



# MUSHROOMS AND HEALTH GLOBAL INITIATIVE BULLETIN

An ISMS Global Initiative to increase the worldwide consumption of mushrooms through the collection, evaluation and dissemination of scientifically validated information.

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### News from the Initiative - Mary Jo Feeney

Thanks for your response to Greg Seymour's request to introduce the *Bulletin* to colleagues looking for the latest research linking mushrooms and health. The word is spreading as new names are added to the e-distribution list. Take full advantage of the Initiative as a resource and:

- Check the Research News section on the Mushrooms and Health website ([www.mushroomsandhealth.com](http://www.mushroomsandhealth.com)) in between the quarterly issues of the *Bulletin* for late breaking research.
- Use the *Mushrooms and Health Report* on the website for published research on mushrooms and health. For example, if you've wondered about the role of mushrooms in wound healing, download <http://www.mushroomsandhealth.com/13.html> which includes background information provided by John Collier, PhD on the complex and dynamic process to restore cellular function and tissue repair. The section also describes *in vitro* studies with *Agaricus bisporus* and animal studies with *Sparassis crispa* (SC), *Ganoderma lucidum* and *Lentinus edodes*.
- Adapt examples of promotion and public relations efforts highlighted in the *Bulletin* to your country. Reports in this issue provide examples on how to work with official health and agriculture agencies to position mushrooms as part of a healthy diet.

### Mushroom Research

#### ► Oyster mushrooms and lipid lowering

Schneider I, et al. "Lipid lowering effects of oyster mushroom (*Pleurotus ostreatus*) in humans." *Journal of Functional Foods*. 2011; 3:17-24.

According to the researchers, this is the first study to investigate the effect of oyster mushrooms on blood lipid profiles in humans, although animal studies have indicated a positive influence. Elevated cholesterol, particularly increased levels of low density lipoprotein cholesterol (LDL-C) and triacylglycerol (TG) levels are risk factors for cardiovascular disease, a leading cause of death for

both men and women in most developed countries. In this study, 20 young adult subjects were randomly assigned to consume one portion of soup containing 30 g dried (equivalent to 300 g fresh) oyster mushrooms or a tomato soup as placebo for 21 days. The oyster mushroom soup decreased TG and oxidized LDL-C levels significantly, and showed a significant tendency to lower total cholesterol levels. Beneficial effects may be attributed to the presence of linoleic acid, ergosterol and ergosta-derivatives which showed oxygen radical absorbance capacity activity and cyclooxygenase inhibition assays *in vitro*.

#### ► **Mushroom immune potentiators**

Wong KH, Lai CKM and Cheung PCK. "Immunomodulatory activities of mushroom sclerotial polysaccharides." *Food Hydrocolloids*. 2011; 25:150-158.

This mini review discusses the immunomodulatory action of mushroom polysaccharides to eradicate tumor cells. The paper describes a study on activation of innate immune cells and T-helper cells in normal and athymic BALB/c mice by three mushroom sclerotial polysaccharides. The review introduction provides an overview of the immune system as the body's defense system comprised of innate and adaptive immunities controlled by a series of responses mediated by different immune cells and their secretory substances including cytokines and chemokines.

#### ► **Pancreas protective effect of button mushroom**

Yamac M, et al. "Pancreas protective effect of button mushroom *Agaricus bisporus* (J.E.Lange) imbach (*Agaricomycetidae*) extract on rats with Streptozotocin-induced diabetes." *International Journal of Medicinal Mushrooms*. 2010; 12(4): 370-389.

This study describes the effects of a hot water extract of *Agaricus bisporus* on symptoms of streptozotocin-induced diabetes in Sprague Dawley rats. Extract doses of 0, 100, 200 and 400 mg/kg body weight (bw) per day were orally applied to streptozotocin-induced rats for 7 days after the onset of diabetes. After sacrifice, histological studies were performed on pancreas tissues, and biochemical parameters were measured in all experimental groups. Serum glucose levels significantly decreased by 29.68% at the 400 mg/kg dose; serum insulin levels were increased to 78.50% at the 400 mg/kg bw dose. According to the researchers the 'most obvious and surprising change' was the increase in cellularity of the Langerhans islets of the pancreas and apparent repopulation with beta cells. The researchers conclude that oral application of high doses of *A bisporus* extract may result in decreased severity of streptozotocin-induced diabetes in the rat.

#### ► **Agaritine and apoptosis in leukemic cell line U937**

Akiyama H, et al. "Agaritine from *Agaricus blazei* Murrill induces apoptosis in the leukemic cell line U937." *Biochimica et Biophysica Acta*. 2011; May; 1810(5):519-25. Epub 2011 Mar 5.

The mechanism of action by which *Agaricus blazei* Murrill (ABM) has been shown to exhibit immunostimulatory and anti-cancer activities is poorly understood. The researchers found that the diffusible fraction of hot-water extract of ABM exhibits anti-tumor activity toward leukemic cells and identified it as agaritine, a hydrazine-containing compound. In the present study, the researchers examined the morphological and cytochemical effects of agaritine on U937 cells to elucidate its tumoricidal mechanism. According to the researchers, results

suggest that the ABM constituent agaritine moderately induces apoptosis in U937 leukemic cells by way of caspase activation through cytochrome c release from mitochondria. (NOTE: Caspases are proteolytic enzymes (which break up proteins) involved in apoptosis (programmed cell death)).

### Abstracts from Experimental Biology

Several researchers presented abstracts or posters on mushrooms during the April 9-13 meeting of the Federation of American Societies for Experimental Biology (FASEB or EB) held in Washington, D.C. EB draws researchers from around the world to present cutting edge research in various areas of basic science and nutrition. Abstracts will be published in future issues of the *FASEB Journal* (<http://www.fasebj.org/>).

**Vitamin D enriched mushrooms significantly reduced inflammatory chemokines and cytokines in the spleens of LPS challenged rats.** Babu US, Balan K, Garthoff LH and Calvo MS. Office of Applied Research and Safety Assessment, Center for Food Safety and Applied Nutrition, Food and Drug Administration, Laurel, MD.

**Plasma lipid response to LPS challenge in rats fed vitamin D2 enriched white button mushrooms.** Weigand-Heller AJ, Gaines DW, Babu US, Garthoff LH and Calvo MS. Office of Applied Research and Safety Assessment, Center for Food Safety and Applied Nutrition, Food and Drug Administration, Laurel, MD.

**Edible mushrooms promote gut immunity by enhancing IL-23 and IL-6 secretion in dextran sodium sulfate (DSS)-treated mice.** Christopher L, French C, Traore D and Kuvibidila S. Nutritional Sciences, Oklahoma State University, Stillwater, OK.

**Differential effects of ethanol extracts of white button mushrooms and shiitake mushrooms on IL-6 secretion by PC3, LNCap and THP1 cancer cell lines.** Kuvibidila S, Christopher L, and French C. Nutritional Sciences, Oklahoma State University, Stillwater, OK.

**White button, shiitake and portabella mushrooms inhibit the secretion of vascular endothelial growth factor (VEGF) and the proliferation of the androgen dependent LNCap prostate cancer cell line.** Kuvibidila S, French C. Nutritional Sciences, Oklahoma State University, Stillwater, OK.

**Inhibitory properties of ethanol extracts of white button mushrooms on interleukin-8 (IL-8) and vascular endothelial growth factor (VEGF) secretion and PC3 cancer cell proliferation.** French C, Christopher L, Traore D, Clarke S, Lucas EA, Smith BJ, Lightfoot S and Kuvibidila S. Nutritional Sciences. Oklahoma State University, Stillwater, OK.

***Ganoderma lucidum* inhibits adipogenesis and adipocyte-induced invasiveness of breast cancer cells.** Thyagarajan-Sahu A, Lane B and Sliva D. Methodist Research Institution and Indiana University School of Medicine, Indianapolis, IN.



## News from Spain - Cristina Clavijo Sáenz and José Antonio Jiménez

Mushrooms were the main protagonist (main feature) on the second day of the Tasting Cycle of Quality Food in La Rioja. The event was organized by Electra Rioja Gran Casino in collaboration with *La Rioja Capital*, and the journal *Qué*.

*La Rioja Capital* is an initiative promoted by the regional ministry of Agriculture that brings together a wide range of activities to promote food and wine of La Rioja, and has potential for tourism, heritage and culture. The program includes promotional and gastronomic events held not only in La Rioja, but also in national and international trade fairs. Attendees learned first-hand about the nutritional characteristics of several fungi grown in La Rioja (*Agaricus bisporus*, *Pleurotus ostreatus*, *Lentinula edodes* and *Pleurotus eryngii*), through a presentation and tasting hosted by ASOCHAMP and CTICH (Centro Tecnológico de Investigación del Champiñon de La Rioja). The tasting cycle began last March with the tasting of Protected Designation of Origin Olive Oil and will last until December, providing insights on the organoleptic quality of different foods from La Rioja. See <http://www.lariojacapital.com/>.

The March issue of "Corazón y Salud", the Spanish Heart Foundation magazine, features "*Champiñón y setas: alimento sano, nutritivo y sabroso*", a divulgative (published) article on the health benefits of mushrooms. Under that title, CTICH researcher Cristina Clavijo recommends including mushrooms in meals for a balanced diet. The article is focused on three characteristics of mushrooms "Low in fat, sodium and cholesterol free" according the agreement ASOCHAMP signed in 2010 with the Spanish Heart Foundation. The magazine shows mushrooms as a proper food to add in diets for cardiovascular risk prevention and includes some cooking tips. "Corazón y Salud" is a monthly publication with an average circulation of 60,000 copies that also reaches thousands of Spanish cardiologists through the Spanish Society of Cardiology (<http://www.fundaciondelcorazon.com/corazon-facil/corazon-y-salud.html>).

Also in March INFORMACIONCONSUMIDOR.COM published an opinion article on the benefits of eating mushrooms for health. INFORMACIONCONSUMIDOR.COM is an initiative promoted by the Foundation Alimentum and financed by the Spanish Ministry of Environment and Rural and Marine Affairs. It aims to create a specialized virtual space in which converge all issues food and health-related, focusing on facilitating relations between different public and private entities that converge in the manufacturing-sale-consumption chain. The website is under the direct supervision of a Multidisciplinary Board responsible for ensuring objectivity and transparency of the contents that make up the page. Industry, consumers and social organizations participate in this council whose technical expertise and behavior code supports information published on the website. <http://www.informacionconsumidor.com/>.

Mushrooms are  
"Low in fat,  
sodium and  
cholesterol free"  
and can help  
lower the risk of  
cardiovascular  
disease.



## News from Australia - Glenn Cardwell

### ► Nurses love mushrooms



Our continuing program of promoting the health benefits of mushrooms led us to present to practising nurses in Brisbane, Queensland. As the photo illustrates, mushroom information and tastings are always a big attraction. On the morning of the first day of the conference, Glenn Cardwell, Accredited Practising Dietitian to the Australian Mushrooms Growers Association (AMGA), spoke about healthy bones, the role of vitamin D and therefore, the potential of vitamin D mushrooms when they arrive on the Australian market. Supercook Carmel Carmichael pictured in the photo, offered tastings from a range of mushroom recipes at the nurses' conference. As usual, the mushroom booth was very popular, giving us the opportunity to talk mushrooms and give out mushroom posters (described below) to anyone wanting to use them in their practice. We were able to sign up another 65 nurses for the Mushroom Lovers' Club.



There is no link of mushrooms to gout. In fact, mushrooms are important in a diet that helps to prevent gout.

### ► Mushrooms and gout

Glenn Cardwell, with assistance from Mary Jo Feeney, developed a fact sheet on mushrooms and gout because so many text books and websites recommend that gout sufferers restrict their consumption of purine containing foods, usually specifically listing mushrooms, spinach and asparagus despite the fact that broccoli and Brussels sprouts have higher levels of purine. The fact sheet can be found here: [http://www.mushroomsforlife.net/fact\\_sheet8\\_gout.html](http://www.mushroomsforlife.net/fact_sheet8_gout.html).

A search of the published literature revealed that non-animal sources of purine are not linked to higher blood levels of uric acid and the formation of sodium urate crystals that cause the pain of gout. Indeed, purine-containing vegetables and mushrooms appear to lower the risk of gout. Glenn Cardwell has written to some websites that currently imply that mushrooms exacerbate gout and encouraged them to update their information regarding vegetables and mushrooms. One US health-related website has taken up the offer.

### ► Mushroom poster

The mushroom promotion program on the island state of Tasmania was completed at the end of March 2011. It was a great success, seeing an increase in mushroom sales and a drop in mushroom waste at the retail level. We produced a poster that included health vignettes on vitamins, minerals, antioxidants, cancer prevention, heart health, immune health and weight control, suitable to be used in doctors' and health professionals' offices. The poster will be available to health professionals around the country on request.

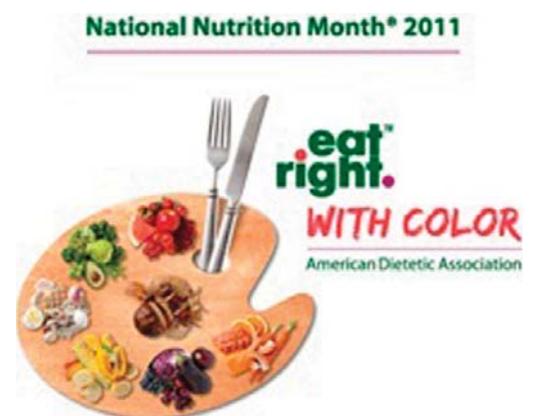


## News from the United States - Heidi Gengler

### ► Mushrooms uniquely suited to help Americans meet the 2010 Dietary Guidelines

The 2010 *Dietary Guidelines for Americans* (DGAs) were released in January by the Department of Health and Human Services (HHS) and the Department of Agriculture (USDA). Of the many recommendations for healthy eating patterns, there are a few guidelines that mushrooms can play a key role in helping to achieve, specifically in terms of maximizing nutrient-dense foods, maintaining calorie balance to sustain a healthy weight, and reducing sodium intake. Vitamin D is also noted as a nutrient of concern, and the guidelines urge Americans to choose foods that contain vitamin D to include in their everyday diets. Thanks to their nutritional profile, mushrooms are uniquely suited to help Americans meet the new guidelines. As such, the long-awaited DGAs presented an ideal opportunity for the Council to highlight the many benefits of mushrooms.

Shortly after the release of the DGAs, mushrooms earned recognition from the American Dietetic Association (ADA) through its "Eat Right with Color" campaign for National Nutrition Month. The ADA's color wheel of healthy foods featured mushrooms in the "white" category – a hue that is regrettably often overlooked in nutrition. Inclusion on the ADA color palette resulted in several print and online placements



Mushrooms are uniquely suited to help Americans meet the new dietary guidelines.

including the *Washington Post* (Washington, DC), *Self* magazine and the ADA's newsletters to health professionals. Additionally, the Council amplified the news via Twitter and Facebook, and revamped content on [MushroomInfo.com](http://MushroomInfo.com) to acknowledge mushrooms' potential role in meeting the new recommendations. To enable the industry to best leverage the 2010 DGAs, the Council developed a health and wellness sales kit. Contents included a retail health sell sheet offering retailers nutrition information and creative practices to encourage mushroom sales in-store; a foodservice sell sheet providing operators with tangible ideas on how to create lower-sodium menu items without losing flavor; and a foodservice sell sheet on mushrooms' nutritional benefits and the 80/20 approach to replace 80 percent of the protein in a dish with mushrooms in order to lower food costs and boost the nutritional profile of menu items. All of these items are available on [www.MushroomCouncil.org](http://www.MushroomCouncil.org).

► **Mushroom research comes to life for consumers**

For several days during National Nutrition Month (March), the homepage of WebMD.com, a high-traffic, health-focused website that reaches 13.5 million unique readers per month, featured the video, "[Mushrooms – They're Good for Your Health!](#)" The clip includes an interview with industry-funded researcher

Keith Martin, PhD, from Arizona State University. Martin discusses his studies on white button mushrooms' effect on the immune system, as well as the extended health benefits of mushrooms.

It is an acknowledged feat that industry-funded mushroom research is permeating high-profile health news outlets geared toward consumers.

Click on the video link to watch Dr. Martin talk about mushrooms' effect on the immune system.



continued...

Be sure to visit the Mushrooms and Health website <http://www.mushroomsandhealth.com/>

Send what's happening in your country to communicate the benefits of mushrooms to consumers, shoppers, households, doctors, health professionals and the media to [info@mushroomsandhealth.com](mailto:info@mushroomsandhealth.com).

**Note:** The *Bulletin* provides links to other sites for your convenience and information. These sites contain information created, published, maintained or otherwise posted by organizations independent of the Initiative which does not endorse, approve, certify or control these sites and does not guarantee the accuracy of the information contained on them.

► **Initiative project team**

- Greg Seymour, President, ISMS General Manager AMGA, Australia; Manager, Mushrooms and Health Global Initiative
- Bart Minor, President, Mushroom Council, United States
- John Collier, Group Research and Development Manager, Monaghan Mushrooms Ltd, Republic of Ireland
- Mary Jo Feeney, Mushrooms and Health Global Initiative Operations Manager, Bulletin Editor, United States
- Glenn Cardwell, Accredited Practising Dietitian, Nutrition Impact P/L, Australia
- Chris Rowley, Communications Consultant, Australia
- Heidi Gengler, Vice President, Edelman Public Relations, United States

► **Strategic communications group**

Members of the Strategic Communications Group strengthen the Initiative's communication capability and develop a local public relations presence in each country whose industry is contributing financially to the project. Members of this group help facilitate stories about mushrooms and health appearing in their local media, monitor mushroom nutrition and health research, liaison with scientists, media and other influencers, and provide feedback to the Initiative. They include:

- Michal Slawski - United Kingdom
- Franz Schmaus - Germany
- Francois Marche - France
- Ignace Deroo, Evy Detroch - Belgium
- José Antonio Jiménez Hernandez - Spain
- Kent Stenvang - Denmark
- Dick Roodhuyzen de Vries - Netherlands
- Elizabeth O'Neil - Canada