticity, combining advanced analytical techniques with sensory analysis to support product differentiation and quality standards of mushrooms, especially truffles. She has actively contributed to the development of quality schemes and geographical indications related to truffle products, as well as to food fraud detection. In parallel, her research explores the valorization of mushroom and food by-products and their application in functional foods and fermented beverages, including kombucha. Eva has authored over 30 scientific publications and collaborates in national and international research projects at the interface of food chemistry, sensory science, and sustainable food innovation.

KN5.1 | Can Mycosilviculture Optimize the Ecosystem Services Provided by Fungi in the Context of Climate Change?

José-Antonio Bonet^{1,2*}

¹Department of Agricultural and Forest Science and Engineering, University of Lleida, Av. Alcalde Rovira Roure, 191, 25198 Lleida, Spain; ²Director, Center of Research in Agrotechnology (Agrotecnio), Av. Alcalde Rovira Roure, 191, 25198 Lleida, Spain.
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The forests provide a wide array of ecosystem services that are increasingly requested by Society as a guarantee of future human welfare. However, the prevalence of other forest functions in the past and a new climatic framework have led the forests to a condition in which they will not be able to meet the changing demands of forest users and society at large. Fungi play a key role in forest ecosystem functioning, but their role in provisioning goods and services also represents one of the most significant demands of the forest. These fungal ecosystem services are not independent of each other, and it is likely that significant trade-offs exist between them. In this scenario, forest management is a tool that can modify the current forest structure and composition, including fungal communities, so that it can fulfill future public demands on these ecosystems whilst assuring climatic resilience. The presentation will broadly review the main ecosystem services that society demands prospecting the proper forest management techniques that will provide such demands. The forest management techniques aiming to optimize fungal diversity and productivity of forest ecosystems will be presented as an example of the open options for the different ecosystem services, including the recent results obtained in the MicroEco project (Microbial Diversity, Ecosystem Services of the Soil Microbiome and Ecosystem Conservation). The data provided will be based on the worldwide largest mushrooms datasets that encompasses the weekly monitoring of mushroom data in more than one hundred permanent plots during the last 30 years.

Keywords: Mushrooms; Forest Management; Ecosystem Services.

Acknowledgments

This research was partially funded by the project PCI2022-135091-2 (MicroEco project - call Biodiversa+ 2021), funded by MCIN/AEI and for the European Union 'NextGenerationEU'/ PRTR.



JOSÉ-ANTONIO BONET

Center of Research in Agrotechnology
Spain

José-Antonio Bonet, PhD in Forest Engineering is Full Professor at the University of Lleida (UdL, Spain). He is also associate researcher and Director of the Centre of Research in Agrotechnology (Agrotecnio, Spain). He is acknowledged as one of the leading European scientists in the field of mycology having participated in more than 50 national and international research and knowledge transfer projects, including large collaborative EU-funded FP6, FP7 and H2020 projects. At present, he is involved in different interdisciplinary international and national research projects (either as main coordinator, work package leader or researcher) aiming at unravelling the relationships between forest management and fungal diversity and productivity based on new-generation DNA sequencing methods, advanced modelling techniques and multi-scale approaches. As a result of his research activity, he has produced more than 100 publications including peer-reviewed international publications, books and book chapters, mainly dealing with above- and belowground fungal dynamics and forest management.

KN6.1 | Cultural Heritage & Biocultural Conservation of Mushrooms Around the World

[Dennis Walker](#)^{1*}

¹Mycopreneur. *mycopreneur@gmail.com

While much attention has been paid to the recent "Shroom Boom" in the West, humanity's relationship with fungi stretches back thousands of years and spans nearly every corner of the globe. Ötzi the 'Ice Man' was found preserved in an alpine glacier in modern-day Italy after having perished over 5,000 years ago during the Copper Age. Among his precious possessions found with him were two different mushrooms – *Fomitopsis betulina* for antiparasitic and medicinal uses and *Fomes fomentarius* for carrying fire embers. In Lesotho, traditional healers have recently been documented as using an endemic *Psilocybe* mushroom species in their practice, marking the first observation of traditional psilocybin mushroom use in Sub-Saharan Africa and challenging the long-held academic and scientific view that such practices were only found in Mesoamerican cultures. In Aotearoa (New Zealand), traditional Māori tattoo artists have been using ink made from the crushed-up bodies of cordyceps fungus-infected caterpillars for hundreds of years dating back to pre-colonial history. In modern times, a world-first Māori-led clinical trial is employing the whole fruiting body of the regionally endemic *Psilocybe weraroa* to treat meth addiction in the local indigenous community. In places as diverse and remote as the Meghalaya forests of Northeast India, the Altai Mountains of Southeastern Kazakhstan, the Lacandon Jungle of Southeastern Mexico, and virtually everywhere else in between, pockets of ancestral fungi knowledge and lore persist unabated since time immemorial. A rising tide of homegrown citizen mycologists, mushroom entrepreneurs, academics and advocacy groups around the world are stepping up to help preserve, connect, and archive this traditional knowledge before it is lost forever due to the acceleration of globalization, urbanization, and cultural erasure. This keynote explores the critical role of citizen mycologists and homegrown conservation advocacy organizations engaging in biocultural conservation and safeguarding of traditional mushroom knowledge in collaboration with the communities that steward it. Drawing upon extensive field work globally and hundreds of long-form interviews conducted over the last five years with Mycopreneur, this presentation highlights examples of fungi heritage of Indigenous, rural, and ethnomycological traditions across Asia, Africa, Europe, Oceania, and the Americas. Particular attention will be given to the interconnected nature of cultural practices, language, ecological stewardship, food systems, and medicinal traditions that collectively sustain fungal knowledge. By positioning fungi within living systems of knowledge, this keynote invites participants to consider a broader vision for the future of mycology in which scientific discovery and economic opportunity are balanced alongside historical context and the preservation of living cultural traditions that have shaped humanity's relationship with mushrooms for millennia. Preserving these traditions is essential for maintaining both biological and cultural resilience in a rapidly changing world.

Keywords: Biocultural Heritage; Fungi Conservation; Citizen Mycology.



DENNIS WALKER

Mycopreneur

United States of America

Dennis Walker is the founder of Mycopreneur, a media platform covering mushroom entrepreneurs and innovation globally. He has interviewed over 250 mushroom entrepreneurs and researchers from over 60 countries for the Mycopreneur Podcast and the weekly free online Mycopreneur Incubator. His work has been featured in Rolling Stone, Forbes, Wired, Vice, The Independent, Los Angeles Times, and many other outlets. He writes about mushrooms for platforms like High Times and Double Blind Magazine, and frequently appears at international conferences and festivals as an emcee, keynote speaker, and *stand up* comedian. Walker is also the Co-Founder of Global Psychedelic Week and the World Mushroom Forum.

KN7.1 | Mushroom-Derived Polysaccharides: Translational Challenges in Efficacy, Safety, and Regulatory Standardization

[Ayman Daba](#)^{1*}

¹Doctor's Data, Inc., St. Charles, IL, USA. *adaba1@yahoo.com

Mushroom-derived polysaccharides and polysaccharopeptides have demonstrated promising biological activity across oncology, hepatology, and immune modulation models; however, their clinical translation remains limited by variability in biological response, safety considerations, and lack of standardized regulatory frameworks. This study integrates previously published findings with experimental observations to evaluate both efficacy and safety within a translational context. In experimental carcinogenesis models, β -glucan derived from medicinal basidiomycete fungi was associated with reduced tumor incidence and modulation of cellular proliferation pathways. In parallel, polysaccharide-peptide complexes from edible mushroom species demonstrated hepatoprotective effects, including normalization of liver enzymes and attenuation of oxidative stress in chemically induced liver injury models. Experimental observations confirmed high β -glucan composition and absence of acute toxicity at elevated doses. Notably, a non-linear and non-dose-dependent biological response was observed during repeated exposure, where lower doses enhanced innate immune signaling, while higher doses were associated with reduced biological response and decreased tolerability; these findings may also reflect modulation of the tumor microenvironment, including immune-cell interactions and inflammatory balance. Structural variability in polysaccharopeptide complexes, particularly within the associated protein fraction, may contribute to differences in biological activity and explain the observed response patterns. These findings indicate that increasing polysaccharide dose does not necessarily improve efficacy and may attenuate biological activity, representing a critical safety consideration. From a regulatory and ethical perspective, the variability of natural bioactive compounds necessitates standardized extraction methods, validated analytical characterization, and risk-based evaluation frameworks. Successful clinical translation will require alignment between scientific evidence, regulatory rigor, and patient safety to ensure consistent and reproducible outcomes.

Keywords: β -glucan; Polysaccharopeptides; Mushroom Therapeutics; Immune Modulation; Translational Research.

Acknowledgments

This research received no external funding.



AYMAN DABA

Doctor's Data

United States of America

Dr. Ayman Daba is an internationally recognized scientist with over three decades of experience in cancer research, medicinal mushrooms, and clinical laboratory sciences. He began his scientific career in 1991, focusing on the anticancer and medicinal properties of fungal polysaccharides. He holds a PhD in Clinical Biochemistry and has published extensively on mushroom bioactives and polysaccharide structure – function relationships. Dr. Daba is a former Fulbright Scholar at the University of Wisconsin USA and completed postdoctoral fellowships at Aarhus Kommune Hospital (Denmark) and Roswell Park Cancer Institute, where he studied tumor microenvironment biology and cancer therapeutics. He previously served as Head of the Department of Pharmaceutical Bioproducts in Alexandria, leading anticancer drug development programs. A former Fellow of the National Academy of Biochemistry, Chartered Chemist (Royal Society of Chemistry, London), and Florida-licensed, board-certified Clinical Laboratory Director, he spent eight years at Abbott Diagnostics (USA) contributing to clinical assay development and laboratory quality systems. He also served as Laboratory Manager at the University of Chicago and currently holds the position of Director of Clinical Operations at Doctor's Data (Chicago, USA). He is a former ASCP Career Ambassador, with leadership spanning ethics, safety, and regulatory-driven laboratory practice.

KN8.1 | Microsterols: Beyond their Function and Regulation in Membrane Fluidity and Structure

[Ángel R. Trigos](#)^{1*}

¹Centro de Investigación en Micología Aplicada, Universidad Veracruzana, Xalapa, Veracruz, Mexico. *atrigos@uv.mx

As is well known, fungi produce various sterols, many of which exhibit diverse biological activities. Of these, the most common and important is ergosterol, which forms part of the cell membrane of these organisms and is the synthetic precursor of vitamin D2 through a light-induced electrocyclic opening mechanism followed by thermal sigmatropic rearrangement. Furthermore, this fungal metabolite oxidizes easily and is converted into ergosterol peroxide, a bioactive compound with a wide range of pharmacological properties found in numerous edible and medicinal mushrooms. Therefore, this work aims to present the most significant results obtained in recent years by our research team on the chemical and pharmacological properties of ergosterol and its peroxide, emphasizing the applications of ergosterol photooxidation. This reaction, among other methodologies, is described as an excellent method for evaluating the pro-oxidant capacity of various photosensitizers through the generation of singlet oxygen. Subsequently, we present our main findings on the pharmacological properties of these sterols and analyze the applications of ergosterol photooxidation in health (antioxidants and dietary supplements), cosmetics (colorants), medicine (photodynamic therapy), and phytopathology (oxidative foliar photonecrosis). Finally, based on our results, we invite reflection on the responsible use of medicinal fungi in relation to public health and health policies.

Keywords: Chagas Disease; Photodynamic Therapy; Oxidative Foliar Photonecrosis; Pro-Oxidant Activity.

Acknowledgments

This research was funded by the Secretaría de Ciencia, Humanidades Tecnología e Innovación (SECIHTI, Mexico) through the FORDECYT-PRONACES/263959/2020 project. At the same time, the author thanks the support received from Irene Lagunes, Manuel Medina, Guillermo Mendoza, César Espinoza, Roberto Hernández Chacón. Karmen Manzano, Luis Mendoza, Anahí Landa and Linda Camacho.



ÁNGEL R. TRIGOS

University of Veracruz

Mexico

Ángel R. Trigos is Emeritus National Researcher, affiliated with the Center for Research in Applied Mycology at the University of Veracruz. He earned his Ph.D. in Chemical Sciences in 1987 from the University of La Laguna, Tenerife, Spain. He is a member of the Mexican Academy of Sciences, Senior member, and a winner of the State Award for Science and Technology (Veracruz, Mexico). He has published more than 125 research articles in indexed journals in Mexico and abroad. He has also served as a visiting professor at institutes and universities in Panama, Peru, Spain, Portugal, and Russia. He is currently a professor in the Faculty of Pharmacy and a faculty member of the doctoral programs in Biomedical Sciences and Applied Mycology at his university. He has also served as Director General of Research at the University of Veracruz, Founding Director of the High Technology Laboratory in Xalapa, and Director of the Department of Chemistry and Biology at the University of the Americas-Puebla.

INDUSTRIAL LECTURES

IL2.1 | From Market Signals to Meaningful Science: Aligning Functional Mushroom Research with Consumer Needs

[Eric Puro](#)^{1*}

¹CEO, KÄÄPÄ Biotech, Finland. *eric.puro@kaapabiotech.com

This presentation will share an industry perspective on the functional mushroom market, focusing on current consumer interests, the needs consumers are trying to address, and the role scientific research can play in supporting the category's development.

It will explore how researchers and universities can use market and consumer insights to identify relevant research questions and develop studies that are meaningful and useful to society.

The presentation will also introduce examples of KÄÄPÄ Biotech's scientific work, including clinical research, the development of analytical methods, the study of mushroom bioactive compounds, and collaborations with universities and scientific organizations.

Finally, it will highlight the value of stronger collaboration between industry and academia. By combining scientific expertise, market understanding and well-characterized mushroom ingredients, these partnerships can help generate practical and relevant research that supports the future of the functional mushroom category.

IL2.2 | Methodology for Testing the Efficacy of Chaga for Support of Stem Cell Surveillance and Mitochondrial Resilience; Additional Insights to Chaga's Role in Immune Health and Cellular Integrity

Chris Fields^{1*}

¹Biochemistry, University of Iowa BVC, Applied Food Sciences Inc. 2500 Crosspark Road, Coralville, IA, USA. *cfields@appliedfoods.com

This clinical proof-of-concept study evaluated acute effects of Nordic origin Chaga mushroom extract (*Inonotus Obliquus*), using methods to document rapid changes to stem cells numbers and mitochondrial resilience in healthy adults.

Using a randomized, double-blind, placebo-controlled, cross-over design, four healthy participants consumed chaga extract versus other botanicals known to illicit stem cell activation as well as a control (placebo) on five separate days at least one week apart. Each participant was scheduled at the same time of the morning for all five visits to minimize effects of each participant's normal circadian changes on the outcomes. Blood samples were collected at baseline, 1, 2, and 3-hour post-consumption. Stem cell numbers were quantified by flow cytometry. Mitochondrial volume and membrane potential were assessed *ex vivo* under oxidative and inflammatory stress using reporter dyes and flow cytometry.

All ingredients induced rapid, ingredient-specific mobilization of distinct stem cell types, where Chaga extract showed robust effects across multiple stem cell types. Consuming chaga led to an average 36% increase in endothelial stem cells above the levels after consuming placebo. Chaga was effective at modulated stress-induced changes to mitochondrial volume and membrane potential.

This proof-of-concept clinical study presents novel findings on the acute effects of consuming chaga extracts, with some effects on stem cell surveillance and the mitochondrial stress response documented already 1 hour after consuming a single dose, when compared to placebo. These preliminary results present evidence for rapid bioactivity of chaga in modulating regenerative and stress-response pathways, supporting their potential as early-phase interventions for promoting cellular resilience and immune support in health individuals.

Keywords: Cellular Resilience; Chaga Mushroom (*Inonotus Obliquus*); Flow Cytometry; Mitochondrial Volume; Mitochondrial Membrane Potential; Oxidative Stress; Pluripotent; Progenitor; Stem Cell Mobilization; Stress Response.

Acknowledgments

This research was funded by Applied Food Sciences Inc. (Kerrville, TX, USA). KAAPA Biotech (Karjalohja, Finland), provided research materials for this study.

IL2.3 | Exploring the Nootropic Potential of *Hericium erinaceus* Extract in Murine Models

Rojison Koshy^{1*}, Achu G Das¹, Jayachandran CV², Seena H², Sarathlal KC², Shiji Kumar PS²

¹Research and Development, Ujala Life Sciences – Unit of Amar Ujala Ltd, C-21-22, Sector 59, Noida, India; ²Department of Pharmacology, Daleview College of Pharmacy and Research Center, Punalal PO, Poovachal, Thiruvananthapuram, India. *rojison@ujalalifesciences.com

Hericium erinaceus, or Lion's mane mushroom, is widely used to improve cognitive function, especially when memory is impaired. Cognitive impairment and memory deficits are few of the major challenges associated with ageing and neurodegenerative disorders. The current study was conducted in male Wistar rats using a scopolamine-induced amnesia model to evaluate the potential beneficial effects of a dual extract derived from the fruiting body of Lion's mane mushroom. The extract was standardized to beta-glucans and hericenones and was administered to the animals for seven consecutive days. Seven groups of animals were chosen, and cognitive impairment was induced in animals using scopolamine in all groups, except the control. Results from training trials (TT) indicated that all groups exhibited similar avoidance responses (AR), indicating uniform acquisition of the conditioned AR. In the retention trial (RT), the scopolamine-treated control group showed a marked reduction in AR (2.83 ± 0.75) compared to control group (7.00 ± 0.63), confirming successful induction of memory impairment. Test substance doses of 50 mg/kg b.w. and 75 mg/kg b.w. administered to the treatment groups resulted in significant cognitive enhancement in the memory impaired rats, with AR values of 6.67 ± 1.21 and 6.83 ± 0.75 respectively, which was at par with the standard drug piracetam which showed AR of (6.85 ± 0.89) when administered at dose of 100 mg/kg b.w. However, lower doses of the test substances at 12.5 mg/kg b.w. and 25 mg/kg b.w. did not produce significant improvement. Bonferroni post hoc test was used to confirm the statistical significance between treatment and control groups. These findings suggests that Lion's mane fruiting body dual extract possess significant dose-dependent nootropic activity and effective reversal of scopolamine -induced memory deficit in rats.

Keywords: *Hericium erinaceus*; Dietary Ingredient; Nootropic; Fruiting Body.

Acknowledgments

This research received no external funding.

IL2.4 | *Ophiocordyceps sinensis*: An Adaptogenic Medical Mushroom From a Network Pharmacology Perspective

[Per Bjork](#)^{1*}

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The medical mushroom *Ophiocordyceps sinensis* (Caterpillar Fungus), known for its ability to enhance “vitality,” is one of the most popular medicines in Asian traditional medical systems. Initially described as *Sphaeria sinensis* by Berkeley in 1843, it was later named *Cordyceps sinensis* by Saccardo in 1878, and in 2007 it was renamed *Ophiocordyceps sinensis*, a member of the genus *Ophiocordyceps*, based on phylogenetic studies. It is endemic to high-altitude regions of the Tibetan Plateau and the Himalayas and has a long history in traditional medical systems of China, Nepal, India, Bhutan, Korea, Vietnam, Thailand, and Japan as a tonic to replenish bodily health. *O. sinensis* contain diverse bioactive metabolites, including nucleosides, sterols, peptides, polysaccharides, and secondary metabolites. Its pharmacological breadth suggests multi-target effects rather than classical single-receptor drug actions.

Network pharmacology is a relatively new, biology-based interdisciplinary field that combines principles of pharmacology and systems biology. It has become a significant framework for elucidating the complex, multi-target actions of herbal and fungal preparations, providing a systematic approach to deciphering these interactions by integrating predicted targets, signaling pathways, molecular docking, and multi-omics data. Stress responses and inflammation are evolutionarily conserved adaptive processes essential for survival and recovery, restoring homeostasis following injury or challenge. Both stress and inflammation are beneficial in acute settings and harmful in chronic settings. While inflammation is firmly established as a pathological and regulatory target in Western medicine, stress adaptation and resilience biology remain poorly integrated. The adaptogenic concept represents a systems-level interpretation of complex physiological responses characteristic of holistic Traditional Chinese Medicine (TCM) and Ayurvedic concepts, whereas European Food Safety Authority (EFSA) regulatory frameworks lack concepts for resilience and adaptive capacity and operate at the level of single, well-defined functional outcomes. This presentation aims to provide a rationale for the adaptogenic and resilience-supporting effects of *O. sinensis*.

Keywords: *Ophiocordyceps sinensis*; Network Pharmacology; Adaptogenic Concept; Resilience.

Acknowledgments

This presentation is based on the research review article *Pleiotropic bioactivity of Caterpillar Fungus, Orange Cordyceps, and cordycepin: Insight from integrated network pharmacology and food and drug regulatory framework*, published in 2026 in *Pharmaceuticals*, Special Issue “Network Pharmacology of Natural Products”, 2nd Edition, by dr Alexander Panossian, whose research for the article has not received external funding.

ROUNDTABLE

**SCIENTIFIC AND INDUSTRIAL
PERSPECTIVES ON MEDICINAL
MUSHROOM RESEARCH AND
INNOVATION**



KÄÄPÄ Biotech

ERIC PURO

Finland

Eric Puro is the CEO and Co-Founder of KÄÄPÄ Biotech, a globally active Finnish biotechnology company specializing in the cultivation, extraction, manufacturing, research and development of functional mushroom ingredients. His work focuses on connecting science, industry and consumer needs to support the responsible development of the functional mushroom category.

Eric believes we should look to nature for answers. This belief led him to biotechnology and ultimately to mushrooms. His curious nature has driven KÄÄPÄ Biotech to continually push boundaries, while his high standards have helped build a culture of excellence, continuous improvement, innovation and exploration. Under his leadership, KÄÄPÄ has grown into a globally recognized leader in the functional mushroom industry.

In recognition of his work and the contributions of the KÄÄPÄ team, Eric was invited to join the Executive Committee of the International Medicinal Mushroom Society.

He lives in Karjalohja, Finland, with his wife, three children, one cat, one dog and two beehives.



100% Natural

PER BJÖRK

Spain

Per Björk is President and co-founder, together with his partner Julia del Río, of 100% Natural, a Spanish Nutraceutical company with 25 years of experience in the Spanish and European Nutraceutical Market.

The founders of 100% Natural has always focused on science based products of high quality, and have pioneered several Nutraceuticals on the Spanish Market, including Krill Oil, Sulforaphane, Purified Palmitoleic Acid, and many more, always with a motto: *we only include products in our catalogue that we ourselves like to consume.*

With a special interest in Botanicals, Medical Mushrooms and Fatty Acids, Per has promoted and participated in several peer reviewed publications with leading Spanish Clinicians and Researchers and is currently working with an international team of researchers focused on *Cordyceps* studies.

He lives in Madrid with his wife and partner.



Highland Mushrooms

JOHN HOLLIDAY

United States of America

Dr. John Holliday is an accomplished Senior Research Scientist with more than 40 years' experience across the dietary supplement and pharmaceutical industries, where he introduced 21st century biotechnology concepts to the agricultural sector for growing mushrooms.

Dr. Holliday is the 20-year past President and Chief Scientific Officer for Aloha Medicinals Inc., a company he founded in 1999. Dr. Holliday has been issued two U.S. Patents on this proprietary process for cultivating *Cordyceps*. Aloha Medicinals produces and distributes this immune system-enhancing and infection fighting mushroom and other medicinal mushroom raw materials to more than 700 drug and supplement companies across the globe, including the product that has proven effective in helping HIV/AIDS sufferers in Africa. He has designed and run a number of Human Clinical Trials, including using Aloha Medicinals formulations as an adjunct treatment for advanced stages of Cancer as well as Hepatitis and Alcoholic Liver Disease, and treatment of HIV infections. He has helped grow Aloha Medicinals to become the largest North American producer of organic medicinal mushrooms, in a global market estimated at \$25 billion.

His current board roles include Chief Scientific Officer for Early Morning Farms, the world's first successful indoor morel cultivation company, and Senior Mycology Consultant for the innovative mushroom biotechnology consulting firm, Mushroom Consulting, LLC. He is Chief Scientific Officer for Sempera Organics Inc, and Chief Scientific Office for Sabina Farms LLC. He is also the Mycology Consultant for the Government of Ghana, on the Editorial board for the International Journal of Medicinal Mushrooms, Vice President of the International Society for Medicinal Mushrooms and Vice President of the African Society for Edible and Medicinal Mushrooms. Lastly, he is one of the Scientific Advisory Board members at R2T Bio Pharma.



Mycology Research Laboratories

DAVID LAW

United Kingdom

Mycology Research Laboratories Ltd, the history started in 1995, when William Ahern, a pharmaceutical licensing executive, approached the California-based **David Law**, a microbiologist, and Malcolm Clark, a biologist and field mycologist, with the idea to form a partnership to clinically prove that mushroom biomass could form the basis for disease modifying therapies.

David and Malcolm founded Gourmet Mushrooms Inc., in 1977 in Sebastopol, California and from their California farm were cultivating culinary mushrooms to supply five-star restaurants in the USA and Europe. Gourmet was the first firm in the western hemisphere to establish controlled cultivation of *Lentinula edodes* (Shiitake) in 1978 and *Hericium erinaceus* (Lion's Mane) in 1983. Both then developed the culinary market for *H. erinaceus* under culinary the trade name "Pom Pom Blanc" mushroom.

In the 1970's, Malcolm had trained as a mycologist under Dr Tsuneto Yoshii at the Yoshii Micological Institute in Japan. In 1987, Malcolm returned to Japan to introduce *H. erinaceus* to his mentor, Dr. Yoshii, who in turn, introduced the cultivation and culinary use of this mushroom in Japan and in China.

In 1997, Mycology Research Laboratories Ltd was incorporated in Brough, United Kingdom. Under the direction of William Ahern, MRL focused on conducting preclinical and clinical research on the use of MRL mushroom biomasses in the United Kingdom, the Netherlands, Portugal, Italy, and Bulgaria to determine effective supplementation schedules in various health conditions.

As part of this effort, MRL has collaborated with practitioner clinics and universities that have led to the publication of over fifty (50) publications and posters on the use of mushroom nutrition with a focus on developing disease modifying therapies.

In 2005, MRL USA was established in Grafton, California and in 2017, MRL opened a state-of-the-art mushroom cultivation facility in Portugal.



Ujala Life Sciences

ROJISON KOSHY

India

Dr. Rojison Koshy is the Vice President of Research & Development and Operations at Ujala Life Sciences, a unit of Amar Ujala Ltd., India, where he leads multidisciplinary research on sustainable cultivation, scalable extraction technologies, and the discovery, characterization, standardization, and clinical evaluation of bioactive compounds from functional mushrooms.

His expertise includes analytical standardization of botanical and fungal dietary ingredients, mycology, food safety, residual contaminant analysis and risk mitigation, and the design and evaluation of clinical studies for safety and efficacy. He is a certified Food Safety and Preventive Controls Qualified Individual (PCQI) trainer and serves as a technical assessor for testing laboratories under the ISO/IEC 17025:2017 standard.

Dr. Koshy earned his postgraduate degree in Pharmacy and earned his PhD at the Manipal Academy of Higher Education, India, where his research focused on developing analytical methods for pesticide residue determination and risk assessment in Indian medicinal plants.

He has authored numerous peer-reviewed publications and contributed to the development of analytical monographs for pharmacopoeias, supporting the quality standardization of Indian medicinal botanicals. His current research advances cultivation and extraction methodologies for functional mushrooms, the screening, isolation, characterization, and standardization of their bioactive compounds to support safe and evidence-based application.

ORAL PRESENTATIONS

ORAL PRESENTATION LIST

SESSION 2 | Personalized Nutrition & Precision Medicine

#	PRESENTING AUTHOR	TITLE
OP2.1	Ayman Turk	From Academic Discovery to Industrial Innovation: <i>Cordyceps</i> as a Bioconversion Factory and CordyScan AI-TLC Platform for High-value Cordycepin Applications
OP2.2	William Goss	Full-Spectrum Standardization of <i>Hericium erinaceus</i> : A Multi-Component Cultivation Approach to Clinically Relevant Bioactive Delivery
OP2.3	Maja Karaman	Linking Fungal Biodiversity and Bioactive Potential of Indigenous Serbian Mushrooms from the Balkan Region: The ProFungi Group Perspective
OP2.4	Sayen Scantlebury	Personalized Mycotherapy and Precision Medicine: Diagnosis to Dispensary
OP2.5	Sara Meiss	LENTICHOL Study: Effects of Shiitake Mushroom (<i>Lentinula edodes</i>) Consumption on Lipid Metabolism in Adults with Borderline Elevated LDL-Cholesterol – A Placebo-Controlled Study
OP2.6	Christine Fields	Lions mane (<i>Hericium erinaceus</i>) Recent Research in Human Health; Linking Actives to Outcome
OP2.7	Julie Daoust	Linking Metabolomic Complexity to Clinically Significant Cognitive Outcomes in U.S.-Grown Functional Mushrooms: Analytical Method Development and Human Dietary Intervention Validation
OP2.8	Ceci Sales-Campos	A Multicriteria Strategy for Selecting Amazonian Mushroom-Derived Functional Ingredients for Sustainable Plant-Fungi-Based Food Development
OP2.9	Paula García-Ponsoda	Influence of the Digestion Process on the Anti-Inflammatory Compounds of <i>Hericium erinaceus</i>
OP2.10	Boris Jakopović	Rapid Minimal Residual Disease Clearance and Durable Remission in Pediatric Common B-Cell Acute Lymphoblastic Leukemia During Standard Therapy with an Exploratory Adjunct Proprietary Mycotherapy Protocol: A Case Report
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OP2.1 | From Academic Discovery to Industrial Innovation: *Cordyceps* as a Bioconversion Factory and CordyScan AI-TLC Platform for High-Value Cordycepin Applications

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Cordyceps militaris is increasingly recognized not only as a medicinal mushroom but also as a biological factory capable of producing cordycepin and transforming natural metabolites into higher-value compounds. This work aimed to establish an integrated academic-to-industry platform combining rapid cordycepin analysis, fermentation-driven metabolite bioconversion, artificial intelligence-assisted quality control, and commercial product development. A rapid thin-layer chromatography platform, designated CordyScan AI-TLC, was developed as an affordable and practical approach for detecting and semi-quantifying cordycepin in fungal materials, extracts, and finished products, with chromatographic results compared with high-performance liquid chromatography. CordyScan AI-TLC was further developed as the analytical basis of a portable cordycepin testing kit. Images of the developed chromatographic plates can be captured using a smartphone and processed through an artificial intelligence-based system designed to recognize cordycepin bands, evaluate their intensity, compare them with a standardized reference database, and estimate cordycepin content. Fermentation systems containing medicinal plants and agro-industrial by-products were also evaluated to improve cordycepin production and investigate the enzymatic transformation of substrate-derived metabolites. Metabolomic and spectroscopic analyses demonstrated that *C. militaris* can convert plant glycosides into aglycones and generate methylated, acetylated, and other modified derivatives, supporting its role as an enzyme factory for bioconversion and value-added metabolite production. The resulting high-cordycepin materials were further considered for incorporation into cosmetic ingredients and functional foods, including protein bars. Overall, the integration of CordyScan AI-TLC screening, artificial intelligence-assisted interpretation, fermentation optimization, metabolite characterization, and product formulation offers a practical pathway for translating *Cordyceps* research into standardized, accessible, and commercially valuable products.

Keywords: *Cordyceps militaris*; Cordycepin; Bioconversion; Artificial intelligence; Functional Foods.

Acknowledgments

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OP2.2 | Full-Spectrum Standardization of *Hericium Erinaceus*: A Multi-Component Cultivation Approach to Clinically Relevant Bioactive Delivery

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The commercial Lion's Mane (*Hericium erinaceus*) ingredient market is largely characterized by poorly standardized products with unquantified active compounds and high residual grain content, limiting clinical utility. This report describes the development of ManeFocus™, a dual-extracted, analytically standardized *Hericium* spp. ingredient developed at Monterey Nutra through an integrated multi-component cultivation strategy. The objective was to maximize the combined concentration of erinacines, hericenones, and hericenones - three complementary classes of neuroactive terpenes - by cultivating mycelium and fruiting bodies separately under component-optimized conditions, then combining them at defined ratios. Mycelium was fermented on antioxidant-rich sorghum substrate to favor erinacine biosynthesis, including Erinacine A, a diterpenoid known to cross the blood-brain barrier and upregulate nerve growth factor (NGF) and brain-derived neurotrophic factor (BDNF). Fruiting bodies were grown on supplemented hardwood to elevate hericenone and hericenone content, which activate complementary NGF signaling pathways including PI3K-Akt and MEK-ERK. Extracellular metabolites produced during fermentation - including phenolics and secondary terpenes - were retained to enhance antioxidant and anti-inflammatory activity. Third-party metabolomic profiling (Twin Arbor Labs) confirmed total quantified neuroactives exceeding 5 mg/g, representing a greater than sixfold improvement over the next-highest commercially available ingredient analyzed. Clinical literature supports cognitive benefits of *H. erinaceus* supplementation, including improved Mini-Mental State Examination (MMSE) scores in older adults, enhanced Stroop task performance in healthy young adults, increased serum BDNF, and gut microbiome modulation associated with improved gut-brain axis signaling. ManeFocus demonstrates that component-specific cultivation and rigorous metabolite standardization can close the gap between traditional whole-mushroom use and modern clinical requirements, establishing a reproducible, high-potency ingredient model for precision nutrition applications.

Keywords: *Hericium erinaceus*; Erinacines; Hericenones; Neuroactive Terpenes; Functional Mushroom Standardization.

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OP2.3 | Linking Fungal Biodiversity and Bioactive Potential of Indigenous Serbian Mushrooms from the Balkan Region: The ProFungi Group Perspective

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Indigenous mushrooms from Serbia represent a largely untapped source of bioactive compounds with potential applications in neuroprotection, biotechnology, and sustainable agriculture. This study presents a synthesis of recent research conducted by the ProFungi group, integrating fungal biodiversity assessment with chemical and functional characterization of selected taxa from the Balkan region, with particular emphasis on Tara and Fruška Gora Mountains.

Field surveys in ecologically preserved forest ecosystems identified 320 fungal taxa. Selected species were analyzed using high-performance liquid chromatography with fluorescence detection and liquid chromatography-tandem mass spectrometry for polyamine, phenolic, and organic acid profiling. Biological activities were evaluated through acetylcholinesterase (AChE) inhibition assays, antioxidant capacity tests (DPPH[•], nitric oxide, ABTS^{•+}, and ferric reducing antioxidant power), and plant biostimulatory assays. Environmental safety was additionally assessed through heavy metal bioaccumulation analyses in 22 fungal species.

Remarkable, neuroactive potential was observed in *Lepista nuda* and *Ganoderma applanatum*, which exhibited AChE inhibition of 99.94% and 98.05%, respectively. The study also provides the first report on polyamine profiling in Serbian fungi, identifying high spermidine and putrescine levels in *Postia caesia* (62.98 ± 3.19 and 55.87 ± 3.16 mg/kg dry weight, respectively), associated with 88.21% AChE inhibition. *Schizophyllum commune* was identified as an iron superaccumulator (2666.76 mg/kg dry weight), highlighting species-specific mineral uptake patterns. Furthermore, polysaccharide fractions from *S. commune* increased *Pisum sativum* L. seedling viability by up to 25% under drought stress, demonstrating promising biostimulatory properties. Controlled UV-B treatment enhanced phenolic production in *Trametes versicolor* and *Flammulina velutipes*, while comparative analyses of *Hydnum repandum* revealed strong environmental influences on quinic acid content (up to 676.07 ng/mL) and antioxidant activity (FRAP to 199.96 mg AAE/g d.w.). These findings demonstrate a direct relationship between fungal biodiversity and bioactivity, positioning indigenous Serbian mushrooms as valuable resources for the development of functional foods, neuroactive compounds, and sustainable biotechnological products.

Keywords: Fungal Biodiversity; Serbia; Acetylcholinesterase Inhibition; Polyamines; Biostimulants; Profungi.

Acknowledgments

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OP2.4 | Personalized Mycotherapy and Precision Medicine: Diagnosis to Dispensary

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Mycotherapy and personalized medicine are evolving from generalized functional wellness to a precise, data-driven discipline. As true precision medicine increasingly relies on pharmacogenomics, genomic sequencing, and dynamic proteomics, the application of medicinal mushroom extracts is carving a legitimate space within customized clinical protocols. This paper explores the transition from diagnosis to dispensing personalized mushroom extracts and protocols, emphasizing the fundamental mechanisms underlying mycological synergy and the entourage effect. The future demands a quantitative formulation framework bridging holistic care with mainstream healthcare. Case studies and clinical references detail the biochemical mechanisms by which specific compounds in mushroom extracts modulate immunity, combat oxidative stress, and improve cellular oxygen utilization in hypoxic environments. Furthermore, we examine the calculation of Combination Index matrices to exploit both intra-species and inter-species synergy. By mapping baseline immune profiles, practitioners can design targeted matrices such as intra-species compound extraction for immunosenescence, multi-species oncology adjuvants for chemoresistance, and neuro-targeted nootropic blends for neurogenesis. These protocols prioritize strict standardization of biomarkers and extraction ratios to ensure clinical efficacy and avoid contraindications. We review current clinical trials validating the synergistic benefits of these matrices in oncology, neuroprotection, broad-spectrum immunomodulation, and adaptogenic stress reduction. Ultimately, while bespoke mushroom blending represents a growing frontier in personal wellbeing and complementary medicine, its integration into true personalized medicine requires rigorous adherence to clinical research, patient-specific biological data, and careful medical supervision.

By utilizing quantitative frameworks and evidence-based synergy, personalized mycological dispensing can move beyond marketing-driven trends to become a powerful, biologically tailored adjunct in modern therapeutic protocols, offering accessible, complementary treatments rooted in both nature and scientific rigor, ultimately fostering a deeper synergy between human health and fungal biology within the framework of advanced precision medical care.

Keywords: Mycotherapy; Precision; Synergy; Formulation.

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OP2.5 | LENTICHOL Study: Effects of Shiitake Mushroom (*Lentinula Edodes*) Consumption on Lipid Metabolism in Adults with Borderline Elevated LDL-Cholesterol – A Placebo-Controlled Study

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Cardiovascular diseases are among the leading causes of death worldwide, and elevated LDL cholesterol levels are considered a major modifiable risk factor. The cholesterol-lowering effect of β -glucans from oats and barley is well documented, and sufficient evidence has led to health claims approved by regulatory authorities. Shiitake mushrooms contain several bioactive compounds, such as eritadenine, β -glucans, and ergosterol, which may have a similarly positive effect on lipid metabolism. While there is already substantial evidence from basic research and animal studies, clinical evidence in humans is lacking. This placebo-controlled study will include 84 adults aged 18-80 years with LDL-cholesterol levels of 116-190 mg/dL and low to moderate cardiovascular risk. Participants will be randomized 1:1 to receive either shiitake powder (10 g daily) or placebo for four weeks. Primary endpoint is the change in LDL-cholesterol from baseline to week 4. Secondary endpoints include extended lipid profiles, inflammatory markers (CRP, IL-6), insulin resistance (HOMA-IR), anthropometric measurements, and patient-reported outcomes assessed with validated questionnaires. An additional observational cohort of 42 individuals initiating statin therapy will provide comparative context. Based on available literature, the study has the statistical potential to detect a clinically relevant difference of 20 mg/dL LDL-cholesterol reduction (Cohen's $d=0.67$) with 80% power at $\alpha=0.05$. Despite the well-established cholesterol-lowering properties of β -glucans, clinical evidence specifically on shiitake mushrooms and lipid metabolism remains limited, and placebo-controlled trials in humans are virtually absent. This protocol describes a research project designed to close this evidence gap and to evaluate whether the bioactive compounds in shiitake translate into clinically meaningful LDL-cholesterol reductions. The final study results are expected in 2027/2028.

Note: This abstract describes the study protocol in advance of participant recruitment.

Keywords: Shiitake; Cholesterol; *Lentinula edodes*; Clinical Study Protocol.

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OP2.6 | Lions Mane (*Hericium erinaceus*) Recent Research in Human Health; Linking Actives to Outcome

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In a randomized, double-blind, placebo-controlled, parallel-arm study design, 87 healthy men and women were assigned to one of three groups: 1 gram/day of Nordic origin fruiting body lion's mane (M-LM), 1 gram/day of a commercially available mycelium and fruiting body lion's mane (MFB-LM), or placebo (PL). Fecal and blood samples, as well as measures of cognitive performance (CNS Vital Signs) and subjective affect (visual analog scales), were collected at baseline (BL) and again after 45 days (POST). Serum biomarkers included brain-derived neurotrophic factor (BDNF), tumor necrosis factor alpha (TNF- α), interleukin-6 (IL-6), and C-reactive protein (CRP), and fecal samples were analyzed for gut microbiota. The results demonstrated that M-LM and MFB-LM elicited notable increases in focus (16.1%, $p = 0.045$, and 9.1%, $p \leq 0.001$, respectively) and concentration (12.3%, $p = 0.013$, and 14.1%, $p = 0.003$, respectively). Improvements in mental clarity (~10.9%, $p = 0.019$) and memory (~15.9%, $p = 0.004$) were unique to M-LM, while MFB-LM demonstrated a possible increase in mental clarity (~9.0%). Gut microbiota analyses revealed that only M-LM significantly increased *Faecalibacterium prausnitzii* ($p = 0.015$), with no additional differences observed for other microbial taxa, serum biomarkers, or cognitive and affective measures. In conclusion, Lion's mane supplementation produced selective cognitive and subjective benefits, particularly for the fruiting body formulation. Lions Mane fruiting body also increased *Faecalibacterium prausnitzii*. Overall effects across serum biomarkers and broader cognitive domains were limited.

Keywords: Lions Mane; *Hericium erinaceus*; Cognition; Mood; Triterpenoids; Human clinical.

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OP2.7 | Linking Metabolomic Complexity to Clinically Significant Cognitive Outcomes in U.S.-Grown Functional Mushrooms: Analytical Method Development and Human Dietary Intervention Validation

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Functional mushrooms are increasingly used in dietary supplements and functional foods, yet their chemical characterization remains limited by scarce analytical standards, incomplete databases, and extraction methods that miss many bioactives. This work integrated complementary studies to characterize full-spectrum mushrooms cultivated by M2 Ingredients, focusing on M2 Lion's Mane 102 (*Hericium erinaceus*). Untargeted metabolomics across ten indoor-grown species used high-resolution mass spectrometry on six complementary liquid chromatography-tandem mass spectrometry (LC-MS/MS) platforms (C18, HILIC, lipidomics) spanning the full polarity range to build a bioactive atlas; a high-performance liquid chromatography-ultraviolet (HPLC-UV) method was developed to quantify representative diterpenes (erinacine A, hericerin, hericene A) for batch consistency and submitted to AOAC as an Official Method; digestive effects were assessed in an artificial gut model and cognitive effects in a randomized, placebo-controlled trial. One product yielded 5,139 annotated metabolites, far exceeding reference datasets, with nearly half classified as lipids, revealing species-specific fingerprints and minimal carryover from substrate. M2 Lion's Mane 102 was rich in diterpenes linked to brain-derived neurotrophic factor (BDNF) and nerve growth factor (NGF), signaling lipids (fatty acid esters of hydroxy fatty acids, palmitoylethanolamide, oleamides), and organic acids. The gut model showed increased butyrate production and improved intestinal barrier integrity. In 109 healthy adults, 2 g daily for eight weeks improved attention, visual memory, sleep quality, mood, and restedness versus placebo, with no adverse events; a proof-of-concept study confirmed increased serum BDNF. Together, these complementary efforts link compositional complexity to human outcomes, demonstrating that full-spectrum mushroom products deliver a broad, biologically relevant metabolite range that translates into measurable functional benefits and advances standardization, efficacy, and scientific rigor in medicinal mushroom research.

Keywords: Metabolomics; Functional Mushrooms; *Hericium erinaceus*; Cognitive Outcomes; Bioactive Markers.

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OP2.8 | A Multicriteria Strategy for Selecting Amazonian Mushroom-Derived Functional Ingredients for Sustainable Plant-Fungi-Based Food Development

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The sustainable use of Amazonian biodiversity emerges as a strategic approach for developing next-generation functional foods through the valorization of agro-industrial by-products as substrates for edible mushroom cultivation. However, strategies capable of integrating nutritional, functional and bioactive attributes for ingredient selection remain scarce. This study integrated multicriteria strategy to identify the most promising Amazonian mushroom-derived functional ingredients for future plant-fungi-based food applications. *Pleurotus ostreatus* and *Panus lecomtei* were cultivated on Amazonian agro-industrial by-products derived from açai (*Euterpe oleracea*) and guaraná (*Paullinia cupana*). Fresh basidiomes were either maintained untreated or subjected to a postharvest UVC treatment (254 nm, 30 min) before drying and milling. Protein, β -glucans, ergosterol, vitamin D₂ and antioxidant activity (DPPH[•], ABTS^{•+}, reducing power and Fe²⁺ chelating activity) were determined using validated analytical methods. Data were integrated through descriptive statistics, correlation analysis, principal component analysis, hierarchical clustering and a weighted multicriteria decision framework to support the objective selection of the most promising mushroom-derived functional ingredients. Distinct cultivation substrates and UV exposure promoted species-specific bioactive profiles, demonstrating that cultivation conditions markedly influenced the nutritional and functional composition of the mushrooms. Guaraná by-products consistently promoted superior cultivation performance and enhanced functional attributes, while postharvest UVC irradiation effectively increased vitamin D₂ levels without compromising the overall bioactive profile. Both species exhibited remarkable levels of protein, β -glucans, ergosterol and antioxidant activity, highlighting their potential as sustainable functional ingredients derived from Amazonian biodiversity. The integration of nutritional, bioactive and functional datasets through the proposed multicriteria framework enabled an objective comparison among treatments and supported the selection of two outstanding cultivation conditions: *P. ostreatus* cultivated on guaraná by-products under UV exposure (T4) and *P. lecomtei* cultivated on guaraná by-products without UV exposure (T7). These findings reinforce the potential of Amazonian agro-industrial by-products as value-added cultivation substrates and demonstrate that multicriteria integration can effectively guide the rational development of sustainable plant-fungi-based foods while promoting the valorization of Amazonian biodiversity and agro-industrial by-products.

Keywords: Amazonian Biodiversity; Next-Generation Functional Foods; Circular Economy.

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OP2.9 | Influence of the Digestion Process on the Anti-Neuroinflammatory Compounds of *Hericium erinaceus*

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Hericium erinaceus has been proposed as a source of bioactive compounds. However, little is known regarding the effect of intestinal transit on its bioactivity. Therefore, this study focuses on analyzing the effect of *in vitro* digestion on the composition and anti-neuroinflammatory activity of an *H. erinaceus* supercritical extract. Powder of *H. erinaceus* (particle size 500-100 µm) was submitted to the following extraction conditions: pure CO₂ at 300 atm and 313.15 K during 3 h. Then, the extract was submitted to digestion (INFOGEST 2.0 protocol), and its chemical composition was analyzed by GC-MS-FID and HPLC-DAD. The *in vitro* anti-neuroinflammatory activity was evaluated using the BV2 microglial cell line. The main compounds identified by GC-MS-FID in the supercritical extract were ergosterol (300.7 ± 16.8 mg/g) and fatty acids (linoleic, 62.2 ± 6.4 mg/g, and oleic, 38.9 ± 0.2 mg/g, acids). Hericene A and C, and hericenone C, D, and E were analyzed by HPLC-DAD, with hericenone C being the most abundant (29.3 ± 0.7 mg/g). Regarding the anti-neuroinflammatory activity, 15 µg/mL of the extract reduced the secretion of pro-inflammatory cytokines TNF-α (30%) and IL-6 (50%). This bioactivity was mainly attributed to the compounds mentioned above. After digestion, the ergosterol concentration remained unchanged, while hericenes and hericenones were no longer detectable. Significant increases in the fatty acids content were detected, particularly linoleic acid (114.2 mg/g), maybe as result from the esterase activity of pancreatic lipase, which hydrolyses tri- or diglycerides and hericene and hericenone compounds. Despite retaining anti-neuroinflammatory activity, its effect was reduced compared with the undigested extract (TNF-α and IL-6 secretion by 15% and 40%, respectively). In conclusion, the *in vitro* digestion process significantly altered the chemical composition of the supercritical extract. Although its anti-neuroinflammatory activity was reduced, it remained substantial.

Keywords: *Hericium erinaceus*; Anti-inflammatory Activity; *in vitro* Digestion; Fatty Acids; Ergosterol.

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OP2.10 | Rapid Minimal Residual Disease Clearance and Durable Remission in Pediatric Common B-Cell Acute Lymphoblastic Leukemia During Standard Therapy with an Exploratory Adjunct Proprietary Mycotherapy Protocol: A Case Report

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Pediatric B-cell acute lymphoblastic leukemia (B-ALL) is routinely treated with multi-agent chemotherapy, whereas the role of adjunctive supportive interventions remains insufficiently defined. We report the clinical course, response dynamics, and follow-up of a teenage girl with common-type, intermediate-risk, central nervous system 1 (CNS1) B-ALL treated according to the ALL-IC BFM 2009 protocol, with concurrent administration of a proprietary mycotherapy protocol which includes liquid extracts Lentifom and Agarikon Plus along with Agarikon.1 tablets, all produced by Myko San Company. This single-case report summarizes diagnostic, cytomorphologic, immunophenotypic, cytogenetic/molecular, and follow-up findings. At diagnosis at the end of 2023, peripheral blood contained 44% blasts, bone marrow cytology showed 99% blasts, and flow cytometry demonstrated 89% immature common-type B-lineage cells; clonally rearranged immunoglobulin heavy chain (IgH) and hyperdiploidy with trisomy 21 and partial trisomy 6 were documented. Early steroid response was favorable. Minimal residual disease (MRD) was 4.12% on day 15 and undetectable on day 33. Bone marrow MRD remained negative on 28 January 2025 and 29 January 2026, while peripheral blood testing on 30 January 2026 showed no detectable clonal IgH rearrangement. Maintenance therapy ended on 9 January 2026, and follow-up evaluation on 26 March 2026 documented clinical remission, no subjective complaints, and an unremarkable clinical examination. This case documents rapid MRD clearance and sustained remission during standard pediatric ALL treatment, with prolonged molecular and immunophenotypic negativity on follow-up. The intervention with standard therapy was well tolerated and did not interfere with treatment; possible contribution to supportive-care or recovery outcomes remains a hypothesis for further research.

Keywords: Pediatric Acute Lymphoblastic Leukemia; Minimal Residual Disease; Mycotherapy; Case Report; Supportive Oncology.

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OP2.11 | Preliminary *in vitro* Results on the Use of the Culinary-Medicinal Mushroom *Pleurotus eryngii* var. *eryngii* as Potential Secondary Starter in the Cheese Aging Process.

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During cheese ripening, filamentous fungi play a key role in the development of cheese organoleptic properties, contributing through their metabolic activity to the enhancement of aroma, texture, and color. Uncontrolled, spontaneous fungal colonization may lead to the colonization of species capable of producing secondary metabolites that can have adverse effects on human and animal health. To guide the ripening process, improve cheese quality, and reduce potential safety risks, selected secondary starters have been used. Typically, the filamentous fungi utilized for this purpose are from the genus *Penicillium* (like *P. roqueforti*), whereas the feasible application of basidiomycetes in cheese ripening remains is still not extensively explored. Four fungal strains of *Pleurotus eryngii* var. *eryngii*, isolated from Sicily and Apulia (Italy), were evaluated as potential secondary starter cultures for cheese ripening. Preliminary *in vitro* assay highlighted the ability of all strains to grow under culture conditions simulating a cheese-like environment. Furthermore, co-inoculation experiments were conducted with *Aspergillus westerdijkiae*, an ochratoxin A (OTA)-producing species frequently associated with cheeses ripened in natural environments, such as caves, in the presence of *Debaryomyces hansenii*, a yeast with known pro-technological role, and the four selected *P. eryngii* strains. Based on these preliminary strain-dependent results, co-inoculation of *D. hansenii* with *P. eryngii* strains is associated with a strong decrease in OTA production by *A. westerdijkiae*, as well as a reduction in fungal growth, compared to control (*A. westerdijkiae* alone) OTA levels were frequently below the detection or quantification limits, while growth reduction ranged from 10.1% (BAF 27) to 28.3% (ITEM13731). These preliminary findings represented a promising application of selected *P. eryngii* var. *eryngii* strains, in combination with *D. Hansenii*, as innovative secondary starter cultures for cheese ripening, with possible benefits for both product quality and food safety, although the specific contribution of each microorganism is still unclear. Therefore, further studies will be additionally conducted to determine the roles of the involved strains and to investigate their pro-technological characteristics in cheese, in terms of proteolytic and lipolytic activity, as well as their characteristic VOC emissions, which are also key factors (for quality) in the aging process.

Keywords: Food Safety; Secondary Starter Culture; Ochratoxin A; Cheese Ripening; *Aspergillus westerdijkiae*; *Pleurotus eryngii*.

OP2.12 | Valorization of *Agaricus bisporus* By-Products Through Lactic Fermentation for Functional Penne Pasta Development

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The recovery of edible mushroom by-products through biotechnological approaches represents an important strategy for circular food systems and for the development of value-added products. This study investigated the effects of lactic fermentation using *Lactobacillus plantarum* on flours produced from *Agaricus bisporus* (J.E. Lange) byproducts and their application in penne pasta formulations. Fermentation induced physicochemical and nutritional changes by about 30%, including reduced pH, increased water holding capacity, and higher dietary content. Fermented flours also showed detectable tocopherols and significantly improved for about 2-fold the antioxidant activity. Antimicrobial activity against *Staphylococcus aureus* improved after fermentation (MIC decrease from 1 to 0.5 mg/mL); while structural modifications included increased particle size and reduced water solubility, indicating matrix reorganization and enhanced functionality. The fermentation water also revealed the presence of soluble polysaccharides and bioactive phenolic compounds. The incorporation of fermented and unfermented mushroom flours into pasta (1%, 5%, and 10% of partial replacement of durum wheat semolina) resulted in improved nutritional profiles, higher bioactive compounds, and increased antioxidant activity. Pasta with fermented flour showed better hydration, texture, and cooking quality while maintaining acceptable sensory properties. Lactic fermentation proved to be an effective strategy for transforming *A. bisporus* byproducts into functional food ingredients with improved nutritional, technological, antioxidant, and antimicrobial properties, supporting sustainable food innovation and circular bioeconomy approaches.

Keywords: Edible Mushrooms; Lactic Fermentation; By-Product Recovery; Food Product Development; Circular Bioeconomy.

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OP3.1 | Biodegradable Nursery Containers Produced from Agricultural Residues and Macromycetes

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The increasing global restrictions on single-use plastics have intensified the need for sustainable alternatives in agricultural production systems. In coffee cultivation, conventional plastic nursery bags are widely used for seed germination and seedling production; however, their disposal generates considerable environmental pollution due to their low degradability and inadequate waste management. This study aimed to develop biodegradable nursery containers using agricultural and post-harvest residues combined with macromycetes-based biomaterials as an environmentally sustainable substitute for conventional plastic bags. The proposed biomaterials were produced through biotechnological processes involving fungal biotransformation of organic residues, including coffee pulp, fruit waste, and vegetable residues. Macromycetes were selected because of their natural lignocellulosic degradation capabilities and their ability to generate resistant mycelial structures suitable for container production. The process was developed in Manizales, Colombia, where coffee-processing by-products were transformed into biodegradable nursery containers for seedling cultivation. The resulting biomaterials demonstrated adequate structural properties for agricultural use while decomposing naturally in soil after transplantation. Additionally, the containers functioned as organic fertilizer, reducing transplant stress, eliminating the need for manual plastic removal, and contributing nutrients during seedling establishment. The study also highlights technological innovations associated with biodegradable biomaterials, including patent NC2017/0012686, invented by Carmenza Jaramillo, related to biodegradable absorbent materials for the collection, treatment, and disposal of organic waste. These findings demonstrate that biomaterials produced from agricultural residues and macromycetes represent a viable and sustainable alternative to conventional plastic nursery bags, contributing to circular economy strategies, reduction of plastic pollution, and sustainable agricultural production systems.

Keywords: Biomaterials; Macromycetes; Post-Harvest Residues; Biodegradable Nursery Containers; Sustainable Agriculture; Circular Economy.

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OP3.2 | Sustainable Innovation in Mushroom - Effect of Extraction Solvents on the Selected Bioactive Compounds in Submerged-Cultivated Mycelial Biomass of *Ganoderma lucidum* and *Laetiporus sulphureus*

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Mushrooms are widely recognized as valuable sources of bioactive compounds, whose extraction yield depends on both cultivation conditions and the solvent used. Submerged mushrooms cultivations offers a controlled strategy for producing fungal biomass and associated bioactive compounds. This study aimed to evaluate the effect of extraction solvents on the composition and biological activity of mycelial biomass from *Ganoderma lucidum* and *Laetiporus sulphureus* obtained under optimized submerged cultivation conditions. Cultivation was performed in malt extract broth, and optimal pH, temperature, and agitation rate were determined for each species using a Taguchi experimental design. Mycelial biomass was extracted by ultrasound-assisted extraction with water (W), or 96% ethanol (E), or 50% ethanol-water mixture (50EW). Extracts were analyzed for total protein, carbohydrates, total polyphenol, and β -glucan, as well as antioxidant activity (DPPH[•] and ABTS^{•+} assays). Optimized conditions led to increased biomass production, with the W-extract of *G. lucidum* reaching 2.3 g/100 mL. The highest protein content was observed in the 50EW-extract of *L. sulphureus* (29.4%), while protein content increased in the following order E<W<50EW-extracts for both species. Total carbohydrates were highest E-extract (48.9%) and W-extract (44.5%) of *G. lucidum*. The highest total polyphenol content was found in the 50EW-extract of *G. lucidum* (2.78 %). Antioxidant activity varied depending on assay and solvent, the strongest ABTS^{•+} scavenging activity was observed in the 50EW-extract of *L. sulphureus* (IC₅₀ = 2.92 mg/mL), while the highest DPPH[•] activity was recorded for the W-extract of *G. lucidum* (IC₅₀ = 0.59 mg/mL). The highest β -glucan content was detected in the E-extract of *G. lucidum* (21%), with total glucans reaching 35%. Overall, the results demonstrate that both optimized cultivation and extraction conditions significantly affect the bioactive profile of mycelium. The extracts demonstrated promising antioxidant properties, indicating their potential for further application in food industry.

Keywords: *Ganoderma lucidum*; *Laetiporus sulphureus*; Submerged Liquid Fermentation; Bioactive Compounds; Food.

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OP3.3 | Characterization and Biotechnological Valorization of Spent Mushroom Compost (SMC)

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Spent Mushroom Compost (SMC) is the residual substrate from mushrooms cultivation. While most of mushroom production is intended for food consumption, an increasing market share is dedicated to medicinal mushrooms containing bioactive compounds with potential health benefits. The valorization of SMCs represents a promising strategy of circular economy complying with the UN 2030 Sustainable Development Goals. This study aimed to evaluate the biotechnological potential of SMCs from four medicinal mushroom species: *Lentinula edodes*, *Hericium erinaceus*, *Ganoderma lucidum*, and *Pleurotus ostreatus*, which are commonly used for nutraceutical productions. Biotechnological applications included degradation and/or adsorption of pharmaceutical compounds for bioremediation and Biochemical Methane Potential (BMP) assays for anaerobic digestion. Some tests were conducted using untreated and autoclaved SMCs from *Pleurotus* and *Hericium* to distinguish enzymatic degradation from physico-chemical adsorption of drugs. Results showed that the tested SMCs contain significantly lower β -glucan levels than fruiting bodies (mg/100 g vs. g/100 g), but retain notable antioxidant, as well as interesting enzymatic activities. The highest cellulase and laccase activities were measured for SMC from *H. erinaceus*, which demonstrated promising bioremediation potential, with adsorption observed for all tested compounds (20–80% reduction). BMP assays using *Pleurotus* SMC as co-substrate in the co-digestion with poorly degradable feedstocks (waste sludge from wastewater treatment) showed synergistic effects especially when a SMC aqueous extract was used (increased methane yield by 18 to 44%). These findings support further investigation into SMC valorization as a sustainable resource for biotechnological applications.

Keywords: *Hericium*; *Pleurotus*; Biodegradation; Biomethane Production.

OP3.4 | Strain-Specific Growth and Reproductive Responses Among Conspecific *Inonotus obliquus* Strains in Dual Culture

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Conspecific interactions among fungal strains may influence vegetative growth and reproductive development, yet their systematic effects remain insufficiently characterized in many wood-inhabiting basidiomycetes. We investigated strain-dependent growth and reproductive responses in the medicinal wood-decaying basidiomycete *Inonotus obliquus* (commonly known as chaga) using 1326 pairwise dual-culture combinations derived from 52 strains and compared these with monoculture controls. The objective of this study was to (a) evaluate strain-dependent effects of dual culture on vegetative growth relative to monoculture conditions and to (b) determine whether basidiocarp formation in dual culture represents a strain-specific response. Radial growth was quantified after 28 days on 2% malt extract agar (MEA) in triplicate. Dual-culture growth was evaluated relative to monoculture growth, and combinations exceeding the global 95th percentile of monoculture measurements were identified as growth-enhancing. In dual culture, the strain exhibiting higher growth exceeded the maximum monoculture value (33 mm) in 60 out of 1326 pairings (4.5%), with half of these showing a statistically significant increase ($p < 0.05$). Among the ten highest growth-enhancing combinations, radial growth reached 39.33 mm, exceeding all monoculture values. Across all combinations, the maximum relative growth reached 161.6% of the corresponding monoculture mean. Basidiocarp formation was infrequent, occurring in 106 of 1326 pairings (8.0%), with simultaneous reproductive induction in both strains observed in 10 cases. Both vegetative growth and reproductive responses were dependent on specific strain combinations, indicating that conspecific interactions in *I. obliquus* generate highly strain-dependent outcomes.

Keywords: Chaga; Intraspecific Interactions; Radial Growth; Basidiocarp Formation.

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OP3.5 | Scaling Full-Spectrum Medicinal Mushroom Production: Lessons From Vertically Integrated Industrial Cultivation at Monterey Mushrooms

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The growing demand for medicinal mushroom ingredients has exposed a significant gap between artisan-scale production and the consistency, volume, and analytical rigor required by nutraceutical and functional food markets. Monterey Mushrooms, one of North America's largest commercial mushroom producers, has leveraged its vertically integrated infrastructure – spanning spawn production through Amycel Inc., substrate formulation, climate-controlled cultivation, and post-harvest processing – to develop scalable full-spectrum ingredient production across multiple medicinal species including *Hericium erinaceus*, *Ganoderma lucidum*, *Cordyceps militaris*, *Tramete versicolor*, and *Grifola frondosa*. This report draws on direct cultivation and product development experience to outline the practical and scientific principles underlying large-scale full-spectrum production. Full-spectrum ingredients capture bioactive compounds from three distinct fungal compartments: mycelium, fruiting bodies, and extracellular metabolites secreted during fermentation. Each compartment contributes a distinct compound profile – including β -glucans, ergothioneine, species-specific terpenes, and polysaccharides – that single-source products cannot replicate. Key variables governing bioactive yield at industrial scale include strain selection, substrate composition and amendment, colonization environment, harvest timing, and extraction method. The integration of spawn development (Amycel) with cultivation and processing (Monterey Mushrooms) enables tight quality control across the full production chain – a structural advantage over contract manufacturers sourcing finished material from multiple suppliers. Analytical standardization, including third-party β -glucan testing and metabolite quantification using validated methods, is presented as a non-negotiable baseline for market credibility. This report positions vertically integrated commercial cultivation as a model for the medicinal mushroom industry – one that can deliver the consistency, traceability, and compound diversity required for clinical alignment, regulatory compliance, and long-term consumer trust.

Keywords: Medicinal Mushroom Cultivation; Full-Spectrum Production; β -Glucans; Vertical Integration; Nutraceutical Manufacturing.

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OP3.6 | Spent Medicinal Mushroom Substrate as a Strategic Feed Resource for Sustainable Beef Cattle Production

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The use of edible and medicinal mushrooms, their products, and waste streams (such as Spent Mushroom Substrate – SMS) in sustainable beef cattle production is gaining widespread publicity and acceptance as the search for alternative feed resources intensifies. In particular, SMS holds great promise as a renewable resource, promotes a circular economy, and offers health-promoting and environmental benefits, while reducing dependence on human-edible grain. The rising cost of cattle feed, increasing beef demand driven by population growth, and the expanding environmental footprint associated with conventional cattle production have led to increased interest in sustainable, cost-effective feeding strategies involving SMS. This presentation summarizes our research and reports on medicinal mushrooms SMS as a dietary supplement, alone or in combination with other feed additives, such as corn silage, kudzu, and oilseeds. Results indicate that 1) *Pleurotus ostreatus* and *P. pulmonarius* improved the nutritional value of corn stover (CS), while *P. pulmonarius* had the highest dry matter digestibility, *P. ostreatus* had the highest crude protein, microbial mass, and total volatile fatty acid concentrations; 2) Two weeks fermentation period is sufficient to improve the nutritive value of CS; 3) Fermentation of CS supplemented with as high as 75% kudzu increased *in vitro* dry matter digestibility comparable to good quality hay; 4) replacing 50% of corn silage with SMS can significantly enhance nutrient digestibility and reduce environmental emissions; and 5) co-ensiling corn silage with SMS and oilseeds improved DM utilization while reducing-methane production with no adverse-effect on rumen fermentation stability or fiber digestion. SMS is an economical, eco-friendly, and promising feed additive for sustainable cattle farming and could replace up to 50% of corn silage in beef diets, leading to a substantial reduction in feed costs.

Keywords: Spent Mushroom Substrate (SMS); *Pleurotus*; Fermentation; *in vitro* Digestibility; Greenhouse Gases, Methane Mitigation.

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OP3.7 | The Influence of Substrate, Perforation Amount, and Perforation Size on the Mushroom Morphometrics of *Hericiium erinaceus*

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Hericiium erinaceus, commonly known as lion's mane, is a culinary and medicinal mushroom of high commercial value due to its neuroprotective and cognitive benefits. Although research on its biochemistry and medicinal properties is extensive, optimization of fruit body morphology remains underexplored, despite its importance for consumer perception, processing efficiency, and marketability. This study addresses this gap by identifying cultivation variables that most significantly influence yield, biological efficiency, and fruit body shape. Two complementary experiments assessed the effects of substrate amount (1 kg versus 2 kg), strain (86, 253, 2205), perforation size (8 mm, 13 mm, 20 mm), and perforation amount (1, 2, 4) on colonization time, fresh weight, biological efficiency, and morphometric traits derived from the X, Y, and Z diameters, including sphericity. All treatments used a 5% inoculation rate, a master mix substrate, incubation at 25 °C, fruiting at 20 °C, and 85–90% relative humidity. Fruit bodies were harvested seven days after primordia formation. The results indicate that a 13 mm perforation consistently produced the largest fruit bodies, with minimal substrate embedded in them. Smaller perforations (8 mm) restricted development, while larger perforations (20 mm) increased handling requirements without improving size. Increasing perforation amount enhanced yield and biological efficiency but reduced both size and sphericity, suggesting a trade-off between airflow and morphological uniformity. Pronounced strain-specific differences were observed: strains 253 and 2205 produced larger, more spherical fruit bodies, whereas strain 86 generated smaller, more elongated forms. These findings demonstrate that fruit body morphology in *H. erinaceus* is determined by interacting parameters. Substrate optimization, perforation orientation, and strain selection offer practical strategies to improve production efficiency and achieve consistent, commercially desirable fruit bodies in *H. erinaceus*.

Keywords: *Hericiium erinaceus*; Cultivation Conditions; Mushroom Morphometrics; Yield; Biological Efficiency.

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OP3.8 | Circular, Sustainable Model of Mushroom Production Applied in Commercial Farm

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Thanks to its biological characteristics, growing mushrooms is a unique branch of agriculture and economy in general, which basically has a model of circularity and potential sustainability. However, many details in modern production are not in accordance with this statement, primarily due to high energy consumption, often high CO₂ emissions, long-distance transport of both raw materials and finished products, etc. Therefore, many analyzes show that the LCA (Life Cycle Assessment) of modern and widely applied mushroom cultivation technology is surprisingly high. The organization of mushroom production in a sustainable way in every sense (from the economic aspect to the impact on the environment) in commercial conditions is possible. At Ekofungi, thanks to a set of innovative solutions applied to production, a unique circular and sustainable production model has been fully implemented. This model was created thanks to shifting the focus from the constant modernization of hardware and software solutions, which dominate the modern development of technology, towards the biology and physiology of fungi and finding solutions in technology that follow their biological cycles. The entire transitional process, from conventional to circular, sustainable and organic certified, lasted almost 15 years, as it was permanently followed by all aspects of investments and concept proof process. Thanks to that, a production model that fully meets Environmental, Social, and Governance (ESG) principles but also provides high-value food absolutely acceptable both in the supplement industry and in nutrition, is presented in this paper. Its basic characteristics are the complete elimination of energy consumption in the technology of substrate production for the cultivation of cellulose types of mushrooms, focusing on raw materials available in a narrow circle around production and the flexibility of technology for their use, a technique that meets the requirements of technology adapted to a low investment, absolute provision of the use of secondary products as waste for the next steps of production, etc. The Ekofungi product has a significantly more favorable LCA score and confirms so far only the theoretical claim about the sustainability of mushroom production.

Keywords: Mushrooms Production; Life Cycle Assessment; Circular Economy.

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OP3.9 | Mushrooms from Farm to Fork, a Coordinated Approach To Develop The Entire Value Chain and Reshape the Position Mushrooms as a “Next-Generation Functional Food” for Metabolic and Environmental Health

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Mushrooms-based diets remain underrepresented in food, health, and environmental, related sectors. The project Mushrooms from Farm to Fork aimed at positioning mushrooms as a nutritional strategy for metabolic and environmental health by bring evidence at three different levels: (a) the traceability in mushrooms cultivation using national agroforestry waste-based substrates; (b) the capability of antioxidant and anti-inflammatory agents and a mushroom-diet supplementation to prevent obesity; and (c) the raising knowledge and awareness about fungi through the coproduction of resources. We combined a normalized production system with advanced methodology in screening of compounds, and mechanistic *in vitro* and *in vivo* approaches and the translation into knowledge and awareness coproduction initiatives. As main results of our cross-disciplines collaboration, we highlight (i) the development and validation of a standardized production protocol for 2 mushrooms species with selected national agroforestry waste-based substrates (hardwood or hardwood combined with acacia, eucalypt, or rice bran); (ii) the identification of terpene and polysaccharide rich extracts with anti-inflammatory and antioxidant action; (iv) the development of a mushroom-based product for preventing obesity and other metabolic diseases now being tested in an international trial within the European project PAS GRAS (doi:10.3030/101080329); (v) the coproduction of events, such as the ‘Mushroom Month’, participatory culinary medicine based workshops involving canteens, and (digital) resources, collaboration with mushroom festivals, and the foundation of the brotherhood Mushrooms and Truffles of Portugal. Our results support that a collaborative research approach – across disciplines and sectors – may drive mushroom consumption and direction in innovation. We also underline that cross-sector measurable targets, and programs commitments, are needed to scalable a sustained development of the entire value chain, beginning in standardized production of substrates and fungi. Ultimately, we advocate a collaborative research framework to reshape the position mushrooms as a “next-generation functional food” for metabolic and environmental health.

Keywords: Mushroom-Based Diet; Using National Agroforestry Waste-Based Substrates; Standardized Fungi Cultivation; Obesity Prevention; Co-Production.

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OP3.10 | Breeding, Greenhouse Cultivation, and Nutritional Evaluation of Morel (*Morchella*) In Türkiye

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Morel mushrooms (*Morchella* spp.) are among the most highly valued edible and medicinal fungi for their exceptional culinary quality, high nutritional value, and abundant bioactive compounds of medicinal importance. Recent advances in cultivation technologies have enabled their commercial cultivation. This research examined morel breeding and sustainable greenhouse cultivation in Türkiye. Wild *Morchella* specimens were collected from diverse ecological regions of Türkiye, identified, and pure cultures were isolated and used to create the first national culture collection of Turkish *Morchella* spp. The National Mushroom Gene Bank of Türkiye now has approximately 400 isolates, representing 15 *Morchella* species. Greenhouse cultivation studies using *M. importuna* and *M. eximia* resulted in the first successful greenhouse production in Türkiye. Mono-mono hybridization was used to obtain superior *M. importuna* isolates for cultivation trials on optimized substrates containing wood ash as a supplement. Analyses of crude protein content and mineral composition (K, P, Ca, Mg, Fe, Zn, and Mn) in harvested fruiting bodies assessed the nutritional content. Isolates KG196, Kg008, KgX7 and KG035, together with hybrid strains FK007, FK060, and FK002, consistently exhibited superior yield (ranging from 10435.2 to 4308.9 kg fresh weight, ha). Wood ash supplementation significantly increased mushroom productivity by up to 258.47% in strain Kg 196. Protein and mineral composition results showed considerable genotypic variation, indicating that breeding can simultaneously improve both agronomic performance and nutritional quality in *M. importuna*. Collectively, the establishment of Turkish *Morchella* species culture collection, breeding to obtain superior strains, and the successful cultivation on wood-ash-supplemented substrates represent a sustainable approach to commercial morel cultivation in Türkiye.

Keywords: *Morchella*; Morel Breeding; Exogenous Nutrition Bag; Greenhouse Cultivation; Nutritional Quality.

Acknowledgments

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OP4.1 | Functional Impact of *Hericium erinaceus*-Derived Metabolites on Transcriptional Programs in Glial Cells

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Hericium erinaceus is recognized for its neurotrophic and antioxidant properties, yet the functional impact of its complex metabolome on cellular transcriptional programs remains poorly defined. While previous studies have often focused on single-compound logic, this study systematically characterizes and compares the transcriptional response of 1321N1 human astrocytoma cells to whole fruiting-body water and ethanol extracts of *H. erinaceus*. In this study, cells were pre-incubated in low-serum medium and subsequently treated with extract-containing or vehicle-matched medium for 24 h. Total RNA was extracted, sequenced, and analyzed using a DESeq2-based pipeline, complemented by threshold-free gene-set enrichment analysis (GSEA) to identify modulated molecular pathways. Results indicate that both extracts elicit modest, distinct transcriptional shifts with weak single-gene overlap. The ethanol extract notably induced NTRK2 (TrkB) expression and down-regulated pathways related to oxidative phosphorylation and mitochondrial energy metabolism. In contrast, the water extract induced a coordinated antioxidant response, characterized by the up-regulation of the Nrf2/NFE2L2 axis and oxidative stress pathways, while suppressing genes associated with cytoplasmic translation and cell-cycle progression. These findings demonstrate that *H. erinaceus* water and ethanol extracts modulate distinct transcriptional programs in astrocytes, consistent with the mushroom's reported neurotrophic and antioxidant biology.

Keywords: *Hericium erinaceus*; Transcriptomics; Astrocytes; Neurotrophic; Antioxidant.

OP4.2 | Temporal Deployment of Lignocellulolytic Carbohydrate-Active Enzymes During Fungal Colonization of a Hardwood Sawdust-Corn Stover Substrate

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Basidiomycete fungi are among the most important decomposers of plant biomass in terrestrial ecosystems due to their ability to degrade lignocellulosic materials. They achieve degradation through the coordinated action of oxidative and hydrolytic enzymes. Elucidating the temporal regulation of these enzymes is essential for improving how fungi is utilized in food, feed, bioenergy, and biotechnological applications. In this study, we investigated the transcriptomic changes that occur during the growth of a novel *Pleurotus* isolate (*Pleurotus* sp. 773) on a 50:50 hardwood sawdust-corn stover substrate without supplementation. We collected samples weekly over a six-week cultivation period representing substrate colonization and progression toward fruit body development. We performed RNA sequencing to characterize the global transcriptional changes and the temporal expression of carbohydrate-active enzymes (CAZymes). Principal component analysis showed a clear separation between early (weeks 1–3) and late (weeks 4–6) developmental stages, with the largest transcriptomic shift occurring between weeks 3 and 4. Differential expression analyses identified extensive remodelling of the CAZyme repertoire throughout cultivation. Oxidative enzymes, particularly auxiliary activity (AA) families, were prominently expressed during intermediate stages, while cellulolytic and carbohydrate-binding module (CBM)-containing genes became increasingly abundant during later stages. Clustering analyses revealed multiple co-regulated temporal modules corresponding to distinct phases of substrate colonization, hemicellulose degradation, cellulose utilization, and late-stage carbon scavenging. The results demonstrate that *Pleurotus* sp. 773 deploys its lignocellulolytic machinery through a series of coordinated transcriptional programs rather than simultaneous expression of all degradative functions. The findings provide insights into fungal biomass deconstruction strategies and establish a molecular framework for future exploitation of *Pleurotus* sp. 773 in lignocellulose conversion, food production, animal feed development, and other biotechnological applications.

Keywords: Basidiomycota; *Pleurotus* spp.; Substrate Degradation; Transcriptomics; Carbohydrate-Active Enzymes.

Acknowledgments

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OP4.3 | From Fungi to Pharma: Machine Learning and Molecular Docking Reveal a Potent Antidiabetic Steroid in *Cordyceps sinensis*

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Drug discovery from fungal natural products is often limited by scattered, unstandardized chemical data. To overcome this, we developed the Mushroom Use Base Bank (available in <https://lmwdatabase.com>) a curated repository of 223 low molecular weight compounds with reported medicinal activities, isolated from 74 fungal species. The objective was to apply this resource to a computational search for inhibitors of protein tyrosine phosphatase 1B (PTP1B), a validated therapeutic target for type 2 diabetes and obesity. Compound information was gathered by literature search screenings. Validated molecules were characterized by physicochemical descriptors and subjected to artificial intelligence (AI) screening using quantitative structure-activity relationship (QSAR) models. We employed Morgan fingerprints with XGBoost and LightGBM classifiers, using applicability domain control and consensus voting. Finally, molecular docking of PTP1B (PDB: 2QBS) was performed to evaluate binding modes, with the protocol validated by redocking the co-crystallized ligand. The Morgan-XGBoost model achieved the best performance (MCC = 0.686; AUC = 0.893), followed by Morgan-LightGBM. Both models concordantly predicted two active compounds: 5 α ,8 α -epidioxy-24(R)-methylcholesta-6,22-dien-3 β -D-glucopyranoside (from *Cordyceps sinensis*) and 1-octadecanoic acid (from *Morchella esculenta*). In docking, the *C. sinensis* steroid exhibited a binding affinity of -8.5 kcal/mol (predicted K_i = 0.59 μ M), matching that of the reference inhibitor, whereas 1-octadecanoic acid showed -5.5 kcal/mol (predicted K_i = 93.1 μ M). This ergostane-type steroid is a strong candidate for PTP1B inhibition, pending experimental validation. Integrating curated databases of medicinal fungal compounds, predictive AI, and targeted molecular docking is an efficient strategy for rapidly identifying promising novel bioactive molecules.

Keywords: Artificial Intelligence; Diabetes; Bioactive compounds; Drug Discovery; *in silico* Methods.

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OP5.1 | *Inonotus obliquus* in Finland: Use History, Cultural Significance, and Transatlantic Diffusion

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The *Inonotus obliquus* i.e. Pakuri (in Finnish), a parasitic fungus growing on birch forming sterile conks, is a unique forest resource of which history in Finland reflects long-term processes of subsistence adaptation, cultural identity formation, and global diffusion. This study synthesizes archival documents, historical newspapers, ethnographic literature, and research reports to examine the history and evolution of Pakuri use, its cultural significance, and its transformation into a modern bioeconomic resource in Finland. Historical sources indicate that documented knowledge of Pakuri use in Finland dates back at least to the mid-19th century, although the practice itself likely predates written records. Early Finnish-language newspapers document the use of “pakuri/pakkula/mahlapahka” as a coffee substitute and additive in the 1860s–1870s, while later 19th century accounts describe well-established preparation methods and widespread household use. Pakuri-based beverages became particularly important during periods of scarcity, including wartime, when locally available resources replaced imported goods. Beyond its practical role, Pakuri was embedded in culture relying on forest resources emphasizing self-sufficiency, resilience, and local knowledge. Ethnographic and literary sources suggest connections to traditional medicine highlighting its multifunctional role in Finnish rural societies in old times. A key dimension of Pakuri history is its diffusion through migration. Finnish emigrants to North America in the late 19th and early 20th centuries carried knowledge of Pakuri use with them, contributing to the persistence of these practices in immigrant communities. Historical Finnish-language publications in North America indicate continuity of traditional uses, illustrating how Pakuri functioned as part of cultural identity in diaspora contexts. From the late 20th century onwards, Pakuri has undergone a significant transition from subsistence resource to commercial and scientifically studied product. Finland has played a pioneering role in research on bioactive compounds and in the development of inoculation-based cultivation methods. These innovations have laid grounds for controlled production systems that originated in Finland and later spread internationally, including to Estonia, Sweden, Canada, and the United States. Overall, the history of Pakuri illustrates a continuum from traditional knowledge to modern bioeconomy applications, demonstrating how cultural heritage and scientific innovation together shape the global development of forest-based resources.

Keywords: Pakuri; *Inonotus obliquus*; Cultural History; Non-Timber Forest Products; Finland; Bioeconomy.

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OP5.2 | Unlocking the Potential of Thermotolerant Medicinal Mushroom Species and Strains for Climate Resilience and Circular Bioeconomy

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Climate change poses an escalating threat to global mushroom production by increasing energy demands for environmental control, reducing yields, and enhancing susceptibility to pests and diseases. The development and utilization of thermotolerant medicinal mushroom species/strains constitute a strategic solution for climate-resilient cultivation and sustainable bioeconomy systems. Their adoption may become indispensable for ensuring the long-term viability and successful cultivation of mushrooms under rapidly changing climatic conditions.

Several high-temperature loving strains of widely cultivated mushroom species such as *Lentinula edodes*, *Agaricus bisporus*, and those of the genus *Pleurotus* have demonstrated enhanced growth, fruiting capacity, and physiological stability under elevated temperatures. These strains, often originating from tropical, subtropical or arid ecosystems, are valuable for breeding programs aiming at generating high-performance heat-tolerant hybrids. Simultaneously, the broader adoption of other exotic thermotolerant species, including *Calocybe indica*, *Agaricus subrufescens*, *Volvariella volvacea*, and *Pleurotus giganteus*, offers substantial opportunities to diversify production systems, expand cultivation into warmer regions and reduce dependence on energy-intensive cooling technologies. Thermal adaptation in these fungi is supported by multiple physiological and molecular mechanisms, including heat shock protein induction, enhanced antioxidant defense systems, osmoprotectant accumulation, maintenance of cellular homeostasis, and hormone-mediated stress signaling pathways. Collectively, these adaptive mechanisms support survival, metabolic stability, and productive performance under thermal stress conditions.

Consequently, the systematic exploration, isolation, and characterization of novel wild strains from naturally warm habitats – in combination with directed breeding – should be prioritized as a key adaptive strategy for maintaining mushroom industry resilience in the face of global warming. Furthermore, the integration of thermotolerant medicinal mushrooms into agricultural systems may substantially reduce dependence on cooling infrastructure, lower carbon emissions, and enhance the bioconversion of agricultural residues into nutraceutical and pharmaceutical products.

Keywords: Thermotolerant Mushrooms; Climate-Resilient Cultivation; Sustainable Mushroom Biotechnology.

OP5.3 | Sustainability of Medicinal and Edible Mushrooms Abundance in the Soil Following Pine Forest Thinning

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Climate change, increased wildfire frequency, and intensive tree removal are becoming key drivers of forest management, with significant consequences for fungal conservation in forest ecosystems. In recent years, controlled forest thinning has been increasingly applied to mitigate these disturbances. We have investigated the impact of pine forest thinning on soil fungal diversity and abundance, with a focus on the biomass of edible and medicinal mushrooms in the soil. The research was conducted in a coniferous forest in Israel, 12 years after the implementation of thinning treatments. Five thinning regimes were established through targeted tree removal: (1) un-thinned plots; (2) medium thinning; (3) heavy thinning; (4) clear-cut plots, and (5) unplanted plots, also serving as a negative control. Each treatment consisted of three replicate plots. Soil samples were collected, total DNA was extracted, and fungal diversity was analyzed using ITS1–ITS2 primers targeting the ITS region. The sequences were generated using the Illumina MiSeq platform. Operational taxonomic units (OTUs) were identified and taxonomically annotated using BLAST searches against the GenBank database. Trophic modes and guilds were assigned using FUNGuild. Monitoring mushroom taxa such as *Morchella* spp. (Morel), *Pleurotus*, *Suillus*, *Tricholoma*, *Tuber*, and other species revealed that their presence and richness in the soil of the different treatments were associated with their trophic mode (saprotrophic or ectomycorrhizal) and species identity. Overall, forested treatments differed significantly from non-forested treatments, whereas differences among thinning intensities within forested plots were minimal, yet they depended on the specific species. These findings suggest that the reserve biomass of mushroom-producing species may be maintained in thinned forest soils, while still enabling forest management practices aimed at reducing environmental deterioration.

Keywords: Forest Thinning; Climate Change; Soil Fungal Diversity; Saprotrophic; ECM.

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OP7.1 | From Lab Scale to Market Application: Bottlenecks in Medicinal Mushroom Product Development

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The functional and medicinal mushroom market is expanding rapidly. However, bringing scientific research from the lab to the market faces serious challenges. This analysis addresses the critical bottlenecks causing medicinal mushroom innovations to stagnate in laboratories rather than reaching the market. Based on practical experience in R&D project implementation involving science-industry collaboration, specific technological, infrastructural, and legal barriers are identified. These bottlenecks stem from fundamental differences in operational goals and structures between both sectors. A primary problem remains the lack of mandatory, rigorous chemical standardization of the raw material. The business sector currently limits itself to minimum regulatory registration requirements, frequently treating them as benchmarks of quality. However, establishing true therapeutic value requires educating consumers to choose commercial products based on qualitative and quantitative parameters, specifically species-specific secondary metabolites. Another critical barrier is the absence of a European network of open-access scale-up pilot plants and demonstration hubs dedicated to the development of the medicinal mushroom sector. Without collaborative infrastructure where researchers and entrepreneurs can verify whether in vitro results are reproducible at a semi-technical scale, introducing medicinal mushroom-based innovations to the market is impossible. Investors will not allocate capital to acquire unverified solutions without solid proof of their scalability. To address the identified challenges, it would be appropriate to establish an international "Medicinal Mushroom Innovation Framework" representing a systemic approach to transforming science-industry relationships. Opening a dialogue to formulate such proposals is essential to realistically unlock the commercial potential of both medicinal mushrooms and the functional mushroom sector.

Keywords: Medicinal Mushrooms; Functional Mushrooms; Technology Transfer; Standardization; Scale-up Infrastructure.

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OP7.2 | The Future of Mushroom Farming

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The 21st century has brought a multitude of changes to the way we do almost everything. Mushroom farming is no exception. We face two major changes in the mushroom industry today, the growth of technology and the increasing difficulty of raising capital for the financing of new farms. One of the ways we can offset this financial difficulty is by cultivating species that have a higher profit potential, while being cheaper to produce. As we find ways to incorporate artificial intelligence (AI) into mushroom farming, this will certainly help. But after my 50 plus years in this industry, the main changes I see have to do with smaller scale, more efficient farms, which are producing specialty wood-decomposing species, moving away from the long standard *Agaricus* mushrooms. As the lesser developed countries move into the information age with the internet and all the exposure to new ideas that engenders, we find more and more small specialty mushroom farms being built. This presentation is about the changes that make this not only possible, but practical.

OP7.3 | Fungal Names and DNA-Based Authentication: Applied Research and Policies

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Accurate fungal identification (ID) and nomenclature are essential to guarantee the safety, standardization, and reproducibility of medicinal macrofungi (MM) products and their research. They are often undervalued in applied mycology and industry. Misidentification and inconsistent labeling can pose significant risks. DNA ID of fungal strains should be mandatory for research on MM, especially with clinical trials. Even closely related species can possess significant biochemical differences and, therefore, differences in their medicinal activities. There is a lack of studies that compare biochemical profiles of closely related species of MM. For example, it is impossible to objectively compare biochemical results and properties of *Ganoderma* species based on vast majority of published papers, where their strains were not characterized using DNA ID. Several studies, including the current one, have shown that most cultivated medicinal Reishi (Lingzhi) corresponds to *Ganoderma sichuanense* (= *G. lingzhi*), while *G. lucidum* (False Lingzhi) is predominantly European species (also found in China) and relatively rarely used for nutraceuticals and functional food production. Our preliminary study of biochemical profiles of these two species shows significant differences in the content of several valuable medicinal compounds, such as lucidenic acids A and N, lanostanoid acid, ergosterol, ganolucidic acid B, and several ganoderic acids. The wrong name problem is very common for three popular MM, such as 1) Reishi: *G. lucidum* vs. *G. sichuanense*; 2) Cordyceps: *Ophiocordyceps* (*Cordyceps*) *sinensis* vs. *Cordyceps militaris* or *Samsoniella hepiali*; 3) Royal Sun Agaricus: *Agaricus blazei* and *A. brasiliensis* vs. *A. subrufescens*. However, this problem also exists at the policy level. For example, names *G. sichuanense* or *G. lingzhi* are not even listed in the EU Novel Food status Catalogue. Integrating DNA authentication into standardization pipeline for fungal products greatly addresses these issues at the basic level. Also, all regulatory documents must be updated with correct fungal names.

Keywords: Medicinal Mushrooms; Fungal Nomenclature; Cross-Sector Standardization; *Ganoderma*; *Cordyceps*.

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OP7.4 | The Mushroom Was More Alive and Vibrant: Patient Reports of Synthetic versus Organic Forms of Psilocybin

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Interest in psychedelic research in the West is surging, however, clinical trials have almost exclusively studied synthetic compounds such as MDMA, ketamine, DMT, LSD, ibogaine, and psilocybin. To date, few clinical trials have utilized whole mushroom/plant material like *Psilocybe* mushrooms, Iboga, or Ayahuasca. Individuals participating in the Roots To Thrive Psilocybin-Assisted Therapy for End of Life Distress program were administered synthetic psilocybin, whole *Psilocybe cubensis*, and mycological extract on separate occasions and post-treatment interview transcripts were qualitatively analyzed to discern themes and patterns.

There was broad consensus that all three forms were helpful and similar, all generating visual and perceptual distortions, emotional and cognitive insight, and mystical experiences. However, synthetic psilocybin was said to feel less natural compared to organic forms, and the overall quality of experience of synthetic psilocybin was inferior to the organic forms. Research should be conducted with whole psychedelic mushrooms and extract in addition to synthetic psilocybin given this preliminary data, especially when considering that medicine keepers around the world have utilized whole mushrooms and plant material for millennia.

Keywords: Psilocybin; Psychedelic; Palliative Care; Psychedelic-Assisted Therapy.

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OP8.1 | The Possibility of Reducing Stress Response in Humans Using Chitin/Chitosan-Glucan-Melanin Complex From *Fomes fomentarius* (ChMGC)

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In recent decades, stress has emerged as a central factor shaping human health, behavior, and adaptive capacity. Unlike evolutionary conditions characterized by acute stress followed by recovery, modern environments increasingly expose individuals to chronic, low-intensity stressors such as information overload, social pressure, environmental challenges, and metabolic disturbances. In regions affected by socio-political instability or armed conflict, including contemporary Ukraine, chronic background stress is often combined with acute, high-intensity stressors, creating a dual burden that overwhelms adaptive mechanisms and increases vulnerability to both somatic and mental disorders. A common biological denominator of these stressors is the induction of oxidative stress. This study employs a conceptual and integrative analysis of stress-induced biological mechanisms with a focus on oxidative processes. The roles of the hypothalamic-pituitary-adrenal (HPA) axis, sympathetic nervous system activation, and reactive oxygen species (ROS) generation were examined. Additionally, the potential modulatory effects of natural bioactive compounds – particularly melanin, β -glucans, and chitin/chitosan – were analyzed based on available experimental and theoretical evidence. Both acute and chronic stress converge on shared physiological pathways involving activation of the HPA axis and increased secretion of glucocorticoids and catecholamines, which stimulate ROS production ($\cdot\text{OH}$, $\text{O}_2^{\cdot-}$, H_2O_2). While ROS play essential roles in cellular signaling under physiological conditions, their excessive accumulation leads to oxidative stress, characterized by damage to lipids, proteins, and DNA. Oxidative stress acts as a central integrator linking stress exposure to metabolic dysfunction, inflammation, immune dysregulation, and disease development. It also contributes to the formation of a tumor-promoting microenvironment by facilitating angiogenesis, immune evasion, and cellular proliferation. Natural biopolymers demonstrate significant potential in modulating these processes: melanin functions as a redox buffer and antioxidant; β -glucans exhibit immunomodulatory and anti-inflammatory properties; and chitin/chitosan contribute to detoxification by binding toxins and reducing exogenous oxidative load. Oxidative stress represents a key unifying mechanism underlying the pathological effects of both chronic and acute stress. Targeting redox imbalance is therefore a promising strategy for mitigating stress-related disorders. Natural bioactive compounds, particularly those of fungal origin, may exert synergistic effects across multiple levels of the stress-response cascade, offering potential as adjunctive interventions for restoring redox homeostasis and preventing disease progression.

Keywords: Stress; Eustress; Distress; Oxidative Stress; Anti-Stress Activity; Chitin/Chitosan-Glucan-Melanin Complex; Tinder Fungus.

OP8.2 | The Ability of Chitin/Chitosan-Glucan-Melanin Complex From *Fomes fomentarius* (ChGMC) to Modify the Course of Cancer

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The tumor microenvironment (TME) plays a central role in the initiation, progression, and therapeutic resistance of malignant neoplasms. It consists of a complex network of cellular and molecular interactions that regulate tumor cell proliferation, angiogenesis, chronic inflammation, immune suppression, and metastasis. Different types of tumors are characterized by differences in growth rate, metastatic potential, and response to treatment. Limitations of conventional therapies, such as toxicity and resistance, necessitate the development of novel adjunctive approaches. A literature-based analysis of preclinical and experimental studies was conducted to evaluate the biological activity of fungal-derived compounds and their potential role in modulating TME-related processes. Fungal-derived bioactive compounds, including polysaccharides (β -glucans), melanin, terpenoids, and phenolic compounds, exhibit antioxidant, anti-inflammatory, immunomodulatory, and antiproliferative effects. In experimental models, it has been established that components derived from the fungus *Fomes fomentarius* (chitin/chitosan, β -glucans, and melanins) can exhibit combined biological activity: water-soluble complex of melanin and β -glucans (MGC) has powerful antioxidant activity against the nuclear DNA of various normal cells, and has a toxic effect on the nuclear DNA of malignantly transformed cell, β -glucans activate immune cells (macrophages, natural killer cells, T-lymphocytes) and cytokine production, melanin reduces the intensity of oxidative stress, and chitin/chitosan modulate inflammation and bind toxic compounds. *In vivo* systems, MGC significantly increased the lifespan of ICR mice and the latent period for spontaneous tumor development in these mice. Fungal-derived compounds represent promising adjunctive agents in cancer therapy through combined cytostatic and immunomodulatory mechanisms. However, further well-designed clinical studies are required to confirm their efficacy and safety.

Keywords: Tumor Disease; Tumor Microenvironment; Oxidative Stress; β -Glucans; Melanin; Chitin; Chitosan; Immunomodulation.

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OP8.3 | Medicinal Mushrooms in Reproductive Medicine: Emerging Evidence, Orthodox Limitations, and Opportunities for Clinical Research in Nigeria

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Infertility remains a major public health challenge globally, particularly in sub-Saharan Africa, where access to advanced fertility care remains limited. Consequently, complementary and alternative medicine continues to play an important role in reproductive health management. Medicinal mushrooms (*Ganoderma* spp., *Lentinula edodes*, *Cordyceps* spp., *Grifola frondosa*, *Pleurotus* spp., etc.) contain bioactive compounds, including β -glucans, polysaccharides, triterpenoids, and ergosterols, that may influence reproductive physiology by modulating oxidative stress, inflammation, insulin resistance, immune responses, and endocrine pathways. Preliminary evidence suggests possible benefits in male fertility parameters, sexual function, metabolic disorders associated with infertility, and stress-related reproductive dysfunction. However, orthodox medical acceptance remains limited due to the lack of randomized controlled trials, poor standardization of preparations, regulatory concerns, inconsistent dosing protocols, and insufficient long-term safety data. Medicinal mushrooms represent a promising but insufficiently validated area within integrative reproductive medicine. Traditional medicine remains culturally accepted in Africa. In Nigeria, alternative medical practices coexist alongside orthodox medicine, unlike in Western countries. Therefore, access to scientifically robust clinical trial pipelines is more readily available for evaluating medicinal mushrooms in medicine, particularly in reproductive health. This report summarizes research on the use of medicinal mushrooms in reproductive health and presents opportunities for ethically designed translational and clinical research in Nigeria. Nigeria could serve as a strategic setting for pilot studies and clinical trials evaluating medicinal mushroom-based adjunctive therapies in fertility care.

Keywords: Medicinal Mushrooms; Infertility; Reproductive Medicine; Integrative Medicine.

Acknowledgments

This research received no external funding.

OP8.4 | Protective Effects of a Polysaccharide-Rich *Hericium erinaceus* Extract Blend Against Fipronil-Induced Oxidative Stress in the *Galleria Mellonella* Insect Model

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Hericium erinaceus is a medicinal mushroom valued for bioactive polysaccharides with antioxidant potential, yet its protective effect against pesticide-induced stress remains underexplored. This study evaluated a polysaccharide-rich extract blend of *H. erinaceus* in the *Galleria mellonella* insect model. Larval extract tolerance was first assessed using three dietary doses (E1–E3), followed by fipronil dose-response testing at 5-60 ppm to identify a stress-inducing concentration. In the protection assay, larvae were fed an extract-supplemented diet and challenged with 40 ppm fipronil; mortality was monitored on days 1, 2, 3, and 5, and hemolymph was analyzed at 48 h for superoxide dismutase (SOD) activity and malondialdehyde (MDA) content. The extract blend was non-toxic at the tested doses, whereas fipronil induced a clear dose- and time-dependent increase in mortality, reaching >50% by day 5 at 40 ppm and complete mortality at 60 ppm. Co-administration of the extract attenuated fipronil-induced mortality and partially reduced the associated oxidative stress response, with lower SOD activity and MDA levels than the fipronil-only group. These findings indicate that the *H. erinaceus* polysaccharide-rich extract blend exerts a protective effect against fipronil-induced oxidative stress in *G. mellonella* and support further investigation of mushroom-derived preparations as natural protective agents against xenobiotic stress.

Keywords: *Hericium erinaceus*; *Galleria mellonella*; Fipronil; Oxidative Stress; Polysaccharides.

Acknowledgments

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OP8.5 | Mushroom Polysaccharides as Cholesterol-Lowering Functional Ingredients

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Mushrooms are recognized as functional foods due to their bioactive properties. While numerous *in vitro* and *in vivo* studies have established the cholesterol-lowering effects of their polysaccharide-rich extracts, however the specific chemical structures of their polysaccharides and their potential roles in lipid metabolism have not been fully elucidated. Therefore, this study aimed to characterize the carbohydrate profiles of *Lactarius deliciosus*, *Macrolepiota procera*, and *Fistulina hepatica*, highly valued edible mushrooms native to Northeast Portugal, and evaluate their efficacy in lowering cholesterol using a simplified *in vitro* intestinal model. Fruiting bodies of *L. deliciosus*, *M. procera*, and *F. hepatica* were extracted with hot water, and the aqueous extracts were fractionated with graded ethanol precipitation. Water-insoluble residue and water-soluble rich fractions were chemically characterized by glycosidic linkages analysis of the partially methylated alditol acetate by GC-MS. All mushroom's water-insoluble polysaccharides were composed of glucose with the presence of t-Glc (10 – 17 % mol), (1→3)-Glc (15 – 26 % mol), (1→4)-Glc (2 – 39 % mol), (1→6)-Glc (4 – 13 % mol), and (1→3,6)-Glc (10 – 14 % mol) linkages. The water-soluble polysaccharides were composed of galactose and glucose, rhamnose (*L. deliciosus*) and fucose (*M. procera* and *F. hepatica*). The glycosidic linkages analysis showed the presence of soluble glucans, rhamnogalactans in *L. deliciosus* and fucogalactans in *M. procera* and *F. hepatica*. Assessment of cholesterol-lowering activity of both water-insoluble and -soluble polysaccharides-rich fractions was measured by GC-MS and ¹H-NMR, using the signal of CH₃ (C-18) of emulsified bile salts, determining cholesterol solubility and bile salts binding capacity, respectively. The rhamnogalactan-rich fractions showed higher cholesterol decrease (50 – 90%) than fucogalactan-rich fractions (13 – 56%) and water-insoluble glucans (13 – 34%). The bile salts sequestration were similar independently of the polysaccharide (0 – 38%). The water-soluble polysaccharides present in *L. deliciosus*, *M. procera*, and *F. hepatica* exhibited significant effects on cholesterol solubility. The chemical characteristics, such as the presence of rhamnose and fucose or the polymerization degree, appear to influence cholesterol solubility through hydrophobic interactions and bile salts binding capacity, that decreases the cholesterol emulsification power. These results highlight the complex role of mushrooms polysaccharides in lipid metabolism.

Keywords: Mushrooms; Polysaccharide; Structure-Function Relationship; Cholesterol Accessibility.

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OP9.1 | Optimizing *Psilocybe cubensis* Bioactivity by Submerged Fermentation

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Psychedelic mushrooms have a long history of use in traditional medicine for the treatment of mental and cognitive disorders, and their active compounds are currently being investigated for therapeutic applications in psychiatry. Our research group is among a limited number worldwide holding formal authorization to cultivate and extract psilocybin producing mushrooms for scientific research. The objective of this study was to develop and optimize bioreactor based cultivation protocols for multiple *Psilocybe* species, with a focus on monitoring strain specific differences in mycelial growth and psychoactive metabolite profiles. We investigated how submerged fermentation parameters influence mycelial biomass production and the accumulation of key bioactive compounds, including psilocybin and psilocin, across different strains of *Psilocybe cubensis*. Experimental variables included strain identity, nutrient media composition, pH, agitation, aeration, and mycelial disruption. Our results demonstrate that both biomass yield and metabolite accumulation are strongly dependent on strain selection and process conditions. These findings provide a foundation for controlled, scalable production of bioactive *Psilocybe* mycelium and support its potential application in the development of standardized mycelial-based pharmaceutical products.

Keywords: Psilocybin; Psilocin; Tryptamines; *Psilocybe*; Psychedelic Mushrooms.

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The authors have reviewed and edited the output and take full responsibility for the content of this publication.

OP9.2 | From Molecule to Mushroom: Regulatory Futures of Psychedelic Psilocybin Therapies

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Psilocybin, the principal psychoactive compound of *Psilocybe* mushrooms, is considered a Schedule I substance under the United Nations (UN) 1971 Convention on Psychotropic Substances, defined as having high abuse potential and no recognized medical use. However, emerging clinical evidence is challenging this classification, with psilocybin showing promise across multiple psychiatric indications, including treatment-resistant depression (TRD). Its development pathway is uniquely complex, positioned at the intersection of pharmaceutical drug development and naturally occurring psychedelic substances. This study aims to examine current regulatory frameworks and explore future scenarios for integrating psilocybin-based therapies into healthcare systems globally. A narrative review of regulatory developments was conducted, including analysis of international drug control frameworks, national regulatory pathways (such as U.S. Food and Drug Administration and European Medicines Agency), and recent policy shifts in selected jurisdictions, supported by secondary sources such as regulatory guidance, policy reports, and industry publications. Comparative analysis was used to contrast synthetic psilocybin formulations with whole-mushroom regulatory considerations. As of 2026, regulatory approaches remain heterogeneous. Synthetic psilocybin is advancing through established drug approval pathways, supported by mechanisms such as *Breakthrough Therapy Designation*, while natural-source approaches, including whole mushrooms and standardized extracts, continue to be explored, raising hypotheses regarding the role of secondary alkaloids (“entourage effects”) and alternative access models. These developments highlight a structural divergence between a pharmaceutical model based on synthetic or modified compounds, intellectual property, and regulatory standardization, and a natural-source model characterized by biological variability, lower intellectual property protection, and potential for broader accessibility. Three forward-looking scenarios emerge: pharmaceutical dominance, parallel integration, and a bifurcated market. Upon approval, psilocybin-based therapies may represent a system-level inflection point, reshaping regulatory, clinical, and cultural frameworks globally. Proactive regulatory alignment will be essential to ensure that innovation in psychedelic therapies translates into safe and effective participant care.

Keywords: Psilocybin; Psychedelic Therapy; Drug Regulation; Clinical Development; Medicinal Mushrooms.

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OP9.3 | *Amanita muscaria* – Ancient Wisdom and Healing Properties of the Iconic Toadstool

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Amanita muscaria is an iconic medicinal mushroom with longstanding use in Paleoasiatic traditions, applied topically and internally for analgesic, anti-inflammatory, anxiolytic, stimulant, and memory-supporting purposes. This work reviews its therapeutic value by linking traditional applications to contemporary pharmacological understanding of its principal neuroactive constituents, muscimol and ibotenic acid. Using a narrative synthesis of reported biochemical properties and research findings, the study describes how muscimol – an agonist of gamma-aminobutyric acid type A (GABA-A) receptors – enhances inhibitory signaling in the central nervous system (CNS), thereby reducing neuronal excitability implicated in anxiety, insomnia, and seizure-related conditions. Ibotenic acid, a glutamate receptor agonist, contributes to neurological effects and can be metabolized into muscimol, shaping the overall activity profile. Across early-stage evidence, muscimol is associated with potential anxiolytic effects, modulation of mood-related pathways, analgesic activity in neuropathic pain, anti-inflammatory effects in systemic and dermatologic inflammatory models, and possible neuroprotective relevance to disorders including Parkinson's, Huntington's, and Alzheimer's diseases. Sleep-focused findings indicate increased rapid eye movement (REM) episodes and duration, supporting restorative sleep and cognitive-emotional processing. In comparison with benzodiazepines, which act as positive allosteric modulators at GABA-A receptors, muscimol is presented as acting more directly on GABAergic signaling, with qualitatively different reports regarding dependence liability and rebound phenomena; however, these comparisons remain insufficiently validated by controlled clinical studies. Overall, *A. muscaria* represents a promising GABAergic therapeutic candidate with multi-domain potential, but rigorous trials are required to establish safety, standardized preparations, dosing ranges, and efficacy relative to established anxiolytic agents, while acknowledging that interpretive frameworks may also include psychological or spiritual dimensions of healing. There is still much to learn about *Amanita's* mysteries. The goal is to offer a new perspective so you can better understand and benefit from this unique mushroom.

Keywords: Muscimol; Ibotenic Acid; GABA-A Receptors; Anxiolytic; Neuroprotection.

Acknowledgments

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OP9.4 | How the Mycophilous Poland Embraced the Use of Fly Agaric (*Amanita muscaria*)

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Poland is a strongly mycophilous country; however, the use of *Amanita muscaria* seems to be a new phenomenon despite the species being common there (growing mainly, but not exclusively, under *Betula pendula*). Our goal was to look at this phenomenon using mainly data from on-line research. In October 2023, we made an Internet questionnaire for *Amanita* users which was distributed from social media. We received 399 responses. Most *A. muscaria* users learned about the mushroom from the media and experimented themselves, usually recently. The users reported very few side effects and often believed in the miraculous properties of the mushroom; many mentioned the ability of the mushroom to help in cases of alcohol addiction. Most users consume small amounts, much less than one cap, but do so regularly. Only a small proportion experiment with hallucinogenic doses. On the 22nd of May 2025, the use or possession of muscimol and ibotenic acid, the active components of *A. muscaria*, became banned and penalized in Poland, which has likely changed the dynamics of the use of the species.

We hypothesize that the extreme popularity of the species in Poland was facilitated by the general mycophilous character of Polish culture and widespread availability of this species in the surrounding environment.

Keywords: Ethnomycology; Medicinal Mushrooms; Entheogens; Hallucinogenic Mushrooms.

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P2.1 | Bioactive Extracts of *Lactarius deliciosus* as Colon Cancer Therapeutic Candidates

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Mushrooms have long been the focus of scientific inquiry due to their nutritional richness and biological potential, making them a subject of study in both the dietary and medicinal domains. *Lactarius deliciosus*, a species of the Russulaceae family, is a widely distributed edible mushroom due to its characteristic taste and texture, valued as a functional food due to its rich content of nutrients, phenolic compounds, and flavonoids, which contribute to its strong antioxidant and antimicrobial properties. This study focused on developing and optimizing an environmentally friendly microwave-assisted extraction technique to maximize the yield of bioactive phenolic compounds from *L. deliciosus* extract (LDE), while also assessing its antioxidant, antiproliferative, antimetastatic, and anti-inflammatory properties against human colon carcinoma (Caco-2) cells. The results of this study demonstrate that both solvent polarity and composition play a crucial role in the recovery of antioxidant biomolecules. Optimal concentrations of antioxidant phenolic compounds were achieved using NaDES (glycerol/glycine/water) combined with microwave-assisted extraction at a temperature of 225 °C. Analysis of LDE revealed a substantial content of phenolic compounds, with 4-hydroxybenzoic acid and vanillic acid identified as the major constituents. LDE significantly suppressed colony formation and cell adhesion in a dose-dependent manner, causing near-complete inhibition of clonogenic survival at 592.16 µg/mL and increased death of non-adherent colon cancer cells. LDE exerted antiproliferative effects on Caco-2 cells by inducing G0/G1 cell cycle arrest and promoting apoptosis, accompanied by mitochondrial potential disruption and elevated caspase-3 activity. Additionally, LDE displayed antioxidant properties through reduced intracellular ROS levels and anti-inflammatory activity via downregulation of *NOS2* gene expression. In conclusion, LDE bioactive compounds show strong promise as therapeutic candidates for colon cancer, demonstrating antioxidant, antiproliferative, antimetastatic, and anti-inflammatory effects.

Keywords: *Lactarius deliciosus*; NaDES-microwave extraction; Caco-2; Anticancer.

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The authors have reviewed and edited the output and take full responsibility for the content of this publication.

P2.2 | Comparative Evaluation of Chitosan Extracted From *Agaricus bisporus* and *Lentinus edodes* Mushrooms

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Chitosan is a natural, non-toxic biopolymer with numerous potential applications in biotechnology, the pharmaceutical industry, biomedicine, and other fields. Chitosan obtained from cultivated mushrooms has several advantages over crustacean chitosan, such as a lower allergenic risk, the presence of additional bioactive compounds, sustainable production, and a non-animal origin. This study presents a comparative evaluation of chitosan obtained from two commercially cultivated mushrooms, *Agaricus bisporus* (ChAb) and *Lentinus edodes* (ChLe), focusing on their chemical characteristics and biological activities. Chitosan was extracted from mushroom fruiting bodies through alkaline treatment (9 M NaOH, 121°C, 1.5 h), followed by acid extraction with 5% acetic acid and alkaline precipitation. Nuclear magnetic resonance (1H-NMR) analysis revealed a similarly high degree of deacetylation for both species (92.7% for ChAb and 92.6% for ChLe), exceeding the values typically reported for commercial mushroom chitosan obtained from crabs (75–85%). Despite comparable structural characteristics, the biological activities of the two chitosan samples differed. ChAb exhibited particularly strong antioxidant properties determined in vitro, with DPPH radical scavenging activity of 99.35% and ferrous ion chelating ability of 98.50% at 5 mg/mL. ChLe showed lower but concentration-dependent antioxidant activity, with DPPH scavenging activity of 87.64% and ferrous ion chelating ability of 85.95% at the highest tested concentration. Antioxidative activity of both samples was higher compared with the standards, ascorbic and citric acids. Antibacterial activity was tested using a broth microdilution assay (conc. 0.078-5.0 mg/ml). Both chitosan samples demonstrated antibacterial activity against foodborne pathogens, including *Enterococcus faecalis* (ATCC 29219) and *Escherichia coli* (ATCC 25922). For ChAb, bactericidal concentrations were 2.5 mg/ml for *E. coli*, and 0.625 mg/ml for *E. faecalis*. ChLe showed strong bactericidal activity in concentration of 0.625 mg/mL against *E. faecalis*, and 5.0 mg/mL against *E. coli*. Overall, the results highlight species-dependent differences in the bioactivity of mushroom-derived chitosan and confirm that both *A. bisporus* and *L. edodes* represent promising sources of bioactive biopolymers for applications in food preservation, antimicrobial materials, and biomedical technologies.

Keywords: Chitosan; *Agaricus bisporus*; *Lentinus edodes*; Biological Activity.

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P2.3 | Effect of *in vitro* Gastrointestinal Digestion on the Nutritional, Antioxidant, and Anticancer Properties Of Mushroom Flours

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For centuries, mushrooms have been present in the human diet across most cultures of the world due to their organoleptic characteristics and nutritional value, containing protein, essential amino acids, dietary fiber, carbohydrates, minerals, vitamins, and low-fat content. For this reason, great interest has been raised within the scientific community regarding their potential in the fields of health, functional nutrition, and bioactive capacity. This study focuses on three commercially valuable edible mushroom species: *Boletus edulis* (BE), *Grifola frondosa* (GF), and *Lactarius deliciosus* (LD), to assess their nutritional, functional, and antioxidant potential using flours made from their fruiting bodies. To this end, proximate characterization, quantification of total phenolic compound content, and evaluation of antioxidant activity were performed before and after *in vitro* gastrointestinal digestion, while also assessing their antioxidant and antiproliferative properties against human colon carcinoma (Caco-2) cells. The results revealed that the three mushroom flours present a remarkable nutritional profile, characterized by a low-fat content, a significant carbohydrate fraction, and appreciable levels of protein and essential minerals. Among them, GF had the highest carbohydrate and protein levels. Regarding the minerals, all mushroom flours stand out for their high potassium, phosphorus, and magnesium contents, with BE being particularly high in selenium. The total phenolic compound content differed significantly between species, with BE exhibiting the highest values. Also, antioxidant activity followed a similar trend to phenolic content, with BE showing the highest antioxidant capacity, followed by GF, while LD presented considerably lower values. Furthermore, the *in vitro* gastrointestinal digestion process significantly increased both phenolic content and antioxidant activity, especially during the intestinal phase, where BE and GF showed the greatest increase, while LD maintained more modest values. These results were consistent with the antiproliferative and antioxidant effects of the digested mushroom flours, which revealed that BE and GF exhibited antiproliferative and antioxidant effects against Caco-2 cells, while LD revealed only antioxidant effects at high concentrations. In conclusion, BE and GF possess remarkable potential as functional or nutraceutical ingredients due to their essential micronutrient content and their antioxidant and anticancer capacity, which is further enhanced after the digestive process.

Keywords: *Boletus edulis*; *Grifola frondosa*; *Lactarius deliciosus*; Digestion; Caco-2 cells.

Acknowledgments

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The authors have reviewed and edited the output and take full responsibility for the content of this publication.

P2.4 | Antioxidant Potential of Underexplored Corticioid Fungi (*Basidiomycota*): A Multi-Assay Screening

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Methanolic extracts were obtained from 51 species of corticioid fungi (*Basidiomycota*; *Hymenochaetales*, *Polyporales*, *Russulales*) collected from dead wood in northeastern Poland, primarily in the Białowieża Primeval Forest. Corticioid fungi represent a highly diverse yet still underexplored group, comprising numerous taxa that remain poorly characterized at the biochemical level. Despite their ecological importance and growing recognition as potential sources of bioactive metabolites, data on their biological activity remain limited. This highlights the need for systematic screening and chemical characterization of corticioid fungi as a promising source of new compounds with potential biomedical and biotechnological applications.

To address this gap, a comprehensive set of antioxidant assays was applied, including DPPH[•], ABTS^{•+}, and FRAP. In addition, total phenolic content (TPC) was determined using the Folin-Ciocalteu method.

Forty-two species were evaluated for antioxidant activity for the first time. The highest antioxidant activities, depending on the assay, were observed for *Crustoderma dryinum*, *Hymenochaete rubiginosa*, and *Xylobolus frustulatus*. The highest TPC values were recorded for *Byssomerulius corium*, *Phlebia centrifuga*, *Phlebia rufa*, and *Xylobolus frustulatus*. Antioxidant potential was strongly assay-dependent, with significant variation observed both between species and within taxa across different analytical methods.

Pearson correlation analysis revealed moderate positive relationships between TPC and DPPH[•] ($r=0.60$), ABTS ($r=0.68$), and FRAP ($r=0.50$), suggesting that non-phenolic compounds substantially contribute to the overall antioxidant capacity of corticioid fungi. One-way ANOVA indicated that differences between fungal orders were statistically significant for all assays; however, the FRAP test showed marginal significance ($p = 0.0501$). These findings highlight corticioid fungi as a promising source of compounds with biomedical and biotechnological potential.

Keywords: Corticioid Fungi; Antioxidant Activity; Phenolic Compounds; *Basidiomycota*; Bioactive Compounds.

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P2.5 | Bioactivity of European *Antrodia* S.L.: A Critical Review and Future Research Directions

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The genus *Antrodia* s.l. comprises a taxonomically diverse group of wood-decaying fungi occurring across temperate forest ecosystems. In contrast to European taxa, the Asian species *Antrodia cinnamomea* has been extensively investigated as a source of biologically active secondary metabolites, including triterpenoids, benzenoids, and polysaccharides with antimicrobial, anti-inflammatory, and anticancer properties.

This study presents a critical review of the current state of knowledge on selected European *Antrodia sensu lato* species, including both common and rare taxa such as *Antrodia serialis*, *Antrodia sinuosa*, *Antrodia xantha*, *Antrodia albobrunnea*, and *Antrodia crassa*. The analysis is based on a curated species list representing a range of ecological niches and taxonomic diversity. Available literature was evaluated with respect to reported chemical composition and biological activities.

The review indicates that, despite well-established taxonomic and ecological frameworks supported by molecular phylogenetic studies, data on the bioactivity of European *Antrodia sensu lato* are limited and highly fragmented. Only isolated reports on secondary metabolites are currently available for European *Antrodia* s.l., including lanostane-type triterpenes from *Antrodia heteromorpha* and serialynic acid from *Antrodia serialis*. For the majority of taxa, including rare species such as *A. albobrunnea*, *A. crassa*, and *A. hyalina*, no data on secondary metabolites or biological activity are currently available.

Based on this assessment, key research gaps are identified, particularly the lack of systematic and comparative studies integrating taxonomic resolution with biochemical and functional analyses. The presented framework highlights the need for systematic comparative studies integrating taxonomy, ecology, chemical profiling, and functional bioassays.

Keywords: *Antrodia sensu lato*; Bioactivity; Wood-Decaying Fungi; Secondary Metabolites; Bioprospecting.

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P2.6 | Sex as a Biological Variable in Assessing Behavioral Effects of *Pleurotus Ostreatus*

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Pleurotus ostreatus is considered a high-quality food, rich in bioactive compounds important for maintaining human health. The mushroom extracts and compounds have demonstrated neuroprotective, neuromodulator, and immunomodulatory activities, as well as an anti-inflammatory and antioxidant potential in neurodegenerative diseases. Mushroom polysaccharides are well-known compounds with numerous biological activities, but their influence in relation to biological sex is largely unexplored. This study aimed to advance our understanding of the sex-related behavioral and mood-regulating properties of polysaccharide extract from *P. ostreatus* (PoP) in adult male and female C57BL/6J mice, the most widely used inbred strain in biomedical research. The polysaccharide extracted from fruiting bodies of *P. ostreatus* commercially cultivated in organic mushroom production were provided by Ekofungi. Moreover, analysis was performed using FTIR spectroscopy, and the content of monosaccharide units was determined using GC-MS. In the FTIR spectrum of the sample, characteristic bands for polysaccharides are observed. The composition of monosaccharide units indicates that the polysaccharide sample consists predominantly of D-glucose (80.95%), while D-galactose (11.23%) and D-mannose (7.62%) are present in very small quantities. Traces of D-xylose (0.08%) and D-arabinose (0.12%) suggest a very small amount of pentose units. The composition indicates the glucan character of the sample with a minor participation of other sugar units. Obtained behavioral data revealed sex-specific effects of the five-week application (oral gavage) of PoP on the psychomotor behavior of mice, in the sense that an antidepressant effect was observed in females, which was not evident in males. Thus, materials such as polysaccharides from mushrooms, whose extracts are water-soluble, are promising agents as an antidepressant treatment in females. These findings are particularly important considering that depression is about twice as common in females compared to males, so PoP as a supplement has the potential to be considered as an effective complementary intervention.

Keywords: *Pleurotus ostreatus*; FTIR; GC-MS; Mood-Regulating Properties; Sex-Related Behavioral.

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P2.7 | Neuroprotective Effects of Mushroom Biomass Digestive Fractions and Gut Microbiota-Derived Metabolites in Models of Alzheimer's Disease

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by the accumulation of β -amyloid plaques, neurofibrillary tangles, neuroinflammation, and oxidative stress. Dietary strategies have been explored as promising approaches to support brain health. Neuroprotective and other health-promoting effects may arise from direct absorption of bioactive compounds, modulation of the gut microbiota, or both. This study evaluated the neuroprotective potential of simulated digestive fractions from mushroom biomass (MB) of *Trametes versicolor* (TV), *Herichium erinaceus* (HE), and *Pleurotus ostreatus* (PO), as well as gut microbiota-derived metabolites, including short-chain fatty acids (SCFAs) and γ -aminobutyric acid (GABA). Cell viability and TBHP-induced intracellular reactive oxygen species (ROS) production were assessed in the human microglial cell line HMC3 following treatment with MB digestive fractions and gut microbiota metabolites. Chemotaxis and paralysis experiments were performed in transgenic *Caenorhabditis elegans* models expressing hyperphosphorylated Tau or β -amyloid proteins. MB digestive fractions significantly reduced ROS production in HMC3 cells, showing dose- and species-specific effects. The highest ROS inhibition was observed for the HE digestive fraction at 1.25 mg/mL (24.00%). SCFAs also demonstrated antioxidant activity, with butyric acid showing the strongest effect on ROS inhibition (43.88%). Regarding *C. elegans* experiments, MB digestive fractions, butyric acid, and GABA improved chemosensory responses in the BR5270 and CL2355 strains. These digestive fractions and metabolites also significantly delayed paralysis progression in the CL4176 strain. Overall, the findings demonstrate that MB-derived digestive fractions and gut microbiota-related metabolites exert neuroprotective effects through the modulation of ROS production and the attenuation of A β - and Tau-induced toxicity. These results support the MB's potential as a functional ingredient with preventive applications against neurodegenerative disorders. Further research is needed to elucidate the molecular mechanisms underlying these protective effects and their translational potential for human neurodegenerative diseases.

Keywords: Mushroom Biomass and Fruiting Bodies; Chemical and Bioactive Characterization; Gastrointestinal Digestion; Gut Microbiota Modulation; Neuroprotective Potential.

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P2.8 | Multifunctional Bioactivity of the Species *Laxitextum bicolor* (Pers.) Lentz, (1956) [1955]: First Evidence of Strong Antioxidant, Antiproliferative, and Acetylcholinesterase Inhibitory Potential

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Laxitextum bicolor (syn. *Stereum fuscum*) is a resupinate wood-decaying basidiomycete commonly found on fallen trunks and stumps of deciduous trees. Despite its widespread occurrence, information on its biological activity remains scarce. This study evaluated the antioxidant, cytotoxic, and enzyme-related activities of *L. bicolor* collected from Papratski Do, Fruška Gora (Serbia), together with its phenolic composition. Methanolic extracts were prepared from dried basidiocarps by maceration in 70% methanol for 24 h, yielding 2.59% (w/w). Additional ethanol extracts 80% EtOH obtained after hydrodistillation were used for biological assays. Antioxidant activity was assessed using DPPH[•], ferric reducing antioxidant power (FRAP), and electron spin resonance (ESR) methods, while total phenolic and flavonoid contents were determined spectrophotometrically. Cytotoxic activity was evaluated against cultured cells after 24 h and 72 h of treatment. Very strong anti-acetylcholinesterase activity was determined according to Ellman assay reaching EC₅₀ at 4.79 mg/mL. The extract exhibited pronounced antioxidant activity, with a DPPH radical-scavenging EC₅₀ value of 3.63 ± 2.50 µg/mL, comparable to the reference antioxidant butylated hydroxyanisole (EC₅₀ = 2.09 µg/mL). FRAP values reached 20.11 ± 3.10 mg ascorbic acid equivalents/g dry matter. Total phenolic and flavonoid contents were 16.75 ± 5.57 mg gallic acid equivalents/g and 4.57 ± 4.21 mg quercetin equivalents/g dry matter, respectively. ESR analysis further confirmed strong free-radical scavenging capacity DPPH[•] radical of *L. bicolor* (0,373 mg/mL). The extract also demonstrated concentration- and time-dependent antiproliferative activity, with EC₅₀ values at 400.85 µg/mL after 24 h and 325.04 µg/mL after 72 h of exposure. To our knowledge, this is among the first reports describing the bioactive properties of *L. bicolor*. The obtained results identify this species as a promising source of antioxidant metabolites with moderate antiproliferative potential, supporting further investigation of its chemical constituents and possible applications in functional foods and natural health-promoting products.

Keywords: *Laxitextum bicolor*; Acetylcholinesterase Inhibition; Antioxidant Activity; Anti-Proliferative Activity; Neuro-Protective Potential.

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P2.9 | Prebiotic Properties and Biological Potential of Aqueous Extracts from *Pleurotus ostreatus*

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Pleurotus ostreatus holds excellent promise worldwide, offering several opportunities and expanding the tools used in biotechnology, medicine, and the food industry. *P. ostreatus* is recognized for its prebiotic properties, which can enhance the nutritional quality of functional foods. These mushrooms contain bioactive compounds that support the growth of beneficial gut bacteria, thereby maintaining a healthy balance of gut microbiota. The antibacterial, antioxidant and chemical analyses of two aqueous extracts of fruit body's *P. ostreatus* (PIAQ1 and PIAQ2) were investigated in this study. The prebiotic properties of extracts used in 10 and 20 mg/mL, were evaluated by their ability to promote probiotic growth *Lactobacillus plantarum*, on two medias (MRS and Low MRS). The extract PIAQ1 demonstrated antimicrobial activity against *Enterobacter cloacae* and *Salmonella Typhimurium* (minimal inhibitory concentrations (MIC) were 2.5 and 0.25 mg/mL, respectively), and stimulated the growth of lactic acid bacteria by 90% at higher concentration on Low MRS medium. Additionally, the new extract (PIMRS10) of the cell-free supernatant from *L. plantarum* cultured with PIAQ1 extract on MRS medium was obtained. At a concentration of 10 mg/mL, PIMRS10 extract exhibited the highest antimicrobial activity against *S. Typhimurium*, *Escherichia coli*, *E. cloacae*, and *Proteus mirabilis*, with MIC values of 0.03, 0.12, 0.12, and 0.5 mg/mL, respectively, using microdilution method. FTIR and GC-MS were used for the chemical characterization of all extracts. Additionally, antioxidative activity was assessed using the DPPH[•], ABTS^{•+}, and FRAP assays. The lowest glucose content was observed in samples, PIMRS10 (321.8 mg/g), compared to the PIAQ1 and PIAQ2 samples. Antioxidant assays showed good mutual correlation. Among the analyzed samples, PIMRS10 and PIMRS20 exhibited the highest antioxidant activity in the DPPH[•] assay, with values of 8.90 and 8.76 mg TE/g, respectively. Overall, these findings suggest that aqueous extracts from *P. ostreatus* can be used to produce functional foods that support gut health.

Keywords: Extracts; Prebiotic; Antimicrobial; Antioxidant; GC-MS; FTIR.

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P2.10 | Bioactivities of Polysaccharide-Rich Hot-Water Extracts from *Pleurotus citrinopileatus* and *Lentinula edodes*: Antioxidant and Cholinesterase Inhibitory Potential

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Edible and medicinal mushrooms have attracted increasing scientific interest due to their nutritional value and health-promoting properties. Among their bioactive constituents, polysaccharides, particularly β -glucans, have been associated with antioxidant, immunomodulatory, anti-inflammatory and neuroprotective effects. In recent years, mushroom-derived compounds have emerged as promising natural ingredients for the prevention and management of chronic diseases, including neurodegenerative disorders. Therefore, the present study aimed to compare the biological activities of hot-water extracts obtained from *Pleurotus citrinopileatus* and *Lentinula edodes*. These mushroom samples were subjected to hot-water extraction to obtain polysaccharide-rich extracts. The antioxidant capacity was evaluated using the ABTS radical scavenging assay, while neuroprotective potential was assessed through acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) inhibitory activities. The extract from *P. citrinopileatus* exhibited higher biological activity than *L. edodes* in all evaluated parameters. Regarding cholinesterase inhibition, *P. citrinopileatus* showed AChE and BChE inhibitory activities of 31.71% and 23.99%, respectively, whereas *L. edodes* presented lower inhibition values of 9.99% and 4.34%. Furthermore, the antioxidant capacity of *P. citrinopileatus*, determined by the ABTS^{•+} assay, was 2.73 mmol Trolox equivalents/g extract. The results demonstrate that hot-water extracts from edible mushrooms possess relevant bioactive properties, particularly regarding cholinesterase inhibition. Among the species evaluated, *P. citrinopileatus* exhibited superior antioxidant and anticholinesterase activities, suggesting a greater potential as a source of functional ingredients for applications targeting oxidative stress and neurodegenerative disorders. Further studies are required to characterize the polysaccharide fraction and elucidate the compounds responsible for the observed biological effects.

Keywords: Medicinal Mushrooms; Polysaccharides; Neuroprotection.

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P3.1 | *Pleurotus ostreatus* (Shimeji) Mushroom Cycle: Development of a Symbiotic Beverage and Full Utilization of Residual Biomass for Human Consumption

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Fungi are versatile organisms that degrade organic matter, produce substances of added value, and are useful for human nutrition. However, understanding of their benefits remains incipient among a large part of the population, such as high school students in public schools in the city of Manaus/Amazonas/Brazil. Knowing this, the present work aimed to teach, share, and develop a project at the Aurea Pinheiro Braga State School - Military Police College (CMPM IV) about the cultivation and benefits of edible mushrooms. It is worth remembering that their cell walls contain polysaccharides of pharmaceutical importance, such as β -glucans, which are immunomodulators. Thus, a symbiotic beverage was developed composed of probiotic substances – derived from the commercial SCOBY (Symbiotic Culture of Bacteria and Yeast) – and prebiotics (derived from the aqueous extract of commercial *Pleurotus ostreatus*). The residual biomass was transformed into a nutritious hamburger, aiming to minimize waste. (*upcycling*). Both the symbiotic beverage and the hamburger were subjected to sensory evaluation ($n = 35$) by the students themselves using a 9-point hedonic scale. The characteristics of color and appearance had the best results, with averages of 7.08 ± 1.61 and 7.2 ± 1.77 , respectively, followed by the other characteristics, refreshment (6.91 ± 1.48), flavor (6.48 ± 1.99) and aroma (5.11 ± 2.09), with the aroma of the beverage needing further study for its refinement being observed. In contrast, the residual hamburger showed greater acceptance among the students, with the highest averages for the characteristics of flavor (7.28 ± 1.67) and aroma (7.14 ± 1.71), followed by appearance (6.48 ± 1.77) and texture (6.4 ± 1.73). It is worth highlighting that the sensory analysis indicated an Acceptability Index (AI) greater than 70% for both products. These results allow us to conclude that the integrated processing of *P. ostreatus* increases resource efficiency, transforming a waste stream into two distinct functional foods, aligning nutritional innovation with zero-waste biotechnology.

Keywords: *Pleurotus ostreatus*; β -Glucans; Edible Mushrooms.

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P3.2 | Influence of Agro-Industrial By-Products on Growth and Ligninolytic Activity of *Ganoderma* Spp.

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Macrofungi of the genus *Ganoderma* are known to produce a broad diversity of bioactive compounds widely exploited in the pharmaceutical, food, and cosmetics industries. However, harvesting wild fruiting bodies based on phenotypic identification limits the reproducibility and standardization of produced metabolites. The present study aims to establish a collection of wild *Ganoderma* spp. strains isolated from diverse natural environments, combining phenotypic characterization with molecular identification. Secondly, it evaluates the influence of various agricultural or industrial by-products on the cultivation of *Ganoderma* strains, and specific enzymatic activities involved in substrate degradation. Isolates of wild-type *Ganoderma* strains were cultivated under controlled conditions on several by-product-based substrates. Key growth parameters, including colonization rate, primordium initiation, and fruiting body development, were monitored. Simultaneously, the activity of three major ligninolytic enzymes (lignin peroxidase, manganese peroxidase, and laccase) was quantified to elucidate the relationship between enzymatic activity and substrate colonization efficiency. Significant variations in colonization rate and growth were observed depending on the strain/substrate combination. Certain by-products significantly enhanced colonization rates and fruiting body yield. These differences could be attributed to variations in the molecular composition of the substrates used or to differences in the enzymatic profiles of the strains. This integrated approach optimizes the strain and substrate selection substrates for the controlled cultivation of *Ganoderma* spp., thereby valorizing industrial and agricultural by-products and paving the way for sustainable and standardized industrial production. This work represents a preliminary step for future investigations on how substrate origin, particularly industrial waste streams, influences the metabolic profiles of *Ganoderma* spp. fruiting bodies with a view to developing active ingredients.

Keywords: *Ganoderma*; Cultivation; By-Products; Enzymatic Activities; Bioactive Ingredients.

Acknowledgments

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P3.3 | Valorization of Rosemary Processing Waste as a Sustainable Supplement for *Pleurotus ostreatus* Cultivation

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Nutritional supplementation is a common agronomic strategy in edible and medicinal mushroom cultivation to improve substrate efficiency, reduce crop cycles, and enhance yield quality, including bioactive compound content. Rosemary (*Rosmarinus officinalis*) is a well-known medicinal, aromatic, and culinary plant widely cultivated in the Mediterranean basin. Its processing generates significant amounts of by-products, particularly woody residues after leaf removal and distilled leaves from essential oil production. In this study, these rosemary by-products (wood waste and distilled leaf powder) were evaluated as sustainable substrate supplements for the cultivation of the edible lignocellulosic fungus *Pleurotus ostreatus*. Fungal growth was assessed both in vitro and in solid substrates. Petri plate assays were performed using PDA supplemented with 3% (w/v) leaf or wood powders, with yeast extract as a positive control. Radial growth was measured after 3, 6, and 9 days at 25 °C. Additionally, supplementation trials were conducted in a wood-based sterile substrate at different concentrations (0.5–5%, w/w), and mycelial growth was monitored over 11 days.

Results showed that both leaf and wood promoted radial mycelial growth after 6 and 9 days (>20% increase), exceeding the effect of yeast extract. Ergosterol content, determined by HPLC as a proxy for fungal biomass, confirmed the growth-promoting effect, with relative growth index (RGI = $E_{\text{treatment}}/E_{\text{control}}$) values up to 2.6 (leaf, 2%) and 2.8 (wood, 1%).

In conclusion, the incorporation of rosemary by-products into *P. ostreatus* substrates represents a sustainable strategy to enhance mycelial growth while contributing to the valorization of agro-industrial rosemary residues in circular bioeconomy framework. Further research should address biological efficiency during fructification and the nutritional composition of fruiting bodies.

Keywords: Edible Mushroom Production; *Pleurotus*; Lignocellulosic Waste; Valorization; Rosemary Plants; Circular Bioeconomy.

Acknowledgments

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P3.4 | Evaluation of Garlic Hydrolate as a Biopesticide in Mushroom Cultivation

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Plant-derived bioactive compounds are increasingly recognized as effective alternatives for pest and disease control in agricultural systems. Among these, garlic (*Allium sativum* L.) is a well-known source of biologically active molecules. The extraction of its main aromatic and bioactive constituents is commonly achieved by hydrodistillation, a process that also generates an aqueous by-product known as a hydrolate. In this study, the chemical composition of a hot-water garlic extract (HWGE) and its potential toxicity on *Agaricus bisporus* mycelium was evaluated. This work represents a preliminary assessment aimed at exploring the feasibility of using garlic hydrolate as a biopesticide in mushroom cultivation. The regional context is particularly relevant, as Castilla-La Mancha is the leading producer of cultivated edible and medicinal mushrooms and garlic in Spain, facilitating access to raw materials and supporting circular economy approaches. GC-MS analysis of HWGE revealed a complex mixture of compounds, predominantly organosulfur constituents such as allyl sulfides and thiosulfinates, which are well documented for their antimicrobial and fungicidal properties. Preliminary results from three experimental trials indicated that the application of HWGE to mushroom crops may lead to significant yield reductions, suggesting a potential phytotoxic effect on *A. bisporus* mycelium. Further research is needed to define optimal application conditions (particularly in terms of dosage and timing) in order to maximize its efficacy as a biopesticide while minimizing negative impacts on crop productivity. In addition, future efforts should also evaluate the activity in other edible and medicinal mushroom crops.

Keywords: *Agaricus bisporus*; Mushroom Yield; Biological Control; Garlic Hydrolate; Organosulfur Compounds.

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P3.5 | Prospection of Physical Methods for Dietary Fiber Extraction from Mushrooms

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Dietary fiber (DF) is characterized by carbohydrate polymers that are not hydrolysed by the endogenous enzymes in the small intestine. The DF may contain both a soluble (gums, mucilages, pectins, beta-glucans, polysaccharides, and oligosaccharides) and an insoluble fraction (cellulose, hemicellulose, and lignin) of dietary fiber or a mixture of several portions of both fractions. Edible mushrooms have been gaining prominence as natural sources of dietary fiber and are considered to have great potential for application in the food industry. They are rich in β -glucans and chitin, which offer proven benefits for digestive health, glycemic control, and lowering cholesterol levels. This study aimed to evaluate the effect of three physical methods (forced percolation, ultrasound-assisted, and extrusion) in dietary fiber modification of *Lentinula edodes*, *Agaricus bisporus*, and *Pleurotus ostreatus* species. For each method, the tested conditions were selected according to a bibliographic review and applied to the different mushroom species. Concerning the forced percolation method, six cycles were applied with temperatures ranging from 40–85 °C for 60 min, while for ultrasound-assisted extraction, amplitudes of 76–100 W and powers of 360–487 W were tested. For extrusion, the temperature applied ranged from 120 °C to 140 °C, at a speed of 250 rpm, with the moisture content varying between 20 % and 40 %. The results revealed differences between methods, the conditions tested in each method, and between the different species of mushrooms, in terms of the quantification of the dietary fiber fractions. This work highlighted the potential use of mushroom fiber extract as a food ingredient, contributing to the functionalisation of foods.

Keywords: Mushrooms; Dietary Fiber; Extraction.

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P3.6 | From Tropical Woodlands to Bioactive Broths: Molecular Characterization and Functional Potential of Wild *Lentinus* and *Auricularia* Isolates from India

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Wild medicinal mushrooms adapted to tropical ecosystems represent an important yet underexplored source of thermotolerant fungal germplasm with potential applications in nutraceutical, pharmaceutical, and sustainable mushroom cultivation industries. In the present study, wild lignicolous basidiocarps resembling *Lentinus* spp. and *Auricularia* spp. were collected from decaying woody substrates, including mango and native forest tree hosts, from tropical environments in India. Pure cultures were established through aseptic tissue culture isolation from freshly collected fruiting bodies. Cultural and morphological characterization revealed distinct colony morphology, pigmentation patterns, and growth behavior among the isolates. The putative *Lentinus* isolate exhibited rapid radial mycelial growth with an average growth rate of approximately 1.2 cm day⁻¹ and developed characteristic concentric ring patterns during colony maturation, followed by dark brown pigmentation after complete plate colonization, indicating active secondary metabolic processes. Similarly, the *Auricularia* isolate demonstrated vigorous mycelial proliferation and efficient plate colonization under laboratory conditions. Both isolates maintained active growth at 32 ± 1 °C, suggesting thermotolerance and adaptation to warm tropical climatic conditions. Submerged culture studies further revealed efficient mycelial biomass production under laboratory conditions.

Morphological examination of the fruiting bodies showed gilled, funnel-shaped characteristics in the putative *Lentinus* isolate, whereas the second isolate displayed gelatinous ear-shaped basidiocarps typical of *Auricularia* species. Molecular characterization using ITS Rdna barcoding and phylogenetic analysis was performed to determine taxonomic identity and evolutionary relationships of the isolates. Sequence analysis showed high similarity with reported edible and medicinal *Lentinus* and *Auricularia* taxa. These isolates may serve as potential sources of polysaccharides, antioxidants, and other bioactive metabolites with prospective applications in medicinal mushroom research and functional food development.

The study demonstrates the potential of tropical wild mushroom germplasm as a sustainable resource for future medicinal mushroom biotechnology and climate-resilient cultivation systems.

Keywords: *Lentinus*; *Auricularia*; Medicinal Mushrooms; Thermotolerance; ITS Barcoding; Fungal Biodiversity; Tissue Culture; Bioactive Metabolites.

P3.7 | Upcycling Pomegranate Pomace into a Fermentation Medium to Produce Health-Promoting *Rhizopus oryzae* Mycofoods

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Filamentous fungi have been utilized for centuries to enhance the nutritional and culinary value of food byproducts, enabled by their ability to metabolize a wide range of substrates. Post-harvest food processing generates significant amounts of underutilized byproducts such as pomaces. These byproducts of fruit juicing are primarily composed of seeds, peels, and residual pulp. Conversion of these byproducts into media for the growth of fungal strains with high nutritional value can promote a circular bioeconomy. While fungal mycelium is typically rich in protein and fiber, only certain fungal strains contain unusually high levels of fucose in their cell wall carbohydrates. Fucose is a rare sugar that has been associated with infant brain development and neuroprotective effects in adults via the diet-gut-brain axis. This study evaluated the potential of an enzyme-assisted aqueous extraction process (EAEP) to convert pomegranate pomace into a liquid medium for submerged fermentation by a fucose-rich strain of *Rhizopus oryzae*. A three-stage pretreatment process consisting of a hot aqueous extraction, a pectinase-assisted extraction, and reduction of antimicrobial phenolics with polyvinylpyrrolidone (PVPP) was developed to produce a fermentation medium conducive to the growth of *R. oryzae* biomass. The pomace-derived medium contained 6.84 g/L carbon and 4.39 g/L free monosaccharides. Pectinase treatment reduced the kinematic viscosity of the medium from 14.4 cSt to 0.8 cSt and increased biomass yield by 150%. PVPP treatment reduced total phenolics from 4.23 to 0.25 mg/mL gallic acid equivalents and resulted in a 32-fold increase in biomass yield. The integrated impact of fermentation temperature, pH, and nitrogen supplementation on biomass yield was evaluated using a central composite rotatable design. The biochemical composition of biomass grown at optimized fermentation conditions will be characterized. The byproduct conversion approach developed in this study can be used to tailor byproduct substrates to other fungal strains with unique nutritional properties.

Keywords: Mycofoods; Filamentous Fungi; Circular Economy; Agro-Food Waste; Upcycling.

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P3.8 | Sustainable Valorization of Non-Conforming *Flammulina velutipes* (Curtis) Singer Mushrooms for Food Enrichment

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The production of edible mushrooms frequently generates non-conforming products that cannot be commercialized due to morphological or dimensional characteristics, despite their nutritional value and technological potential. The valorization of these materials represents a sustainable strategy to reduce food waste and promote a circular economy. This work aimed to develop a functional flour from non-conforming *Flammulina velutipes* (Curtis) Singer mushrooms with potential application in nutritional enrichment and the development of innovative food products. Nutritional characterization of the flour was performed using official AOAC methods, including the determination of protein, dietary fibre, ash, total fat, carbohydrates, and energy value. Additionally, sugars were quantified by high-performance liquid chromatography with refractive index detection (HPLC-RI), while the fatty acid profile was determined by gas chromatography coupled with flame ionization detection (GC-FID). The resulting flour exhibited a promising nutritional profile, characterized by a high dietary fiber content (67%) and a protein content of 13.7 ± 0.01 g/100 g, together with low levels of carbohydrates, sugars, and fat. These characteristics support their potential use as a functional ingredient in different food formulations, contributing to the nutritional enhancement of food products. The conversion of non-conforming *F. velutipes* into a functional flour represents an effective strategy for the valorization of underutilized resources and the development of value-added food ingredients. This approach contributes to food waste reduction, promotes the efficient use of resources, and supports the principles of the circular economy, aligning with the United Nations 2030 Agenda for Sustainable Development, particularly SDG 12 (Responsible Consumption and Production).

Keywords: *Flammulina velutipes* (Curtis) Singer; Functional Flour; Food Waste Valorization; Dietary Fiber; Circular Economy.

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P3.9 | *Marasmiellus inoderma*: An Emerging Mushroom from African with Edible and Nutritional Properties

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Marasmiellus inoderma (Berk.) Singer is an edible mushroom consumed as a delicacy in West Africa. It colonizes leaf litters, debris and dead wood in the forest. The research reports on the cultivation studies of *M. inoderma*, an indigenous edible mushrooms in Nigeria. The aim of the study is to evaluate the vegetative growth and fruitbody production of the mushroom. The effects of carbon sources, culture media, pH and temperature on the vegetative growth of *M. inoderma* were determined. Sawdust of three woods; *Brachystgia nigerica*, *Haevea brasiliensis* and *Bombax buonopozense* were used as substrates. Prepared substrates supplemented with wheat bran at 0%, 5%, 10%, 15% and 20%, were inoculated with spawn and incubated for mycelia colonization. Proximate and nutritional value of the harvested fruitbodies were determined. The result revealed that *M. inoderma* was able to utilize all carbon sources and media for vegetative growth. The culture media tested significantly ($p < 0.05$) affected the growth of *M. inoderma*. The fungus mycelium completely colonizes the petri-dish within 3-4 days after inoculation. The mushroom was tolerant to temperature range of 24–35 °C and pH range of 5.5 (51.67 ± 1.03 mm) to pH 8.5 (72.10 ± 2.33 mm). Supplementation of sawdust increased sporophore formation. The proximate composition of the mushroom revealed the protein content is as high as 39.67%, carbohydrate (33.87%), fiber (2.36%), fat (10.93%), and ash (9.29%). The phytochemicals present include alkaloids, tannins, flavonoids and saponins. The result showed the presence of vitamins B1, B2, B6, D3, C, and minerals such as Calcium, Potassium, Selenium and Zinc. These findings has therefore highlighted the nutritional value and medicinal potential of the mushroom. Consequently, *M. inoderma* is a promising edible mushroom that can be sustainably cultivated to reduce protein and mineral deficiencies in populations vulnerable to mal-nutrition.

Keywords: Cultivation; Friubody; *Marasmiellus inoderma*; Mushroom; Substrate.

P3.10 | Effects of Feeding Fungal Extracts on Carniolan Honey Bees (*Apis mellifera carnica*, Pollmann, 1879)

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The agricultural system has been exposing honey bees to different stressors that vary with crop type and region. Therefore, studies on natural products to improve colony health have increased in recent years. Among them, fungal extracts have been shown to be beneficial to honey bees. However, there is a knowledge gap regarding lifespan and histomorphological studies of bees fed with fungal extracts. Our current study aimed to assess the impacts of extracts from *Ganoderma lucidum*, *Hericium erinaceus*, *Inonotus obliquus*, and *Trametes versicolor* on the lifespan and midgut of honey bees. Newly emerged Carniolan honey bees (*Apis mellifera carnica*) were fed 4% of each fungal extract until the death of the last individual to assess survival probability. For histomorphological analyses, bees were fed for 7, 14, and 21 days and sampled at the same time point. Then, the midguts were dissected and histologically processed for qualitative and semi-quantitative microscopic analyses. The results showed that the fungal extracts did not significantly affect honey bee survival, and that the histomorphology of the intestinal villi, digestive cells, and regenerative cells in fungal extract treated bees did not differ from that of untreated bees over the analyzed period. Similarly, no differences were observed in the lesions index of midguts between all treatment groups. Overall, the absence of harmful effects on lifespan and the midgut suggests that feeding fungal extracts may be a potential alternative for supporting bee health.

Keywords: Fungal Extracts; Bees' Lifespan; Midgut; *Apis mellifera carnica*.

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P3.11 | Factors Affecting Inoculated Pakuri (*Inonotus obliquus*) Growth on Experimental Plots in Northern Boreal Conditions

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Inonotus obliquus i.e. Pakuri (in Finnish) cultivation represents a promising non-timber forest product for boreal regions, yet knowledge on factors affecting its successful production remains limited. This study aimed to identify key drivers of *I. obliquus* infection, conk formation, and growth on inoculated birch trees under northern environmental conditions. The study was based on data collected from four experimental forest sites established in Lapland, Finland, as part of an agroforestry project. A total of 433 inoculated downy birch (*Betula pubescens*) trees were analyzed 3–4 years after inoculation with strains from LUKE strain collection. Tree- and stand-level variables, infection indicators, and *I. obliquus* conk measurements were recorded. Statistical analyses were conducted using generalized linear mixed models to evaluate factors influencing infection probability, conk occurrence, and conk volume. On average, 84% of trees showed signs of infection, with notable variation among sites (69–96%). The cultivated fungal strain significantly affected infection probability, with certain strains increasing infection likelihood up to fourfold. However, differences between strains were not consistent across pairwise comparisons. *I. obliquus* conks were observed in 10% of trees, with substantial variation between stands (0–23%). Tree diameter was a key predictor of conk formation, increasing the probability by approximately 17% per centimeter increment in diameter. Strain selection also influenced conk occurrence, with the most productive strain tripling the likelihood of conk formation. For conk growth, both tree diameter and fungal strain were highly significant factors. Each additional centimeter in diameter increased conk volume by approximately 6%, while selected strains increased conk size up to twofold compared to the reference strain. Despite identifying statistically significant drivers, the predictive accuracy of the models remained low, indicating the presence of additional unobserved factors affecting *I. obliquus* development. The results highlight the importance of both host tree characteristics and fungal strain selection in optimizing *I. obliquus* cultivation. The findings provide practical insights for selecting suitable trees and strains in boreal agroforestry systems, while emphasizing the need for further research to improve predictive modeling and reduce uncertainty in production outcomes.

Keywords: Pakuri; *Inonotus obliquus*; Non-Timber Forest Products; Modeling; Boreal Forests; Agroforestry.

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P3.12 | Strain Validation and Cultivation Performance of *Inonotus obliquus* in Boreal Birch Forests

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The cultivation of *Inonotus obliquus* i.e. Pakuri (in Finnish) has emerged as a promising non-timber forest product in boreal regions, yet significant uncertainty remains regarding the influence of fungal strain selection on infection success and conk yield formation. This study evaluates the performance of multiple *I. obliquus* strains under field conditions, with the aim of improving cultivation outcomes and supporting the development of standardized production practices. Field experiments were established in 2019 at two boreal sites in Finland (Punkaharju and Parkano). A total of 18 *I. obliquus* strains, originating from different regions of Finland, were inoculated into downy birch (*Betula pubescens*) using colonized wooden plugs. Each strain was inoculated into ten trees, with three inoculation points per tree at different heights. In addition to plug inoculation, alternative inoculation methods (plugs made of living conk, grain and liquid inoculum) were tested in a subset of trees. The experimental setup included 180 trees per site, and growth responses were monitored over a five-year period. Preliminary results show that strain selection influences both infection success and early conk formation. The probability of *I. obliquus* occurrence at inoculation sites varied widely between strains, ranging approximately from 6% to 48%. However, differences between strains were not statistically significant at this stage, reflecting high variability under field conditions. Site-level differences were observed, with infection probabilities reaching approximately 40% under favorable conditions, although site effects were not consistently significant. Conk formation remained limited after five years, with average conk sizes still small (<100 mL), indicating slow biomass accumulation during early development phases. Observational evidence suggests that inoculation technique may play a critical role in cultivation success. Mechanical wounding of the host tree prior to inoculation appeared to enhance infection establishment and conk development, while protective treatments such as wax sealing were not deemed necessary. Conks were not always formed directly at the inoculation point, indicating complex growth dynamics within the host tree. The results highlight the importance of both biological and technical factors in *I. obliquus* cultivation. While strain selection contributes to variability in outcomes, cultivation success is also strongly influenced by host characteristics and inoculation methodology. The findings support the need for continued long-term monitoring and integrated approaches to optimize *I. obliquus* production systems in boreal forestry and bioeconomy applications.

Keywords: Pakuri; *Inonotus obliquus*; Fungal Strain; Non-Timber Forest Products; Boreal Forests; Agroforestry.

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P3.13 | Incorporation of *Pleurotus ostreatus* Stems in Meat Products: Effects on Composition and Sensory Properties

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Pleurotus ostreatus, commonly known as the oyster mushroom, is a species belonging to the genus *Pleurotus*. It is widely consumed across the world due to its appealing taste, pleasant aroma, high nutritional value, and notable medicinal properties. Pharmacological studies have demonstrated that this edible mushroom exhibits a wide range of biological activities, including immunomodulatory effects, hypoglycaemic and hypolipidemic properties, as well as anti-tumor, antioxidant, antibacterial, and anti-inflammatory activities. In addition, *P. ostreatus* is considered a functional food due to its rich composition of bioactive compounds, such as polysaccharides, proteins, amino acids, phenolic compounds, vitamins, and fatty acids. In addition, the industrial processing of this mushroom generates significant amounts of by-products, particularly stems, which are often discarded due to their tough texture and associated disposal costs. Nevertheless, these by-products are increasingly being explored for the development of value-added products, especially in the food industry, due to their nutritional value and contribution to circular economy and environmental sustainability. The present study aimed to evaluate the incorporation of *P. ostreatus* stems into a meat-based product. To this end, both the mushroom stems alone and meat-mushroom formulations were analyzed. Proximate composition, namely moisture, protein, and ash content, was determined to assess the nutritional impact of mushroom incorporation. In addition, a sensory analysis was performed to assess consumer acceptability of the developed products. Sensory attributes were characterized using a combination of free-choice profiling and quantitative descriptive analysis.

This work contributes to the development of value-added meat products and to the sustainable valorization of mushroom by-products within the framework of the circular economy.

Keywords: *Pleurotus ostreatus* Stems; Meat Product Reformulation; Valorization.

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P3.14 | Agro-Industrial Residues as Elicitors in *Pleurotus ostreatus* L.: Effects on Antioxidant Activity

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Mushrooms are valued for their nutritional and bioactive composition with antioxidant, anticancer, and anti-inflammatory properties. Substrate influences this bioactive potential, and the use of elicitation through the incorporation of agro-industrial residues can stimulate the accumulation of secondary metabolites, while simultaneously promoting waste valorization and circular economy. This study evaluated the effect of adding citrus peels or grapevine pruning residues to the substrate on the antioxidant activity of *Pleurotus ostreatus* L. *P. ostreatus* was cultivated on a control substrate (PO_T; 98% lignocellulosic material + 2% gypsum) and on substrate supplemented with 5% or 10% citrus peels (PO_C5, PO_C10) and 5% or 10% grapevine pruning residues (PO_V5, PO_V10). Fruiting bodies were lyophilized and extracted with methanol/water (80:20 v/v). Antioxidant activity was evaluated in the lyophilized extract in triplicate using DPPH• and TBARS assays and total phenolic content. Compared to the control (DPPH• EC₅₀ 0.62 ± 0.03 mg/mL; TBARS EC₅₀ 0.99 ± 0.02 mg/mL; phenolics 1.03 ± 0.00 mg GAE/g extract), supplementation with 10% of the residues improved EC₅₀ in the DPPH• and TBARS assays: PO_C10 (0.56 ± 0.02 mg/mL; 0.94 ± 0.01 mg/mL) and PO_V10 (0.47 ± 0.03 mg/mL; 0.64 ± 0.01 mg/mL). Conversely, 5% supplementation raised total phenolic content (PO_C5: 2.58 ± 0.10 mg GAE/g extract; PO_V5: 2.49 ± 0.01 mg GAE/g extract) without a corresponding improvement in EC₅₀. In the case of PO_C5, a slight loss in performance was even observed (DPPH•: 0.85 ± 0.04 mg/mL; TBARS :1.04 ± 0.05 mg/mL). Substrate supplementation altered the antioxidant response of *P. ostreatus* depending on the dose and the type of residue. Total phenolic content did not directly predict antioxidant activity, suggesting that phenolic composition should also be studied. The PO_V10 substrate produced mushrooms with the highest antioxidant activity, validating elicitation with agro-industrial by-products as a strategy to enhance the functional quality of mushrooms.

Keywords: Elicitation, Antioxidant Activity, Agro-Industrial Residues, Sustainable Production.

Acknowledgments

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P4.1 | Cultural Variation and Growth Characteristics of *Cordyceps Militar* Strain by Subculture Stage in Korea

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Cordyceps militaris is an entomopathogenic fungus that parasitizes insects of the order Lepidoptera, colonizing larvae, pupae, or adults to form fruiting bodies. Taxonomically, it belongs to the phylum Ascomycota, class Ascomycetes, order Hypocreales, family Clavicipitaceae, and genus *Cordyceps*. *C. militaris* strains show severe variation, and after 3~4 subculture passages, fruiting body formation suddenly ceases, causing a 60-day production loss during the cultivation period. This study was conducted to compare and analyze the subculture timing and growth characteristics of *C. militaris* strains, with the aim of ensuring stable strain preservation and cultivation. Three strains were examined: two commercial cultivars (KMCC05775 “Dowonhongcho” and KMCC05776 “Yedang No. 5”) and one wild strain (KMCC05777). After tissue isolation, subcultures were maintained up to the 5th transfer (14 days), and variation occurrence was assessed. Mycelial growth characteristics were investigated on PDA (Potato Dextrose Agar) medium at 25 °C under both dark and light conditions for 14 days. The KMCC05777 ‘Yedang No. 5’ strain exhibited a color change from orange to white at the 3rd subculture passage under light cultivation conditions, with white mycelia appearing under dark cultivation conditions and orange mycelia under light cultivation conditions. Spawn for bottle cultivation was prepared by inoculating liquid SDAY medium (Sabouraud Dextrose Agar with Yeast extract) and culturing for 3~5 days, followed by transfer into a rice-based substrate (brown rice 60 g + water 70 mL) in 850 cc bottles. Cultivation was carried out at 25 °C for 4~5 days, and fruiting was induced at 18~20 °C and 80~85% relative humidity for 45~50 days. As a result, under light cultivation conditions, the yield of commercial cultivars progressively decreased with successive subculture passages, while the wild strain failed to produce fruiting bodies after the 3rd subculture passage. In addition, under dark cultivation conditions, fruiting bodies were not produced at any subculture passage, suggesting that mushroom growth is significantly influenced by light conditions. These findings suggest that genetic or physiological variation during subculture can inhibit fruiting body development. This study provides insights into strain variation and growth characteristics of *C. militaris*, offering strategies for stable strain preservation and industrial utilization.

Keywords: *Cordyceps militaris*; Growth; Fruiting Bodies.

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P6.1 | Traditional Healer Perspectives on *Ganoderma* Use in Rural Bengaluru: A Preliminary Qualitative Case Study on Folk Practice, Supplement Integration, and Responsible Knowledge Documentation

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Traditional medical knowledge systems in India are increasingly interacting with commercial mushroom-derived nutraceuticals, yet local practitioner perspectives on medicinal mushroom use remain under-documented. This preliminary qualitative case study aimed to document how a traditional rural healer from the Bengaluru region understands and applies *Ganoderma* within folk-herbal practice. A semi-structured interview was conducted to record knowledge transmission, local terminology, perceived indications, preparation practices, dosage, safety considerations, and views on responsible communication of traditional knowledge. The practitioner reported learning folk herbal medicine from his uncle and later expanding his understanding through interactions with Ayurvedic practitioners. He identified *Ganoderma*, locally referred to as “red wood mushroom”, as a medicinal mushroom used to support blood circulation, nerve-related symptoms, tremors, dizziness, weakness, stress reduction, and immunity. He did not report field identification or wild collection practices; instead, he used a commercially available *Ganoderma* extract capsule in combination with selected herbs, particularly Shilajit. The reported adult dosage was approximately one capsule (1 g) per day, with increased use in older adults, typically for around 90 days. Safety-related observations included avoidance during pregnancy, restriction to individuals above 12 years of age, and a perceived “body heat” effect managed with aloe vera juice. This case highlights a contemporary transition in traditional healing, where medicinal mushroom supplements are interpreted and used through folk-medical frameworks rather than through wild collection-based ethnomycological practice. The findings support ethical, practitioner-informed documentation and cautious public communication of medicinal mushroom knowledge.

Keywords: *Ganoderma*; Ethnomycology; Traditional Medicine; Rural Bengaluru; Biocultural Knowledge.

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P8.1 | Heavy Metals Bioaccumulation and Systemic Toxicity Induced by an Edible Wild Mushroom, *Volvariella volvacea*, from Municipal Waste Dump Sites in Male Wistar Rats

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Consumption of wild edible mushrooms is considered a favorite delicacy in many countries due to their high protein and trace mineral content. However, there is a plethora of studies indicating mushrooms as hyper-accumulators of toxic heavy metals from contaminated habitats. This study therefore assessed the incipient risks associated with the consumption of wild edible *Volvariella volvacea* collected from municipal waste dumpsites in Wistar rats. *V. volvacea* was collected from two major dump sites in Ibadan, Nigeria, and the mushroom's heavy metal profile was determined using standard methods. Twenty-four male Wistar rats were randomly divided into four groups ($n = 6$). Group A was for 30 consecutive days while groups B, C and D were fed with diet containing 10, 25 and 50% of *V. volvacea*, respectively, for 30 consecutive days. Hematological parameters, antioxidant profiles, histology, and sperm profiles of exposed rats were evaluated. The *V. volvacea* contained 62.3, 0.79, 9.47, 2.26, 1.43, 175.6, and 274.4 mg/kg of Pb, Cd, Ni, Cr, Co, Cu, and Zn, respectively, which were above the WHO/FAO acceptable limit. Compared to the negative control, there was a significant increase ($p \leq 0.05$) in the levels of selected metals in the liver, kidney, brain, and intestine of exposed rats. Consumption of the mushroom showed no hematotoxic effects, but catalase activity in the liver and plasma, and lipid peroxidation of exposed rats significantly increased ($p \leq 0.05$). There was a marked reduction in sperm count and motility and pathological alterations were observed in the livers and kidneys of treated rats. These findings indicate the potential toxicological effects that consumption of wild or heavy metal-contaminated *V. volvacea* might pose to humans.

Keywords: Toxic Metal Bioaccumulation; Dumpsites Contaminated Mushroom; Wistar Rats' Sperm Profiles; *Volvariella volvacea*; Haematology.

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P8.2 | Influence of Drying Conditions on Ultrasound-Assisted Ergosterol Extraction from *Agaricus bisporus* (J.E. Lange) Imbach

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Ergosterol is the main precursor of vitamin D₂ in mushrooms, making its efficient extraction a key step in the production of natural vitamin D₂-enriched ingredients. Since drying conditions can influence the preservation and extractability of this sterol, optimizing the final moisture content before extraction is essential. This study evaluated the effect of different residual moisture contents in *Agaricus bisporus* (J.E. Lange) Imbach on ergosterol recovery by ultrasound-assisted extraction (UAE), with the aim of identifying the most suitable drying conditions for subsequent process optimization. Fresh mushrooms supplied by Mogaricus, Lda. were dried to final moisture contents of 3.0%, 3.5%, 5.0%, and 6.0%. The dried samples were ground and extracted using UAE with ethanol as the extraction solvent (375 W, 15 min). Ergosterol was identified and quantified by high-performance liquid chromatography coupled with ultraviolet detection (HPLC-UV). Samples dried to 6.0% residual moisture showed the highest average ergosterol recovery (approximately 78 mg/g extract), whereas those dried to 3.0% exhibited the lowest values (approximately 30 mg/g extract). Based on these findings, the most promising drying condition will be selected for further studies evaluating the influence of grinding particle size on ergosterol extraction efficiency. Overall, this work provides a basis for optimizing the processing of *A. bisporus* to obtain ergosterol-rich extracts for the sustainable production of natural vitamin D₂ ingredients.

Keywords: Mushrooms; Ergosterol; Vitamin D₂; Ultrasound-Assisted Extraction.

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P8.3 | Residual Moisture as a Key Factor Affecting Ergosterol Extraction from *Agaricus bisporus* (J.E. Lange) Imbach Mushrooms

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Residual moisture is an important processing parameter that can influence the recovery of bioactive compounds from mushrooms. Since ergosterol is the main precursor of vitamin D₂ in mushrooms, preserving this sterol during processing is essential for maximizing its subsequent photoconversion into vitamin D₂ and the development of value-added functional ingredients. This study investigated the impact of different residual moisture levels (3.0%, 3.5%, 5.0%, and 6.0%) on the extraction of ergosterol from *Agaricus bisporus* (J.E. Lange) Imbach. Fresh mushrooms supplied by Mogaricus, Lda. were dehydrated until reaching the desired moisture contents, then milled and extracted by heat-assisted maceration using ethanol (81.6 °C for 150 min). Ergosterol was identified and quantified by high-performance liquid chromatography with ultraviolet detection (HPLC-UV). Among the tested conditions, samples with 3.5% residual moisture achieved the highest ergosterol recovery, reaching approximately 58 mg/g of extract. These findings demonstrate that optimizing residual moisture before extraction is an effective strategy to improve ergosterol recovery and obtain suitable raw material for vitamin D₂ production through photoconversion. Overall, this work contributes to the optimization of mushroom processing conditions and supports the sustainable production of high-value natural bioactive ingredients.

Keywords: Mushrooms; Ergosterol; Vitamin D₂; Heat-Assisted Maceration.

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P8.4 | Electrochemical Molecularly Imprinted Polymer Sensor for Ultrasensitive Detection of Erinacine A from *Hericium erinaceus*

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Erinacine A, a cyathane-type diterpenoid isolated from *Hericium erinaceus* biomass produced by Mycomedica Ltd., Slovenia, is a bioactive neuroactive compound with promising therapeutic potential in neurodegenerative disorders, including Alzheimer's and Parkinson's diseases. However, its quantification remains challenging, as conventional analytical approaches are predominantly based on time-consuming chromatographic techniques (e.g., HPLC-UV or HPLC-MS), requiring sophisticated instrumentation and extensive sample preparation. Herein, we report for the first time a label-free electrochemical sensing platform based on a molecularly imprinted polymer (MIP) for the selective detection of erinacine A. A thin MIP film was electropolymerized onto a carbon screen-printed electrode (SPE) using o-phenylenediamine as the functional monomer. Following template removal, well-defined recognition cavities complementary to erinacine A were generated within the polymer matrix, enabling selective rebinding. The sensor fabrication process was systematically optimized by tuning key parameters, including monomer concentration and electropolymerization conditions (time, applied potential), to improve analytical performance and reproducibility. Film formation and sensor modification were systematically characterized using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and square wave voltammetry (SWV), while morphological and elemental analysis was performed by FE-SEM coupled with EDX mapping. The developed sensor exhibited a linear response in the concentration range from 10 pM to 500 pM, with a limit of detection (LOD) of 12.3 pM. Selectivity studies confirmed minimal interference from structurally related compounds, including erinacine C, and successful application in fungal extract samples demonstrated its applicability for complex matrices. This work represents a significant advancement in the electrochemical detection of bioactive fungal metabolites and provides a robust foundation for the development of portable, low-cost, and rapid sensing platforms for on-site monitoring of erinacine A in real-world biological systems.

Keywords: Molecularly Imprinted Polymer (MIP); Electrochemical Biosensor; Erinacine A.

P8.5 | *Trametes versicolor* Biomass as a Biosorbent for Polystyrene Nanoplastics: Coupling Remediation with Electrochemical Detection

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Nanoplastics (NPs) are increasingly recognized as an emerging class of pollutants due to their ability to cross biological membranes and persist in the environment, raising concerns for both ecosystem integrity and human health. Their small size (<1 µm) and composition hinder detection and removal, as conventional methods are often insufficient and require tedious pre-separation. Fungal biomass offers a promising, sustainable, and accessible strategy to mitigate NPs in aquatic environments. This study introduces a combined approach for the investigation of NPs removal by *in situ* electrochemical detection using polystyrene NPs (PSNPs) as model plastic nanoparticles. The biosorption properties of the medicinal fungus *Trametes versicolor* (developed and produced by Mycomedica Ltd., Slovenia) were examined using europium (Eu)-labeled polystyrene NPs (Eu-PSNPs). The effects of key operational parameters, including biomass-to-solution ratio, contact duration, and system configuration (batch vs. column), were systematically evaluated. By optimizing adsorption conditions, the removal efficiency reached levels as high as 78.0%. For quantitative analysis, PSNPs were measured via inductively coupled plasma-optical emission spectroscopy (ICP-OES) by monitoring Eu as a tracer element. Laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) was employed for the elemental mapping of the spatial distribution of PSNPs. To overcome the cost, complexity, and time demands of spectroscopic methods, an electrochemical approach was developed for on-site PSNP detection. Gold screen-printed electrodes (SPEs) were coated with a mesoporous silica film using electrodeposition and subsequent functionalization with proline via epoxy silane to promote nanoparticle interaction. Electrochemical characterization using cyclic voltammetry (CV) demonstrated rapid and sensitive detection of 6.1 nm PSNPs, indicating its suitability for real-time monitoring in remediation studies and other applications. The addition of fungal biomass to PSNPs suspension resulted in a nearly complete nanoparticle removal in the batch system, demonstrating efficient adsorption. Adsorption kinetics and isotherm modeling were further employed for in-depth understanding of the sorption behavior and interaction mechanisms between the NPs and fungal biomass. Overall, the methodology provides an effective framework for on-site monitoring of NP removal, contributing to bioremediation strategies for reducing plastic contamination in aquatic systems.

Keywords: Nanoplastics; Polystyrene Nanoplastics; *Trametes versicolor*; Biosorption; Electrochemical Sensor.

P8.6 | Methanolic Extract of *Pleurotus citrinopileatus*: Antioxidant Capacity and Acetylcholinesterase Inhibition in the Context of the Gut–Brain Axis

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Pleurotus citrinopileatus, a cultivated mushroom species, has garnered increasing attention for its striking appearance and promising medicinal potential. In this study, we explored whether a methanolic extract of *P. citrinopileatus* can influence processes associated with cholinergic signaling through inhibition of acetylcholinesterase (AChE), the enzyme responsible for acetylcholine hydrolysis. Beyond its classical role in neurotransmission, acetylcholine is a key mediator of gut-brain communication, contributing to the regulation of intestinal motility, epithelial barrier integrity, and immune responses, thereby supporting homeostasis along the gut-brain axis. The extract was chemically characterized by High-Performance Liquid Chromatography with Diode Array Detection, revealing the presence of phenolic acids and catechin, with antioxidant activity confirmed by the ABTS^{••} radical scavenging assay (5.96 µmol Trolox equivalents/g dry weight). Among the identified compounds, protocatechuic acid was the most abundant phenolic acid (13.85 mg 100/g dry weight). Functional assays showed that the extract exerted a moderate inhibitory effect on AChE activity (29%), suggesting a potential role in preserving acetylcholine levels and alleviating cholinergic dysfunction. Taken together, the combined antioxidant capacity and AChE inhibitory activity point to a dual mechanism of action that may be relevant for modulating neurotransmitter balance at the gut-brain-immune interface. These findings highlight *P. citrinopileatus* as a promising candidate for nutraceutical applications targeting neuroprotection, immune regulation, and maintenance of gut-brain axis homeostasis.

Keywords: *Pleurotus citrinopileatus*; Acetylcholinesterase Inhibition; Gut-Brain Axis.

Acknowledgments

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P9.1 | Pronounced Variability in Tryptamine Profiles of *Psilocybe cubensis* Fruiting Bodies: Inter- and Intra-Strain Differences Across 14 Strains Cultivated Under Controlled Conditions

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Psilocybin-producing mushrooms exhibit considerable biochemical diversity, yet the extent of variability within a single species under standardized conditions remains insufficiently characterized. This study quantified concentrations of active tryptamines, including psilocybin, psilocin, baeocystin, norbaeocystin, aeruginascin, and norpsilocin, across 14 distinct strains of *Psilocybe cubensis* to evaluate inter- and intra-strain biochemical heterogeneity. The mushroom strains were cultivated, dried, and extracted under uniform laboratory conditions. Strain identities were verified through morphological assessment and molecular analysis of the internal transcribed spacer (ITS) region via PCR, confirming all samples as *P. cubensis*. Chemical analysis was performed using high-performance liquid chromatography with photodiode array detection (HPLC–PDA). To characterize intra-strain variation, five individual fruiting bodies from six selected strains were analyzed separately. The results show that despite strict methodological standardization, total tryptamine concentrations varied by more than sixfold among strains, with psilocybin consistently emerging as the dominant compound (between 19.6 mg/g to 2.03 mg/gram dry weight). Analysis of individual fruiting bodies revealed substantial intra-strain variability, with coefficients of variation for psilocybin ranging from 12.81% to 42.4%. These findings demonstrate that significant biochemical heterogeneity persists even under controlled conditions, suggesting that species identification alone is insufficient to predict psychoactive profiles. Our results underscore the critical importance of strain selection, rigorous chemical profiling, and dosing precision in future pharmacological research and therapeutic applications of *P. cubensis*.

Keywords: Fungi; Psilocybin; Tryptamines; *Psilocybe cubensis*; Strain Variability; ITS; PCR.

Acknowledgments

This research was partially funded by the Israeli Ministry of Innovation, Science and Technology [grant number 1001829007]. We would like to thank Paula Vasconcelos Morais (University of Coimbra, Portugal) for her scientific support.

P9.2 | Toward a Mycological Repository of *Psilocybe* Species: Development of a Spore Print Collection

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A census of *Psilocybe* species occurring in Italy has recently launched to define their habitats and ecological traits. In addition to the species census, herbarium specimens were prepared by storing collected samples in airtight bags with unique labels that also include the precise coordinates of the collection site, the date, the location, and the collection period. For each surveyed species, basidiospores were statistically measured, and molecular analyses was performed to confirm the correct identification of ambiguous species or to record local variants never before mapped in Italy. At the Department of Soil, Plant, and Food Sciences of the University of Bari Aldo Moro, a dedicated collection of *Psilocybe* spore prints has been established to preserve biodiversity and, at the same time, provide essential material for future research, which will begin once the necessary regulatory approvals are obtained. Once regulatory approvals are obtained, the collection is expected to become a valuable resource for investigating the biosynthetic pathways and therapeutic potential of *Psilocybe* species, thereby supporting the development of innovative, nature-derived approaches for mental health treatment.

Keywords: *Psilocybe*; Spore Bank; Biodiversity.

P10.1 | Efficiency of Stump Inoculation with *Ganoderma lucidum* and *Trametes versicolor*

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In traditional forest management, private forest owners are seeking alternative sources of income from their forests, therefore, *Ganoderma lucidum* (Basidiomycota, Ganodermataceae) and *Trametes versicolor* (Basidiomycota, Polyporaceae) have potential in the non-timber use of forests.

To analyze the effectiveness of *G. lucidum* and *T. versicolor*, strains originating from Estonia were used. Stump inoculation with *G. lucidum* strains was carried out at two thinning sites and two clear-cut sites, while inoculation with *T. versicolor* strains was performed at two thinning sites in May 2024. In total, across four sites, 160 stumps were inoculated with *G. lucidum* strains, 80 stumps with *T. versicolor* strains, and 80 stumps were left as controls (320 stumps in total). DNA was extracted, and qPCR analyses were performed. For each target species, standard equations were generated, and sample concentration and DNA mass per 0.1 g of material were calculated. In samples collected before stump treatment, the natural occurrence of *G. lucidum* at clear-cut sites averaged 11.6%. At thinning sites, *G. lucidum* was detected at only one site and at a considerably lower level (1.6%). The presence of *T. versicolor* was not detected prior to stump treatment. After 18 months, a higher occurrence of *G. lucidum* was detected in stumps at thinning sites, with a total of 36 positive stumps across two sites. At clear-cut sites, 18 positive samples were recorded. No statistically significant difference was observed between thinning and clear-cut sites ($p > 0.05$). The success rate of stump inoculation with *G. lucidum* ranged from 10.5% to 30.5%. The success rates of stump inoculation with *T. versicolor* were consistent (33% and 30%). Based on initial visual assessments conducted 18 months after inoculation, *T. versicolor* fruiting bodies were observed on both Silver birch and Norway spruce stumps. Molecular analysis of wood samples indicated that *T. versicolor* occurred more frequently in spruce stumps. Molecular analysis of wood samples indicated that *T. versicolor* occurred more frequently in spruce stumps. Research will continue in the future to analyze the development of the fungus's fruiting bodies.

Keywords: Stump Inoculation; Norway Spruce; Silver Birch; *Ganoderma lucidum*; *Trametes versicolor*.

Acknowledgments

This research was funded by Estonian Environmental Investment Centre project RE.4.08.23-0111, Estonian Research Council (projects PUTJD858 and PRG1615) and Estonian University of Life Sciences project PM220078MIME.

P10.2 | Color Matter: Antibacterial Activity of Mycelial Culture of White and Black Morels

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Morels (*Morchella* genus) are important edible and medicinal mushrooms exhibiting a range of species, habitats, and fruiting body colors. In general, they are grouped as white, black, and yellow morels. Each factor may affect the biochemical composition of the fruiting bodies, including the mushroom's color. Yet, the fungal mycelium of the different species may act differently from the fruiting bodies when grown in the same conditions. Morels contain a diverse array of bioactive compounds and exhibit multiple biological activities, including antibacterial activity. In the present study, the antibacterial activity of a mycelial culture of a white morel species and a black Morel species was examined against a range of gram-positive and gram-negative pathogenic bacteria using the microdilution assay. The bacteria examined were *Staphylococcus aureus*, *Enterococcus faecalis*, *Staphylococcus epidermidis*, *Escherichia coli*, *Enterobacter aerogenes*, *Salmonella typhimurium*, and *Listeria monocytogenes*. Both species exhibited antibacterial activity against all the bacterial strains examined, although the magnitude of activity varied among the different bacteria. In most cases, the black species displayed greater antibacterial activity than the white species. These findings are consistent with our previous study, which showed that darker fruiting bodies accumulate higher levels of bioactive antioxidants and phenolic compounds.

Keywords: Antibacterial Activity, Morchella, Morel Mushroom, Pathogenic Bacteria.

Acknowledgments

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P10.3 | Hot-Water Extraction of β -Glucans from *Agaricus bisporus* By-Products for Dysbiosis-Oriented Applications

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Intestinal dysbiosis is associated with impaired gut barrier integrity, altered immune responses and gastrointestinal and systemic disorders. β -Glucans are mushroom-derived bioactive polysaccharides with prebiotic and immunomodulatory potential, due to their resistance to upper gastrointestinal digestion and possible interaction with gut microbial communities. *Agaricus bisporus* is a widely cultivated edible mushroom that generates commercially relevant by-products, which remain underexploited as sources of functional polysaccharides. This work aimed to valorize *A. bisporus* byproducts through β -glucan detection, nutritional characterization, hot-water extraction optimization using Response Surface Methodology (RSM), and preliminary evaluation of microbiota-oriented functionality. Total glucans, α -glucans and β -glucans were quantified in *A. bisporus* by-products using an enzymatic method based on controlled hydrolysis and spectrophotometric quantification of released glucose. β -Glucans were calculated as the difference between total and α -glucans. Nutritional characterization was performed on a fresh weight basis. β -Glucan-containing extracts were obtained by hot-water extraction using an initial solid-to-liquid ratio of 1:20 at 90 °C for 1 h, followed by RSM-assisted optimization to improve extraction efficiency and process reproducibility. Preliminary prebiotic potential was assessed by incorporation into culture media, serial dilution and enumeration of beneficial bacteria. Resazurin-based assays and flow cytometry were used to evaluate effects on selected pathogens. *A. bisporus* by-products showed relevant β -glucan levels and a nutritionally valuable profile, including 90.20 g/100 g moisture, 2.99 g/100 g protein, 4.20 g/100 g carbohydrates, 1.34 g/100 g fiber, and 35.60 kcal/100 g. Hot-water extraction generated β -glucan-containing extracts with yields around 12%. Preliminary assays indicated support of *Lactobacillus* spp. and *Bifidobacterium* spp., with possible inhibitory effects against *Escherichia coli*. *A. bisporus* by-products are promising substrates for sustainable recovery of β -glucan containing extracts with potential microbiota-oriented applications.

Keywords: *Agaricus bisporus*; Mushroom By-Products; β -Glucans; Hot-Water Extraction; Gut Microbiota.



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