



# 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

Even with limited resources, countries are customizing mushroom nutrition messages to meet consumer interest.

Several members of the Initiative Team and Strategic Communications Group shared what’s happening globally in mushroom nutrition communication at a marketing workshop organized by Greg Seymour prior to the International Society for Mushroom Science (ISMS) conference in Beijing. During the workshop, mushroom industry leaders, staff and consultants from Canada, China, Denmark, Netherlands, Russia, South Africa, Spain, the United Kingdom as well as Australia and the United States gave presentations, networked and learned how others, even with limited funds and resources, are customizing mushroom nutrition research to meet consumer interest in health and nutrition. Share what you are doing with *Bulletin* readers. Send your short article to: [info@mushroomsandhealth.com](mailto:info@mushroomsandhealth.com).

At both ISMS and the International Congress of Dietetics, Team members Cardwell and Feeney explained how the Initiative worked, its core components (the *Mushrooms and Health Report*, website and *Bulletin*) and how the Initiative is a resource for media and health influencers (See Glenn’s report from Australia). Traffic to the MHGI website after these presentations increased demonstrating interest in these resources.

Dr. Peter Roupas and his team at CSIRO will continue to update the



*Mushrooms and Health Report* for 2014. Be sure to visit <http://www.mushroomsandhealth.com/mushrooms-health-report-s101/> to read the 2012 report posted in August.

## Mushroom Research

### ► Vitamin D4 in mushrooms

Phillips KM, Horst RL, Koszewski NJ, Simon RR (2012) [Vitamin D4 in Mushrooms. PLoS ONE 7\(8\): e40702. doi:10.1371/journal.pone.0040702](#). PLoS One is an open access journal.

The investigators report on an unknown vitamin D compound observed in the HPLC-UV chromatogram of edible mushrooms when analyzing vitamin D2 as part of a food composition study. The compound was found to be vitamin D4 (22-dihydroergocalciferol) and was quantified by HPLC with UV detection, with vitamin [3H] vitamin D3 as an internal standard. White button, crimini, portabella, enoki, shiitake, maitake, oyster, morel, chanterelle, and UV-treated portabella mushrooms were analyzed, as four composites each of a total of 71 samples from U.S. retail suppliers and producers. Vitamin D4 was present (0.1 mcg/100 g) in a total of 18 composites and in at least one composite of each mushroom type except white button. The level was highest in samples with known UV exposure: vitamin D enhanced portabella, and maitake mushrooms from one supplier (0.2–7.0 and 22.5–35.4 mcg/100 g, respectively). Other mushrooms had detectable vitamin D4 in some but not all samples. In one composite of oyster mushrooms the vitamin D4 content was more than twice that of D2 (6.29 vs. 2.59 mcg/100 g). Vitamin D4 exceeded 2 mcg/100 g in the morel and chanterelle mushroom samples that contained D4, but was undetectable in two morel samples. The vitamin D4 precursor 22, 23- dihydroergosterol was found in all composites (4.49–16.5 mg/100 g). Vitamin D4 should be expected to occur in mushrooms exposed to UV light, such as commercially produced vitamin D enhanced products, wild grown mushrooms or other mushrooms receiving incidental exposure. Because vitamin D4 coeluted with D3 in the routine HPLC analysis of vitamin D2 and an alternate mobile phase was necessary for resolution, researchers analyzing vitamin D2 in mushrooms and using D3 as an internal standard should verify that the system will resolve vitamins D3 and D4.

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### ► Reishi for cancer treatment

Jin X, Ruiz Bagueire J et al. [Ganoderma lucidum \(Reishi mushroom\) for cancer treatment](#). Cochrane database of systematic reviews (Online) 2012; 6: CD007731.

Laboratory research and a handful of preclinical trials have suggested that *Ganoderma lucidum* carries promising anticancer and immunomodulatory properties. The popularity of taking *G. lucidum* as an alternative medicine has been increasing in cancer patients. However, no systematic review has evaluated the actual benefits of *G. lucidum* in cancer treatment. To evaluate the clinical effects of *G. lucidum* on long-term survival, tumour response, host immune functions and quality of life in cancer patients, as well as adverse events associated with its use, the authors ran an extensive set of databases including the Cochrane Central Register of Controlled Trials (CENTRAL) for randomised controlled trials (RCTs) in October 2011. Other strategies included

scanning the references of articles retrieved, hand searching of the *International Journal of Medicinal Mushrooms* and contact with herbal medicine experts and manufacturers of *G. lucidum*. To be included studies had to be RCTs comparing the efficacy of *G. lucidum* medications to active or placebo control in patients with cancer diagnosed by pathology. All types and stages of cancer were eligible and trials were not restricted on the basis of language. Five RCTs met the inclusion criteria. Two independent review authors were assigned to assess the methodological quality of individual trials. Common primary outcomes were tumour response evaluated according to the World Health Organization (WHO) criteria, immune function parameters such as natural killer (NK)-cell activity and T-lymphocyte co-receptor subsets, and quality of life measured by the Karnofsky scale score. No trial had recorded long-term survival rates. Associated adverse events were reported in one study. A meta-analysis was performed to pool available data from the primary trials. Results were gauged using relative risks (RR) and standard mean differences (SMD) for dichotomous and continuous data respectively, with a 95% confidence interval (CI). The methodological quality of primary studies was generally unsatisfying and the results were reported inadequately in many aspects. Additional information was not available from primary trialists. The meta-analysis results showed that patients who had been given *G. lucidum* alongside with chemo/radiotherapy were more likely to respond positively compared to chemo/radiotherapy alone (RR 1.50; 95% CI 0.90 to 2.51,  $P = 0.02$ ). *G. lucidum* treatment alone did not demonstrate the same regression rate as that seen in combined therapy. The results for host immune function indicators suggested that *G. lucidum* simultaneously increases the percentage of CD3, CD4 and CD8 by 3.91% (95% CI 1.92% to 5.90%,  $P < 0.01$ ), 3.05% (95% CI 1.00% to 5.11%,  $P < 0.01$ ) and 2.02% (95% CI 0.21% to 3.84%,  $P = 0.03$ ), respectively. Leukocyte, NK-cell activity and CD4/CD8 ratio were marginally elevated. Four studies showed that patients in the *G. lucidum* group had relatively improved quality of life in comparison to controls. One study recorded minimal side effects, including nausea and insomnia. No significant haematological or hepatological toxicity was reported. The review did not find sufficient evidence to justify the use of *G. lucidum* as a first-line treatment for cancer. It remains uncertain whether *G. lucidum* helps prolong long-term cancer survival. However, *G. lucidum* could be administered as an alternative adjunct to conventional treatment in consideration of its potential of enhancing tumour response and stimulating host immunity. *G. lucidum* was generally well tolerated by most participants with only a scattered number of minor adverse events. No major toxicity was observed across the studies. Although there were few reports of harmful effect of *G. lucidum*, the use of its extract should be judicious, especially after thorough consideration of cost-benefit and patient preference. Future studies should put emphasis on the improvement in methodological quality. Further clinical research on the effect of *G. lucidum* on cancer long-term survival is needed.

There is insufficient evidence to justify the use of *G. lucidum* as a first-line treatment for cancer. It remains uncertain whether *G. lucidum* helps prolong long-term cancer survival. *G. lucidum* could be administered as an alternative adjunct to conventional treatment because of its potential to enhance tumour response and stimulate host immunity.

#### ► *Agaricus bisporus* lectin and cell proliferation

Cheung YH, Sheridan CM, Lo ACY, and Lai WW. [Lectin from \*Agaricus bisporus\* inhibited S phase cell population and Akt phosphorylation in human retinal pigment epithelia cells.](#) *Ophthalmol. Vi. Sci.* Published online before print October 4, 2012, doi: 10.1167/iovs.12-10589 Invest. Ophthalmol. Vis. Sci. October 4, 2012 IOVS-12-10589.

The researchers investigated how *Agaricus bisporus* lectin inhibited retinal pigment epithelial cell proliferation.

Lectin from *Agaricus bisporus* (ABL) was found to inhibit cell proliferation of some ocular and cancer cell-lines. To elucidate how ABL inhibited retinal pigment epithelial (RPE) cell proliferation, the researchers investigated the changes in cell cycle distribution and cell proliferation-related signalling pathways after ABL treatment. Primary human RPE cells were isolated and grown in DMEM/F12 with or without the ABL (20 or 90µg/ml) for three days. Analysis of cell cycle was performed by flow cytometry. Phosphorylation status of Erk, Jnk, p38, and Akt as well as p53 expression levels were investigated by Western blotting. The role of phosphorylated-Akt in RPE cell proliferation was further evaluated using LY294002. After ABL treatment at 90µg/ml, the amount of cells present in the S phase was found to be reduced. These changes were not apparent in cells treated with 20µg/ml ABL. Erk and Akt were found to be hyper-phosphorylated and hypo-phosphorylated, respectively. The expression levels of phosphorylated-Jnk, phosphorylated-p38 and p53 were not altered when compared with those of the control cells. When RPE cells were treated with LY294002 and deprived from phosphorylated-Akt expression, cell proliferation rate was reduced. Reduction in the amount of cells present in S phase was also observed. According to the researchers, results showed that ABL hypo-phosphorylated Akt and this observation is in line with the fact that ABL attenuates cell proliferation. Since the level of p53 was not significantly altered by ABL, ABL-arrested cell cycle progression was independent of p53 activation.



## News from Australia - Glenn Cardwell

### ► International Society for Mushroom Science (ISMS) Beijing

The ISMS conference in Beijing was preceded by a meeting of mushroom organisations around the world to share their experiences in promoting mushrooms to the public. Glenn Cardwell spoke of the promotion of mushrooms to health professionals, while Greg Seymour gave an insight into the new “Power of Mushrooms” campaign directed at the public in Australia. This was a great opportunity for us to learn of the promotional methods used in other countries. Glenn also presented at the marketing section of the ISMS conference.

### ► Doctors and nurses

The General Practitioner and Practice Nurse Convention and Exhibition was held in Brisbane, Queensland in September. This first event of this type in Brisbane attracted 850 doctors and nurses. Glenn Cardwell gave four workshops on “Superdiets & Superfoods” and two nutrition quizzes, many of the questions featuring mushrooms. The quiz was a surprisingly effective way of giving the mushroom messages. There were three rounds of eight questions, with prizes given out after each round. We were able to sign up 300 new members for the Mushroom Lovers Club, about one third of all those that attended. The photo of Glenn and Jacinta illustrates the winning combination of combining workshops with tasting mushrooms.



Doctors and nurses hear that mushrooms are a 'superfood.'

A smaller affair was the Practice Nurses events in Perth, Western Australia, and Adelaide, South Australia, where Glenn gave a presentation, emphasising the potential role of mushrooms in reducing the risk of breast cancer. About 260 nurses got to savour mushrooms and hear our story. In the photo, Pam Tobin, Judy Slupniski and Jane Allen present mushrooms to nurses.



► **Dietitians**

For dietitians, the big event of the year was the International Congress of Dietetics (ICD) in Sydney in September, where we again had a very successful mushroom-themed breakfast for 200 dietitians, hosted by celebrity chef Fast Ed. Mary Jo Feeney gave an update on the Mushrooms and Health Global Initiative, the importance of international collaboration and the value of the 2012 *Mushrooms and Health Report* released in June and now posted on the Initiative's website [www.mushroomsandhealth.com](http://www.mushroomsandhealth.com). Glenn Cardwell updated the delegates with a brief summary of the international research of the last 12 months, including research from the University of Western Sydney. The event was also attended by Professor Johanna Dwyer, a member of the International Mushroom Research Advisory Panel and Professor Penny Kris-Etherton who has published research on ergothioneine, and important antioxidant in mushrooms. The event was thoroughly enjoyed by all. Penny Kris-Etherton (center) along with Mary Jo Feeney and Greg Seymour are featured in the photograph.



The mushroom message was heard by dietitians from around the world at ICD 2012

### ► Home Economists

The Australian Mushroom Growers Association had an exhibition booth at the International Federation of Home Economics conference in Melbourne. As with all events for health professionals, we gather their names for inclusion into our Mushroom Lovers Club and our *Talking Research* newsletter, which is specifically for health professionals. Caroline Westmore, our Victorian state director, gave a talk on food presentation for photography using the mushroom as an example.

### ► Talking Research newsletter

Each quarter we send an e-newsletter to health professionals on our database, updating them on the latest in mushroom research. The last one covered the last two papers on mushrooms influence on immune function from the University of Western Sydney, as well as the paper on edible mushrooms in health from the CSIRO in Australia. (See Roupas P, Keogh J, Noakes M, Margetts C and Taylor P. [The role of edible mushrooms in health: Evaluation of the evidence](#). *Journal of Functional Foods* 2012).

### ► The future

The Australian Mushrooms For Life team recently met to determine our direction for the next two years in getting doctors and dietitians to hear the mushroom and health story such that they use our resources and encourage their clients to choose mushrooms.



## News from Spain - Maria Luisa Tello Martin

At 9<sup>th</sup> September, 21 farmers and 54 wineries came together to participate in latest Agricultural and Wine Growers Contest of La Rioja, which this year celebrates 44 and 22 years respectively.

Thousands of people gathered in central Logroño to admire and buy garden products made in La Rioja, in all regions of the community.

For decades, the agricultural section has claimed the quality of their fruits and vegetables. As proof of this, the contest showcased spectacular presentations of vegetables in size and appearance.

The CTICH (research and technological centre on mushroom business) also attended by publicizing new varieties of exotic mushrooms that are beginning to grow in La Rioja, as *Pholiota nameko*, *Agrocybe aegerita* (Pioppino) and *Pleurotus eryngii* (King oyster.)





## News from the United Kingdom - Michal Slawski Bord Bia

### ► More to Mushrooms promotion

The €2.5 million “More to Mushrooms” promotion in the United Kingdom (UK) is now in its second year. The promotion is funded by Bureau members in the UK and Ireland matched by funds obtained from the European Union (EU) with the assistance of Bord Bia and the Department of Agriculture, Food and the Marine in Ireland.

To recap, the strategy of the campaign is to implement a three year programme that broadens the role of mushrooms in the UK diet by surprising consumers about the nutritional benefits of mushrooms and reinforcing their taste and versatility. This is being done by communicating the benefits of mushrooms to households, doctors and nutritionists and mass caterers, using advertising in women’s magazines, digital media, public relations (PR) and via educational measures.

At the start of the campaign, several different creative routes were explored, each focusing on a different attribute of mushrooms – taste, versatility and health. Online research work was carried out to ascertain which route would be most likely to change consumer purchasing behaviour. As the campaign has a three year lifespan, it has the opportunity to bed in changes of opinion about mushrooms through repeated exposure. The research showed that health was the strongest motivating factor in bringing about a change in consumer purchasing.

Research showed that health was the strongest motivating factor to change consumer purchase.

The campaign is governed by very strict guidelines on health and nutritional information that can be used, so the style had to be precisely factual, but engaging at the same time. The kernel of the idea for the new campaign focuses on the iconic shape of the mushroom, and invites consumers to think about mushrooms in terms of other vegetables particularly associated with good health. The carrot and the tomato were two of the options that were chosen, and a considerable amount of time was spent in ensuring that the image looked like both a mushroom and the chosen vegetable. Easier to explain by looking at the picture than by writing it down!



**Mushrooms. So many B vitamins, they could make a tomato blush.**

Mushrooms aren't just tasty, you know. They're also really good for you. They're a natural source of minerals and vitamins B<sub>1</sub>, B<sub>2</sub>, and B<sub>3</sub>, which help you build a stronger immune system. As they're low in fat and low in calories they are the ideal filler-upper. And just 80g counts as a quick way to one of your five-a-day.

Feast your eyes on over 250 tasty recipes at [moretomushrooms.com](http://moretomushrooms.com)



 Campaign financed with aid from the European Union.



**Mushrooms help maintain your sight. What an eye-opener.**

Being utterly delicious isn't enough for mushrooms. They're really good for you, too. Low in fat, low in calories and just 80g counts as a quick way to one of your five-a-day. Not forgetting that they're a natural source of B vitamins and minerals, which can help maintain your sight. Clear enough?

Over 250 tasty recipes at [moretomushrooms.com](http://moretomushrooms.com)



Feedback on the campaign has been very positive, as the ads have real stand out in the context that they are placed. The sales results have been very encouraging too, with an estimated increase in the volume of sales of mushrooms of 2700 tonnes in the UK in 2011, covering both retail and food service sectors. On top of that, online tracking studies show a rise in the association of mushrooms and B-Vitamins, which can only be positive news in the long run.



## News from the United States - Heidi Gengler

### ► Dietetic Practice Groups partner to educate communities about mushrooms

The Mushroom Council (Council) is working with three subgroups of the Academy of Nutrition and Dietetics in 2012 to promote mushroom consumption and education within communities of interest. The subgroups include two dietetic practice groups (DPGs), which are the Food and Culinary Professionals (FCP), and Weight Management (WM) groups and member interest group (MIG) National Organization of Blacks in Dietetics and Nutrition (NOBIDAN). These three groups were selected to foster and deepen relationships with these audiences, disseminate mushroom nutrition information, establish the Council as a viable resource and create mushroom ambassadors. The tailored programs focus on promoting increased vegetable consumption, specifically highlighting mushrooms.

The purpose of the Weight Management DPG partnership is to create an educational fact sheet about vegetables' role in maintaining weight balance including mushroom nutrition tips and Swapability messaging. This is something WM members have been clamoring for because of their desire to have resources to use in practice. WM members are developing the document, which is set to be completed by the end of year and promoted in early 2013.

The scope of the Council's work with FCP and NOBIDAN is paralleled, including an educational webinar with each group and a tailored grant program for each of their member sets. Through a grant application process, both subgroups select three members to receive \$1,000 to be used for encouraging vegetable consumption within their communities. The grant program was open for the duration of the fall with FCP and NOBIDAN heavily promoting the programs to their members through internal communications (newsletters, social media, list servs, e-blasts, etc.).

In September, the Council sponsored the first webinar with FCP members to educate them about mushrooms' nutrition benefits and versatility.

Jackie Newgent, registered dietitian, chef and one of FCP's own esteemed members, presented why mushrooms are one of her go-to ingredients.

Menu-strategist Steve Solomon introduced "Swapability" as the latest culinary trend and reviewed new research from a mushroom sensory study conducted at the University of California at Davis. The webinar drove FCP members to find more information on the Council's website, promoted the FCP grant program and encouraged attendees to visit the Council's booth at FNCE. Results of these three programs will be promoted in early 2013 and through National Nutrition Month in March.

The Council is working with targeted dietetics professionals to foster and deepen relationships, disseminate mushroom nutrition information, establish the Council as a viable resource and create mushroom ambassadors.

#### Today's Menu: Getting to Know Mushrooms

- Shine light on a food that's cultivated in the dark
- Get an in-depth look at a culinary superfood
- Catch the buzz on new trends and research



## Mushrooms get social

### Australia

Power of Mushrooms website  
My Mushrooms blog  
Mighty Mushroom Twitter  
Mushroom Lovers Club  
Facebook  
Power of Mushrooms YouTube

### Canada

Mushrooms Canada website  
Mushrooms Canada blog  
Mushrooms Canada Twitter  
Mushrooms Canada Facebook  
Mushrooms Canada Pinterest  
Mushrooms Canada YouTube

### Italy

Italian Association  
Fungicoltori (AIF) website  
Italian Association  
Fungicoltori (AIF)  
info@fun.go.it email  
Funghincucina Twitter  
Funghincucina Facebook  
Funghincucina Pinterest

### Netherlands

Champignonidee website  
Champignonidee Twitter  
Champignonidee Facebook  
Champignonidee Pinterest  
Champignonidee YouTube  
Champignonidee Google+

### South Africa

SAMFA website  
Fresh Mushrooms Twitter

### Spain

CTICH website  
Championidea website  
Asochamproja Twitter  
Asoc Prof Cultivadores  
Champiñon de La Rioja,  
Navarra y Aragon Facebook  
Asochamproja YouTube  
ASOC.PROF.CULT Champiñón  
DE LA RIOJA Google+

### United Kingdom & Ireland

More to Mushrooms website  
More to Mushrooms Twitter  
More to Mushrooms Facebook

### United States

Mushroom Info website  
The Mushroom Channel blog  
Mushroom Channel Twitter  
Mushroom Channel Facebook  
Fresh Mushrooms Pinterest

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
- Ignace Deroo - Belgium
- José Antonio Jiménez Hernandez - Spain
- Kent Stenvang - Denmark
- Elizabeth O'Neil - Canada