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.

MAY 2013 ISSUE #22

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News from the Initiative - Mary Jo Feeney

This issue of the *Bulletin* includes abstracts of several mushroom research projects presented at the April 20-24 meeting of the Federation of American Societies for Experimental Biology (FASEB) in Boston, MA. Experimental Biology (EB) is a multidisciplinary scientific meeting in the general fields of study including anatomy, physiology, biochemistry, pathology, nutrition and pharmacology. The majority of the nearly 14,000 international attendees represent university and academic institutions as well as government agencies, non-profit organizations and private corporations.

The nine abstracts listed in the Nutrition Research section below currently are published in the *FASEB Journal* and may subsequently appear as full manuscripts in peer-reviewed journals. The *Bulletin* is listing these titles as an information service to you so you may be aware of this cutting edge research and contact the principal investigators for additional information.

Mushroom research was presented at Experimental Biology.

Sometimes a presenting researcher's institution issues a press release on the investigator's study to inform others interested in mushroom research and to communicate mushrooms' benefits to consumers looking to improve their health through nutritious food choices. Examples of coverage of mushroom research presented at EB include Fitbie, New York Daily News, and Everyday Health.

Mushroom Research

▶ Abstract titles presented at Experimental Biology, April 2013. Click on the link for the full abstract.

Poddar KH, Ames M, Chen H, et al. (2013) Positive effect of white button mushrooms when substituted for meat on body weight and composition changes during weight loss and weight maintenance – A one-year randomized clinical trial. *FASEB J.* 27, 852.4.

O'Neil CE, Nicklas TA, and Fulgoni III VL. (2013) Mushroom consumption is associated with increased nutrient intakes and better diet quality in adult participants of the National Health and Nutrition Examination Survey (2001–2010). *FASEB J.* 27, lb350.

Click on the links for full abstracts.

Williams J, Lu Z, and Holick MF. (2013) Mushrooms not only produce vitamin D2 but can also produce vitamin D3 and vitamin D4. *FASEB J.* 27, 794.6.

Keegan R and Holick MF. (2013) Isolation and identification of vitamin D2 and photobyproducts. *FASEB J.* 27, 794.5.

Bogusz J, Pagonis G, and Holick MF. (2013) Evaluation of the bioavailability of vitamin D2 in mushrooms in healthy adults. *FASEB J.* 27, 794.4.

Dai X, Stanilka JM, Rowe CA et al. (2013) Consumption of *Lentinula edodes* modulates human immune function by altering cytokine secretion of PBMC *ex vivo*. *FASEB J.* 27, 643.15.

Stanilka JM, Rowe CA, Creasy RA et al. (2013) *Lentinula edodes* consumption: Proliferation, activation and modification of memory and naive innate immune cell populations. *FASEB J.* 27, 643.17.

Tejera C, House LA, and Percival SS. (2013) Consumer knowledge, attitudes and behaviors about foods that have immune benefits: focus on mushrooms. *FASEB J.* 27, 643.14.

Wang J, Niu X, Du X, et al. (2013) Dietary supplementation with white button mushroom augments the protective immune response to *Salmonella* vaccine in mice. *FASEB J.* 27, 123.2.

▶ Edible mushrooms may enhance gut immunity through IL-23

Chandra LC et al. White button, portabella, and shiitake mushroom supplementation up-regulates interleukin-23 secretion in acute dextran sodium sulfate colitis C57BL/6 mice and murine macrophage J.744.1 cell line. http://www.nrjournal.com/article/S0271-5317(13)00037-7/abstract.

These researchers previously reported on edible mushroom extracts' ability to enhance antimicrobial α-defensin production in HL60 cells. Interleukin-23 (IL-23), a cytokine produced primarily by dendritic cells, is involved in host defense against gut pathogens and promotes innate immunity and inflammatory responses through the IL-23/interleukin-17 axis. Because IL-23 is involved in defensin production, the researchers hypothesized that edible mushrooms may modulate its secretion and gut inflammation. Eight-week-old C57BL/6 mice were fed the AIN76 diet or the same diet supplemented with 5% white button (WBM), portabella, or shiitake mushrooms. To assess *in vivo* and *in vitro* cytokine secretion, 7 to 8 mice per group received 3% dextran sodium sulfate (DSS) in drinking water during the last 5 days of the 6-week feeding period. To delineate the mechanisms by which mushrooms alter IL-23 secretion, J.744.1 cells were incubated with (100 µg/mL) WBM, portabella, and shiitake extracts without and with 100 µg/mL curdlan (a dectin-1 agonist) or 1 mg/mL laminarin (a dectin-1 antagonist). The dectin-1 receptor is a pattern-recognition receptor found in phagocytes, and its activation promotes antimicrobial innate immunity and inflammatory responses. In DSS-untreated mice, mushrooms significantly increased IL-23 plasma levels but decreased those of interleukin-6 (IL-6). In DSS-treated mice, mushroom-supplemented diets increased IL-6 and IL-23 levels. Mushroom extracts potentiated curdlan-induced IL-23 secretion, and mushroom-induced IL-23 secretion was not blocked by laminarin *in vitro*, suggesting the involvement of both dectin-1–dependent and dectin-1–independent pathways. Although

all mushrooms tended to increase IL-6 in the colon, only WBM and shiitake tended to increase IL-23 levels. These data suggest that edible mushrooms may enhance gut immunity through IL-23.

▶ New mushroom species on Iberian Peninsula

Olariaga L, Grebenc T, Salcedo I, and Martín MP. Two new species of Hydnum with ovoid basidiospores: H. ovoideisporum and H. Vesterholtii. Mycologia, 104(6):1443-55, December 2012. doi:10.3852/11-378.

Two new species of Hydnum, characterized by slender Hydnum rufescens-like basidiomes and ovoid to broadly ellipsoid basidiospores, from the Iberian Peninsula are described based on morphological and ITS molecular data. The need to typify the name Hydnum rufescens is discussed, and a provisional key is given for the European taxa of Hydnum.

▶ Safety assessment of UV light technologies to produce D mushrooms

Simon RR, Borzelleca JF, DeLuca HF and Weaver CM. Safety assessment of the post-harvest treatment of button mushrooms *(Agaricus bisporus)* using ultraviolet light. *Journal of Food Chemical Toxicology, 2013 (56):278-289*.

Vitamin D mushrooms produced using UV light technologies were considered safe and suitable for introduction to the marketplace.

The researchers present a comprehensive review of information relevant to the safety of introducing vitamin D mushrooms, produced using UV light technologies, to the food supply. Wild mushrooms are an excellent source of vitamin D attributed to sunlight exposure, which catalyzes the conversion of fungal ergosterol to vitamin D_2 via a series of photochemical/thermal reactions. Mushroom growers now incorporate UV light treatments during processing to produce mushrooms with levels of vitamin D that compare to those in wild mushrooms. The article discusses historical reference to the use of UV light for production of vitamin D and reviews studies evaluating the nutritional value and safety of vitamin D mushrooms. Traditional safety evaluation practices for food additives are not applicable to whole foods; therefore, the application of substantial equivalence and history-of-safe-use is presented. According to the information in the article, vitamin D in mushrooms, produced using UV light technologies, are equivalent to vitamin D in mushrooms exposed to sunlight, and that UV light has a long-history of safe use for production of vitamin D in food. Vitamin D mushrooms produced using UV light technologies were therefore considered safe and suitable for introduction to the marketplace.

Mushrooms were a key sponsor for Australia's Healthy Weight Week 2013.

News from Australia - Glenn Cardwell

▶ Australia's Healthy Weight Week

The Australian mushroom industry teamed up with the Dietitians Association of Australia (DAA) to promote healthy eating (and a healthy weight) in January 2013. This was the 6th year of the event, but the first year that mushrooms have been involved. An e-cookbook, using the recipes of celebrity chef Luke Mangan, was downloaded 1600 times in January. It included mushrooms in three of the seven recipes. The cookbook and healthy weight information is available all year round from: http://www.healthyweightweek.com.au. We have had follow-up meetings with DAA suggesting ways we can more broadly promote Australia's Healthy Weight Week for 2014.

The mushroom industry has obtained promotional space in the DAA newsletter to get our message to those dietitians who do not come to the annual conference

and attend our breakfast. There are 5000 dietitians in Australia, but only 800 have been to our very successful breakfasts. The first full page promotion will be in the May newsletter.

▶ Doctors' Program

We are running a pilot program in Adelaide, South Australia, in which we are using our database of doctors and nurses to encourage them to place our mushroom and health poster and our recipes in their waiting rooms. Our aim is to initially get over 50 doctors' offices in the inner Adelaide area to become mushroom ambassadors and regularly request our recipe leaflets. With what we learn from the pilot program we can then spread the concept throughout the rest of Australia.

The Queensland team has also found ways to attract the attention of doctors and get them to help promote good eating, fresh produce and mushrooms. Dietitian Glenn Cardwell addressed a group of doctors in Brisbane, told them of the health research on mushrooms and encouraged them to use our poster and recipe leaflets.

▶ Talking Research

Our e-newsletter to health professionals has been aligned to the health awareness weeks during the year. The last one came out during Salt Awareness Week, mentioning the umami flavour and how less salt can be used when including mushrooms in a meal.

▶ Social Media

Social media and digital advertising provide additional reasons to eat more mushrooms.

A combination of social media and digital advertising has been used to reinforce a number of key health messages. Digital advertising using keyword targeting has allowed the cost effective alignment of messages on key on-line sites in Australia.

One example is the approach adopted during Coeliac Awareness Week. During this period consumers searching for gluten-free recipes on the largest Australian recipe site – Taste.com.au – were served with a digital advertisement highlighting mushrooms as a delicious gluten-free source of fibre.

Consumers that then "clicked" on the advertisement were taken to a landing page that explained the suitability of mushrooms in a gluten-free diet and provided a selection of appropriate mushroom recipes. The approach and messaging is also further backed up by information provided on Facebook and Twitter. Cross posting of the information on other relevant

Facebook pages further extended the reach of the message to those people interested in Coeliac Awareness. A similar approach was also used for World Salt Awareness week and will be used for other upcoming health “events”.

News from the United States - Heidi Gengler

▶ Mushroom Council Announced Three-Year Commitment to Help Reduce Childhood Obesity

On March 8, 2013, at the Partnership for a Healthier America (PHA) second annual “Building a Healthier Future Summit” in Washington, D.C., the Mushroom Council (Council) announced a commitment to help reduce childhood obesity by bringing more vegetables to the plates of American families.

PHA was created in 2010 in conjunction with – but independent from – First Lady, Michelle Obama's Let's Move! effort. It is devoted to working with the private sector to ensure the health of the nation's youth by solving the childhood obesity crisis. As a nonpartisan, nonprofit organization, it is led by some of the nation's most respected health and childhood obesity experts and brings together public, private and nonprofit leaders.

Council Chair Fletcher Street unveiled the Council’s commitment at the summit: six million dollars over three years to help reduce childhood obesity by bringing more vegetables to the plates of American families. Other speakers to take the same stage for the closing session included keynote speaker, Michelle Obama as well as Eli Manning, American football quarterback for the New York Giants of the National Football League; Cory Booker, mayor of Newark, New Jersey; and Lawrence Soler, PHA CEO. Mr. Soler and Ms. Street are featured in the photo at the Summit.

Mushroom industry supports efforts to reduce childhood obesity.

While there, Street, Katie Preis (marketing coordinator, Mushroom Council) and representatives from the American Mushroom Institute engaged with opinion leaders and representatives from corporations, advocacy groups, and foundations to educate them about how mushrooms are a unique solution, and discussed ways to collaborate to combat childhood obesity together.

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
Champinonidea website
Asochamprioja Twitter
Asoc Prof Cultivadores Champiñon de La Rioja, Navarra y Aragon Facebook
Asochamprioja 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.

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
- 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
- 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