



## **Final Report**

### **Communication and education of mushroom nutrition research to health professionals (Phase 2)**

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Nutrition Impact P/L

Project Number: MU14000

## MU14000

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science to justify the nutrition and health claims in their 2016 advertising campaign.

The project has finished with thousands of health professionals around the country now aware that mushrooms are high in a wide range of nutrients, from B vitamins and vitamin D, to selenium and potassium, with a range of attendant health benefits, giving growers an increased marketing potential for their product knowing that mushrooms work to the benefit of public health.

As health is a key driver to food decisions, it is recommended that the health and nutrition information continue to be available and updated on the Australian Mushrooms website, and that the results of published research on the health benefits of mushrooms be promoted to health professionals as they are a publicly trusted voice regarding health knowledge.

## **Keywords**

Mushrooms; health; nutrition; *Agaricus bisporus*; research; promotion; vitamin D.

## Introduction

Market research conducted in project MU04001 identified the link between mushrooms and improved health as a key driver to consumption over the forthcoming decade. The Australian Mushroom Industry Strategic Plan 2011-2016 also identified research and the education of health professionals as being important in making sure that market demand matches the projected increase in mushroom production.

Further market research undertaken by Mobium (2010) revealed that about half the population are unaware of the nutritional benefits of mushrooms, yet 55% want to receive more health information. In summary, 65% of Australian consumers consider mushrooms to be 'very nutritious', and a further 28% stating they are 'quite nutritious'. The research identified that 77% of consumers will be willing to change their mushroom consumption behaviour if they are provided with credible, easy-to-understand information about the health benefits of mushrooms when regularly consumed. The information needs to come from credible and trusted sources such as doctors, nurses, dietitians, health policy officers and/or health regulators.

Research on the nutrition and health benefits of the white button mushroom (*Agaricus bisporus*) has blossomed in the period 2006-2014, particularly since 2010, much of it indicating that the mushroom has quite unique health properties. Many of these benefits have become known from research projects undertaken by the industry and funded by Horticulture Australia Ltd. Examples of those projects are MU04007 and MU04008 on cancer research, MU10019 and MU08015 (Alzheimer's Disease), MU06023 (University of Western Sydney research program, vitamin B12 & vitamin D), MU06019 (breast cancer), MU07014 (weight management), MU09002 (Mushrooms and Health Global Initiative), MU10004 (liver disease), MU10006 (inflammatory disease), MU10007 (cognition), MU10008 (vitamin D2 and ergothioneine), MU10009 (vitamin D2), MU10010 (vitamin D2 bioavailability), MU10011 (infection resistance), MU10012 (immune function), MU10014 (vitamin D2) and MU07015, MU07016, MU07017, MU07018 completed in 2010.

There are now hundreds of scientific papers and publications which deal with the nutritional and health promoting benefits of mushrooms. However, the material is usually written in scientific language for academic readership even though the published results are of great relevance to sectors of the mushroom industry supply chain, health professionals and consumers. This project is designed to source important scientific publications and to prepare information packages for health professions to convey to a mainly non-scientific audience, the public.

The project developed strong relationships between the Australian mushroom industry and the Mushroom and Health Global Initiative (MHGI) during 2008-2016, providing researchers and health professional with regular updates on published papers showing the positive influence of mushrooms on health. The project was the springboard for establishing mushroom research at the University of Western Sydney (2007-2011), the CSIRO (2012-2014), the University of Sydney (2013) and the National Measurement Institute (2015). Research information and the biennial CSIRO Mushroom and Health report (2008-2014) are kept on the mushroomsandhealth.com website.

This final report marks the end of a decade-long program informing health professionals, researchers, media writers, bloggers and mushroom growers of the emerging peer-reviewed research on the benefits of mushrooms to consumers, from the nutritional benefits, through to physiological benefits such as the positive effects on immune function, blood glucose and breast

cancer risk, giving growers confidence that they could use the same information to create new products and promote their produce based on credible nutrition and health information.

## Methodology

The project endeavoured to influence as many health professionals as possible through delivering papers at conferences, being present in their exhibition halls to provide information and respond to questions, writing articles for their professional journals or their newsletters to members or the public, providing referenced information in printed and electronic form, and offering support to outside projects when requested.

In this manner, we were able to influence general practitioner doctors, clinical and practice nurses, dietitians, diabetes educators, naturopaths, home economists, nutrition students and academics, as well as those who write about food and health in print and electronic media.

The audience was chosen based upon the likelihood they would be providing information on diet and health to their clients/patients/students. Then the best method of providing that information was determined. Being involved in each industry's conference was valuable. After agreeing to be in their exhibition hall, an abstract was submitted with the hope that it would be accepted, allowing a direct opportunity to present a paper to a key group of nutrition and health influencers. Only twice were we permitted to talk only about the research on mushrooms at a national conference (Home Economics Institute of Australia 2014; Dietitians Association of Australia 2015). The remainder of the conferences allowed papers on topics such as:

- Bone health, where we could include the research on the vitamin D content of mushrooms and the evidence that mushrooms improved bone integrity;
- Nutrition mythology, where we spoke of the myth that mushrooms should be deleted from the diet of those with gout; and
- Superfoods, including the substantive reasons why the mushroom meets the criteria for a superfood.

This was very effective as we could then drive the delegates straight to the mushroom stand for more information (and samples). Being a sponsor of events meant that we could provide shopping bags, brochures, recipes and handouts to delegates or professionals for later use. We also collected email addresses for those wanting to be a member of the AMGA's Mushroom Lovers Club or wanting to be kept up-to-date with mushroom research via the *Talking Research* e-newsletter.

Some unforeseen benefits of presenting at conferences were:

- When the presentation was well-received, based on delegate feedback, we would be asked to present again at a later conference, such as the Home Economics Institute of Australia and the General Practice Conference and Exhibition.
- In addition, we were often invited to then write an article on mushrooms and health for their member journal or their public newsletter, or be interviewed for a blog or printed newspaper. In two cases, we were able to submit peer-reviewed articles to the journal of the Home Economics Institute of Australia.
- Being in the exhibition hall and cooking samples to taste always attracted more visitors than other stands as the delegates wanted to try experienced mushrooms cooked in a new way. (This did become more difficult in the last two years as venues placed more restrictions on

cooking, cooking equipment and access to venue kitchens, and even charging for a cooking license).

- The novelty of having fresh produce exhibiting at a conference meant that we often attracted a greater interest than other stands. It was an opportunity to have a conversation with key influencers, especially as many wanted to know why mushrooms were exhibiting at their conference.

Information was readily provided to anyone wanting to write about the mushroom. If an interview was required for an article, we could either directly provide the information needed or offer to write the article for them, an offer accepted by some magazines. Often the destination of the information was unknown and it would be found fortuitously later, or our information was used to generate an article without our knowledge, such as the four-page spread in the Healthy Food Guide (see point #21). Many online examples can be found by searching with the key words 'mushroom', 'health' and 'Australia'.

The project assisted and benefitted from the Mushrooms and Health Global Initiative (MHGI). It was instrumental in getting four biennial *Mushrooms and Health Reports* written by the CSIRO. This report was the scientific basis for much of what we told health professionals as it was both credible and came from Australia's premier scientific body. Each quarter, the MHGI Bulletin condensed the latest published mushroom research and gave a summary of the activities being held in different countries to promote mushroom consumption. It was sent to mushroom associations, health professionals, mushroom researchers and other academics. After 35 editions of the Bulletin, nine years, the last edition was distributed in August 2016.

Through our international presence, Australia became known for its mushroom research, hence we were asked to contribute to the 2015 McGraw-Hill Yearbook of Science and Technology on the topic of enhancing the vitamin D content of mushrooms through ultra-violet light exposure, and invited to the International Society of Mushroom Science conference to present on the vitamin D analysis of retail button mushrooms.

The MHGI Bulletin was also important in providing the background information for our *Talking Research* e-newsletter, which went to over 1300 health professionals around the country. The database of subscribers was collected voluntarily at conferences, sometimes using tracking devices that collect email addresses. *Talking Research* gave a brief, yet practical, summary of recent mushroom research, along with useful links and mushroom recipes suitable to the season. Often there was a link between the research and an upcoming health week. For example, *Talking Research* would discuss mushrooms influence on blood glucose before Diabetes Week.

To generate further interest in those who were most likely to write and talk about mushrooms we held very successful farm tours around the country, including workshops on food styling and mushroom cooking. This gave people the opportunity to see a mushroom farm and the atmospherically controlled growing rooms, pick their own mushrooms, ask questions about growing methods and, most importantly, be told of the range of health benefits that mushrooms offer. The attendees then used social media to chat about their experience and their learning.

One remarkable aspect of the mushroom is that it is the only non-animal source of vitamin D. Closely working with Food Standards Australia New Zealand on the correct method of collection, and the federal government's National Measurement Institute for the ideal analysis process, mushroom samples were collected from the five main capital cities and analysed for their vitamin D. Surprisingly, retail mushrooms provided 23% of the daily requirements of vitamin D in a 100g serve. This information is now a part of the official government nutrient database, so growers can promote



their mushrooms as a source of vitamin D. Those growers wanting to offer retail mushrooms with 100% of the daily needs of vitamin D, through exposure to pulsed UV light, were helped in navigating the supermarket chain bureaucracy and designing their nutrition information panels in line with the Food Standards Code.

# Outputs

**1. Home Economics Institute of Australia (HEIA)** national conference was attended by 250 delegates (11-13 January 2017). As part of our sponsorship we had a brochure and booklet inserted into their conference bags. They requested a peer-reviewed article for their Journal. This is quite a coup as not all HEIA conference presentations are asked to also provide a journal article. Fifteen teachers at my presentation requested copies of the slides for them to use in their classes. The presentation was given a 4.6 out of 5 by the delegates. This prompted a request to present at the HEIA conference in Queensland which, surprisingly, has more delegates than the national conference (390). Names and emails were collected for the Mushroom Lovers Club and forwarded to Bite Communications.

The HEIA Queensland conference on 12<sup>th</sup> August 2017 is the biggest home economics conference in the country. The dietitian gave a workshop to 35 attendees, while 50 delegates came to the cooking demonstration with Jamie Fleming, Masterchef finalist. He made recipes using mushrooms, and these recipes were later sent to all 390 delegates.

**2. Dietitians Association of Australia (DAA).** We had a mushroom stand in the exhibition hall in each of the last three DAA national conferences in Perth 2015 (810 delegates), Melbourne 2016 (1000+), where Glenn Cardwell presented a paper on vitamin D in retail mushrooms, and Hobart 2017 (622). In Hobart, we provided 2700 samples (Moroccan style mushrooms and lamb, mushroom soup and marinated mushrooms), along with recipes leaflets, handouts and brochures. Dietitians have been our strongest allies, with many writing articles about the mushroom (see point #21). We also supported the DAA 2014 Bariatric Road Show, Sydney 26 September 2014 (78 delegates), Adelaide (58 delegates) and Perth (59 delegates), providing mushrooms samples and the health professional brochure. Further with our DAA relationship, we were involved in Australia's Healthy Weight Week.

**3. Australia's Healthy Weight Week.** For five consecutive years we supported the DAA's Australia's Healthy Weight Week (AHWW) in February. We were involved in their national launch, including events in Adelaide, Melbourne and Sydney, provided social media updates for health professionals, and featuring mushrooms in their downloadable cookbook (<http://healthyweightweek.com.au/australias-healthy-weight-week-cookbook/>). In 2017 there were 544 events registered and held around Australia, a large increase since the first one in 2012, when a total of 57 events were held! In 2016, there were more than 740 events and more than 1,100 dietitians involved. The campaign infographic from 2016 appears here: <http://healthyweightweek.com.au/wp-content/uploads/2014/11/ahww-infographic-summary-2016.png>. The 2015 campaign was supported by Diabetes SA (<https://www.diabetessa.com.au/latest-news/ahww-2015-australia-s-healthy-weight-week-2015.html>) which led us to be further involved with their program (see point #23).

Some of the more creative AHWW events registered include a hula-hooping class, smoothie bikes, supermarket tours, and cooking demonstrations. Many of the events were run by local business owners, including more than 50 pharmacists, a number of government offices, universities, and local markets. DAA provided copies of the mushroom recipes from the cookbook to Bite Communications to promote through social media. The handout the project provided to dietitians gave the science behind mushrooms helping with weight loss, all in simple language. The handout was approved by

DAA before printing (see Appendices).

**4. Dietitian Day.** Presented to 250 dietitians and nutrition students for Dietitian Day, Brisbane 13 March 2015, offering mushroom samples, recipes and brochures. For Dietitian Day in 2017, we provided 215 conference bags (Australian Mushrooms shopping bags) and health professional brochures for the delegates (31 March 2017, Melbourne). See Dietitians Day sponsors report in Appendices.

**5. General Practice Conference and Exhibition (GPCE).** We had a previous involvement with GPCE in the period 2009-2012 as they had a good reputation in delivering CPD information to GPs and nurses. Presentations at this popular conference were:

- Perth (23-24 July 2016) two presentations on "Superfoods" to a total of 86 delegates (out of a total of 260).
- Melbourne (11-13 November 2016; 1250 delegates) where we gave two presentations on "Increasing Calcium and Vitamin D in the diet".
- Perth (22-23 July 2017; 275 delegates), giving one presentation on "Nutrition Myth-busting for Health Professionals". Dr Shivi Rayar interviewed Glenn Cardwell for her podcast series.
- Brisbane (1-3 September Brisbane 2017; 406 delegates), where we gave two presentations on "Nutrition Myth-busting for Health Professionals".

Each presentation included a section on the mushrooms as a source of vitamin D, as the audience found that the most intriguing aspect of the mushroom, as there was a strong acceptance that the mushroom was rich in essential nutrients.

The most common comment from these events is that our samples were tastier and healthier than the food provided by the conference venue. We use a tracker to collect names of delegates to go on our list of recipients for our *Talking Research* e-newsletter (see point #11).

We provided handouts, brochures and recipes for every delegate. In summary, we distributed: 1400 recipe leaflets, 200 mushroom bags, 1150 health professional brochures, 50 posters and spoke with virtually every one of the delegates, encouraging them to join the Mushroom Lovers Club and subscribe to the *Talking Research* e-newsletter. Our involvement in these, and past, GPCE conferences led us to be involved with the educational arm of the organisation called ThinkGP.

**6. Think GP.** We were able to engage Professor Rebecca Mason, Sydney University, to be our guest expert on a video for GPs and health professionals, discussing her area of research, vitamin D deficiency. Glenn Cardwell, Dietitian, discussed the vitamin D content of mushrooms and Sue Dodd did the food styling. The video was available on the ThinkGP website from February 2016-February 2017. The video was heavily promoted when it first came out, and again in October 2016. There were 330 views in the first six months, and another 143 views in the second six months (a total of 477 views). Each view counted towards GP's CPD points and came with a downloadable fact sheet (see point #14). As we retain the copyright, the video has been sent to White Prince Mushrooms to use on their website (no longer available), however White Prince still use our nutrition information (<http://www.whiteprince.com.au/health/nutritional-information/>). The video is also available on the Australian Mushrooms website (<http://www.australianmushrooms.com.au/health-nutrition/vitamin-d/>). Professor Rebecca Mason has previously commented on vitamin D in mushrooms (<http://www.news.com.au/national/breaking-news/mushrooms-are-vit-d-factories-scientist/news-story/eaad1d90c5cdb7702836800df8b86b6f8>).

**7. Royal Australian College of General Practitioners (RACGP).** For the first time, we

promoted mushrooms to 280 delegates at their national conference in Perth (29 September – 1<sup>st</sup> October 2016) as we knew that they attracted a different delegate range than GPCE. We served 450 mushrooms samples to GPs over three days, spoke to many delegates and provided handouts, recipes and brochures. No presentation was given at this conference.

**8. Australian Practice Nurses Association.** Exhibited at their annual conference in May 2016 which attracted 300 practice nurses. Of those, 75 attended the breakfast with celebrity chef Fast Ed Halmagyi (from Better Homes and Gardens) who gave them a cooking demonstration on simple ways to include mushrooms in recipes. Glenn Cardwell spoke about the numerous health benefits unearthed by mushroom research. Mushrooms featured on the conference website, and each delegate was given a copy of the brochure on mushrooms and bone health. Practice nurses often have to dispense nutrition advice to patients in GP clinics and, fortunately, mushrooms can be recommended for just about every type of restricted diet eg diabetes, heart disease, and weight control.

**9. Australian College of Nursing (ACN).** We became part of their Community and Primary Health Care Nursing Week 19-25 September 2016 (<https://www.acn.edu.au/community-and-primary-health-care-nursing-week-2016>). A 1400 word referenced article was written for their e-newsletter which goes to 7500 members. Mushrooms were acknowledged three times on Nurseclick with 9500 views and in their quarterly print journal, along with a 200-word summary of their nutritional value, and promotional facts (see example below). Mushrooms also appeared on ACN's Webpage, Facebook, Twitter, LinkedIn pages, media releases, and their e-book. The ACN sponsors report is in Appendices.



**10. Mushrooms and Health Global Initiative (MHGI).** This initiative was instrumental in alerting growers, mushroom associations, health professionals and other researchers about recently published research and health promotional activities. A quarterly Bulletin, edited by Mary-Jo Feeney, USA, was created through a collaboration with the USA, UK, Spain, Netherlands and Australia (<http://www.mushroomsandhealth.com/mhgi-bulletin/>). As the funding ended, the last Bulletin was distributed in August 2016 (see Appendices). The MHGI also served to promote the four CSIRO *Mushroom and Health Reports* to health professionals throughout Australia and the world. The

Bulletin often was the basis for articles in the *Talking Research* e-newsletter. Through MHGI we were invited to present on vitamin D in Australian retail mushrooms at the 2017 International Society of Mushroom Science conference (<http://www.isms.biz/amsterdam/volume-19-part-1-article-46/>). See point # 25.

**11. Talking Research.** Our regular research update e-newsletter, *Talking Research*, went to 1333 subscribers on 12 occasions between September 2014 and August 2017. It highlighted the most recent published health-oriented mushroom research, often linked to a health promotion week. Topics included vitamin D, salt reduction, umami flavour, and the release of the 2014 CSIRO *Mushrooms and Health Report*, antioxidants and prebiotics in mushrooms, memory influence, and blending mushrooms with meat to enhance the nutrition profile of, for example, burgers. *Talking Research* had an open rate of 25-28%, which is higher than the industry average for health-related e-newsletters (about 16%). The average click through rate is 8.5%, higher than the industry average of 6.35%. Chris Rowley assisted with the design, editing and distribution of the content. Copies of the most recent editions are available below.

**July 2017**                    [Ergothioneine, glutathione and Neanderthals](#)

**March, 2017**                [Mushroom polysaccharides](#)

**December, 2016**         [Diabetes and Mushrooms](#)

**August, 2016**             [Antioxidants and Prebiotics](#)

**January, 2016**            [Mushrooms and Brain Health](#)

**12. Australianmushrooms.com.au.** The nutrition section of the website was updated, including the fact sheets and the vitamin D section based on new figures regarding the vitamin D content of retail mushrooms. The website Nutrition pages had 44,000 visits July 2014 – June 2015. This increased to 67,896 visits from Australia between 1 July 2015 – 13 May 2016, which was 29% of all the page views on the website. That is about 6500 health and nutrition page views per month from within Australia. The most popular sections were the advice on protein, carbohydrate, vitamins and minerals in mushrooms, and vitamin D. With the new Australian Mushrooms website (it changed in May 2016), the health and nutrition page views have dropped considerably, down to 865 page views per month, as the marketing becomes less nutrition and health focused.

**13. Health professional brochure.** The updated fully referenced 12-page health professional brochure *Discover the Power of Mushrooms* was launched at the Dietitians Association of Australia annual conference in 2015, and distributed to the State Promotion Officers for use at their functions. The brochure was available online, while the printed version was given out at events and conferences. The handouts, fact sheets and health professional brochure are no longer available from the Australian Mushrooms website.

**14. Handouts - Healthy Bones & The 3<sup>rd</sup> Food Kingdom.** In conjunction with the ThinkGP video we also produced a handout to be used by doctors, nurses, dietitians and home economists on calcium and vitamin D for healthy bones, focusing on mushrooms as a vitamin D source (based on the NMI analysis accepted by FSANZ – see point #25). This has been distributed around the country and a copy could be downloaded from the ThinkGP website when the video was still current. As mentioned in point #3, a public handout on mushrooms and weight control, to be given out by dietitians, was designed the Australia's Healthy Weight Week, however, this became a very useful handout for any audience. A copy of each handout is in the Appendices.

**15. Naturopaths.** We had two 3-page fully referenced articles on the benefits of mushrooms

published in the Australian Natural Therapists Association journal, *The Natural Therapist*, with a 10,000 circulation. After negotiating with the journal editor, the three pages were placed alongside a ½ page paid advertisement over two editions (March 2016 Vol 31 (1): 16-19 & July 2016 Vol 31 (2): 16-19). Part 2 is online: [https://issuu.com/antatherapist/docs/tnt\\_v31\\_1\\_march\\_16\\_final\\_print2](https://issuu.com/antatherapist/docs/tnt_v31_1_march_16_final_print2)).

**16. CheckUP** is a Queensland-based health professional body that run workshops for GPs, nurses and allied health professionals. We had a 2-year relationship with them, over four conferences. A 200-word article on mushrooms was included in four separate e-newsletters to their members. They always gave us an opportunity to speak to the entire conference about the latest research on mushrooms. We were the only exhibitor permitted in the conference hall, so that the aroma of cooked mushrooms pervaded the conference, making us the single most popular exhibitor at the conferences, which were:

- CheckUP Nurses conference, Brisbane 12<sup>th</sup> June 2015 (90 delegates);
- CheckUP Health Professionals conference 28 August 2015 (150 delegates),
- CheckUP Health Professionals conference 2<sup>nd</sup> September 2016 (160 delegates),
- CheckUP Nurses conference 11<sup>th</sup> November 2016 (98 delegates).

**17. Nutrition Australia.** Supported Nutrition Australia's National Nutrition Week (NNW) in October 2016 through their *Try for 5* campaign, aimed at encouraging consumers to eat five serves of vegetables each day. Mushrooms were promoted through their Facebook page (19,000 followers), Twitter (11,000 followers), their mailing list (8,500) and website. The NNW report from Nutrition Australia is in the Appendices.

**18. Breast Cancer Awareness Week.** An audience of food bloggers and writers, dietitians and chefs invited to the AMGA's dinner functions in Sydney, Melbourne, Adelaide and Perth (Sept-Oct 2014), were given presentations on mushrooms and the 10 published papers showing a link between mushroom consumption and a lower risk of breast cancer. Each event attracted 30-50 attendees keen to hear the latest research news. That year many mushroom growers used pink packing boxes to promote Breast Cancer Awareness Week. The media interest was generated through AMGA marketing.

**19. Australian Mushroom Growers Association (AMGA).** At the AMGA conferences in 2016 (Mildura, Victoria) and 2014 (Melbourne) we presented on the outcomes of the project to the growers at their biennial conference. The project assists the growers as required. We worked with both Coles and Woolworths to meet their requirements for the sale of Vitamin D Mushrooms, the design of their punnet labels to meet the Food Standards Code, assist the growers in obtaining nutritional analyses of their mushrooms, and provide information that they can include on their company websites. For example, we helped Nick Femia, SA Mushrooms, with the analysis data from Symbio Laboratories, a vitamin D fact sheet and the background information for his launch of Vitamin D Mushrooms (<http://www.samushrooms.com.au/vitamin-d/vitamin-d-background>). Their story appeared online 4<sup>th</sup> July 2017:

<http://www.fruitnet.com/produceplus/article/172693/mushroom-delivers-vitamin-d> and here: <https://foodmag.com.au/vitamin-d-mushroom-released/>. We helped White Prince Mushrooms negotiate with Coles supermarkets, and Costa with Woolworths, to get Vitamin D Mushrooms onto the shelves. White Prince have included their Vitamin D Mushroom information here: <http://www.whiteprince.com.au/health/nutritional-information/>, while Costa Mushrooms discuss Vitamin D Mushrooms here: [http://costagroup.com.au/mushrooms/white\\_mushrooms](http://costagroup.com.au/mushrooms/white_mushrooms).

AMGA Journal coordinator, Chris Rowley, keeps the growers up-to-date with regular articles on MU14000 and how it is promoting mushroom health benefits around Australia. We have also

provided specific articles as requested, such as an article on the protein and fibre content of mushrooms (Autumn 2015).

Assisted the AMGA with their TV advertisements in January 2016, in response to a series of questions that needed to be resolved before Commercials Advice (CAD) would permit them to be aired. The project also provides nutrition advice for press releases, recipes and advertising that targets the public.

Lifecykel is new grower of oyster mushrooms in Perth and Melbourne. We provided nutrition advice and linked them to a researcher at Sydney University who will be analyzing their mushrooms for various nutritional components. This data is yet to be published.

**20. Farm Tours.** The project has supported farm tours, and cooking and food styling demonstrations because they are very popular, very practical and generate a lot of discussion (and appreciation) about the mushroom. They are attended by bloggers, food media, academics, nutrition students and dietitians. Mushroom farm tours:

- Adelaide SA Mushrooms (23 dietitians, bloggers and writers), 6 June 2017
- Melbourne Parwan Valley Mushrooms and Prahran Markets (36 dietitians, bloggers and writers), 5 August 2017
- Perth Costa Mushrooms Casuarina and Fremantle TAFE (26 dietitians, bloggers and writers), 15 June 2017.
- Adelaide SA Mushrooms attracted 40 bloggers, media and dietitians and nutrition students, 14 June 2016
- Melbourne Parwan Valley and Prahran Markets had 42 attendees, including academics, student dietitians, nutritionists and food media, 16 July 2016
- Sydney cooking and food styling demonstration with chef Janelle Bloom, Sydney (29 August 2015), capped at 30 attendees. This had a focus on Blendability looking at ways of using both mushrooms and meats in the same dish (see Blendability pdf in Appendices).
- Melbourne Bulla Mushrooms and Prahran Markets (27 June 2015) with 38 attendees.

Each attendee at the tours and demonstrations receives a quiz to complete to go into the running for a prize of an apron, cookbook and cooler bag pack. The Twitter and Instagram feed for the 2016 Melbourne farm tour at Parwan Valley farm and Prahran markets reached over 100,000 people, while the 2017 event reached over 220,000 people. An example of what is written after a farm tour is here: <http://foodiecravings.com.au/2017/07/much-know-humble-mushroom/>

**21. Assisting the media and health professionals.** Responded to requests for help from dietitians, bloggers, journalists and researchers specifically about mushrooms, new research results and health. For example:

- Provided quotes for the PR company, Bite Communication, and their story for *Body & Soul* magazine (News Corporation, 352,000 readers). The article appeared 12 March 2017 (a copy can be found in Appendices). Our quotes were attributed to Dietitian Rebecca Gawthorne because she has 150,000 Instagram followers and therefore a great reach to the public.
- Dietitian Sue Radd and her award-winning cookbook, *Food as Medicine*, includes eight mushrooms recipes and mentions Vitamin D Mushrooms. She specifically stated that she was influenced by the information provided by the project.
- A Twitter conversation on mushrooms, created by dietitians Emma Stirling and Catherine

Saxelby, was conducted with health professionals (17 June 2015) and generated 603 tweets with a potential reach of over 90,000 people.

- Journalists used mushroom nutrition information to generate 391 print articles in the period Sept 2014 – August 2015). We wrote an article on Mushrooms for Movember (November 2015) article for chef Jaye Keogh.

Dietitians continue to be conduits of the mushrooms and health message. A wonderful example is the four-page article on mushrooms in the July 2016 edition of the *Healthy Food Guide*, written by a dietitian, using our information, yet published without our involvement (see Appendices). The Healthy Food Guide has over 260,000 readers and 57,000 Facebook followers.

In June and November 2015, TV personality and dietitian Dr Joanna McMillan included mushrooms as a superfood for new mums here: <http://www.theglow.com.au/health/best-foods-for-new-mums/> and here: <https://drjoanna.com.au/recipebank/roast-mushroom-cauliflower-soup-389/>

Well-known author and dietitian Catherine Saxelby has also written about mushrooms and vitamin D. (<http://foodwatch.com.au/blog/healthy-eating-for-wellness/item/mushrooms-a-surprising-source-of-vitamin-d.html>).

Media Dietitian Susie Burrell has been a keen supporter of mushrooms, writing about them in her blog on two occasions (<http://www.shapeme.com.au/blog/everything-you-need-to-know-about-mushrooms/> and <http://www.shapeme.com.au/blog/the-nutritional-benefits-of-mushrooms/>).

Sometimes, well-meaning people muddle the message. Nutrition Force did a blog on vitamin D and stated that mushrooms were 'fortified' with vitamin D, implying vitamin D was added when it is naturally generated by sunlight or another source of UV light. This was corrected 28 august 2016 (<http://nutritionforce.com.au/food-good-bad-2/>).

Mushrooms are now frequently being seen as a good source of vitamin D, for example:

<http://www.heraldsun.com.au/news/national/mushrooms-the-new-superfood-that-delivers-double-your-vitamin-d-requirement/news-story/d0a83b0c4138535bda8eb36253bdfa57>

<http://www.news.com.au/national/breaking-news/mushrooms-help-fight-winter-health-threat/news-story/c6f4757d173596bff59ef850cc8b7643>

<http://english.astroawani.com/lifestyle/eat-mushrooms-avoid-brittle-bones-australian-researchers-65028>

<http://www.mnn.com/food/healthy-eating/blogs/9-foods-naturally-high-vitamin-d>

<http://tasmaniantimes.com/index.php?plategrape-article/the-mighty-mushroom-/>

<http://www.burwoodscene.com.au/2015/07/light-shines-on-mighty-mushrooms/>

The video of Glenn Cardwell and celebrity chef Fast Ed Hamagyi discussing mushrooms and vitamin D has now had over 11,000 views ( [https://www.youtube.com/watch?v=FWpvHYJMd\\_w](https://www.youtube.com/watch?v=FWpvHYJMd_w) ), while another interview on the same topic with Professor Michael Holick has had 3500 views (<https://www.youtube.com/watch?v=LDMY-lXXftc> ).

There are many more examples on-line. In September 2017, placing the words 'mushroom', 'vitamin D' and 'Australia' in an online search engine found that over 90% of the first 80 listings used information provided by the project. It is similar when 'mushroom', 'health' and 'Australia' are placed in the search engine. This is an indication of the legacy of the project.

**22. Outside experts:** Dr Shiuan Chen, from the City of Hope Beckman Research Institute, US, has



researched the influence of mushrooms on both breast and prostate cancer. During his visit to Adelaide, in August 2015, we were able to take advantage of his brief stay by generating local media attention in the *Advertiser* newspaper and three radio programs. As mentioned in point #6, Professor Rebecca Mason from the University of Sydney, a world-renowned expert in vitamin D, provided the commentary on our video for ThinkGP.

**23. Diabetes SA.** On two occasions, we presented at their annual health seminars. The first one was in conjunction with Australia's Healthy Weight Week (21 February 2015), with Dr Alison Coates (235 delegates), and included mushroom sample tasting and offered recipes and handouts. The second opportunity was on 25 February 2017, to 300 delegates, with Professor Trevor Lockett from the CSIRO. Again, there were mushroom samples, recipes and handouts. This prompted the request for a 600 word article for their July 2017 *Living* magazine which goes to 28,000 readers with diabetes (<https://www.diabetessa.com.au/latest-news/living-july-2017/pdf.html>). This, in turn led to a request for an article for the Parenting Expo in Adelaide, via the Food Studio who have promoted mushrooms for many years (<https://www.pbcepo.com.au/pregnancy/pregnancy-nutrition/why-mushrooms-are-good-for-you-and-baby/>).

**24. Diabetes ACT.** Specifically requested handouts on the 3<sup>rd</sup> Food Kingdom and Healthy Bones (Calcium and Vitamin D) to give out at National Multicultural Festival and the Royal Canberra Show. An example in an increased interest in mushrooms through our involvement with dietitians and their trust in the credibility of the information.

**25. Food Standards Australia New Zealand (FSANZ) & NUTTAB nutrient database.**

Analysis of retail mushrooms for their vitamin D content by the National Measurement Institute (NMI) in 2015 revealed a surprisingly high level of vitamin D in mushrooms available to the consumer, such that we can now promote that a serve of mushrooms provides 23% of the Adequate Intake (AI) of vitamin D, while those given pulsed UV light generated at least 100% of the AI of vitamin D. The entire process was coordinated through state directors and the project manager, following the sampling directives of FSANZ and using an accredited method of analysis by NMI. This information appeared on the FSANZ website in 2015:

<http://www.foodstandards.gov.au/science/monitoringnutrients/nutrientables/Pages/Data-provided-by-food-companies-and-organisations.aspx> and the full report can be found here:

<https://www.foodstandards.gov.au/science/monitoringnutrients/nutrientables/Documents/FINAL%20-%20Vitamin%20D%20Mushrooms%20report.pdf>.

PR company Porter Novelli was engaged to promote the new data from NMI to health professionals and the public, using a fact sheet, infographic and media releases. Their media coverage and infographic is in the Appendices and describes how the publicity attained nearly 40 million impressions using key nutrition commentators. Further information on the media clippings is available on request.

In July 2017, FSANZ stated that the vitamin D data will be included in the updated NUTTAB database, to be known as the Australian Food Composition database. Now all researchers, dietitians and nutrition professionals will see that mushrooms are the only significant non-animal source of vitamin D, which is important for the 2.1 million Australian vegetarians (Roy Morgan survey August 2016).

## Outcomes

The project generated a significant body of nutrition and health information available to health professionals, and the consumers they advise, in total confidence that mushrooms have both short-term and long-term health benefits when consumed regularly.

Attending state and national conferences was an effective way to engage with delegates, the people most likely to repeat the message about the benefits of mushrooms to clients, family and friends. The mushroom booth was always popular in the conference exhibition halls as we would cook mushroom samples and the aroma would attract an audience and comments. This gave us an opportunity to talk about mushrooms, provide recipes and supporting information. Because our information was always scientifically justified recipients could reliably broadcast the information. In turn, this led to a number of requests for articles, interviews and further involvement in conferences.

With the change in the structure to project management and Horticulture Innovations Australia it became more expensive to run events in each state as the program was no longer integrated into the AMGA marketing program, while conference venues became stricter and constraining in their exhibition guidelines.

Nevertheless, the project achieved a broad range of significant outputs. For example, as we had engaged dietitians since 2009, they became regular supporters of mushrooms in their work. Sue Radd, a well-known dietitian, included eight mushroom recipes in her "Food as Medicine" cookbook that was awarded the Best Health & Nutrition Cookbook in the World for 2016. A dietitian wrote a four-page article in the July 2016 edition of the Healthy Food Guide, using our information, yet without our involvement. Other famous dietitians Joanna McMillan and Cath Saxelby have been long-time supporters, and mushroom recipes appeared in the Dietitians Association of Australia's downloadable cookbook for Australia's Healthy Weight Week 2015-2017.

As the project progressed we expanded our range of health professional to include natural health practitioners and home economists, especially as the latter influence chefs, cooks and students in their food and ingredient choices. Health professionals directly obtained information on practical tips based on newly published research through the *Talking Research* e-newsletter, receiving four editions a year for the past three years. Based on a half-page promotion we were able to get a 3-page article in two editions of the *Natural Therapist* journal, and had a strong relationship with the Home Economics Institute of Australia.

All the objectives were achieved, sometimes beyond our expectations. For example, although we did anticipate having articles published in professional journals, such as the *Natural Therapist*, we had not expected to be invited to write articles for peer reviewed journals and books.

A key benefit is that there is now a much greater appreciation that the mushroom is not a vegetable, and not even a plant food, so it has a different nutrition profile and different effects on human physiology and health. For example, plants don't generate vitamin D when exposed to a source of UV light, such as sunlight, while mushrooms do. Three mushroom growers have produced retail Vitamin D Mushrooms (using UV light as the stimulus). That has given the growers confidence to experiment with enhancing the vitamin D levels in dried and powdered mushrooms. The major supermarkets have faith in the industry after the project responded to all their questions and

demands before placing Vitamin D Mushrooms on the shelves, a process that took 6-12 months of submissions using scientific justification for our statements. The supermarkets were concerned that something unnatural was being done, or added, to the mushrooms and it took some time for them to appreciate that exposure to UV light was merely mimicking what occurs with wild mushrooms and sunlight. To get a sense of the breadth of the acceptance of mushrooms as a source of vitamin D, you only need to place the words "Mushroom, vitamin D, Australia" into an internet search engine to see the number of on-line articles using the information provided by this project (over 90% of the first 80 listings, September 2017).

After having retail mushrooms around Australia tested for vitamin D back in 2015, FSANZ will be including the data in their new NUTTAB database, to be known as the Australian Food Composition Database. We adhered to all their guidelines for submitting information and this was accepted without modification, so now mushrooms will be known as a source of vitamin D. It was pleasing to hear that our submission was the first time a food industry or company had met all the criteria for data acceptance at the first application. Admittedly, we first ran a very small pilot program to iron out any problems with the collection and analysis process before we did the full-scale sampling from around the country.

The health information we supply is well-respected as it is based on the CSIRO *Mushrooms and Health* biennial reports along with recently published research. The project finishes with the mushroom industry having a good reputation as a provider of quality information.

Additional benefits from the project have been very supportive articles, recipes and chapters appearing in magazines, books and cookbooks without our knowledge or from being requested based on our reputation, including the four peer-reviewed articles listed in the Scientific Refereed Publications section of this report, none of which were part of the initial objectives.

The project has generated a huge amount of confidence in both health professionals and the consumer for the mushroom industry and the nutritional and health value of the mushroom. In the long term, there is now an opportunity to continue the public and professional confidence in mushrooms by regularly reminding them of their benefits through monitoring published research and placing nutrition and health summaries on the Australian Mushrooms website.

The 2014 CSIRO Mushroom and Health report will retain its high stature until about 2019 when it will be considered out-of-date. Previously it was updated every two years. The industry will need to assess if an update is an effective use of funds.

The mushroom is truly unique and has an enviable opportunity to be considered an essential food group, or termed the 3<sup>rd</sup> Food Kingdom after plants and animal-derived foods. The scientific evidence provides all the evidence to justify such a stance.

## Evaluation and Discussion

The educating, and communicating to, health professionals has been a decade-long process with the three years of MU14000, and its predecessors MU1102 and MU06023. The project has established a reputation as a reliable source of scientific information substantiating the positive influence mushrooms has on the short and long-term health of consumers.

Conference presentations were crafted to suit each audience, always providing practical information that the delegates could immediately use, such as the best sources of vitamin D, how to assess a food label, and the reasons why mushrooms may reduce the risk of breast cancer. Organisers would rarely accept presentations that focused solely on mushrooms, yet there were happy to accept nutrition-based presentations that had a small section dedicated to the science and research of *Agaricus bisporus* button mushrooms. The mushroom information was kept to the final part of the presentation so that it was freshest in their minds, before being directed to the mushroom stand for samples and further information. Each conference provided delegate feedback, and our presentations commonly received an 8-10 out of 10 for practical usefulness. This was the main reason GPCE and HEIA continued to invite us to return over the years.

Creating websites, fact sheets, health professional and public brochures, presenting to health professionals, doctors, nurses, health writers and mushroom growers has meant that the project team has generated a significant body of nutrition and health information, giving consumers and health professionals total faith that mushrooms have proven health benefits when consumed regularly.

The Mushroom Lovers Club was an excellent method to get nutrition information to subscribers, especially in the era before 2015 when the project was integrated with the AMGA marketing program. Likewise, *Talking Research* is another simple means to get to health professionals and new subscriptions could be encouraged at conferences or through competitions. It had an above industry average open rate and was always designed to be a quick read, written in simple language, accompanied by a couple of seasonal recipes.

The growers have been very supportive of the project and having curious visitors at their farms, despite the 1-2 hour disruption to the farm management. Indeed, the farms encouraged us to return as they enjoyed talking about their craft. Farm tours are very well accepted and should be continued as each of the farm managers have been eager to talk about the growing process and permit the cutting and tasting of fresh mushrooms direct from the growing beds.

It was pleasing to the growers to have mushrooms promoted somewhere each month for the past three years knowing that the supporting information was high quality and they, in turn, could rely on the advice provided by project management. Over the last decade the project has updated the growers at each of the AMGA national conferences.

Knowledge of the Food Standards Code was critical in dealing with any concerns of Commercial Advice (CAD) when advertising on free-to-air television, and dealing with supermarkets when wanting to launch a new product such as Vitamin D Mushrooms. That same knowledge was required for developing nutrition information panels for mushroom punnet labels and mushroom paper bags, and responding to requests from supermarkets and health agencies.

There was suspicion that retail button mushrooms could be providing vitamin D to the consumer. After a pilot study, with the direction of FSANZ and the government laboratory NMI, it was established that, on average, a serve of mushrooms provided 23% of the daily adult vitamin D requirements. First, this generated a lot of publicity throughout the country, with the help of a PR agency, and secondly, the data has been incorporated into the official government nutrient database. It is quite a coup for the industry to be able to state that mushrooms are a significant source of vitamin D.

Conferences have been a particularly useful way to influence health professionals, especially if you can get a place on the conference program, obtain their contacts for your database, and provide fully referenced documents on the benefits of mushrooms. In the latter years it has become difficult to offer cooked samples in convention centres and hotels, as they now prefer only their own staff in the kitchen, all electrical equipment to be tagged, some ingredients only provided by the venue (at a much higher cost), and an expensive short-term licence to cook on site. It may be that in the future that the industry can provide only health information to delegates and not cooked samples from an exhibition booth.

Health professionals are a worthwhile group to influence as they are willing to convey information about mushrooms to both the public and their patients. Future projects should continue to target anyone who is a conduit of nutrition information, from doctors and dietitians to chefs, cooks and catering companies.

The project has been particularly successful in generating interest in the health benefits of mushrooms based on peer-reviewed published research. It has left a legacy of health information on websites and in the published science and a band of health professional supporters. It is hoped that the future will see further promotion to health professionals, health writers and bloggers and the wider media to keep mushrooms as a food of first choice in the minds of the consumer at the supermarket.

So much good will has been created through this project and it has provided a solid foundation for new ways to engage the health professional, cooks, and writers in the future with emerging media and methods of communication.

## **Recommendations**

1. That local research continues to be promoted via conferences and newsletter as these methods are very simple and powerful ways of generating interest from health professionals.
2. The research should also be widely promoted to health and food writers as they have a direct influence on consumers.
3. Nutrition information on the website should be updated annually to reflect the growing knowledge about mushrooms, nutrition and health.
4. Consideration be given to creating a new health professional promotion campaign as they are a publicly trusted voice regarding health information.
5. Collaborate with home economists, chefs and catering companies to appreciate the nutrition and health benefits of the mushroom.

## Scientific Refereed Publications

### Journal article

Cardwell, G., 2016. Practical nutrition advice for healthy bones. *Journal of the Home Economics Institute of Australia* **23** (3), 15-18

<http://search.informit.com.au/documentSummary;dn=710529537214537;res=IELIND>

Cardwell, G., 2014. Mushrooms – the 3rd food kingdom. *Journal of the Home Economics Institute of Australia* **21** (2), 13-19

<http://search.informit.com.au/documentSummary;dn=110218155407984;res=IELIND>

Feeney, MJ., Roupas, P. 2014. Mushrooms - biologically distinct and nutritionally unique: exploring a "third food kingdom" *Nutrition Today* 2014; **49** (6), 301-307 (see Appendices)

### Chapter in a book or Paper in conference proceedings

Cardwell, G., 2015. Vitamin D-enhanced mushrooms. In: 2015 McGraw-Hill Yearbook of Science and Technology published in the USA, pp. 378-380.

<http://www.accessscience.com/content/vitamin-d-enhanced-mushrooms/YB150932>

# Intellectual Property/Commercialisation

No commercial IP generated



# References

Nil.

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## Appendices

1. Australia's Healthy Weight Week handout, titled "The 3<sup>rd</sup> Food Kingdom".
2. Australia's Healthy Weight Week 2016 sponsors report
3. Sunday Times Body and Soul article March 2017
4. Healthy Bones handout
5. Dietitian Day 2017 sponsors report
6. Australian College of Nursing sponsors report
7. Final Mushrooms & Health Global Initiative Bulletin August 2016
8. National Nutrition Week 2016 report from Nutrition Australia
9. Blendability handout Sydney 2015
10. Healthy Food Guide article July 2016
11. Porter Novelli Media results
12. Porter Novelli Media tracker
13. Porter Novelli mushroom infographic
14. Nutrition Today paper (Feeney et al)