

National University of Cusco, San Agustín National University of Arequipa, National Amazonian University of Madre de Dios, and Global Mountain. In addition, it had economic sponsorship from some national and international companies, notably Impala, Nikon microscopes, Paccu, Chipola, Inkaterra, Genlab, and Inkatours.

All activities of the Congress were

intended to bring together the international mycological community, improve and increase relationships between the mycologists in the region, and position Peru and the Peruvian University Cayetano Heredia as focal points for collaborative international mycological research. At the same time, it promoted interest in the study of fungi, provided an opportunity to

exchange experiences at the international level, and an opportunity to be updated on the newest technologies and developments in mycology.

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9th International Medicinal Mushrooms Conference (IMMC9)



In 24–28 September 2017 over 200 delegates gathered in Mondello (Palermo), Italy, for the 9th International Medicinal Mushrooms Conference (IMMC9). This biennial conference moves around the world – they have been held in Kiev (Ukraine) in 2001, Pathaya (Thailand) in 2003, Port Townsend (USA) in 2005, Ljubljana (Slovenia) in 2007, Nantong (China) in 2009, Zagreb (Croatia) in 2011, Beijing (China) in 2013, and Manizales (Colombia) in 2015. IMMC9 in Palermo was the first to be held in Italy, and the theme was “Advances in Medicinal Mushroom Science: Building Bridges between Western and Eastern Medicine”. The conference provides a unique event given its scientific relevance and an opportunity for meeting scientists engaged in research on medicinal mushrooms. IMMC9 participants had the opportunity to discuss and share scientific innovations in the medicinal mushroom sector and to become aware of current research results.

I was given the responsibility of organizing IMMC9, which sponsored by DXN Malaysia, Jangsu Alphay Biological

Technology, Funghi Energia e Salute di Funghi Meravigliato Sas, AVD Mico, Aloha Medicinals Inc., Freeland, Società Agricola IoBoscoVivo, Consiglio Nazionale delle Ricerche, Lickson s.r.l., Associazione Planthology, Gourmet Mushrooms, and Mycology Research Laboratories ed Energetica Pharm. Several donors supported the Conference: Gheos, Frantoio D’Orazio, Fondazione Internazionale pro Herbario Mediterraneo, Libera Accademia di Medicina Biologica, Italmiko, Azienda Agraria Castelluccio, Gruppo Micologico Siciliano, Erboristeria Galenus, Natural 1, Impresa Leone s.r.l., and Autoscuole Ragona e Fata Assicurazioni. IMMC9 was organized under the patronage of the Università degli Studi di Palermo, Ministero delle Politiche Agricole, Alimentari e Forestali, Città di Palermo, Unione Micologica Italiana, European Mycological Association, Società Botanica Italiana onlus, Project FUNGUS, Organization for the Phyto-Taxonomic Investigation in the Mediterranean Area (OPTIMA), and Istituto Euro-Mediterraneo di Scienza e Tecnologia.

It is impossible in a brief report to do full justice to the variety and scope of the six keynote lectures, 64 oral presentations (arranged in five symposia), and 61 e-posters. S.P. Wasser (Israel/Ukraine), P.C.K. Cheung (China), L. van Griensven (The Netherlands), U. Lindequist (Germany), P. Stamets (USA), and O. Isikhuemhen (USA) were keynote speakers.

Attendees were fascinated by a video provided by Paul Stamets on the use of mycelial extracts from polypore mushrooms to reduce viruses and extend life-spans of the European Honey Bee (*Apis mellifera*). The main congress was organized into six symposia.

Molecular Systematics and Evolution: This started with a presentation on “The

changing shape of mushrooms: toward the new science of fungal evo-devo” by David Hibbett (USA) which was followed by ones on the molecular systematics and phylogeny of *Ganoderma*, *Fomitopsis*, *Schizophyllum* and other medicinal mushrooms by V. Papp (Hungary), V. Fryssouli (Greece), A. Shnyreva (Russia), N. Purtseva (Russia), and E. Bošković (Serbia). Scott Redhead (Canada) then reported on changes made in the rules relevant to the nomenclature of mushrooms that would be included in the Shenzhen edition of the *International Code of Nomenclature for algae, fungi, and plants*.

Cultivation of medicinal mushrooms:

This session commenced with lectures on “Simplified and lower cost methods for mushroom cultivation using cold sterilization techniques” (J. Holliday, USA) and “Cultivation of medicinal fungi biomass and pharmaceutical compounds in bioreactors” (M. Berović, Slovenia). This was followed by others by C. Jaramillo (Colombia), S. Montoya (Colombia), I. Bandura (Ukraine), A. Jasińska (Poland), J. Okhuoya (Nigeria), C. Adenipekun (Nigeria), and M.L. Gargano (Italy) on topics ranging from the use of different agricultural residues as a substrate, the effect of blue led-light on the production of *Ganoderma “lucidum”*, solid state fermentation, to ones on production of *Grifola frondosa* in the tropics, and influence of substrate on the zinc content of *Agaricus subrufescens*. Several contributions by the African speakers were greatly appreciated, and concerned cultivation of *Marasmius*, *Pleurotus*, and *Volvariella*, and work based on a culture collection of strains of potential nutraceutical interest.

Biochemistry of Medicinal Mushrooms:

Following a lecture on “Understanding diversity and potential of mushrooms derived low molecular weight aroma



Giuseppe Venturella (left) and Solomon Wasser (right) chair the Closing Ceremony.

and biologically active metabolites” (V. Varshney, India) this symposium included contributions by F. Cateni (Italy), T. Reid (Zimbabwe), S. Zhou (China), J.-Y. Wu (China), O. Isikuehmen (USA), A. Taylor (USA), G. Koutrotsios (Greece), and K. Tešanović, Serbia). These dealt with topics including anti-*Salmonella typhi* activity, nutritional composition, compounds with antioxidant potential, changes in triterpene and polysaccharide content in *Ganoderma “lucidum”* during basidiome growth, properties and biological activities of *Ophiocordyceps sinensis*, vegetative growth and polysaccharide secretion in *Lentinus squarulosus*, and quantifying growth rate and biomass in solid substrate fermentations. The symposium was completed by presentations on enhancement of bioactive compounds in *Pleurotus*, and the biopotential and phosphate metabolism of *Coprinus comatus* and *Coprinellus truncorum*.

Science, Technology and Potential Value of Medicinal Mushrooms: This symposium

started with a lecture of on the antiparasitic activity of ergosterol peroxide isolated from *Pleurotus ostreatus* f. sp. *florida* (A. Trigos, Mexico). The topic of the symposium attracted much interest and this lecture was followed by contributions from Ha Won Kim (South Korea), Qi Wang (China), A. M. Gammazza (Italy), O. Isikhuemhen (USA), M. Nikšić (Serbia), M. G. Cusimano (Italy), A. Bonanno (Italy), J. Robinson (USA), S. Masaphy (Israel), C. Gründemann (Germany), B. Jakopovic (Croatia), H.-C. Lo (Republic of China), C. Sales-Campos (Brazil), M. Mizuno (Japan), K.-I. Minato (Japan), M. Karaman (Serbia), L. Janjušević (Serbia), J. Okhuoya (Nigeria), E. Savino (Italy), X. Yang (China), U. Sandabe (Nigeria), S. Parola (Italy), P. Angelini (Italy), and J. Okhuoya (Nigeria). Subjects covered here included ones on

a wide range of mushrooms reporting on anti-allergic activity, antioxidant potential, anti-hypertensive mechanisms, anti-carcinogenic effects, new antimicrobial peptides, activation of the immune response, anti-inflammatory activity, inhibition of acetylcholinesterase, effects on trans-epithelial transport and activation of dendritic cells.

Medicinal Mushrooms: the importance of randomized clinical trials and evidence-based medicine: Consideration of this key issue was opened with a report on “micomedicine” in China (H.-Y. Bao, China). This was followed contributions followed by D. Yamanaka (Japan), F. Oliviero (Italy), W. Brand (Germany), M. Tutone (Italy), W. Ardigò (Italy), S. Cazzavillan (Italy), S. Duque Henao (Colombia), P. Rossi (Italy),

and N. Salviato (Italy). The topics included use of *Agaricus brasiliensis* as an oral vaccine to increase antibody production, antioxidant and anti-inflammatory properties of a preparation for the prevention of oxidative stress and autoimmune diseases, a clinical trial on HPV patients, a case study on arterial hypertension control, management of fecal calprotectin, benefits of yogurt enriched with β -glucans, reduction of mood and sleep disorders, and the prevention of metabolic syndrome.

New to IMMC9 was an e-poster session, an innovation never adopted in the previous congresses of the series. This provided a more immediate visualization of the contents, the opportunity to download the poster onto a mobile device, and also contributed to the environment in terms of paper savings.

Werner Greuter (Germany/Italy), Director of the Berlin Botanical Garden and Museum for many years, represented the Organization for the Phyto-Taxonomic Investigation in the Mediterranean Area (OPTIMA) and the International Foundation for Herbarium Mediterranean at the Closing Ceremony. A video in support of Nantong’s candidacy to host IMMC10 in 2019 was presented by Yu Li, who invited attendees to participate in that event. Afterwards, participants visited the medieval villages of Castelbuono and Cefalù where they were received and addressed by the Mayors of the two towns.

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IMMC9 Participants.