INTERNATIONAL SOCIETY FOR MEDICINAL MUSHROOMS

国际药用菌学会

International Society for Medicinal Mushrooms （ISMM）was founded in Vancouver, Canada. As a global non-profit organization, ISMM promotes the development of research, education, production, transportation, marketing and cultivation of medicinal mushrooms to have people to work towards common aspirations and goals. The integration will increase the impact of the international medicinal mushroom industry and benefit the health of people in the world.

Honorable President: Prof. S.T.Chang, Prof.S.P. Wasser
President: Academician Li Yu
Executive President: Mr. Chen Hui
Secretary General: Mr. Liu Ziqiang

国际药用菌学会（International Society for Medicinal Mushrooms），简称ISMM，在加拿大温哥华注册成立，由从事药用菌产业的科研、教学、生产、流通、市场、文化及相关产业链的单位、团体和个人自愿组成的为实现共同意愿的非营利性国际组织。本学会致力于促进国际药用菌产业各个领域的融合与发展，以提升药用菌行业在全球的影响力，造福人类健康。

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NEWSLETTER OF THE INTERNATIONAL SOCIETY FOR MEDICINAL MUSHROOMS

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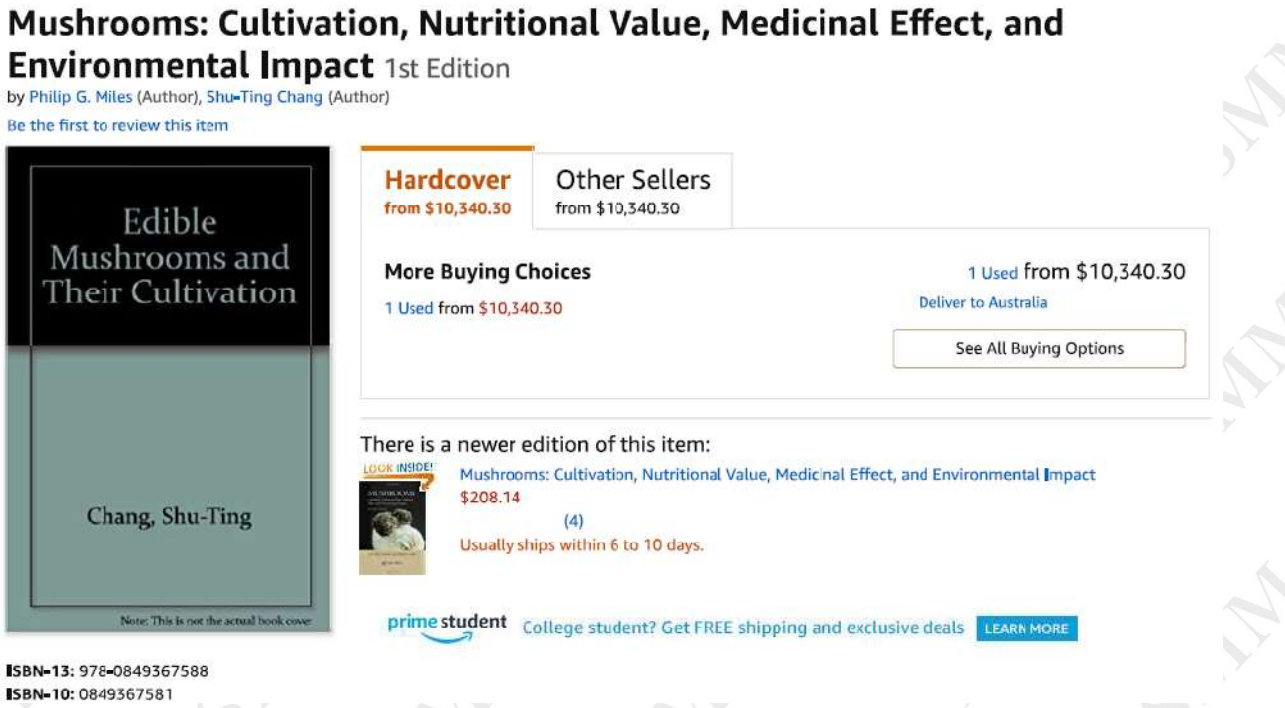
News Reports

The Most Expensive Mushroom Book

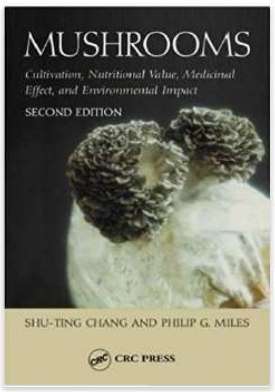
Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact, authored by Shu-Ting Chang and Philip G. Miles in 1989 (first edition) now sold USD 10,340.30 in Amazon. It is known as the most expensive mushroom book.



Since the publication of the first edition, important developments have emerged in modern mushroom biology and world mushroom production and products. The relationship of mushrooms with human welfare and the environment, medicinal properties of mushrooms, and the global marketing value of mushrooms and their products have all generated great attention, identifying the need for an updated, authoritative reference.

Second Edition (2004) presents the latest cultivation and biotechnological advances that contribute to the modernization of mushroom farming and the mushroom industry. It describes the individual steps of the complex mushroom cultivation process, along with comprehensive coverage of mushroom breeding, efficient cultivation practices, nutritional value, medicinal utility, and environmental impact. Maintaining the format, organization, and focus of the previous edition, this thoroughly revised edition includes the most recent research findings and many new references. It features new chapters on medicinal mushrooms and the effects of pests and diseases on mushroom cultivation. There are also updated chapters on specific edible mushrooms, and an expanded chapter on technology and mushrooms.

‹ Back to search results for "shu ting chang"



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Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact 2nd (second) Edition by Miles, Philip G., Chang, Shu-Ting published by CRC Press (2004)

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Rather than providing an encyclopedic review, this book emphasizes worldwide trends and developments in mushroom biology from an international perspective. It takes an interdisciplinary approach that will appeal to industrial and medical mycologists, mushroom growers, botanists, plant pathologists, and professionals and scientists in related fields. This book illustrates that mushroom cultivation has and will continue to have a positive global impact on long-term food nutrition, health care, environmental conservation and regeneration, and economic and social change.

Statistics on the Exports of Edibile & Medicinal Mushroom in China

Unit: kg; USD; USD/kg

		2016			2017			Year-on-year		
HS code	Item	Export amounts	Export value	Everage unit price	Export amounts	Export value	Everage unit price	Amounts	Value	Unit price
20031011	*Agaricus comtulus*, in air tight containers	180,297,220	235,144,344	1.30	172,203,883	221,595,224	1.29	-4.49%	-5.76%	-1.33%
07123910	Dried *Lentinula edodes*	91,538,101	1,499,259,357	16.38	128,492,646	1,994,342,969	15.52	40.37%	33.02%	-5.24%
06029010	Mushroom spawn	76,410,597	44,900,217	0.59	88,485,049	50,936,727	0.58	15.80%	13.44%	-2.04%
07123200	Dried *Auricularia auricula*	37,593,341	628,733,237	16.72	46,230,629	743,202,290	16.08	22.98%	18.21%	-3.88%
07095990	Other mushroom, fresh or chilled	28,625,524	47,866,539	1.67	38,163,557	53,544,734	1.40	33.32%	11.86%	-16.09%
20031019	Other mushrooms, in air tight containers	34,601,587	73,875,375	2.14	31,940,834	60,426,768	1.89	-7.69%	-18.20%	-11.39%
20039010	Other mushroom, canned	21,556,876	92,170,787	4.28	22,273,201	102,692,393	4.61	3.32%	11.42%	7.83%
07095920	*Lentinula edodes*, fresh or chilled	17,944,329	51,368,291	2.86	17,424,528	46,897,472	2.69	-2.90%	-8.70%	-5.98%
20039090	Other mushrooms and truffles, prepared or preserved otherwise than by vinegar or acetic acid	13,282,664	211,312,668	15.91	15,224,370	209,610,595	13.77	14.62%	-0.81%	-13.46%
07095930	*Flammulina velutipes,* fresh or chilled	4,099,634	5,806,214	1.42	11,423,629	17,282,313	1.51	178.65%	197.65%	6.82%
07108040	*Boletus* spp., frozen	6,542,661	28,383,419	4.34	9,431,547	41,888,917	4.44	44.15%	47.58%	2.38%

07095100	Mushrooms of *Agaricus* spp., fresh or chilled	4,581,913	8,059,493	1.76	8,549,745	13,846,394	1.62	86.60%	71.80%	-7.93%
07115119	Other mushrooms of *Agaricus* spp., in brine	9,368,525	20,221,430	2.16	8,216,320	17,870,232	2.17	-12.30%	-11.63%	0.77%
07115990	Other mushrooms and truffles, provisionally preserved	4,704,866	9,760,999	2.07	6,764,285	14,650,392	2.17	43.77%	50.09%	4.40%
07115919	Other mushroom and truffles, in brine	5,892,453	18,414,049	3.13	6,654,412	16,988,963	2.55	12.93%	-7.74%	-18.30%
12119029	*Poria cocos*, fresh or dried	6,189,685	36,622,161	5.92	6,436,518	29,165,605	4.53	3.99%	-20.36%	-23.41%
07123300	Dried *Tremella fuciformis*	4,308,162	71,154,105	16.52	3,824,677	55,727,839	14.57	-11.22%	-21.68%	-11.78%
07115112	*Agaricus comtulus*, in brine	2,799,002	5,143,323	1.84	2,565,864	4,872,413	1.90	-8.33%	-5.27%	3.34%
07123950	Dried *Boletus* spp.	1,372,965	29,222,094	21.28	1,629,537	35,263,114	21.64	18.69%	20.67%	1.67%
07095960	Truffle, fresh or chilled	1,779,455	6,314,954	3.55	929,543	5,659,704	6.09	-47.76%	-10.38%	71.57%
20031090	Other mushrooms, prepared or preserved otherwise than by vinegar or acetic acid	836,158	6,992,028	8.36	835,957	8,135,402	9.73	-0.02%	16.35%	16.38%
07095910	*Tricholoma matsutake*, fresh or chilled	714,263	35,296,399	49.42	703,841	38,092,894	54.12	-1.46%	7.92%	9.52%
07123999	Other dried mushrooms and truffles				655,748	10,820,335	16.50			
07095950	*Leucopaxillus giganteus*, fresh or chilled	430,997	689,054	1.60	504,025	781,183	1.55	16.94%	13.37%	-3.06%

07108010	*Tricholoma matsutake*, frozen	756,998	16,141,197	21.32	430,335	8,957,956	20.82	-43.15%	-44.50%	-2.37%
07095940	*Volvariella volvacea*, fresh or chilled	395,812	422,139	1.07	392,871	560,038	1.43	-0.74%	32.67%	33.66%
12119022	*Rhizoma gastrodiae*, fresh or dried	177,626	3,155,264	17.76	164,871	3,182,787	19.30	-7.18%	0.87%	8.68%
07123100	Dried mushrooms of *Agaricus* spp.	128,704	2,516,872	19.56	155,184	2,985,496	19.24	20.57%	18.62%	-1.62%
07115911	*Tricholoma matsutake*, in brine	31,345	720,879	23.00	43,516	907,120	20.85	38.83%	25.84%	-9.36%
07123991	Dried *Morchella* spp.				35,581	5,774,843	162.30			
07123920	Dried *Flammulina velutipes*	3,082	31,889	10.35	5,276	52,246	9.90	71.19%	63.84%	-4.29%
12119016	*Cordyceps sinensis*, fresh or dried	634	11,124,938	17547.22	1,006	27,765,303	27599.70	58.68%	149.58%	57.29%
07123930	Dried *Volvariella volvacea*	450	6,120	13.60	999	6,772	6.78	122.00%	10.65%	-50.16%
07123940	Dried *Leucopaxillus giganteus*	5	177	35.40	300	424	1.41	5900.00%	139.55%	-96.01%
07115190	Other *Agaricus* spp., provisionally preserved	13,610	21,697	1.59						
07123990	Other dried mushrooms and truffles	800,751	19,630,993							
	Total	**557,779,995**	**3,220,482,702**		**630,794,284**	**3,844,487,857**		**13.09%**	**19.38%**	
Date from Customs of the People's Republic of China										
Collected by Edible Fungi Chamber, China Chamber of Commerce of Foodstuffs and Native Produce										

Up-coming Events

Second Announcement of the 9th International Conference on Mushroom Biology and Mushroom Products

November 12-19, 2018 Shanghai and Zhangzhou, China

We are pleased to invite you to join us during November 12-19, 2018 in Shanghai and Zhangzhou, Fujian Province, China for the 9th International Conference on Mushroom Biology and Mushroom Products (ICMBMP). This is a special occasion to meet with fellow scientists from around the world as they discuss topics pertaining to the latest research and discoveries in mushroom biology and mushroom products. ICMBMP meetings provide novel opportunities for face-to-face discourse with distinguished colleagues and potential mentors, and offer dynamic perspectives on all aspects of mushrooms and mushroom-derived commodities.

Organizers

World Society for Mushroom Biology and Mushroom Products (WSMBMP)
Shanghai Academy of Agricultural Sciences (SAAS)
Mycological Society of China
China Edible Fungi Association
China Chamber of Commerce of Foodstuffs and Native Produce

Co-organizers

The International Society for Medicinal Fungi
Mushroom Branch of the Chinese Agricultural Society
National Engineering Research Center of Edible Fungi, China
Engineering Research Center of Edible & Medicinal Fungi, Ministry of Education, China
Key Laboratory of Edible Fungi Resources and Utilization (South), Ministry of Agriculture, China
Key Laboratory of Edible Fungi Resources and Utilization (North), Ministry of Agriculture, China
Shanghai Horticultural Society
Shanghai Society for Microbiology
Shanghai Agricultural Society

Conference Advisory Committee

S. T. Chang (Australia)
GU Guoxin (China)
PAN Yingjie (China)
LI Yu (China)
Daniel J. Royse (USA)
WU Aizhong (China)

RONG Weidong (China)
GUO Liangdong (China)
Jose E. Sanchez (Mexico)
Anton Sonnenberg (Netherlands)
John A. Buswell (UK)
Koji Takabatake (Japan)
Manjit Singh (India)

Organizing Committee

Chairman	CAI Youming, SAAS
Coordinating Commissioner	LIU Ziqiang, China Chamber of Commerce of Foodstuffs and Native Produce
Organizing Commissioner	TAN Qi, SAAS
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Secretariat	BAO Dapeng, Institute of Edible Fungi, SAAS

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www.emushroom.net
www.fungichain.com
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Shi Yong Jun (Journal)
Edible & Medicinal Mushrooms (Journal)
Journal of Fungal Research (Journal)
Mushroom Business (Journal)
Korean Mushroom Journal
Russian Mushroom Journal

Language

Working languages for the conference are Chinese and English. Simultaneous translation will be provided for conference oral presentations.

Scientific Program

The 9th ICMBMP will incorporate the latest advances relating to all aspects of mushroom biology and mushroom products in the form of keynote lectures, oral presentations and poster displays. Panel topics include 1) Diversity and Taxonomy; 2) Omics and Bioinformatics; 3) Genetics and Breeding; 4) Physiology and Development; 5) Mycosourced Molecules and their Nutritional and Medicinal Properties; 6) Mushroom Cultivation, Substrates, Factory Production and Equipment Innovations; 7) Pest and Disease Management; 8) Product Quality and Safety Controls; 9) Mushroom Economics and Cultural Impacts.

Joint Mushroom Product Exhibition

In order to give mushroom producers and researchers a more thorough understanding of the current state of the mushroom industry in China, the 9th ICMBMP will include a mushroom product exhibition to be held during the 12th Chinese Mushroom Days from November 16 to 19, 2018 in Zhangzhou, Fujian Province. For detailed information about the exhibition, please contact the China Chamber of Commerce of Foodstuffs and Native Produce.

Registration

Regular and Student registration entitles participants admission to all conference sessions and the Exhibition Hall, together with the conference bag containing the Book of Abstracts, the Program Booklet, a disc containing the Conference Proceedings, and other meeting materials.

Registration can be done online at http://9th-wsmbmp.csp.escience.cn. Registration rates are as follows:

	Regular participant	Student*	Accompanying guest#
Advanced Registration *on or before August 31, 2018*	500 USD	300 USD	400 USD
Late Registration *after August 31, 2018*	600 USD	400 USD	400 USD

***Proof of student status is required upon registration**

#Accompanying Guest Registration includes admission to the Opening Ceremony, the Welcome Reception and to the Exhibition Hall.

Please note: *Refund requests must be made in writing, and all refunds are subject to a USD 50.00 administrative fee. A full refund will be given if the request is received by July 15, 2018, and a 50% refund will apply to applications received between July 16 and August 31, 2018. Refund requests received after August 31, 2018 will not be processed.*

Please note: the registration rates shown above only cover access to the scientific program of the conference in Shanghai. For information about registering to attend the mushroom exhibition in Zhangzhou, please refer to the announcement of the 12th Chinese Mushroom Days.

Submission of Abstracts and Manuscripts

Both oral and poster presenters are required to submit an abstract and all participants are encouraged to submit a research article for publication in the conference proceedings.

Abstracts and manuscripts should be written in English or in Chinese with a corresponding English translation, and relate to one of the nine topics listed in the scientific program. Authors should indicate the topic and the preferred form of presentation (oral/poster).

Abstracts should include the title, author(s), author affiliation(s), email or other form of contact address, zip code, and the abstract body consisting of a short background to the research, brief methodology, major results and conclusions. A full paper should include the title, author(s), author affiliation(s), email or other form of contact address, zip code, and the manuscript body consisting of the background to the research, aims and objectives, methodology, results, discussion and conclusion, and references.

In order to ensure prompt publication of the conference proceedings, all abstracts and manuscripts must be submitted online at http://9th-wsmbmp.csp.escience.cn by **August 31, 2018**.

Accommodation

Information relating to hotel accommodation is available at the conference registration site http://9th-wsmbmp.csp.escience.cn and special rates will apply to participants booking through this site. Please note that these special rate options will only become available once registration has been completed. Due to limited availability, we strongly recommend early registration to guarantee accommodation at the special rates.

Contact Information

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2. China Chamber of Commerce of Foodstuffs and Native Produce (For the mushroom product exhibition)
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World Society for Mushroom Biology and Mushroom Products (WSMBMP)
February 15, 2018

The First International Woodfungi Conference

About the Conference

INTRODUCING THE FIRST INTERNATIONAL WOODFUNGI CONFERENCE

The First International WoodFungi Conference is dedicated to wood fungi or lignicolous mushrooms. WoodFungi is taking place in June 3-6, 2018 in Ghent, Belgium!

For decades, our mission has been to work hard to improve the cultivation quality of wood-loving fungi. Now it's your time!

You want to exchange ideas and compare practical solutions to common problems, find answers to long lingering questions, share some wisdom and enjoy recognition.

We are realizing your dream: our anniversary year 2018 is the perfect occasion to organize the WoodFungi Conference, the first international conference dedicated to the cultivation of lignicolous fungi.

WHY IS THIS CONFERENCE DIFFERENT?

We are hosting a diverse group of speakers presenting pragmatic advice, we offer networking opportunities and a fantastic setting, right in the center of the city of Ghent, Belgium. You bring your insight, your observations and your know-how.

Together, the speakers have more than 500 years of practical experience. You will learn about cultivation from other cultivators. It is truly a growers conference. Of course, expect cutting edge technology in wood fungi cultivation.

Enjoy the visits to Inagro and Devroe, two industry giants. No visit to Belgium, home of the world's best beers, would be complete without a visit to a brewery, in our case, Brouwerij Rodenbach! And to balance culture, we offer two mycelium material exhibitions.

The new generation of university students is encouraged to participate – they are the future voice of our exciting and ever expanding industry!

SPECIAL PROGRAM FOR YOUR PARTNER

The accompanying persons' program includes a visit to Ghent with its incredibly rich history and Bruges, home to no less than three world heritage sites.

"Wood Fungi like the Shiitake and King Oyster are undervalued in Europe and the US. I see it as part of my mission to put them in the spotlight." *Magda Verfaillie, Mycelia, Belgium*

Schedule

Please check again soon, we are still working on the order of speakers in the schedule.

Please click on copy in red to find out more.

DAY ONE, SUNDAY, JUNE 3RD Welcome to the first ever Woodfungi Conference!

16:00 - 20:00 Hospitality tour of Ghent

18:00 - 20:00 Arrival and registration

20:00 - 22:00 Welcome to the opening reception

DAY TWO, MONDAY, JUNE 4TH Challenges in growing wood fungi

8:00 - 8:50 Registration with coffee and a waffle

09:00 - 09:15 Welcome

9:15 - 9:45 HLP, Ulrich Groos

9:45 - 10:10 WUR, Anton Sonnenberg

10:10 - 10:40 Fine Funghi, Patrick Romanens

10:40 - 11:10 Coffee Break

11:10 - 11:35 Saco2, Jan Van Nuffel

11:35 - 12:00 Lambert, Chris Smith

12:00 - 12:30 CNC Exotic Mushrooms, Bert Rademakers

12:30 - 13:30 Lunch Break

13:30 - 13:50 CATÉ, Alain Kerbiriou

13:50 - 14:30 Panel Discussion

14:30 - 14:55 CTICH, Spain: Luisa Maria Tellín

14:55 - 15:20 VUB, Belgium: Elise Elsacker

15:20 - 16:00 Coffee Break

15:20 - 16:30 Bus Transport to Mycelia

17:00 - 22:00 Reception at Mycelia

DAY TWO FOR ACCOMPANYING PERSONS, MONDAY, JUNE 4TH Visit to Bruges

10:30 - 14:30 Visit to Bruges

15:30 - 17:00 Reception at Mycelia

DAY THREE, TUESDAY, JUNE 5TH Discoveries, best practices and miracles

8:00 - 8:50 Registration with coffee

9:00 - 9:30 Bio Mycotec, Torsten Jonas

9:30 - 9:55 WUR, Johan Baars

9:55 - 10:20 INAGRO, Patrick Sedeyn

10:20 - 10:50 Sylvan, Christelle Chevalier

10:50 - 11:20 Coffee Break

11:20 - 11:50 Substratproduktion Kynast-Löcke, Jürgen Kynast

11:50 - 12:20 Chaire ABI d'AgroParisTech, France: Mathilde Grandchamp

11:50 - 12:20 Chaire ABI d'AgroParisTech, France: Antoine Fayeulle

12:05 - 12:30 Dimitrios Argyropoulos

12:30 - 13:30 Lunch Break

13:30 - 14:00 Pilze Nagy, Adrienn Nagy

14:00 - 15:00 Panel Discussion

15:00 - 15:20 TEB VERD, Carlos Tarrago

15:20 - 15:50 Coffee Break

15:50 - 16:15 Phillips Mushrooms, USA: Tina Ellor

15:20 - 15:50 Amycel, Italy: Daniele Borsato

16:40 - 17:00 Holpol, Piotr Hamrol

17:00 - who knows...? :) Enjoy Ghent by night

DAY THREE FOR ACCOMPANYING PERSONS, TUESDAY, JUNE 5TH Visit to Ghent

10:30 - 14:30 Visit to Ghent

DAY FOUR, WEDNESDAY, JUNE 6TH Field Trip

8:30 Bus Departure

10:30 - 12:00 Visit to Devroe

12:00 - 14:00 Brewery Rodenbach

14:00 - 15:30 Guided Tour Brewery Rodenbach

15:45 - 17:30 Visit Inagro, Research Centre for Mushroom Production

17:30 - 18:30 Bus trip back to Ghent

Tickets

- **Standard Registration**

  480 EUR

  After February 1, 2018

  Standard registration **includes full access to all conference activities, talks, receptions and lunches.** It does **NOT** include the optional field trip on the last day. For this you will have to purchase the **OPTIONAL** Field Trip ticket.

- **Student Registration**

  320 EUR

  30% off standard registration with proof of current enrollment in an accredited university.

  Student registration **includes full access to all conference activities, talks, receptions and lunches.** It does **NOT** include the optional field trip on the last day. For this you will have to purchase the **OPTIONAL** Field Trip ticket.

- **Accompanying Persons**

  200 EUR

  Accompanying persons' program includes two receptions and one day trip to Bruges and another day trip to Ghent, but no admission to conference or any of the talks.

This ticket does **NOT** include the optional field trip on the last day. For this you will have to purchase the **OPTIONAL** Field Trip ticket.

- **Lunches and Receptions Only (Accompanying Person)**

  100 EUR

  For accompanying persons: bring your spouse, your partner, family member or friend, introduce them to your colleagues at our wonderful receptions and lunches. (2 each)

  If you purchase a regular conference ticket, wether it be early bird, standart or student you DO NOT need to buy this ticket. This is for partners who ONLY want to enjoy our good food, beverages and ambiance at receptions. This does **NOT** include the trips to Bruges and Ghent. (For this, see accompanying person ticket) It does **NOT** include the optional field trip on the last day. For this you will have to purchase the **OPTIONAL** Field Trip ticket.

- **Field Trip**

  85 EUR

  Join us on a field trip to round off your great conference experience.

  Be sure not to miss Wednesday's visits to INAGRO, the Flemish Mushroom Research Centre, and to De Vroe, a grower of lignicolous mushrooms.

  Enjoy a guided tour, beer tasting and lunch in Brewery Rodenbach.

- **One Day Only**

  240 EUR

  If you really cannot make it every day of the conference, there is a possibility to attend one day of your choice: June 4th or June 5th.

  A day ticket registration **includes full access to all conference activities that day and lunches.** It does **NOT** include the activities of other days nor the optional field trip on the last day.

  You can specify June 4th or June 5th on the registration form.

For more information about the conference: https://woodfungi-conference.org/.

UKRAINIAN MUSHROOM INDUSTRY
LOOKING INTO THE FUTURE
III INTERNATIONAL CONFERENCE

KYIV
June 6-7, 2018

Ukrainian mushroom industry

The conference-exhibition **"Ukrainian mushroom industry" is the largest mushroom event in Ukraine.** It gathers the absolute majority of producers of cultivated mushrooms, substrates, technologies and equipment.

In 2018 Umdis Informational agency organizes in Ukraine the third International Conference "Ukrainian Mushroom industry: looking into the future". At the event on **JUNE 6-7** we expect more than 300 participants from **a dozen countries**: Ukraine, Poland, Russia, Belarus, Moldova and others. The venue is **KYIV**, the Mercure Kyiv Congress Hotel.

Registration is open now. Register to get the maximum discount for participation. The cost for two days of the conference is 170-200 EUR per person depending on the month of payment.

The conference "Ukrainian mushroom industry-2018" is:

The hall devoted to the motto of the conference "**LOOKING INTO THE FUTURE**". There are lectures on robotics for mushroom production, energy saving, modern marketing and promotion recourses being used for mushroom industry. We are to discuss how the Ukrainian and global mushroom industry is going to be look like in a few years.

TECHNOLOGY hall. Well-known Ukrainian consultants, technologists and directors of Polish and Dutch companies are answering your most difficult questions on growing champignons and oyster mushrooms. They are to give practical pieces of advice how easily overcome all mushroom production`s challenges.

600 m^2 of **EXHIBITION** devoted to mushroom production. You are to meet producers of compost: Greenyard Micogen, Veres, “World of Straw”, the largest producers of cover soil, mycelium, packaging, shelving and mushroom equipment. If you want use mushroom exhibition to make producers from Ukraine, Russia, Poland, Belarus, Moldova, Georgia, Romania and other countries buy your products – you can hold a stand on the exhibition. In such case – contact us.

The opportunity to meet in one place 300+ future customers, suppliers and colleagues – and establish **PERSONAL CONTACTS**. Here it is easy to drink coffee with the director of Umdis, or the owner of a large Dutch equipment manufacturer. And, of course, with all SPONSORS of the conference: Greenyard Micogen, Amysel, AgroProjects, Mushroom Team, Italspawn, Mantek Makine, Hoving Holland, Dalsem, EuroMycel, Veres and the “World of Straw”.

GALA-DINNER in the banquet hall with artists, dances, awards and surprises. The hotel Mercure which holds the conference is a part of the big entertainment center. So you can easily find there shopping mall, cafes, restaurants, cinemas and much more. Hotel Mercure is a part of international brand AccorHotels.

And just the cool **“MUSHROOM PARTY”**.

Contacts

The organizer of the conference is Umdis Information agency www.umdis.org
Vernadskogo 36v, Kyiv, Ukraine
Please contact Inna Ustilovskaja
Phone + 38 (093) 569 09 41
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THE TWELFTH CHINESE MUSHROOM DAYS

第十二届中国蘑菇节

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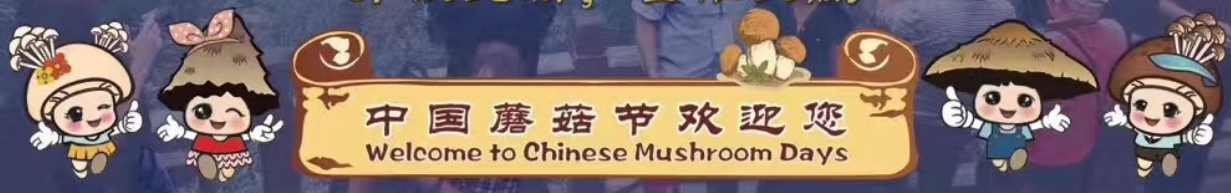

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Research progress

Addition of mushroom powder to pasta enhances the antioxidant content and modulates the predictive glycaemic response of pasta

By Xikun Lu [a,b], Margaret A. Brennan [a], Luca Serventi [a], Jianfu Liu [C], Wenqiang Guan [C], Charles S. Brennan [a,b,C]

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Abstract: This study reports the effects of addition of mushroom powder on the nutritional properties, predictive *in vitro* glycaemic response and antioxidant potential of durum wheat pasta. Addition of the mushroom powder enriched the pasta as a source of protein, and soluble and insoluble dietary fibre compared with durum wheat semolina. Incorporation of mushroom powder significantly decreased the extent of starch degradation and the area under the curve (AUC) of reducing sugars released during digestion, while the total phenolic content and antioxidant capacities of samples increased. A mutual inhibition system between the degree of starch gelatinisation and antioxidant capacity of the pasta samples was observed. These results suggest that mushroom powder could be incorporated into fresh semolina pasta, conferring healthier characteristics, namely lowering the potential glycaemic response and improving antioxidant capacity of the pasta.

Keywords: Mushroom powder, Pasta, Nutritional profile, Starch digestibility, Antioxidant

Food Chemistry, In press, accepted manuscript, Available online 30 April 2018

Elemental characteristics of mushroom species cultivated in China and Poland

By Mirosław Mleczek [a], Piotr Rzymski [b], Anna Budka [c], Marek Siwulski [d], Agnieszka Jasińska [d], Pavel Kalač [e], Barbara Poniedziałek [b], Monika Gąsecka[a], Przemysław Niedzielski [f]

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Abstract: China is the first and Poland the fifth the greatest producers of cultivated mushrooms worldwide. Because new species are being domesticated and gaining popularity there is a need to study their biological activities and chemical composition. In this study, a multi-elemental analysis was conducted on 14 culinary and/or medicinal

mushroom species cultivated in China and Poland, all of which were available in German and Polish oriental and internet shops (*Agaricus bisporus*, *Amauroderma rude*, *Auricularia auricula-judae*, *Auricularia nigricans, Ganoderma lucidum*, *Lentinula edodes, Lignosus rhinocerus, Ophiocordyceps sinensis*, *Pleurotus ostreatus*, *Sparassis crispa, Tremella fuciformis, Wolfiporia cocos* and *Volvariella volvacea*). Overall, the contents of 5 macroelements and 31 trace elements were quantified. The studied mushrooms varied widely in their content of both essential and toxic deleterious elements. *A. rude* was found to contain the highest content of toxic deleterious elements Al, As and Pt. Platinum content was of particular concern as it exceeded 7 mg kg^{-1} dry matter. The studied mushrooms were generally found to contain higher amounts of Pt, Ni (particularly *W. cocos*), and rare-earth elements Er and Nd (particularly *V. volvacea*) than reported in many literature data. The study generally concludes that the levels of various elements in the analysed mushrooms are not toxic, although further attention should be paid to reducing Ni levels in commercial mushrooms available as culinary.

Keywords: Food composition, Food analysis, Cultivated mushroom species, Trace elements, Food safety, Heavy metals, Mushroom toxicity, Macroelements

Journal of Food Composition and Analysis, Volume 66, March 2018, Pages 168-178

Aphrodisiac Activity of an Aqueous Extract of Wood Ear Mushroom, *Auricularia polytricha* (Heterobasidiomycetes), in Male Rats

By Gaurav Gupta[a], Rakesh Kumar Sharma[b], Rajiv Dahiya[c], Anurag Mishra[b], Juhi Tiwari[a], Ganesh N. Sharma[a], Sanjay Sharma[d], Kamal Dua[e,f,g]

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Abstract: *Auricularia polytricha* is a popular mushroom found all over the world. In this study we considered the effect of an aqueous extract of *A. polytricha* (AEAP) on restoring sexual performance parameters to normal, evaluated by considering observations of sexual behavior. At 0, 6, 12, 18, and 24 days, the following parameters of sexual performance were identified before and throughout the observations: mount latency, intromission latency, ejaculation latency, mounting frequency, intromission frequency, ejaculation frequency, and postejaculatory interval. Treatment of rats under stress with AEAP showed promising effects on overcoming stress-induced sexual dysfunction, on sexual performance, and on accessory sexual organs and body weight. Mounting latency, intromission latency, ejaculation latency, and postejaculatory interval parameters were significantly decreased by AEAP, whereas mounting frequency, intromission frequency, and ejaculation frequency were significantly increased by AEAP. These properties were identified in sexually dynamic and indolent male rats. We conclude that AEAP has a potent aphrodisiac activity.

Keywords: AEAP, aphrodisiac, *Auricularia polytricha*, infertility, medicinal mushrooms, sexual behavior, stress

International Journal of Medicinal Mushrooms, Volume 20, 2018 Issue 1, pages 81-88

Determination of the Biological Efficiency and Antioxidant Potential of Lingzhi or Reishi Medicinal Mushroom, *Ganoderma lucidum* (Agaricomycetes), Cultivated Using Different Agro-Wastes in Malaysia

By Surya Sudheer [a], Ibrahim Alzorqi [a], Asgar Ali [b], Poh Guat Cheng [c], Yasmeen Siddiqui [d], Sivakumar Manickam [a]

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Abstract: This study investigates the cultivation of *Ganoderma lucidum* using different agricultural biomasses from Malaysia. Five different combinations of rubber wood sawdust, empty fruit bunch fiber, and mesocarp fiber from oil palm, alone and in combination, were used to cultivate *G. lucidum*. Although all the substrate combinations worked well to grow the mushroom, the highest biological efficiency was obtained from the combination of empty fruit bunch fiber with sawdust. A total yield of 27% was obtained from empty fruit bunch fiber with sawdust, followed by sawdust (26%), empty fruit bunch fiber (19%), mesocarp fiber with sawdust (19%), and mesocarp fiber (16%). The quality of mushrooms was proved by proximate analysis and detection of phenolic compounds and flavonoids. The antioxidant activity verified by DPPH, ferric-reducing ability of plasma, and ABTS analyses revealed that the empty fruit bunch fiber with sawdust had higher activity than the other substrates.

Keywords: antioxidant assay, biomass, cultivation, empty fruit bunch fiber, *Ganoderma lucidum*, medicinal mushrooms, mesocarp fiber

International Journal of Medicinal Mushrooms, Volume 20, 2018 Issue 1, pages 89-100

What can tiny mushrooms in fruit flies tell us about learning and memory?

By Toshihide Hige

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Abstract: Nervous systems have evolved to translate external stimuli into appropriate behavioral responses. In an ever-changing environment, flexible adjustment of behavioral choice by experience-dependent learning is essential for the animal's survival. Associative learning is a simple form of learning that is widely observed from worms to humans. To understand the whole process of learning, we need to know how sensory information is represented and transformed in the brain, how it is changed by experience, and how the changes are reflected on motor output. To tackle these questions, studying numerically simple invertebrate nervous systems has a great advantage. In this review,

I will feature the Pavlovian olfactory learning in the fruit fly, *Drosophila melanogaster*. The mushroom body is a key brain area for the olfactory learning in this organism. Recently, comprehensive anatomical information and the genetic tool sets were made available for the mushroom body circuit. This greatly accelerated the physiological understanding of the learning process. One of the key findings was dopamine-induced long-term synaptic plasticity that can alter the representations of stimulus valence. I will mostly focus on the new studies within these few years and discuss what we can possibly learn about the vertebrate systems from this model organism.

Keywords: Synaptic plasticity, Associative learning, Olfaction, Drosophila, Mushroom body

Neuroscience Research, Volume 129, April 2018, Pages 8-16

Antiproliferative Activity and Cytotoxicity of Some Medicinal Wood-Destroying Mushrooms from Russia

By Alla V. Shnyreva [a], Anastasia A. Shnyreva [a], Cesar Espinoza [b], José M. Padrón [c], Ángel Trigos [b,d]

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Abstract: We analyzed the antiproliferative activity of 6 medicinal wood-destroying mushrooms (*Fomes fomentarius, Fomitopsis pinicola, Trametes versicolor, Trichaptum biforme, Inonotus obliquus*, and *Coniophora puteana*) that are common in deciduous and mixed coniferous forests in Central Russia. Morphological identification of strains collected from the wild was confirmed based on ribosomal DNA internal transcribed spacer phylogenetic analysis. We observed cytotoxic and cell growth–inhibitory effects of hot water extracts from mycelial biomass of 5 species−*T. versicolor, C. puteana, F. fomentarius, F. pinicola*, and *I. obliquus*−on leukemia cell lines (Jukart, K562, and THP-1), the effective extract concentrations were mostly less than 50 μg · mL^{-1}. However, we observed no antiproliferative activity of dry biomass from methanol−chloroform (1:1) extracts of *C. puteana* and *F. fomentarius*. A chemosensitivity assay showed that the most effective polypore mushroom extract was the methanol extract of *T. versicolor* (strain It-1), which inhibited the growth of 6 various solid tumors (A-549 and SWi573 [lung], HBL-100 and T-47D [breast], HeLa [cervix], and WiDr [colon]) at concentrations below 45 μg · mL^{-1}, with a concentration as low as 0.7–3.6 μg · mL^{-1} causing 50% reduction in the proliferation of cancer cells in lung and cervix tumors. Methanol extracts of *F. pinicola* and *I. obliquus* were less effective, with proliferation-inhibiting capacities at concentrations below 70 and 200 μg · mL^{-1}, respectively. Thus, *T. versicolor* is a prospective candidate in the search for and production of new antiproliferative chemical compounds.

Keywords: antiproliferative effect, bioactive aphyllophoroid wood-destroying fungi, medicinal mushrooms and fungi, molecular identification, *Trametes versicolor*

International Journal of Medicinal Mushrooms, Volume 20, 2018 Issue 1, pages 1-11

Cell Proliferation and DNA Repair Ability of *Ganoderma neo-japonicum* (Agaricomycetes): An Indigenous Medicinal Mushroom from Malaysia

By Wee Cheat Tan [a,b], Umah Rani Kuppusamy [a,c], Chia Wei Phan [a,d], Vikineswary Sabaratnam [a,b]

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Abstract: *Ganoderma neo-japonicum* is an annual polypore that grows on decaying bamboo in the forests of Malaysia. The indigenous Temuan tribe uses this species as a medicinal mushroom to cure fever and epilepsy and to improve body strength. The potential use of *G. neo-japonicum* in genoprotection and DNA repair was established using a single-cell gel electrophoresis (comet) assay. The effects of the ethanol and hot aqueous extracts from wild and cultivated basidiocarps, solid substrate-fermented (SSF) wheat grains, and mycelia via submerged culture on H_2O_2-damaged murine RAW264.7 macrophages were investigated. An ethanol extract from wild basidiocarps showed the most significant protective effect on murine RAW264.7 macrophages, followed by ethanol and hot water extracts of cultivated basidiocarps, and this effect was dose dependent. However, only the ethanol extracts from SSF and submerged culture showed significant protective effects compared with the control. As for DNA repair ability, only the ethanol extract from wild and cultivated basidiocarps showed significant results when compared with the negative control. The findings suggest the potential therapeutic use of *G. neo-japonicum* in genome protection and as a DNA repair stimulator.

Keywords: DNA repair, ethnomycology, *Ganoderma neo-japonicum*, genoprotection, medicinal mushrooms

International Journal of Medicinal Mushrooms, Volume 20, 2018 Issue 2, pages 155-163

Application of winter mushroom powder as an alternative to phosphates in emulsion-type sausages

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Abstract: This research evaluated the utilization of winter mushrooms as a replacement for phosphate in emulsion-type sausages. Winter mushroom powder (WMP) was added to the sausages at 0, 0.5, 1.0, 1.5, and 2.0% (w/w), and phosphate was added at 0.3% as a positive control. The WMP additions above 1.0% increased the pH of meat batter and efficiently inhibited the exudation of fat from the sausages ($p < 0.05$). Lipid oxidation of sausages was inhibited by the addition of WMP ($p < 0.05$). On the other hand, the addition of phosphate and WMP provided different instrumental texture properties. However, no adverse effects were observed with respect to the color and sensory properties of the sausages containing WMP, except for that containing 2.0% WMP. Therefore, this research

indicates that WMP can effectively replace phosphate in meat products, and that the most effective addition level may be 1.0% WMP.

Keywords: Winter mushroom, Phosphate, Replacement, Antioxidant, Meat pH

Meat Science, Volume 143, September 2018, Pages 114-118

Cloning and Characterization of Promoters of the Fungal Immunomodulatory Protein Genes from *Ganoderma* spp. (Agaricomycetes) and Their Response to Methyl Jasmonate and Salicylic Acid

By Qi-Zhang Li [a], Yu-Zhou Chang [a], Kai-Qi Su [a], Xiao-Lei Wang [a], Xiao-Hui Bai [b], Xuan-Wei Zhou [a]

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Abstract: *Ganoderma* mushrooms for medicinal use contain various bioactive compounds, but the genetic elements available for these medicinal mushrooms are still limited. In this study we cloned and analyzed the promoters of fungal immunomodulatory protein (FIP) genes from *G. lucidum* and *G. atrum*. FIP gene expression was induced by different concentrations of methyl jasmonate (MeJA) and salicylic acid (SA), and messenger RNA expression was detected by quantitative reverse-transcription polymerase chain reaction. The results provided 5' upstream sequences of FIP genes from *G. lucidum* and *G. atrum*. Sequence analysis showed that the *FIP-glu* promoter sequence contained 11 CAAT boxes, 3 TATA boxes, 3 MeJA-responsive elements, 3 MYB binding site (MBS) motifs, 1 abscisic acid responsive element, 1 TGA, 1 anaerobic inducible element, 2 circadian elements, 1 fungal elicitor, 1 meristem-specific activation element, 3 Skn-1 motifs, and several light-responsive elements. The 5' flanking region of *FIP-gat* included 9 CAAT boxes, 4 TATA boxes, 3 MeJA-responsive elements, 1 AuxRR core, 1 GC motif, 1 MBS, 1 fungal elicitor, 1 meristem-specific activation element, 3 Skn-1 motifs, and several light-responsive elements. On the transcriptional level, both *FIP-glu* and *FIP-gat* reached their highest expression after treatment with MeJA at 500 µmol/L. *FIP-glu* expression depended on the concentration of SA (0-1000 mg/L), the expression of the *FIP-gat* gene was highest at a concentration of 100 mg MeJA/L. This research lays the foundation to use *Ganoderma* mycelia as bioreactors for producing FIPs.

Keywords: expression regulation, FIPs, *Ganoderma* spp., medicinal mushrooms, promotor

International Journal of Medicinal Mushrooms, Volume 20, 2018 Issue 2, pages 177-189

ITS1/5.8S/ITS2, a Good Marker for Initial Classification of Shiitake Culinary-Medicinal *Lentinus edodes* (Agaricomycetes) Strains in China

By Xiao-Xia Song [a], Yan Zhao [a], Chun-Yan Song [a], Chuan-hua Li [a], Ying Song [b], Ming-Jie Chen [a], Da-Peng Bao [a], Qi Tan [a]

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Abstract: China is home to rich wild and cultivated strains of *Lentinus edodes*, an important edible and medicinal mushroom. Artificial selection of *L. edodes* has a long history, and the widely cultivated strains belong to populations different from those of most wild strains. Internal transcribed spacer (ITS) regions have been used as good markers to identify *L. edodes* populations. But because ITS regions exhibit incomplete concerted evolution, the use of an ITS to identify *L. edodes* populations has been questioned. The objective of this study was to determine whether the ITS region is suitable for identifying *L. edodes* populations and which populations the widely cultivated strains and the most wild strains belong to by investigating intraindividual and differential ITS polymorphisms between 44 cultivars and 44 wild strains of *L. edodes* in China. Intraindividual ITS polymorphism is common in *L. edodes* strains, and most strains possessed 2 different ITS sequences, which came from their heterokaryons. The genetic polymorphisms of ITS1, 5.8S, and ITS2 in *L. edodes* strains are distinct. All strains were divided into one 5.8S type (5.8S-A), 2 ITS1 types (ITS1-A and ITS1-B), and 2 ITS2 types (ITS2-A and ITS2-B), which were subdivided into 2 branches (ITS2-A1 and ITS2-A2, ITS2-B1 and ITS2-B2). ITS1/5.8S/ITS2 could be used as a good marker in preliminary classification of *L. edodes* strains in China. It not only exhibited classified information of ITS1, 5.8S, and ITS2 for each strain at the same time, it also indicated whether the strain was heterozygous. The 44 cultivated strains were mainly the A/A/A1 type, and the 44 wild strains were mainly the A/A/A2 and other mixed types.

Keywords: haplotype, intraspecies, ITS, *Lentinus edodes*, medicinal mushrooms, polymorphism

International Journal of Medicinal Mushrooms, Volume 20, 2018 Issue 3, pages 227-242

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Recommendation of Book--

Mushroom Biotechnology

Developments and Applications

Author: Marian Petre

ISBN: 978-0-12-802794-3

Foreword by John Buswell

Mushroom Biotechnology – Developments and Applications focuses our attention on the highly diversified attributes of a fascinating group of fungi whose contributions to economic and technological development have often been greatly under-estimated. The volume is edited by Professor Marian Petre, organizer in 2012 of the International School of Advanced Studies on Mushroom Biotechnology and Bioengineering at the University of Pitesti. Contributing authors are distinguished mushroom biologists who are all actively engaged in research at prestigious universities and research institutes worldwide. Compiling a publication of this kind is a demanding and complicated exercise, and all concerned are to be congratulated on a highly successful outcome.

Mushrooms impact on human welfare in many ways. For centuries, edible varieties have been treasured for their high nutritive value and desirable organoleptic qualities. Over 60 species are now cultivated on a commercial scale, and this figure is increasing every year as more species are domesticated. Also, the health-promoting properties of mushrooms have long been recognized in some cultures, especially in China, although this perception has, until recently, largely depended on empirical observations. However, latter-day application of modern analytical techniques has identified various mushroom-derived compounds, polysaccharides and triterpenoids for example, which exhibit a wide range of medicinal properties including immuno-enhancing, anti-tumor, anti-viral and hypocholesterolemic activities. There is growing experimentally-based evidence to suggest that dietary supplements based on bioactive compounds extracted from mushrooms (mushroom nutriceuticals) increase resistance to disease and, in some cases, cause regression of a diseased state. Mushroom cultivation also impacts positively on the environment since the lignocellulosic waste materials generally used as growth substrates are often disposed of using less environmentally-friendly methods. Moreover, the metabolic diversity of mushrooms is integral to bioremediation and biocontrol functions.

One important facet of mushroom biotechnology is focused on mushroom products obtained by fermentation or extraction from fruiting bodies, fungal mycelium, or spent culture liquor. It is this sector of the mushroom industry, currently estimated to be worth in excess of 20 billion US dollars annually, that is expanding most rapidly. Therefore, it is appropriate that two contributions to this book (*Chapters 1 and 9*) focus on fungal biomass production using fermenter-based systems. Depending upon the mushroom species, traditional mushroom cultivation periods can extend to several months, during which time microbial contamination and/or insect infestation may occur and adversely effect quality and yield. Production of bioactive mushroom metabolites through the controlled cultivation of fungal biomass in bioreactors, using both submerged and solid–state processes, allows system parameters to be easily and accurately manipulated to maximize product yields in the shortest time.

The two chapters on the use of winery and fruit tree wastes will appeal to the more entrepreneurial wine producer/fruit grower. Although some basic principles apply, mushroom cultivation does not necessarily require highly automated growth facilities and the heavy capital investment associated with *Agaricus bisporus* (white button mushroom) production in Europe and North America. Low-technology cultivation systems also have the potential to increase profit margins by generating an added-value cash crop from plentiful supplies of locally-available agricultural waste materials that would otherwise require cost-incurring disposal.

Major mushroom growing enterprises, especially those producing *A. bisporus*, are already using highly automated, computer-controlled systems. It will be interesting to see how long it takes for the virtual robotic prototype for safe and efficient cultivation of mushrooms, introduced in Chapter 4, to become reality.

Since it is generally accepted that *A. bisporus* cultivation was first undertaken in France, it is perhaps fitting that French researchers are associated with the two chapters in the book that are focused solely on "Le champignon." The first emphasizes the role of the mushroom in sustainable agricultural development and the importance of conserving and improving germplasm resources. The second pertains to the major pathogens affecting the mushroom and the need to adopt environmentally-friendly solutions.

The chapter on sclerotium-forming mushrooms is a helpful addition to the relatively sparse literature describing this interesting group of fungi. Sclerotium-forming *Pleurotus tuber-regium* is economically important in Africa, both as a food and a medicine, while *Inonotus obliquus* (chaga mushroom) has a long history of use as a tonic and for the treatment of various ailments.

Mushrooms are non-photosynthetic and instead produce a battery of extracellular enzymes (e.g., cellulases, hemicellulases, and ligninases) in order to convert the lignocellulosic residues that normally serve as the growth substrate into products that can be assimilated for fungal nutrition. Although *Aspergillus niger*, the fungal subject of Chapter 10, is not a mushroom, it is feasible to extrapolate the methodology used to produce xylanases by this fungus to high xylanase-producing mushroom species.

The penultimate chapter describes the identification of mating type loci and genes in the straw mushroom, *Volvariella volvacea*, and the various techniques adopted for molecular marker–assisted breeding. The methodologies described are again generally applicable but this chapter will be of special interest to breeders and growers located in tropical and subtropical regions where the straw mushroom is widely cultivated.

Two other contributions are both concerned with "mycorestoration" – the use of fungi to restore degraded environments. Mushrooms as a source of various biocontrol agents are the subject of the former, while the latter describes the significance of fungal ligninolytic enzymes in the degradation of recalcitrant agro-pesticides (mycoremediation).

Mushroom Biotechnology – Developments and Applications covers a wide range of topics which highlight the versatility of mushrooms and their fundamental importance to the welfare of humankind. It will appeal to both specialists and non-specialists alike, and I am confident it will enjoy a wide readership and provide a stimulus for future research.

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Points and Reviews

Medicinal Mushrooms in Human Clinical Studies.

Part I. Anticancer, Oncoimmunological, and Immunomodulatory Activities: A Review (Part II)

Solomon P. Wasser

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ABSTRACT: More than 130 medicinal functions are thought to be produced by medicinal mushrooms (MMs) and fungi, including antitumor, immunomodulating, antioxidant, radical scavenging, cardiovascular, antihypercholesterolemic, antiviral, antibacterial, antiparasitic, antifungal, detoxification, hepatoprotective, antidiabetic, and other effects. Many, if not all, higher Basidiomycetes mushrooms contain biologically active compounds in fruit bodies, cultured mycelia, and cultured broth. Special attention has been paid to mushroom polysaccharides. Numerous bioactive polysaccharides or polysaccharide-protein complexes from MMs seem to enhance innate and cell-mediated immune responses, and they exhibit antitumor activities in animals and humans. While the mechanism of their antitumor actions is still not completely understood, stimulation and modulation of key host immune responses by these mushroom compounds seems to be central. Most important for modern medicine are polysaccharides and low–molecular weight secondary metabolites with antitumor and immunostimulating properties. More than 600 studies have been conducted worldwide, and numerous human clinical trials on MMs have been published. Several of the mushroom compounds have proceeded through phase I, II, and III clinical studies and are used extensively and successfully in Asia to treat various cancers and other diseases. The aim of this review is to provide an overview of and analyze the literature on clinical trials using MMs with human anticancer, oncoimmunological, and immunomodulatory activities. High-quality, long-term, randomized, double-blind, placebo-controlled clinical studies of MMs, including well-sized population studies are definitely needed in order to yield statistical power showing their efficacy and safety. Clinical trials must obtain sufficient data on the efficacy and safety of MM-derived drugs and preparations. Discussion of results based on clinical studies of the anticancer, oncoimmunological, and immunomodulating activity of MMs are highlighted. Epidemiological studies with MMs are also discussed.

KEY WORDS: antioxidant activities, antitumor, β-glucans, biological response modifiers, cancer patients, clinical studies, clinical trials, epidemiological studies, immunomodulation, interferons, interleukins, medicinal mushrooms, natural killer cells, oncoimmunology, polysaccharides, quality of life, secondary metabolites

ABBREVIATIONS: AHCC, active hexose correlated compound; **AIDS**, acquired immunodeficiency syndrome; **ALL**, acute lymphocytic leukemia; **BRM**, biological response modifier; **CAPE**, caffeic acid phenethyl ester; **COX**, cyclooxygenase; **DC**, dendritic cell; **DS,** dietary supplement; **DSHEA**, Dietary Supplement Health and Education Act; **GXM**, glucuronoxilomannan; **HIV**, human immunodeficiency virus; **HSV**, herpes simplex virus; **IC50**, half-maximal inhibition concentration; **IFN**, human type I interferon; **IκBα**, nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor alpha; **IL**, interleukin; **iNOS**, inducible nitric oxide synthase; **MDS**, myelodysplastic syndromes; **MM**, medicinal mushroom; **NF-κB**, nuclear factor kappa B; **PAMP**, pathogenassociated molecular pattern; **NK**, natural killer; **PRR**, pattern-recognition receptor; **PSP**, polysaccharide peptide; **QOL**, quality of life; **RCT**, randomized controlled trial; **TCM**, traditional Chinese medicine; **TLR**, Toll-like receptor; **TNF-a**, tumor necrosis factor-a; **WHO**, World Health Organization

Continued from previous issue:

IV. HUMAN CLINICAL STUDIES

The popularity of MMs and the number of their applications in modern medicine are constantly increasing. However, despite the wide acceptance of MMs, most people are not sufficiently informed in terms of the health benefits, clinical efficacy, and safety of MM use. Unlike synthetic drugs, most products derived from MMs have not yet undergone rigorous evaluation based on the rules and protocols of evidence-based medicine. Therefore, clinical studies are a very important step in bringing new and effective drugs developed from MMs to the consumer at large.

Each clinical study involves research on human volunteers (healthy or with specific diseases/conditions) that aims to provide investigators with novel medical knowledge. Two main types of clinical studies exist: clinical trials and observational studies.

A. Clinical Trials

Clinical trials represent investigations that are done in the framework of clinical research. These studies include tests and experiments carried out on groups of human participants and are designed to answer specific questions raised by scientists about biomedical or behavioral interventions. Participants are exposed to certain interventions according to the experiment's protocols or research plans created by the investigators. These interventions may include the use of medical products such as drugs, novel vaccines, or DSs; tests of newly developed medical devices or procedures; and even changes to participants' behavior, such as diet. The main idea behind the trial is to assess both the safety and efficacy of the drug, device, or procedure on humans by comparing the results of participants exposed to test interventions with those of a group receiving a control treatment. It is important to note that patients in both groups should be enrolled, treated, and followed for the same period of time.[49]

The entire clinical trial should be designed, executed, and analyzed in such a manner to ensure the statistical significance, scientific validity, and reproducibility of the results obtained. Ideally, the trial should be randomized (when test subjects are randomly allocated to different groups in the study), should be double-blind (in which neither researchers nor participants know the exact group each participant is assigned to, in contrast to single-blind or

open-label trials, in which either only researchers or both researchers and participants are familiar with the type of treatment each subject is receiving), and should include a placebo-controlled group. In some cases, however, it is not possible to achieve this gold standard.

Clinical trials may vary on the criteria of the outcome measurements, observation period, size, cost, and other parameters. They can be carried out in a single research facility or present a collaboration of multiple facilities situated in different countries all over the world.

Before undergoing clinical trials, all medicinal substances are thoroughly investigated and tested *in vitro* and *in vivo* on animals to ensure their safety and efficacy. Only after such preliminary studies can the substance receive approval from health authorities/ ethics committees for use in clinical trials, so that the risk-to-benefit ratio of future studies is considered acceptable.

B. Observational Studies

Another clinical study design is observational studies. In contrast to clinical trials, participants in observational studies are not assigned to specific interventions by the investigators, although participants may receive some intervention or procedure as part of their routine medical regimen. In situations when it is not possible to conduct a valid clinical trial because of the objective limitations, including ethical aspects, observational studies may be the next best method to answer questions raised by the researchers. A well-designed observational study is capable of providing scientists with objective and statistically significant information, the quality of which will not be far behind that of a randomized controlled trial (RCT). Cohort studies and case-control studies are the 2 main types of observational studies that have been used in medical science to establish a relationship between different diseases and exposures.

An example of observational study would be a cohort study in which investigators follow a group of adults who smoke for some significant period of time in order to find more data on the relationship between smoking habits and risks of developing different types of respiratory diseases.

Table 1 provides a simplified hierarchy of evidence from the Center for Evidence-Based Medicine (University of Oxford, Oxford, UK; http://www .cebm.net/index.aspx?o=1025).

One can see from Table 1 that RCTs, along with systematic reviews and meta-analyses of those trials, hold the highest rank in the hierarchy. However, RCTs of a lesser quality occupy a lower level of evidence (II), along with high-quality observational studies such as individual cohort studies. Case reports, clinical examples, and anecdotal evidence present the lowest level of scientific evidence in modern medicine.

TABLE 1: Levels of Evidence

Level	Study Type
I	High-quality, multicenter or single-center, randomized, controlled trials, or systematic reviews of randomized controlled trials
II	Individual cohort studies, low-quality randomized controlled trials, or systematic reviews of these studies
III	Individual case-control studies or systematic reviews of case-control studies
IV	Case-series, poor-quality cohort and case-control studies
V	Expert opinions, case reports, or clinical examples; evidence based on physiology, bench research, etc.

All general information on clinical studies, including defining the clinical study (e.g., who conducts the research, the purpose and length of the study, reasons for conducting the study, who can participate in the study) can be found on the website of the US National Institutes of Health (www.clinicaltrials.gov), which currently lists 206,158 studies with locations in all 50 states of the United States and 191 other countries.

Clinical trials involving tests of different MM substances in patients diagnosed with specific diseases have been conducted all over the globe, especially in Asian countries. The findings from these clinical studies suggest that MM products may have multiple pharmacological activities largely due to polysaccharides, their major active constituents.

These activities may be minor, moderate, or lacking, depending on many factors, such as inappropriate dosage regimen, difficulties in finding acceptable clinical biomarkers and end points, large interpatient variability in responses to specific treatment, and unknown modes of action. Clinical studies of MMs may encounter great difficulties because specific MMs contain various active components, therefore introducing problems in the standardization and quality control of their preparations complications; thus, a dose-response relationship is difficult to establish.

C. Regulation Issues

Different countries have created their own legislation and adopted various regulation systems for the use of medicinal plants and substances derived from them in order to ensure the quality control of these products and to establish suitable standards for consumers (Regulatory Situation of Herbal Medicines. A Worldwide Review (WHO/trm/98.1) Geneva: 1998. World Health Organization). These regulations introduce criteria for assessing the safety, efficacy, and quality of DSs or medicinal substances and contain guidelines and requirements for licensing, dispensing, manufacturing, labeling, and trading these products. In Western and Eastern countries, herbal and mushroom medicines fall under different regulation procedures. In 1994, the Dietary Supplement Health and Education Act was signed into law by the US president. Under the definition of this Act, DSs represent products that are used to supplement a regular diet and contain ingredients such as vitamins, minerals, herbs or other botanicals, amino acids, metabolites, different extracts, or various combinations of those ingredients. In the period from 1998 to 2005, the WHO issued a number of guidelines outlining the main criteria for evaluating safety and efficacy, and monitoring the quality, production, and registration of herbal medicines and preparations, which aimed to assist national regulatory authorities, scientific organizations, and manufacturers. [50] Although the status of herbal or mushroom preparations may vary significantly, depending on a country's laws and regulations, most Western countries usually consider plant/mushroom extracts as DSs, meaning that clinical studies (phases I-IV) are not mandatory for such products to be legally introduced to the market. However, China defines many herbs and some mushrooms as medicinal products or drugs, and valid phase I–IV studies are necessary to receive approvals.[51]

Phase I–IV studies are required for new herbal and mushroom drugs before they can be claimed to possess therapeutic properties and receive the approval of the State Food and Drug Administration of China. Clinical trials or clinical verifications of new drugs should be sanctioned by the Ministry of Public Health and provide sufficient data on toxicity, pharmacological properties, and efficacy. In phase I, a new drug or herbal/mushroom preparation is tested on a small group of people to explore general acceptance, evaluate its safety, determine a safe dosage range, and identify possible adverse effects. Phase II involves a larger group of test subjects in order to further evaluate the safety of a drug while investigating its efficacy and determining effective dosages. Phase III is carried out to receive

additional confirmation of the effectiveness of the treatment, monitor the most common adverse effects, and supply researchers with information that will allow the drug/preparation to be used safely. Finally, phase IV studies are executed after the drug is commercially available. They are intended to gather information on rare side effects and possible complications connected with long-term usage. Also, they provide important information on the effects of the drug in various populations,[51] presented a scheme outlining the main objectives of different stages of clinical trials for herbal and mushroom medicines (Fig. 3). The creation of a unified international regulation code governing the market of DSs and medications derived from fungi and plants will significantly facilitate the availability of these products for people all over the globe and will enable the high level of quality and safety of these products to be maintained.

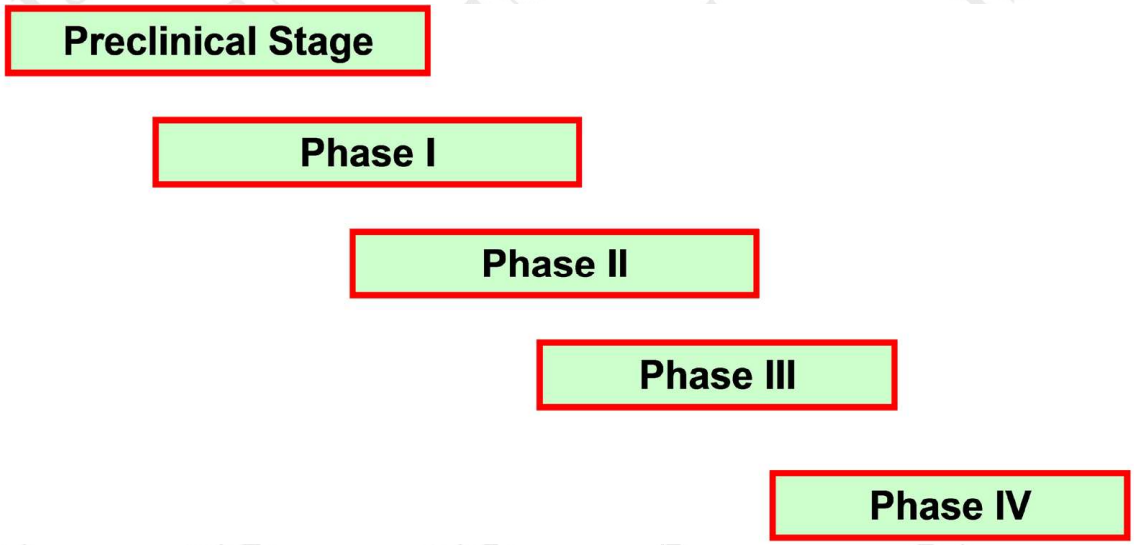

FIG. 3: Objectives of clinical trials for herbal and mushroom medicines.[50]

D. Dosage Considerations

Defining effective and safe dosages for various herbal and mushroom DSs and medicinal preparations represents a fairly complicated issue. Doses of a substance not only determine the therapeutic effects of medical treatment and the manifestation and duration of health benefits; they also directly influence the severity of adverse effects, toxicity, and the probability of different complications connected with the treatment. It is difficult to standardize dosages because different species of mushrooms possess various medicinal properties and synthesize multiple active substances. Also, these MMs are used in different forms: powdered fruiting bodies or submerged cultivated mycelia, extracts, single mushroom species in the preparation, or a combination of several mushrooms and/or herbs. Consequently, the concentrations of active ingredients vary significantly from product to product. Many other important factors should be taken into consideration when deciding doses of drugs, including the patient's age, sex, ethnicity, body weight, liver and kidney function, the presence of chronic diseases, treatment history, smoking status, and so on. Additional medications prescribed may also affect the drug dose. Thus, it is important to study interactions between MM preparations and other medicinal substances in order to understand whether they are synergistically amplifying or weakening each other's effects, and whether they can be safely used together in the first place. Other individual factors may contribute to this picture, making it even more puzzling. Folk medicine in different cultures is based mostly on experience accumulated over generations. Because it was developed at a time when people knew little about anatomy, physiology, biochemistry, and the whole idea of a valid scientific approach, this knowledge

should be treated very carefully. The dose-response relationships of many substances used in traditional medicine have not been established, nor have their safety and efficacy. Nowadays, we should follow the principles of evidence-based medicine and conduct thorough preclinical/clinical studies of multiple mushroom-derived preparations in order to obtain objective information and create guidelines for dosage regimens.

E. Pharmacokinetic Issues

Pharmacokinetics is a branch of pharmacology that investigates the "movement" of substances administered to living organisms over a period of time. The complex scheme of interactions between the organism and the test substance is commonly divided into the following stages: absorption, distribution, metabolization, and excretion. Sometimes an initial stage, called liberation, is distinguished. Liberation represents the process of the release of a drug from the pharmaceutical formulation. The time course of concentrations of substances in different body systems constitutes the basis of their therapeutic and toxicological effects. Thus, pharmacokinetic studies are usually carried out in parallel with studies of pharmacodynamics that reveal the biochemical and physiological properties of a drug. Thorough preclinical and clinical pharmacokinetic studies are mandatory for all synthetic drugs and are executed in order to assess the toxicity of the drug candidate, establish therapeutic schedules, and calculate dosage adjustments in particular patients (which may be necessary because of genetic pharmacokinetic variations). However, data on pharmacokinetics for most herbal and mushroom preparations are fragmented and insufficient.

Recent advances in physiologically based pharmacokinetic modeling and other novel methodological approaches give scientists a powerful tool that will help to accurately predict the pharmacokinetic properties of drugs in humans based on preclinical animal studies.[52] This will allow clinical investigators to reduce the exposure to risk of test subjects and patients during the first phases of clinical studies of novel drugs.

The question of the bioavailability of different polysaccharides—the major class of biologically active substances derived from MMs—is of particular interest because most mushroom preparations are administered orally. In this sense, bioavailability characterizes the fraction of the ingested dose that will be absorbed after oral administration, presenting one of the principle pharmacokinetic properties of herbal/mushroom medicinal substances. Bioavailability is directly connected with dosage-related issues.

F. Preclinical/Clinical Scaling

The development pathway of novel drugs is typically divided into three major stages: discovery, preclinical studies, and clinical trials. Thus, preclinical development represents a very important stepping stone between the initial drug discovery and the subsequent human clinical trials. During the course of preclinical studies, researchers investigate the pharmacokinetics and pharmacodynamics of a drug, select its best formulation, develop future clinical trials, address the issues of initial doses of tested substances in clinical trials, and so on. Ultimately, preclinical studies aim to reveal whether the new medicinal substance has the potential to start the clinical phase. Preclinical investigations are required to receive authorities' approval for *in vivo* studies of human subjects, which is why answering questions regarding the safety and tolerability of discovered/developed drugs represents one of the major objectives of such studies.

Rigorous preclinical studies, including studies of at least 2 animal species, are mandatory for all synthetic drugs.[51] Both rodent and nonrodent mammalian models are used to determine pharmacokinetic patterns and toxicity, as well

as to establish the general safety of novel drugs.[53] Despite obvious interspecies differences between humans and other mammals, proper consistent pharmacokinetic and pharmacodynamic patterns and methods of modeling enable researchers to effectively extrapolate obtained data on efficacy and safety to humans before entering phase I clinical trials. Such scaling procedures are generally reasonable and accepted.

However, one should still be particularly cautious when extrapolating preclinical data on herbal and mushroom substances for clinical studies of humans. For instance, multiple *in vitro* and *in vivo* studies of animals demonstrated that some MM substances, especially polysaccharides (including β-glucans), activate different immune response factors, such as macrophages, T lymphocytes, and NK cells, and induce the synthesis of cytokines (e.g., tumor necrosis factor-a, ILs, and IFNs).

However, these significant beneficial effects may not be observed in cancer patients.[51] That is why preclinical studies alone do not reveal the final answer on the efficacy of a drug/preparation on humans.

G. Toxicity Issues

Toxicity can be defined as the degree of damage a substance can cause to an organism. Toxicological effects can apply either to a whole organism (animal, plant, bacterium, etc.) or to its target constitutional components, such as cells in multicellular organisms (cytotoxicity) or some specific organs/systems (for instance, hepatotoxicity, neurotoxicity, nephrotoxicity, cardiotoxicity, hematologic toxicity). A central concept of toxicology points out that these damaging effects are dose-dependent, which makes even virtually harmless substances toxic at specific concentrations. The toxicity of herbal medicines is increasingly perceived as an important concern. The field of herbal toxicology is growing in parallel with the increasing use of herbal products. Many plants, over the course of their evolution, acquired the ability to produce toxic secondary metabolites as part of their natural defense mechanisms and survival strategies. Plant materials may become toxic to the human body through toxic constituents and metabolites, the unfavorable cellular responses induced by them, or undesirable interactions between herbal preparations and other administrated drugs. A number of studies demonstrated that some herbal medicines can cause substantial injuries to human organs.[51]

Another important issue regarding the toxicity of some herbs and mushrooms is their ability to accumulate toxic minerals and heavy metals in doses that are potentially harmful to humans. Longterm consumption of such products leads to the accumulation of these compounds and can cause acute poisoning and severe damage to organs and the whole body. Also, mushrooms can significantly accumulate different radioactive compounds when growing in radioactively exposed areas; thus, consumption of these mushrooms or substances derived from them override all positive therapeutic effects. For instance, the levels of radioactive ^{137}Cs and ^{90}Sr in mushrooms collected from areas contaminated by the Chernobyl disaster, which took place on April 26, 1986, are still very high and pose a great danger to human health.[54] It is noteworthy to mention that different groups of mushrooms have lower or higher potentials regarding radioactive accumulation.

Preclinical toxicity studies demonstrated that many well-known and commonly used herbs possess multiple potential toxicological activities, including ginseng (roots of *Panax ginseng*), St. John's wort (the aerial parts of *Hypericum perforatum*), kava kava (*Piper methysticum* roots), ginkgo (*Ginkgo biloba* leaves), aloe (*Aloe vera* leaves), licorice (*Glycyrrhiza glabra*), aristolochia (*Aristolochia contorta*), willow bark (*Salix* spp.), germander (*Teucrium chamaedrys*),

and many others.[55,56] Therefore, it is very important to assess the possible toxicity of MM products, especially for situations of long-term therapeutic usage or in conjunction with different types of synthetic drugs.(...to be continued)

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Exploitation, Creation and Utilization of Edible and Medicinal Fungi Resources

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To: National Science and Technology Progress Awards of China

Topic: “Exploitation, Creation and Utilization of Edible and Medicinal Fungi Resources". Authors: Li Yu, Bao Haiying, Bau Tolgor (Tu Li Gu Er), Chen Hui, Zhong Chengzan, and Dai Yucheng

From:

Solomon P. Wasser, Academician Member of National Academy of Sciences of Ukraine, Professor, PhD, Dr. Sci (Biol.); Head of the International Center of Biotechnology and Biodiversity of Cryptogamic Plants and Fungi, Institute of Evolution, University of Haifa, Israel; Scientific Adviser of the N.G. Kholodny Institute of Botany NAS Ukraine

To Whom It May Concern:

The interdisciplinary field of science that studies medicinal mushrooms has been developed and increasingly demonstrates potent and unique properties of compounds extracted from a range of mushroom species in the last three decades.

Nowadays, medicinal mushrooms are used as: a) dietary food (world mushroom production was 33 million tons in 2014); b) dietary supplement products (the market of medicinal mushrooms dietary supplements products is rapidly growing; c) a new class of drugs called “Mushroom Pharmaceuticals”; d) natural bio-control agents in plant protection demonstrating insecticidal, fungicidal, bactericidal, herbicidal, nematocidal, and antiphytoviral activities; and e) cosmeceuticals – different compounds of medicinal mushrooms including polysaccharides, such as soluble β-glucans, glucuronoxilomannan, sacchachitin, tyrosinase, and other enzymes are used by cosmetic companies for their film-forming capability, activation of epidermal growth factor, antioxidative, antiallergic, antibacterial and anti-inflammatory activities, stimulation of collagen activity, inhibition of autoimmune vitiligo, and treating acne.

Medicinal mushrooms are comparable to “medicinal plants” and can be defined as macroscopic fungi, mostly higher Basidiomycetes and some Ascomycetes, which are used in the form of extracts or powder for prevention, alleviation or healing multiple diseases, and/or in balancing a healthy diet. According to the definition of “herbal drugs”, dried fruit bodies, mycelia, or spores are considered “mushroom drugs” or “fungal drugs”. Analogous to “phytopharmaceuticals” or “herbal preparations”, the resulting mushrooms preparations should be considered as “mushroom pharmaceuticals” or “mushroom preparations”.

Mushrooms are currently evaluated for their nutritional value. They are rich in proteins, chitin (dietary fibers), vitamins, and minerals, low in total fat but with a high proportion of unsaturated fatty acids, and have no cholesterols. As for the characteristics of taste, mushrooms serve as a delicious foodstuff and also as a source of food flavoring

substances (because of their unique flavors). In addition to the volatile eight-carbon compounds, the typical mushroom flavor consists of water-soluble taste components such as soluble sugars, polyols, organic acids, free amino acids, and 5-nucleotides.

Pharmacological properties of mushrooms are currently widely recognized. They make up a vast and yet largely untapped source of powerfully new pharmaceutical products. In particular, and most importantly for modern medicine, medicinal mushrooms present an unlimited source of polysaccharides (especially β-glucans) and polysaccharide-protein complexes with anticancer and immunostimulating properties. Many, if not all, higher Basidiomycetes mushrooms contain different types of biologically active high-molecular-weight and low-molecular-weight compounds (triterpens, lectins, steroids, phenols, polyphenols, lactones, statins, alkaloids, and antibiotics) in fruit bodies, cultured mycelia, and cultured broth.

There are a total more than 200 medicinal functions produced by medicinal mushrooms and fungi. Recently studied medicinal actions of mushrooms included antitumor, immunomodulating, antioxidant, radical scavenging, cardiovascular, cholesterol-lowering, antiviral, antibacterial, anti-parasitic, antifungal, detoxicative, hepatoprotective, anti-diabetic, anti-obesity, neuroprotective, neuroregenerative, and some others effects. Also, substances derived from medicinal mushrooms can be used as painkillers and analgetics. The best implementation of medicinal mushrooms drugs and medicinal mushrooms dietary supplements has been in preventing immune disorders and maintaining good quality of life, especially in immunodeficient and immunodepressed patients, patients under chemotherapy or radiotherapy, patients with different types of cancers, chronic blood-borne viral infections of Hepatitis B, C, and D, different types of anemia, the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), Herpes simplex virus (HSV), chronic fatigue syndrome, Epstein Bar virus, patients with chronic gastritis and gastric ulcers caused by *Helicobacter pylori*, and people suffering from dementia (especially Alzheimer's disease).

Academician Professor Yu Li and his team is an outstanding Chinese scientific specialist in mycology (taxonomy, biodiversity, ecology, geography, biotechnology, pharmacology, and medicinal value of mushrooms), and Chairman Chen Hui and his team. Chairman Hui is an outstanding Chinese specialist in medicinal mushrooms and a well-known businessman as well as the founder and developer of the famous biotechnological Alphay Co.

Academician Professor Li Yu is, without a doubt, one of the most outstanding mycologists in China. His numerous scientific contributions have covered diverse topics such as the biodiversity, resources, systematics, ecology of different groups of fungi and mushrooms, studies on the cultivation of culinary-medicinal fungi and mushrooms, pharmacological activity, development of new products, and ethnomycology. However, it is his contribution to the study of fungi and mushrooms that has brought him recognition as the most knowledgeable specialist in Asia and in the world. Professor Li Yu was elected in 2013 as President of the International Society of Medicinal Mushrooms. He was the organizer and President of two Medicinal Mushrooms Conferences in China (2007 and 2013 in Nantong and in Beijing).

In 2002 Chairman Chen Hui started to build one of the most successful medicinal mushroom companies, the Biotechnological Alphay Co., well known not only in China but also around the world. Chen's achievements are widely regarded, and his reputation is well recognized around the world. He was able to bring together the best scientific

knowledge and the best business model. The Alphay Co. is now one of the most successful companies in the world in the field of medicinal mushrooms. Chen Hui was elected as a Member of the Editorial Board of the International Journal of Medicinal Mushroom (Begell House, Inc., USA) in 2017. He was an organizer of 2 very successful international medicinal mushroom conferences in China (one of them was organized on the basis of his Alphay Co.) and was elected in 2013 as Vice President of the International Society of Medicinal Mushrooms.

Li Yu and Chen Hui and they team are reputable teachers. For the last 20 years more than 200 students finished Master and PhD degrees in the field of medicinal mushrooms. They published 8 monographs, more than 200 papers, and received more than 20 patents in the field of medicinal mushrooms. Thousands of young scientists and mushroom producers went through different exhibition, courses, and presentation organized by Alphay Co.

The project team under supervision of Academician Li Yu started in 1997 to develop a very important model for a research program of a complex study of culinary-medicinal mushrooms including biodiversity, distribution, resources, domestication, cultivation, chemical composition, pharmacological activity, and product development. This research showed an excellent example of combining basic and applied research. Chinese scientists studied species diversity on different mushrooms, including medicinal mushrooms. They identified more than 20,000 specimens of mushrooms from different climatic and ecological environments. They found 120 species as new species for China and another 300 species new for different provinces. What was primarily important was their discovery of 25 species new for science. Based on this data, they domesticated some new species and strains for mushroom cultivation in China, for example, they received new productive strains of *Ganoderma lucidum* (especially a very important strain for industrial cultivation, strain BE2009308-2), *Hericium coloritus, Inonotus hispidous,* and other new species of medicinal mushrooms obtained by a new technology of multi-genesis and breeding (with ion beam implantation).

They studied the chemical composition with special emphasis on antitumor compounds of Chinese medicinal mushrooms as well as on the mechanisms of antitumor activity of studied compounds. Chinese scientists studied the chemical composition of 52 of the most important medicinal mushroom species and identified known and new compounds with biological activity. They isolated 15 antitumor compounds and studied them *in vitro* and *in vivo.* Special attention was paid to ergoresterol activity on a molecular level as well as the antitumor mechanisms. They provided the important scientific basis for the development of new medicinal mushroom products in China. Quality products developed by Chinese scientists of new products, such as “Junshui Bao capsule” and “Jinshui Bao pill”, were recorded in the Chinese Pharmacopoeia. It is also important to stress that new products of Chinese scientists have great economic benefits and have been approved by Chinese State Food and Drug Administration for different health food products. In recent years approximately 1 billion USD have been earned in the health food industry of China.

Without any doubt, the project presents a unique model system for the complex study of culinary medicinal mushrooms and combines classical and new methods in the study of medicinal mushrooms, including the utilization and industrialization of the mushroom industry. All data received by Chinese scientists has important value on agricultural and health industries, not only in China but around the world, too.

FINAL CONSIDERATIONS

I strongly recommend Academician Professor Li Yu, Chairman Chen Hui and their team, including Bao Haiying, Bau Tolgor (Tu Li Gu Er), Zhong Chengzan, and Dai Yucheng to receive the 2018 National Science and Technology Progress

Awards of China for their outstanding input in the field of culinary-medicinal mushrooms of China, which has far-reaching international benefits in health and agriculture as well.

Call for Papers

Aiming to build the relationship between the members and the Society, the publication of the newsletters was proposed before the launching of the Society. The newsletters represent one of the key official publications from the Society. Contents of the newsletters will include notifications of the decisions made by the committee board, reviews or comments contributed by ISMM committee members, conferences or activities to be organized, and the status updated in research, industrialization, and marketing for medicinal mushrooms. The newsletters will be released quarterly, by the first Monday of every January, April, July, and October, with possible supplementary issues as well. The Newsletter is open to organizations or professionals to submit news, comments, or scientific papers relating to medicinal mushroom research, marketing, or industry.

Contact information

For any inquiry in membership enrollment, subscribing to ISMM newsletters, upcoming activities and events organized by ISMM, or submitting news reports, statements, or manuscripts to the Society, please contact the secretariat's office in Beijing, China.

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