Communication and education of mushroom nutrition research to health professionals

Greg Seymour
Australian Mushroom Growers Association Ltd (AMGA)

Project Number: MU11002

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This report is published by Horticulture Australia Ltd to pass on information concerning horticultural research and development undertaken for the mushroom industry.

The research contained in this report was funded by Horticulture Australia Ltd with the financial support of the mushroom industry.

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ISBN 0 7341 3411 8

Published and distributed by:
Horticulture Australia Ltd
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179 Elizabeth Street
Sydney NSW 2000
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Horticulture Australia

MU11002

Communication and education of mushroom nutrition research to health professionals

Final Report

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HAL
Know-how for Horticulture™

AMGA™
Australian Mushroom Growers Association

HAL project: MU11002

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Report
This is the final report explaining the results and outcomes of the Communication and education of mushroom nutrition research to health professionals project.

Funding
This project was facilitated by HAL in partnership with the Australian Mushroom Growers Association and was funded by the Mushroom Industry levy. The Australian Government provides matched funding for all HAL's R & D activities.

Date: Tuesday, 30 September 2014

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Media summary

Market research by the Mobium Group has identified improved health as the key driver to mushroom consumption over the foreseeable future. Four out of five people want more health information about the mushroom. Knowing the health benefits of mushrooms 77% said they are very likely to increase their mushroom consumption.

This project tracks the scientific papers and publications that deal with the nutritional and health benefits of mushrooms, collating them to provide a coherent and easy-to-understand benefits summary for health professionals, researchers, media writers and mushroom growers.

The project has established strong international links via the Mushroom and Health Global Initiative (MHGI) since 2008, keeping mushroom scientists and health professionals up-to-date with peer-reviewed science. The project has been the springboard for establishing mushroom research at the University of Western Sydney (2007-2011), the CSIRO (2012-2014) and the University of Sydney (2013). Research information and the biennial CSIRO Mushroom and Health report are kept on the mushroomsandhealth.com website.

The project is also relentless in conveying the health benefits of mushrooms to health professionals, health writers and bloggers, with great success, through presentations at workshops and conferences, and newsletters for health professionals. A regular e-newsletter was created to inform doctors, nurses and dietitians in particular, of the latest science about mushrooms and health. Submissions and updates to government and non-government agencies in response to food and nutrition policy have made mushrooms prominent in the minds of regulators and policy makers.

The project enabled provision of nutrition and health information on our website (www.powerofmushrooms.com.au) through a series of 15 fact sheets on the nutrition profile and the health benefits of mushrooms. This is an increase from the eight fact sheets offered three years ago. The nutrition information attracts about 24,000 pageviews a month and has generated a dramatic rise in mushroom and health interest via social media.

This project is the basis to allow the industry to further promote the health benefits of mushrooms to health professionals, chefs, home economists and food writers through a new project (MU14002).

Technical summary

Mushrooms have been a culinary ingredient for centuries. Interest in using mushrooms for cooking has increased in Australia over the last 30 years. Knowing that good nutrition was important to consumers, the mushroom industry promotes mushrooms from a health platform, as well as highlighting their taste and versatility through recipes.

Every two years the CSIRO produce a Mushrooms and Health report. The 4th report was completed and made available in July 2014 from the mushroomsandhealth.com website. This is the foundation of our health information delivered to health professionals, researchers and the public.

A published summary of the CSIRO Mushrooms and Health report appeared in 2012. This paper is one of the 10 most requested papers from the journal in 2013.

- Roupas P, Keogh J, Noakes M, Margetts C, Taylor P. The role of edible mushrooms in health: Evaluation of the evidence. *Journal of Functional Foods* 2012; 4 (4): 687-709

The CSIRO are also conducting research on mushrooms, vitamin D and brain health. A recent paper showed that mushrooms have anti-dementia potential.

- Bennett L, Kersaitis C, Macaulay SL, Münch G, Niedermayer G, Nigro J, Payne M, Sheean P, Vallotton P, Zabaras D, Bird M. Vitamin D2-enriched button mushrooms (*Agaricus bisporus*) improves memory in both wild type and APPswe/PS1dE9 transgenic mice. PLOS One 2013; 8 (10): e76362

The science completed since 2011 at the University of Western Sydney included three published papers:

- Mushrooms influence on immuno-modulatory function, in particular Immunoglobulin A (Jeong SC, Koyyalamudi SR, Pang G. Dietary intake of Agaricus bisporus white button mushroom accelerates salivary immunoglobulin A secretion in healthy volunteers. *Nutrition* 2012; 28 (5): 527-531)
- The potential anti-cancer effect of AB polysaccharides in mushrooms (Jeong SC, Koyyalamudi SR, Jeong YT, Song CH, Pang G. Macrophage immunomodulating and antitumor activities of polysaccharides isolated from Agaricus bisporus white button mushrooms. *Journal of Medicinal Food* 2012; 15 (1): 58-65)
- The mineral content of mushrooms (Koyyalamudi SR, Jeong SC, Manavalan S, Vysetti B, Pang G. Micronutrient mineral content of the fruiting bodies of Australian cultivated Agaricus bisporus white button mushrooms. *J of Food Composition & Analysis* 2013; 31: 109-114)

The Applied Horticultural Research group at the University of Sydney produced an unpublished document on the effect of exposing mushrooms to winter sunlight and vitamin D production. This was to demonstrate that the public could produce their own vitamin D mushrooms at home.

- Eckman J. Quantification of vitamin D levels in mushrooms (Agaricus bisporus) exposed to sunlight. Applied Horticultural Research 2013

The publishing company McGraw-Hill requested a chapter on vitamin D mushrooms for their Science and Technology Yearbook that goes to colleges and universities.

- Cardwell G. Commercial Production of Vitamin D-enhanced Mushrooms. Yearbook of Science & Technology 2015. McGraw-Hill 2014

Both international and Australian research results give the project further reason to promote mushrooms from a health perspective. There is accumulating research that mushrooms modulate the appetite and assist weight control, enhance immune function, have compounds that lower blood cholesterol and blood glucose, have antioxidants such as ergothioneine which has vitamin-like properties, and contain two polysaccharides that appear to kill breast cancer cells. Mushrooms provide significant amounts of essential minerals such as chromium, copper and selenium. Since Australian research has demonstrated that one in three Australians are vitamin D deficient there has been an increased interest in mushrooms with high levels of vitamin D from the retailer, the consumer and the health professional.

There was a six-fold increase in media coverage of the nutrient and health benefits of mushrooms over the five years 2005-2010. In 2005-6 there was a $10 million value in mushroom coverage in magazines and newspapers. This had increased to over $60 million in value in 2009-10. As the cost of media monitoring became prohibitive, this stopped at the beginning of 2011. The increasing interest in mushrooms through digital media and the number of page views on mushrooms and health from the powerofmushrooms.com.au website has given us clear indication of the greater demand for health information of mushroom in the period August 2011-August 2014. It has given confidence to the mushrooms grower and health professional about promoting mushrooms to their clients. It has also given confidence to the consumer, with about two thirds of consumers classing mushrooms as being very nutritious.

It is becoming clear that mushrooms can be of significant public health benefit to all Australians, contributing to a reduced government’s health budget. The potential has been acknowledged leading to a new three year program MU14002 commencing October 2014.

Introduction

In 2005 there was very little information or research regarding how mushrooms could benefit health beyond their nutrient content. Through the joint efforts of HAL and the AMGA, the nutrition and health benefits were promoted to mushroom farmers, cooks, chefs and the food media who, in turn, inform the general public. The program was renewed in 2008, and again in 2011, to include health professionals such as general practitioners, nurses, dietitians, home economists and food and health writers. It was supported by the scientific credibility of local research from the University of Western Sydney, the University of Sydney and the biennial CSIRO Mushroom and Health report.

Figures from our website download data attest to health being of great interest. For the six months March-August 2014 there were 8000-12,000 downloads of either recipes or nutrition facts sheets from powerofmushrooms.com.au. There were 24,000 nutrition page views in August 2014 (see Appendix H).

There are now many peer-reviewed scientific publications that have reported the nutritional and health promoting benefits of mushrooms. These are reported in the MHGI Bulletin every quarter and archived on mushroomsandhealth.com. The published material is written in scientific language for academic readership, however the results are of great relevance to sectors of the mushroom industry supply chain, to the traditional and digital media, and to the health professionals who advise the general public on their health and well-being.

This project was designed to source and encourage important scientific publications, determine what additional research was required and prepare information packages for a non-scientific readership.

It is clear from the research that mushrooms have nutritional and physiological characteristics not found in plant foods such as vegetables, fruit and grains. Mushrooms have compounds that help control blood glucose and blood cholesterol levels, they are high in B vitamins, the minerals selenium, copper, chromium, have compounds that kill or modulate cancer cells, provide glutamate and other compounds that help regulate appetite and enhance immunity, and have the ability to easily generate a days supply of vitamin D in a single serve. This accumulating data is gradually making health professionals and public alike take notice of mushrooms.

The project continues to influence and educate those involved in providing health and nutrition advice to the public. Another focus involves providing nutrition and health information to those growing and selling mushrooms through the entire supply chain. A flow-on effect through to consumers is magnified when both areas of focus are coupled with the industry's marketing and promotion program.

Observable benefits to the mushroom industry have been:

- greater efficiency in disseminating information to health professionals;
- a better informed supply chain, from compost maker to retailer;
- greater interest from both the digital and conventional media, accessing data about the health benefits of mushrooms (usually along with requests for recipes that showcase mushrooms);
- better informed scientists, researchers and health policy makers working in the field of human health and nutrition;

- better informed dietitians, general practitioners, nurses, home economists, health writers and bloggers; and
- an effective link to international scientists conducting mushroom research through the MHGI.

Project Team
The *Mushrooms for Life* project team comprises Glenn Cardwell and Chris Rowley. Glenn Cardwell is an Accredited Practising Dietitian with 35 years experience in clinical and public health nutrition, including 10 years as consultant dietitian to the National Heart Foundation. Glenn makes frequent media appearances and has written four books, *Diet Addiction*, *Gold Medal Nutrition* (five editions), *Getting Kids to Eat Well* and the *Top Blokes Food Manual*, as well as two books for the Heart Foundation.

Chris Rowley has worked extensively with HAL on a number of critical across-industry projects most notably the *Go for 2 & 5* campaign. Chris has the ability to translate complex R&D issues into layman's language, thus taking the mystery out of potentially hot topics for industry. Chris has a highly developed understanding of the legislative environment that food operates within Australia.

Materials & Methods

Scientific literature review
A constant search of the peer-reviewed published scientific research was conducted with the assistance of the Mushrooms and Health Global Initiative (HAL project MU09002) and the CSIRO. The MHGI is an international collaboration of mushroom professionals that alerts everyone to new research about mushroom nutrition or mushroom health benefits, whether still currently undertaken, presented at a conference, or published in a peer-reviewed journal.

The CSIRO completes a review of the mushroom nutrition and health research (not just *Agaricus bisporus*) every two years and this forms the basis for providing health information to journalists, growers and health professionals. Reports have been completed for the years 2008, 2010, 2012, and 2014 and available from mushroomsandhealth.com. This information is the basis for a health professional and public brochure on the nutritional benefits of the mushroom.

University studies
Since the last report in 2011 a further three papers from the University of Western Sydney and two papers from the CSIRO have been published. In July and August 2013 the Applied Horticultural Research group of the University of Sydney wrote a document titled: Quantification of Vitamin D levels in mushrooms (*Agaricus bisporus*) exposed to sunlight (J Ekman 2013). The study showed that retail mushrooms exposed to the midday winter sun for 1-2 hours were able to generate 10 mcg or more of vitamin D. The studies are listed in the Technical Summary.

Mushrooms and Health Global Initiative (MHGI)
Each quarter the MHGI produces a Bulletin for researchers and health professionals detailing relevant new mushroom research. The project also gives feedback on mushroom research proposals, including those being funded within Australia to ensure they will assist us to better understand the health properties of mushrooms.

Dietitians Association of Australia
The project has been involved in the DAA's Australia's Healthy Weight Week in 2013 and 2014. Each year there is an online cookbook that includes mushroom recipes, cooking demonstrations with mushrooms and the opportunity to be involved in any of the events organised by dietitians around the country. In AHWW 2014 the cookbook was downloaded 3200 times, there were nine cooking demonstrations and 292 events held by dietitians around the country. In addition, 10 mushroom-themed recipes were placed on the DAA website.

An annual joint agreement with avocadoes and almonds to assist DAA promote fresh produce provides an opportunity to place three infotorials a year in the DAA newsletter that goes to 6000 dietitians, and be involved in three DAA events around the country.

Websites
To assist scientists, health professionals, the public and growers to be familiar with the health and nutritional benefits of mushrooms, the *Power of Mushrooms* website (www.powerofmushrooms.com.au) is regularly updated, the last time being August 2014. The website now includes fact sheets with references (including downloadable versions), press releases

and articles. It also has a full library of mushroom recipes. The website, first established in 2005, is actively promoted to health professionals, doctors and the media. The media use the website for background information.

With the first commercial release of Vitamin D Mushrooms in 2013 we created a new website to answer all the common enquiries about how mushrooms were able to generate vitamin D. The website is www.vitamindmushrooms.com.au

A third website, the International Society for Mushroom Science site (www.mushroomsandhealth.com) houses the biennial CSIRO Mushroom Report and alerts scientists to newly published mushroom research.

Fact sheets
There are now 15 fact sheets available to the public from powerofmushrooms.com.au. Each one covers a topic, from heart health to all the myths and facts that are mentioned about mushrooms. Each is also fully referenced to give the reader confidence that the information is correct and up-to-date. A 12-page health professional brochure was written to highlight the health benefits of the mushroom in simple language, along with 47 references so readers were confident of the science behind the information. The brochure is given to health professionals at conferences and meetings.

Infographics
With the assistance of our colleagues in Canada a mushroom infographic and a slide graphic that covers all the health benefits of the mushroom based on published research has been produced (see Appendix G).

Technical support
Each of the State Promotions Officers are given nutrition information in a form suited to the public, and background information to use in media interviews, hosted dinners and presentations. The growers are given support for public enquiries, providing nutrition information (eg vitamin D in mushrooms), and on labelling requirements. Responses are provided to health professional and media enquiries about mushrooms.

When it is felt that mushrooms have been misrepresented or if there has been incorrect information given about the mushroom, contact is made with the author or the agency to try and correct their information. For example, many sites state that mushrooms, spinach and asparagus need to be avoided in gout, yet this is not based on science. In fact, the evidence suggests that the consumption of mushrooms and vegetables help to avoid gout.

Conventional media
Regular responses are made to enquiries from magazines, television and radio to ensure they provide accurate information about the health benefits of mushrooms. There are common media requests for recipes, photographs, interviews and nutrition and health information regarding the mushroom. The media at large now see the project as the main Australian source of mushroom information. International and local research frequently provides the basis of a health-related story about the mushroom. The project also answers health professional requests for information about the mushroom.

Social media, videos and newsletters
The project provides nutrition and health information for use on social media as many health professionals, journalists and the public seek and obtain health information via social media sites. A health professional e-newsletter (*Talking Research*), and the Mushroom Lovers Club newsletter are distributed to the AMGA's health professional database and consumer database respectively. The newsletters contain health-related information that is tailored to the needs of each audience and promotes the *Power of Mushrooms* website. An e-bulletin from the MHGI goes to mushroom promoters around the world detailing how different countries promote mushrooms to consumers.

A video on vitamin D and mushrooms was completed with celebrity chef Fast Ed Halmagyi and dietitian Glenn Cardwell and is available on YouTube.

Presentations
Since 2009, the project has been actively involved in the promotion of mushrooms to health professionals. The dietitian, Glenn Cardwell, gives presentations to general practitioners and nurses, dentists, fitness leaders each year. He also presents to the annual Dietitians Association of Australia conference at a sponsored breakfast about the latest research on mushrooms. Each event has included cooking demonstrations and the opportunity to provide health information about the mushroom.

Submissions
Technical support extends to submissions to government food and nutrition policy. In January 2014 the Australian Health Survey 2011-2013 includes mushrooms with vegetables. The AMGA made a claim that mushrooms should be separated from other vegetables like zucchini and avocado as mushrooms have a completely different nutrition profile and biology to plant foods. A backgrounder on Food Standards Code 1.2.7 regarding health claims was developed so the industry can determine the best way to legally promote the health benefits of mushrooms. In August 2013 a response was made to a Food Standards Code submission regarding dietary fibre arguing that a serve of mushrooms should be able to claim to be a "source of fibre".

Results

Scientific literature review

By constantly searching the scientific literature the project team was able to keep abreast of published science on the nutritional profile and the health potential of *Agaricus bisporus* mushrooms. Collating this information allowed the team to update all the information provided to mushroom farmers and health professionals, and a vast array of communication channels. For example, it has been possible to promote mushrooms on their high B vitamin and anti-oxidant levels, in particular an antioxidant called ergothioneine, on their vitamin D levels, and their potential to reduce the risk of some cancers, all based on published research.

The biennial CSIRO Mushroom Report reviewed all the published mushroom research, including *Agaricus bisporus*. The report is converted into a website suitable form by MJ Feeney (Mushroom Council, USA) and Glenn Cardwell. This report is then made available to international mushroom researchers, mycology students and health professionals. The CSIRO report is used as the basis for mushroom and health information provided to media, public, health professionals and growers.

The AMGA has been able to establish strong links with the mushroom industries in the US, UK, Netherlands, Ireland and Spain, in the form of the Mushrooms and Health Global Initiative (MHGI). The MHGI has been essential in alerting the *Mushrooms for Life* project to new and impending research. This means that Australia is forewarned of breaking research findings before they have been published.

Each quarter the MHGI produce a quarterly Bulletin that includes summaries and links to recently published mushroom research and includes mushroom promotion activities around the globe. The MHGI Bulletin underpins the credibility of the project, in a similar manner as does the CSIRO Mushrooms and Health report, by reporting on breaking global research news that is often the catalyst for mushrooms and health stories in the Australian media. The Bulletin is an e-newsletter sent to direct subscribers around the world who then further distribute the Bulletin through industry networks. Past issues are available from the mushroomsandhealth.com website.

Another e-newsletter, *Talking Research*, goes to Australian health professionals each quarter, detailing recent research on the mushroom. It has a circulation of 1,229 and has been well received by readers. It has an open rate of 22-26%, which is higher than the average open rate of 15% for e-newsletters. It goes out about every two months and is aligned with a topical health message eg vitamin D levels in Australians, breast cancer awareness week.

Publications

All new publications are listed in the Technical Summary on page 5.

Websites

To assist a wide range of audiences to be familiar with the health benefits of mushrooms a *Power of Mushrooms* website (www.powerofmushrooms.com.au) has been created and provides up-to-date scientific information and nutrition fact sheets. There are downloadable pdf versions of each fact sheet.

The nutrition section of the powerofmushrooms.com.au website attracts 4000-8000 visitors a month, up from 900 visitors a month in 2011. It is now the most popular section of the website and outstrips recipes, the previously most visited section, almost 2:1 in page visits. This is an excellent indicator that the industry's marketing campaign promoting health benefits is starting to gain traction.

Enquiries
Website enquiries from the media, public and health professionals have included questions on gluten, mushrooms and asthma, vitamin B12, vitamin D (eg for an author in Tasmania), selenium and glutamate in mushrooms.

As there has been a trend towards an avoidance of gluten-free foods, we have received more enquiries about the gluten content of mushrooms, partly because the compost contains wheaten straw. Mushrooms were analysed in Holland and found to have no detectable levels of gluten. There is no gluten in straw; gluten appears only in the seed (wheat), which is not used in compost. In response, a fact sheet on gluten was produced.

Videos

- A video on vitamin D mushrooms by Glenn Cardwell and Fast Ed Halmagyi has had 8000 downloads and is available here: https://www.youtube.com/watch?v=FWpvHYJMd_w&list=UUZN6nFu5XHbFFdcywIMXFYA&index=4
- With information furnished by the project dietitian Sue Radd mentions vitamin D mushrooms in her regular TV segment (http://vimeo.com/37279895).
- Now there are many videos regarding mushrooms and health, looking at specific components of the mushroom. They are archived here: https://www.youtube.com/user/Powerofmushrooms/videos.

Fact sheets
A series of fact sheets on the nutritional profile and the health benefits of mushrooms are regularly updated as new science is published. They are:

1. *Vitamin D* to inform people they can get a day's supply of vitamin D in a single serve of UV light-exposed or sun-exposed mushrooms.

2. *Heart health* including the cholesterol-lowering compounds in mushrooms.

3. *Essential vitamins and minerals* as mushrooms are very good at concentrating key nutrients such as riboflavin, niacin, selenium, potassium and copper.

4. *Flavour without salt* as the umami flavour means less salt can be used for flavouring.

5. *Keeping trim* as mushrooms are very low in kilojoules, yet very high in appetite satiety.

6. *Diabetes & Glycaemic Index*. Mushrooms have an exceptionally low GI, and the ability to help control blood glucose.

7. *Cancer*. There is accumulating evidence that regular mushroom consumption is linked to a lower risk of breast and prostate cancer.

8. *Mushrooms & gout*. The science shows that mushrooms are not linked to gout, and may help to prevent gout.

9. *Protein & carbohydrates* as they are different in mushrooms when compared to vegetables and appear to by positively influencing our health.

10. *Immune booster* based on research showing mushrooms boosting immune function.

11. *Long life.* Mushroom eaters tend to eat better than non-mushroom consumers and mushrooms have compounds that reduce the risk of many common diseases.

12. *Myths and facts* because there are many, such as whether mushrooms should be peeled or washed before serving.

13. *Skin and hair*. People are keen to know what nutrients are good for their looks. Mushrooms provide those very nutrients.

14. *Coeliac disease*. To reassure people that mushrooms are gluten-free.

15. *Superfood*. No matter how you define a superfood, the mushroom exceeds the nutritional criteria.

To keep up-to-date with the emerging science, the fact sheets are updated every six months and include all the scientific references to give the reader confidence in the information provided.

Social Media
Social media is a popular way to get nutrition information to the food and health media, and health professionals. Our social media program began in late 2010. Sites directly controlled include Facebook (via *Mushroom Lovers Club*), Twitter (via *Mighty Mushroom*) and Instagram. Efforts are regularly made to extend the outreach to influential food and health bloggers.

Number of followers in social media channels

Media channel	**July 2013**	**June 2014**
Facebook	19,845	27,493
Twitter	996	1,193
Instagram	118	638

Health Professional Presentations
A significant part of the project has been to educate and inform health professionals about nutrition in general and mushrooms in particular. The mushroom industry has had a strong presence at health professional conferences, especially those for dietitians, doctors, nurses and home economists. Presentations were made to public health regulators and medical writers. A list of the conferences that have featured presentations on mushrooms, nutrition and health are listed below.

- Professor Michael Holick (University of Boston) tour November 2011. Spoke about vitamin D at Sydney University and Deakin University and incorporated commentary on vitamin D in mushrooms. Samples of vitamin D mushrooms were offered to each delegate.
- Nutrition Australia (WA) seminar on Mushrooms and Health (60 delegates)
- General Practice Conference & Exhibition, 18-20 May 2012, Sydney (4 x 1.0 hr workshops + 1 quizzes + sampling; 1600 delegates)
- International Federation of Home Economists conference 18-19 July 2012, Melbourne (Sampling and brochures to 2000 delegates)

- General Practice Conference & Exhibition, 14-16 September 2012, Brisbane (3 x 1.0 hr workshops + 2 quizzes + sampling; 800 delegates)
- Practice Nurse Conference & Exhibition, 15-16 September 2012, Brisbane (1 x 1.5 hr workshop + sampling; 60 delegates)
- Practice Nurse Conference & Exhibition, 11-12 October 2012, Adelaide (1 x 1.5 hr workshop + sampling; 100 delegates)
- General Practice Conference & Exhibition, 16-18 November 2012, Melbourne (3 x 1.0 workshops + quiz + sampling; 1500 delegates)
- Practice Nurse Conference & Exhibition, 17-18 November 2012, Melbourne (1 x 1.5 hr workshop + sampling; 80 delegates)
- WA School Canteen Association seminar, 24 November 2012, Perth (1 x 1.5 hr seminar)
- Practice Nurse Conference & Exhibition, 21 June 2013, Perth (1 workshop; 50 delegates)
- Dietitians Association Australia/International Congress of Dietitians mushroom breakfast, Sydney, 7 September 2012 (200 attendees)
- Mothers' Day dinner Perth May 2013; 45 attendees
- Australia's Healthy Weight Week, January 2013 (with Channel 9, Luke Mangan & DAA)
- Nutrition and Medicine Conference, 3-5 May 2013, Sydney (for GPs, nurses, dietitians, naturopaths; mushroom samples and brochures; 750 delegates)
- Dietitians breakfast at the DAA National Conference 23-25 May 2013, Canberra (120 delegates with Dr Pennie Taylor CSIRO)
- CheckUP health professional conference, Brisbane 4 April 2014 (brief presentation, brochures & sampling; 160 delegates). A survey of the entire CheckUP membership triggered a request for more information from 164 health professionals.
- Home Economics Conference South Australia 30 May 2014 (Samples and brochures; 200 delegates)
- Fitness and Health Expo, Sydney 7-9 August 2014 (6 x mushroom presentations & sampling)

At the three-day GPCE events there are four workshops and a seminar, while at the one-day PNCE events there is one 90 minute workshop. At conferences a mushroom-themed meal (DAA) or mushroom samples from the recipe brochures are provided. The DAA breakfast feature two presentations on mushroom research results. Presentations are very effective and persuasive method of educating health professionals. Many in the audience have media links and use our information and recipes to further promote the mushroom.

At the request of health professionals a poster titled "10 reasons why you should eat three a day" was created, summarising the nutrition and health benefits of the mushroom. This poster is used by health professionals in their place of work.

Doctors' promotion
Mushroom posters and recipes were distributed to interested doctors in Adelaide. Out of 137 surgeries contacted, 50 agreed to display the poster, but on follow-up only five surgeries placed the poster for public viewing, while 45 took a box of recipes for the waiting room. After three months the posters were removed to be replaced by new posters. Usually the surgery did not ring for replacement recipes.

In Queensland, 270 doctors and nurses that attended the CheckUP seminar or the General Practice conference in Brisbane were asked if they wanted material sent to them for their waiting rooms and offices. About 7 out of 10 said 'Yes' and we can only assume that most of them used the material sent, but there are not the resources to visit each surgery in Queensland.

A health professional brochure was developed in 2009, and was updated in 2010, 2011 and July 2013. This brochure provided more scientific data on mushrooms and health, including scientific references. It is available to delegates at health professional conferences.

Technical support
The project has made submissions to government agencies in an endeavour to provide factual and evidence-based information about the mushroom, as for too long mushrooms have been forgotten as an important source of nutrition. All new proposed government documents on food and health policy were tracked to ensure that mushrooms are featured as an important food for Australians to meet their nutrition and health goals.

Each of the State Promotion Officers are sent background information they can use when discussing mushrooms and health with the public and in media interviews.

When there is misinformation about the mushroom, or if the mushroom has been left from a list in which they would have a strong nutrient or health influence, the dietitian writes to the author to provide evidence about the mushroom. For example, many websites specifically state that gout sufferers should avoid spinach, asparagus and mushrooms, supposedly because of their purine content, yet never list popular vegetables with a much higher purine content. There is no research linking mushrooms or common vegetables to gout. In fact, a high vegetable consumption is inversely associated with the risk of gout. One website (www.seekwellness.com) requested further information and subsequently changed their website information based on the data we provided. On request, their gout and nutrition page was updated in February 2013 (http://www.seekwellness.com/gout/faqs_about_gout.htm)

Prof Peter Ebeling, Uni Melbourne mentions "UV light-irradiated mushrooms as a source of vitamin D" in an article published 14 January 2014 (http://theconversation.com/my-vitamin-d-levels-are-low-should-i-take-a-supplement-21738). I wrote to Prof Ebeling and mentioned that sunlit mushrooms also great for vitamin D.

Recipes
Twice a year, the AMGA produces recipe brochures. Each recipe is healthy and nutritious allowing the recipes to be used as a vehicle to tell the public about the health benefits of mushrooms. Before the project began AMGA produced excellent recipe brochures and books, but now they include mushroom health messages derived from this project. The significant nutrition information from this project has been picked up to add value to the recipe program. The Mushroom Lovers Club has over 36,438 members who receive recipes via email. Ten mushroom recipes were uploaded onto the DAA website in July 2013.

Media awareness

The project is also an important resource for media seeking health information about mushrooms. For the second time, *Frank* magazine (for men with prostate cancer and their families; see Appendix D) and *Verve* magazine (for women with breast cancer and their families; see Appendix E) made contact with the project. Each wanted the latest health information, and the scientific references, as well as recipes.

Diabetes Matters magazine initially wanted some mushroom recipes but accepted our offer of an article. They then published a one page article and five pages of recipes! Requests for information and interviews also came from:

1. Men's Health magazine
2. Radio 2UE, ABC Adelaide, 2CH, 2SM, and Melbourne Vision radio when they heard of generating vitamin D mushrooms via sun exposure based on the research by the Applied Horticultural Group at Sydney University (September 2013)
3. Radio 2UE City to Surf events in both August 2013 and 2014 regarding mushrooms, health and fitness.
4. Based on the University of Western Sydney research on salivary IgA production after consuming 100g of mushrooms daily for 7 days. There was a 50+% production of salivary IgA (11/1/12). The release triggered an interview with ABC News Radio (4 mins) and Radio MTR Melbourne (6 mins).

Grower communications
Before either Coles (2013) or Woolworths (2014) would stock vitamin D mushrooms there were responses to months of questions about why mushrooms would have vitamin D, whether the vitamin D would be retained after purchase and cooking, as well as what needed to be placed on the label. The growers were assisted all through all stages of this process.

Conclusion

The *Mushrooms for Life* project has been exceptional in promoting the nutrition and health benefits that can be derived from the regular consumption of mushrooms. Creating websites, fact sheets, health professional and public brochures, presenting to health professionals, doctors, nurses, home economists, health writers and mushroom growers has meant that the project team has generated a significant body of nutrition and health information to give consumers and health professionals total confidence that mushrooms have both short-term and long-term health benefits when consumed regularly.

The research by University of Western Sydney from August 2007 to September 2011, the University of Sydney and the biennial CSIRO Mushroom and Health report helped support a rapidly increasing interest in the health benefits of mushrooms through the *Mushrooms for Life* project. The potential benefits unearthed by the research were conveyed to growers, supply chain, media and health professionals.

Scientific findings from local and international published research has been used to make growers and health professionals aware of the latest research and to generate publicity to enhance awareness of the health benefits of the mushroom.

Recommendations

Due to the success of the *Mushrooms for Life* project, the AMGA has had a submission approved for the continuation of the project – MU14002. This will permit the ongoing promotion of mushrooms based on their nutrition and health properties.

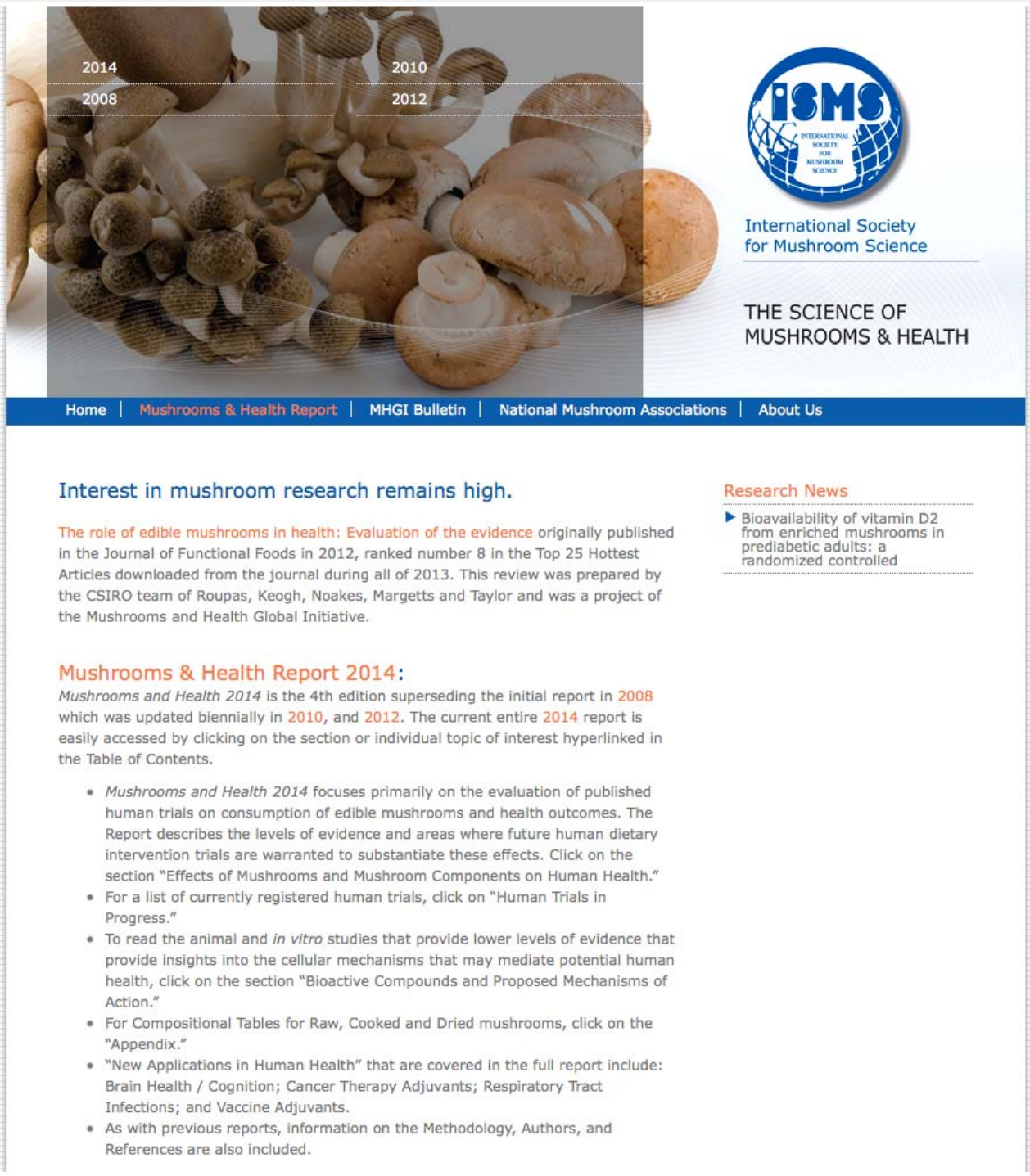
Glenn Cardwell
Accredited Practising Dietitian

Chris Rowley
Writer & PR consultant

Tuesday, 30 September 2014

Appendix A. Nutrition & Health page www.powerofmushrooms.com.au

Appendix B. CSIRO Mushrooms & Health report page www.mushroomsandhealth.com



Appendix C. Talking Research e-newsletter that goes to 1229 health professionals

Talking Research

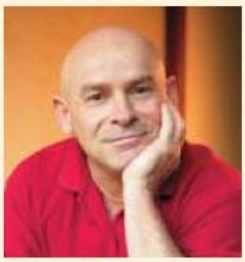
September 2014

Nutrition research highlighting the power of mushrooms

from the Australian Mushroom Growers

Inside this Edition

- CSIRO Review highlights research trial benefits of mushrooms
- Mushrooms solve vitamin D puzzle
- Give you meals the power of mushrooms

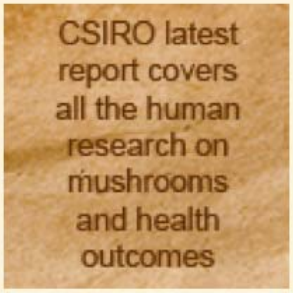


Glenn Cardwell - Accredited Practising Dietitian.

CSIRO Review highlights research trial benefits of mushrooms

Australia's premier research group, the CSIRO, has completed a review of over 1000 human research trials on mushrooms and how they enhance on our health. Some of the conclusions are:

- In comparison to common vegetables, the common white button mushroom (Agaricus bisporus) remains a remarkable source of protein, phosphorus, magnesium and vitamin D. Human trials have demonstrated the bioavailability of vitamin D2 from UV-B-exposed button mushrooms in healthy adults deficient in serum 25-hydroxyvitamin D.
- The bioavailability of vitamin D2 from button mushrooms via UV-B light exposure was effective in improving vitamin D status and not different to a vitamin D2 supplement.
- Several human trials have recently described physiological benefits and significant improvements in quality of life indicators from mushroom consumption by patients affected by a variety of cancers. This strongly suggests that mushrooms contain compounds with a significant impact on human health outcomes.
- There is a definite association between mushroom consumption and a lower risk of breast cancer. Aromatase converts androgens to estrogens and aromatase expression occurs in cancerous breast tumours. While mushroom extracts have previously been suggested to inhibit aromatase activity, new research suggests it is the beta-glucans in the extracts that are responsible for this action.
- There is a rapidly growing body of evidence that suggests that mushrooms may have an immune-stimulatory effect on immune-compromised patients.



The entire executive summary and entire report can be read at the following LINK.

Appendix D. Page from Frank magazine for prostate cancer sufferers & their families

UNEARTHING MUSHROOMS

Glenn Cardwell

Pop quiz: what would you call a mushroom? A vegetable? Or a fruit? And why should you eat them as part of a healthy, well-balanced diet? Accredited Practising Dietitian Glenn Cardwell answers these questions and more.

MUSHROOMS AREN'T a vegetable, although they're often seen as one. And they're not a fruit. They're not even a plant. Instead, they're a fungus. This means the nutrients you get from eating them can be quite different to what you get from eating fruit and veg. Mushrooms are full of B vitamins, essential minerals like chromium, copper and selenium, and lots more.

Can mushrooms help fight cancer?

Research shows that mushrooms seem to have an influence on the risk of certain cancers, such as breast and prostate cancer. Some laboratory studies show that extracts from mushrooms can reduce breast and prostate cancer cell growth.

"Eating 100 grams, or even less, of mushrooms per day could have an effect on preventing new breast cancers," said researcher Dr Shiuan Chen from the Beckman Research Institute, USA.

One study from the University of Western Australia showed that women who ate an average of only 10g of mushrooms a day had a much lower risk of breast cancer.

How might they help?

The male hormone testosterone is converted to another form by a specific enzyme the body produces. This enzyme is thought to play a role in the development of prostate cancer and benign prostate enlargement in men.

Laboratory research suggests that compounds in mushrooms can keep this enzyme in check. This means they could have a potential role to play in protecting against prostate cancer.

Mushrooms also contain a substance that can stop an enzyme which is linked to the development of breast cancer.

While there is a load of research that connects eating mushrooms to a reduced cancer risk, it is unlikely that there is one magical nutrient or substance in food that protects against cancer and other chronic conditions.

It is far more likely that the whole range of nutrients you get from your diet work together effectively to help protect the body. That's why it's important to eat a healthy, well-balanced diet, one that includes mushrooms, fruit and veg. For adult men, Australian dietary guidelines recommend between five and six serves of veggies* and two of fruit every day.

There are loads of other good reasons to eat mushrooms regularly, as their nutrients will work well with those found in vegetables. A normal serve of mushrooms is 100g – just three button mushrooms, or one flat mushroom, a day will do the trick.

To find out more about the health benefits of mushrooms as well as get your hands on some tasty recipes, visit the Australian Mushroom Growers' Association website at www.powerofmushrooms.com.au

*Up to the age of 50, six serves of veggies a day should do you. Between 51 and 70, this drops to five and a half serves. And once you're over 70, this drops again to five serves a day.

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Appendix E. Page from Verve magazine for those with breast cancer

food for thought

The verdict on mushrooms

Glenn Cardwell

How would you classify mushrooms? As a vegetable? Or a fruit? And what are the benefits of including them as part of a healthy, well-balanced diet? Accredited Practising Dietitian Glenn Cardwell answers these questions and more.

The answer? While mushrooms are usually regarded as a vegetable, they are actually neither vegetable nor fruit, as they are not a plant. Instead, they are fungi. This gives them a very different nutrition profile to fruit and vegetables. As well as other nutrients, they are rich in B vitamins and the essential minerals chromium, copper and selenium.

Can mushrooms help fight cancer?

Research shows that mushrooms seem to have an influence on the risk of certain cancers, such as breast and prostate cancer. Some studies show that extracts from mushrooms can reduce breast cancer cell growth. "Eating 100 grams or even less of mushrooms per day could have an effect on preventing new breast cancers," said researcher Dr Shiuan Chen from the Beckman Research Institute, USA.

Soon after these early results, three international studies found a link between women who eat mushrooms and a lower risk of breast cancer compared to those who do not eat mushrooms. One study from the University of Western Australia showed that women who ate an average of only 10g of fresh mushrooms a day had a lower risk of breast cancer.

These have been quite remarkable findings, stimulating the CSIRO to say in their 2014 Mushrooms and Health Report: "The most promising data appear to be those indicating an inverse relationship between mushroom consumption and breast cancer risk."

How might they help?

The mushroom contains compounds that suppress an enzyme called aromatase. Aromatase converts the hormone androgen to oestrogen, which in turn can promote the development of breast cancer, especially in post-menopausal women. A recent Australian laboratory study has also revealed that two specific carbohydrates found in mushrooms can inhibit breast cancer cell growth.

While the evidence that links eating mushrooms to a reduced breast cancer risk looks promising, it is unlikely that any one nutrient or compound in food provides protection against cancer and other chronic conditions. It is far more likely that the synergy of many compounds in food combine effectively to offer protection to the body. That means eating a healthy well-balanced diet, one that includes mushrooms, fruits and vegetables. For adult women, Australian dietary guidelines recommend five serves of vegetables and two of fruit every day.

There are lots of other good reasons to eat mushrooms regularly, as their nutrients will complement those found in vegetables. A normal serve of mushrooms is 100g – just three button mushrooms, or one flat mushroom, a day will do the trick.

If you would like more information on all the health benefits of mushrooms as well as some tasty recipes, visit the Australian Mushroom Growers' Association website at www.powerofmushrooms.com.au

Mushroom tips

SELECTING: Choose mushrooms that feel firm, are one colour all over, and are slightly shiny.

STORING: Store mushrooms in a brown paper bag at the bottom of your fridge to help them stay fresh for at least a week.

PREPARING: There is no need to peel or wash mushrooms. If there is still dirt on them, simply wipe them gently with a clean, damp cloth. Mushrooms will quickly absorb water, so if you do prefer to wash them, only give them a brief rinse then quickly dry them.

- Mushrooms naturally contain vitamin D, the only non-animal food that does, and generate it when exposed to sunlight. Vitamin D is important for healthy bones.
- Mushrooms don't contain gluten, so they can easily be used in a gluten-free diet.
- The rich, savoury flavour of mushrooms is called 'umami'. This flavour could replace some of the salt you may add to your cooking, which is good news for your blood pressure.

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Appendix F. Page from the blog of food writer Judy Davie

GOOD HEALTH GREAT TASTE
the food coach

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Mad about mushrooms!

By: Information courtesy of The Australian Mushroom Growers Association

Don't let the humble button mushroom fool you! Hidden beneath its creamy white dome is a powerhouse of natural flavour and goodness. Neither a vegetable nor a fruit, mushrooms are a fungus, unique in flavour yet they make a surprisingly versatile addition to your menu.

Seven powerful reasons to eat mushrooms!

- Mushrooms are low in kilojoules and have virtually no fat, so they are perfect for weight control. They are also filling which means that they will curb your appetite-great news if you are trying to cut back on your food intake to lose weight.
- Mushrooms are packed full of antioxidants. As you know, antioxidants help to keep the body healthy.
- One serve of mushrooms provides over 20% of your daily intake of B vitamins: riboflavin (vitamin B2), niacin (vitamin B3), pantothenic acid (vitamin B5) and biotin as well as the minerals selenium and copper.
- Mushrooms have vitamin B12 both on the surface and on the flesh, this is the same B12 found in animal foods. This vitamin is both important for your brain and nervous system functions. What's more, the B12 found in mushrooms, is easy for your body to absorb.
- Mushrooms are the only non-animal food to contain vitamin D. Adequate levels of vitamin D in the body lower the risk of heart disease, osteoporosis, bowel cancer and diabetes.
- Mushrooms contain unique compounds that appear to have a protective action against breast and prostate cancer. Australian research is showing that by eating just 10g of mushrooms a day, a woman can decrease her risk of breast cancer by 66%.
- Mushrooms are bursting with flavour-and as they mature from a button to a flat mushroom this flavour increases.

Enough of their goodness.....Mushrooms are also great to eat!

The distinctive flavour and texture of mushrooms makes them a fantastic choice to add to any of your favourite savoury dishes. Toss some button mushrooms in a salad, slicea few and saute them for brekkie, or add to your favourite spaghetti bolognaise sauce. They're also great on kebabs, added to pie fillings, served as a sauce with your favourite steak, on a pizza...frankly, mushrooms are so versatile they can be enjoyed at any meal.

A serve of mushrooms is 100g (that's just three button mushrooms or 1 one flat mushroom) so why not make the most of mushrooms and make them one of your 2 & 5 fruit and vegetable serves every day?

latest comments

Be the first to comment!

Appendix G. Single slide that captures the science-based health benefits of the mushroom

Appendix H. Health and Nutrition information pageviews 2012-2014