We must provide consumers with compelling reasons, frequently. Much has been written on how habits are formed and the message is – it can take a long time.

For consumers to include mushrooms regularly in their food choices – and increase the worldwide consumption of mushrooms – we must provide consumers with compelling reasons, frequently. Much has been written on how habits are formed and the message is – it can take a long time. This issue of the Bulletin showcases the demonstrated results when mushrooms’ benefits are communicated consistently and frequently both to consumers and influencers. Here are some examples:

• Spain has participated five times in "Mushroom Passion Days," providing attendees with a repeated tasty mushroom experience.

• Australia has supported “Australia’s Health Weight Week” for three years resulting in a public presentation about mushrooms’ benefits.

• The United States has surveyed dietitians for seven years to gauge the impact of program materials and efforts. The current survey indicates that now 3 out of 4 surveyed dietitians recommend mushrooms to their clients.

Communicating mushrooms’ benefits is not a one time effort. Results occur only when frequent messages that connect with consumers’ interests and health goals are repeated over and over.
Antioxidant components of isolated polysaccharides


The researchers investigated the major chemical constituents and antioxidant activities of water-soluble polysaccharide (PS) fractions isolated from three edible mushrooms. Crude PS (CPS) isolated from the mushroom hot water extract by ethanol precipitation contained 15–30% (w/w) total protein and 2–5% phenolics. The CPS were fractionated by ion exchange chromatography and the neutral, and slightly ionic PS fractions (eluted with 0 and 0.1 M NaCl) contained 70–80% carbohydrate with low protein and phenolic contents, while the ionic PS fractions (eluted with 0.3 M and 0.7 M NaCl) had higher contents of protein (20–70%) and phenolics (2–13%). The antioxidant activities of all PS fractions were significantly correlated with the total phenolic and protein contents but not with the carbohydrate content. Purified PS free of phenolics and proteins had no significant activities. According to the researchers, the phenolic and protein components instead of carbohydrates were mainly responsible for the antioxidant activities of mushroom PS.

Functional uses of ergosterol-enriched extracts


Results of this study suggest that fungal ergosterol-enriched extracts could be used to design hypocholesterolemic foods and beta-glucans could be used to bind bile acids to decrease blood cholesterol levels.

According to the abstract, ergosterol-enriched extracts obtained from *Agaricus bisporus* were incorporated into lard, butter and white chocolate as food carriers to study their potential as ingredients with hypocholesterolemic properties to design functional foods. Lard was supplemented with several concentrations of cholesterol and ergosterol, beta-sitosterol (as control) and two types of ergosterol-enriched extracts obtained by supercritical fluid extraction (SFE) and accelerated solvent extraction (ASE). The prepared food combinations were submitted to a specific in vitro digestion model, their dietary mixed micelle (DMM) fractions isolated and administrated to Caco2 cell cultures.

Ergosterol was as effective as some phytosterols such as sitosterol, in the displacement of cholesterol from the DMMs when applied to the food matrix in a ratio (1:2, w/w, cholesterol:sterol). The ASE extract was not effective but addition of the SFE extract provoked a 67% reduction in the DMM cholesterol content. Lard supplementation with fungal beta-glucans able to bind bile-acids enhanced the cholesterol displacement from the DMMs induced by the sterols although it also reduced ergosterol incorporation. Fungal sterols also impaired proper cholesterol transport through Caco2 monolayers.
**Agaricus bisporus and induced colitis**


Although widely-consumed and reported to have anti-inflammatory and antioxidant activities, little is known regarding *Agaricus bisporus* (white button mushroom WBM) effects in dextran sulfate sodium (DSS)-induced colitis, a condition related to dysfunction of intestinal immunity. This study investigated the effects of WBMs in an animal model of DSS-induced colitis. Male, 4-week-old ICR mice (n=10 per group) were fed a normal diet with or without 10% WBM for 4 weeks, and colitis was induced by 3% DSS in drinking water for 7 days. WBMs prevented DSS-induced shortening of colon length (P=.033) and diminished diarrhea (P=.049) and gross bleeding (P=.001), resulting in a decreased disease activity index. Results of histological analysis showed that WBMs suppressed mucosal damage. In addition, WBMs attenuated the DSS-induced increase in myeloperoxidase activity (P=.012) and upregulation of proinflammatory cytokine tumor necrosis factor-α (P=.020) in the colon segment. Taken together, these findings suggest a possible role for the WBM as an immunomodulator that can prevent and/or treat ulcerative colitis.

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**Status of medicinal mushroom science**


The present review draws attention to the current perspectives, advances, evidences, challenges, and future development of medicinal mushroom science in the 21st century. Medicinal mushrooms and fungi are thought to possess approximately 130 medicinal functions, including antitumor, immunomodulating, antioxidant, radical scavenging, cardiovascular, anti-hypercholesterolemic, antiviral, antibacterial, anti-parasitic, antifungal, detoxification, hepatoprotective, and antidiabetic effects.

The data on mushroom polysaccharides and different secondary metabolites are summarized for approximately 700 species of higher hetero- and homobasidiomycetes. Numerous bioactive polysaccharides or polysaccharide-protein complexes from the medicinal mushrooms described appear to enhance innate and cell-mediated immune responses, and exhibit antitumor activities in animals and humans.

Whilst the mechanism of their antitumor actions is still not completely understood, stimulation and modulation of key host immune responses by these mushroom compounds appear central. Polysaccharides and low-molecular-weight secondary metabolites are particularly important due to their antitumor and immunostimulating properties. Several of the mushroom compounds have been subjected to Phase I, II, and III clinical trials, and are used extensively and successfully in Asia to treat various cancers and other diseases. The review also gives special attention to many important unsolved problems in the study of medicinal mushrooms.

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**Mushrooms – The third food kingdom**


The authors suggest that because of mushrooms’ nutrient and culinary characteristics, it may be time to reevaluate food groupings and health benefits in the context of 3 separate food kingdoms: plants/botany, animals/zoology, and fungi/mycology. Mushrooms as fungi are biologically distinct from plant- and animal-derived foods (fruits, vegetables, grains, dairy, protein [meat, fish, poultry, legumes, nuts, and seeds]) that comprise the U.S. Department of Agriculture food patterns operationalized by consumer-focused *MyPlate* messages. Although mushrooms provide nutrients found in these food groups, they also have a unique nutrient profile. Classified into food grouping systems by their use as a vegetable, mushrooms’ increasing use in main entrées in plant-based diets is growing, supporting consumers’ efforts to follow dietary guidance recommendations.
Health Star Rating

The Australian government has instituted a voluntary Health Star system for categorising all foods. It is expected that the majority of food companies will use the system, else the government will make it mandatory in 2017. As to be expected, mushrooms receive the maximum five health stars, as does the majority of fresh produce. As unsalted cashews, for example, get four stars and the avocado gets 4.5 stars, some have justifiably argued that all fresh produce should automatically receive five stars.

Movember – Changing the Face of Men’s Health

Each November, the men of Australia are invited to grow a moustache for the month to raise funds for prostate cancer research. We also used this moment to promote the cause and remind men of the power of mushrooms for their health. See www.powerofmushrooms.com.au/health-awareness/mens-health.

Vitamin D Mushrooms

Currently, there is very little information regarding the vitamin D content of foods in the official Australian food tables, partly because it has been difficult to get accurate figures for wholesome foods like eggs, oily fish and mushrooms. The Food Standards Australia New Zealand wants the vitamin D levels in Australian foods to be measured during 2015 for later publication in the Australian food tables. As we have good evidence that even store-bought mushrooms have a significant level of D, this is a great opportunity to have mushrooms ‘sanctioned’ as a source of D in government and health authority documents and websites.
Australia’s Healthy Weight Week 2015

Mushrooms are again supporting Australia’s Healthy Weight Week (AHWW), held in February (www.healthyweightweek.com.au). Mushrooms appear in some of the recipes in the free downloadable cookbook (www.healthyweightweek.com.au/australias-healthy-weight-week-cookbook/). We have also been invited to a CSIRO public presentation in Adelaide to give the case for mushrooms and be involved in other AHWW activities, all endorsed by the Dietitians Association of Australia.

For the 3rd year, mushrooms support Australia’s Healthy Weight Week.

Dietitians’ Day

This year will be the 2nd year of celebration of Dietitians’ Day in Australia. Although not formally run through the Dietitians Association of Australia, it has become another opportunity to promote mushrooms to dietitians Australia-wide via a conference and webinar from Brisbane, Queensland. One well-known media dietitian has already included a blog on mushrooms, featured on her website (www.susieburrell.com.au/everything-you-need-to-know-about-mushrooms).

NEWS FROM SPAIN

Maria Luisa Tello Martin

Once again “Mushroom Passion Days” took place in Autol (La Rioja-Spain). This fifth edition continues with the spirit to promote the consumption of these products, promote local cuisine and highlight the crucial contribution of this sector to economic growth in La Rioja.

This year offered a new tasting combination between the Rioja wine and mushrooms. The event, organized by ASOCHAMP and winery Marqués de Reinosa, was led by Ana Isabel Rubio, enologist of the winery, Jesus Ariznavarreta, manager of the winery, Maria Luisa Tello, agronomy engineer of Mushroom Technological Research Center (CTICH) and Juan Cuatrecasas wine and gastronomy admirer and blogger.

Continued on pg. 6
The tasting combination is an innovative method for mushroom promotion using a very renowned product such as Rioja wine. This initiative was a complete success and the organization promised to prepare events like this in next editions.

During the hour and a half of the tasting, characteristics of the wines and health and nutrition properties of each of three fungi tasted were explained in detail.

The three mushrooms chosen were *Agaricus bisporus*, *Pleurotus ostreatus* and *Lentinula edodes* (shiitake). With this information and thanks to the culinary skills of Juan Cuatrecasas, attendees enjoyed the combination of each of the wines with tapas prepared specially for the occasion. The event, which filled the capacity of the facility, provided the 250 attendees with a tasty mushroom experience they will want to repeat.

**NEWS FROM THE UNITED STATES**

Michelle Green

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Three out of four registered dietitians surveyed recommend mushrooms to their clients

For the past seven years, the U.S. Mushroom Council (Council) has conducted an annual survey of nutrition influencers to track knowledge and awareness surrounding mushrooms and health. Additionally, the survey allows the team to identify any challenges or opportunities among this key audience to address through programming and education. Over the years, there is one question that has served as an overall benchmark for the efficacy of the Council’s nutrition influencer program: the number of dietitians who recommend mushrooms to their clients.

The 2014 survey revealed an all-time high. Currently, 74.5 percent of influencers surveyed say they recommend mushrooms to their clients. This represents a 5 point year-over-year increase, and overall, nearly doubles the rate of recommendation at the inception of the Council’s influencer program in 2008. As in previous years, awareness surrounding some of this year’s science topics has increased (See Survey Highlights on pg. 7), with increased awareness for vitamin D and immunity benefits of mushrooms following related research published and promoted in 2014.

Continued on pg. 7
This year’s data comes on the heels of an impressive run of nutrition communication efforts that kicked off with the Mushrooms and Health Summit in September 2013 and carried momentum into 2014 with:

- Three published articles in prominent journals added credibility to mushrooms’ celebrated nutrition story to date (Journal of Nutrition, Journal of Food Science and Nutrition Today) and new funded and independent science was released supporting the blend, immunity and vitamin D;
- Increased mushroom visibility with the nation’s top health and nutrition influencers at industry conferences than any previous year (the Bulletin #28, see page 6);
- The most nutrition professionals reached (9,000, 20 percent more than 2013) via Council; communications and newsletters; and
- The biggest annual media splash celebrating the health and culinary benefits of fresh mushrooms in Council history, led by a record-breaking integrated marketing campaign for National Mushroom Month.

2014 Influencer Survey Highlights

- 74% of dietitians surveyed recommend mushrooms to their clients
- 96% agree mushrooms are nutritious and part of a healthy diet
- 92% believe the blend (mushrooms and meat) can enhance flavor and nutrition of everyday recipes
- 72% believe mushrooms are a source of vitamin D
- 67.7% believe mushrooms are an immunity-boosting food
- 63% think umami in mushrooms can enhance flavor and acceptability of a diet low in sodium

OTHER PROMOTIONAL ACTIVITIES

Stephen Allen

Just Add Mushrooms

The next burst of the “Just Add Mushrooms” advertising campaign starts in the United Kingdom & Ireland in February. The celebrity chosen to front this campaign is Jodie Kidd, a former model and TV presenter. She has participated in BBC’s Strictly Come Dancing and was a runner up in this year’s Celebrity Masterchef. The BBC programs’ Facebook page further increased its reach with over 90,000 consumers liking the page.
Resources

Be sure to visit the Mushrooms and Health website 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.

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; Project Manager, Mushrooms and Health Global Initiative
- Bart Minor, President, Mushroom Council, United States
- 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
- Juan Valverde, Food Science Programme Manager, Monaghan Mushrooms Group, Ireland
- Michelle Green, 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/market that is participating in 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:
- Ignace Deroo – Belgium
- Elizabeth O’Neil Meurehg – Canada
- Kent Stenvang – Denmark
- Franz Schmaus – Germany
- Annemieke Bouwmeester – Netherlands
- Jose Antonio Jimenez Hernandez – Spain
- Stephen Allen – United Kingdom