

COMMUNICATING THE HEALTH BENEFITS OF PORK CONSUMPTION

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Report prepared for the
Co-operative Research Centre for High Integrity Australian Pork

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Executive Summary

Rationale for undertaking the Project

Fresh pork is a core food that delivers important key nutrients to the diet and may be associated with favourable effects on body composition and cardiovascular health. Despite this, consumer research suggests that pork is perceived as less healthful and fattier in comparison to beef and chicken [1-3]. Recent research also suggests that consumers may be unsure of the unique nutrition and health benefits of fresh pork in comparison to other sources of meat [4]. Given the significant investment by Pork CRC towards research that has identified several unique health benefits, it is important that evidence evaluating the effect of fresh pork on health be identified, reviewed and translated to a form easily accessible to a range of individuals including health professionals and the general public.

Outcomes of the project

A narrative review was constructed to focus on areas where there was sufficient research on a health outcome associated with fresh pork consumption. The areas where pork was associated with favourable health effects included body composition and cardiovascular health. A discussion of the important contribution of pork to nutrient intakes was also included. Two summary documents were developed, suitable for communicating the findings of the narrative review and other pertinent information about the health benefits of pork to health professionals, and to the general population. Finally, a scoping study was conducted that identified several opportunities for communicating the health and nutrient benefits of pork consumption, including communication to the Dietitians Association of Australia and Royal Australian College of General Practitioners memberships, via partnership opportunities, conference sponsorship, and communication via social media.

Relevance of the project's outcomes to the Australian Pig Industry

This research and associated components has consolidated the evidence base surrounding the positioning of fresh pork as a healthy meat that may have favourable effects on both body composition and measures of cardiovascular health when consumed as part of a healthy diet. The dissemination of information summaries created within this project will help inform consumers and health professionals of the contribution of fresh pork to a balanced diet and may help to dispel the myth that pork is less healthy than other meats. It is anticipated that the appropriate dissemination of the information created throughout this project may assist with positively raising the profile of fresh pork. Such an approach could assist in driving consumer demand for fresh pork, potentially leading to an increase in sales, which will directly benefit the Australian Pig Industry.

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1. Introduction

Fresh pork represents a core food in the Australian diet, as well as in many other cuisine contexts worldwide and is responsible for the contribution of a range of essential nutrients. Recent research has demonstrated that the unique nutrition composition of fresh pork may have favourable health effects in areas such as the contribution of key nutrients and weight management. In a previous Pork CRC funded project examining pork consumption in Australian children, fresh pork was found to contribute 13% of total protein consumed, 15% of thiamine, 12.4% of long chain omega-3 polyunsaturated fatty acids, and 10% of niacin, as well as smaller amounts of other essential nutrients such as zinc, phosphorous and potassium [5]. Similarly, fresh pork was found to contribute substantially to intakes of thiamine, niacin, protein and selenium in a representative survey of Australians [6].

Similarly, the consumption of up to 1 kg of lean fresh pork per week resulted in significant reductions in weight, body mass index (BMI), and measures of body fat compared with a habitual diet in overweight adults in a Pork CRC funded study [7]. Consumption of a diet rich in pork protein for 4 days also resulted in a larger increase in the 24-hour energy expenditure of participants compared with diets rich in carbohydrate or soy protein [8]. Finally, an acute study also found that pork increased the secretion of the gut hormone peptide YY (which increases feelings of fullness) to a greater extent than either beef or chicken [9].

Despite its nutrient contribution, and the aforementioned health effects, pork meat is often perceived less favourably than other foods within the meat category. In particular, consumer research suggests that fresh pork is perceived as less healthy and fattier in comparison to beef and chicken [1-3]. Recent research also suggests that consumers may be unsure of the unique nutrition and health benefits of fresh pork in comparison to other sources of meat [4]. Given the significant investment by Pork CRC towards research which has identified several unique health benefits, it is important that evidence evaluating the effect of fresh pork on health be identified, reviewed and translated to a form easily accessible to a range of individuals including health professionals and the general public. Outcomes from this process should be coupled with information to assist in the identification of appropriate and cost-effective channels to distribute any final information to health professionals for education to consumers. It is anticipated that outcomes from this project should assist both consumers and health professionals to identify some of the health benefits associated with fresh pork consumption and to dispel some of the myths surrounding the perception of fresh pork as a less healthy meat variety.

The aim of this project was to review and consolidate the evidence base surrounding the health benefits of pork consumption and to translate this

evidence into a form easily understood by a variety of stakeholders, including health professionals and the general public.

Specific objectives for this project were to complete a comprehensive narrative-style literature review of the health benefits of pork consumption, translate evidence acquired for this review into a consumer-friendly format for marketing the health benefits of pork and to complete a scoping study to identify costs and best strategies to distribute this information to health professionals.

2. Methodology

This project initially involved a narrative style literature review to identify relevant literature exploring the health benefits of pork consumption. For the completion of this review, Medline, PubMed, Cochrane Library and ScienceDirect databases were searched to August 2015 using the following search terms: (pork OR "pork meat" OR bacon OR ham) AND (health OR "weight loss" OR obesity OR nutrient OR children OR older adult* OR cognition OR satiety OR "nutrient dens*" OR "energy expenditure" OR thiamin* OR diet OR protein). The search was limited to articles published in the English language and focussed primarily on human research, however, some animal research was considered for mechanistic purposes. Additional relevant articles were also sourced from the reference lists of original articles. Unpublished data from Pork CRC research reports was included, where appropriate.

Following completion of the search, all relevant information obtained was consolidated into a narrative style literature review, suitable for publication in a scientific journal.

The information obtained throughout the literature review was then utilised as a basis for the completion of two summary documents, one suitable for health/nutrition professionals and one suitable for the general population. Information on how pork may be included within the Australian diet in accordance with the most recent Australian Dietary Guidelines [10] was also included within each summary document. The SMOG readability formula (a tool used to estimate the number of years of education a person would need to understand a piece of writing) was utilised to ensure the appropriateness of each summary document to the target audience [11].

Finally, a scoping study was conducted. This involved contacting key individuals from organisations involved with the distribution and interaction of nutrition information to health professionals who may then discuss this information with consumers. Options (including costings, strategies and contact details) for the communication of information relating to the health effects of fresh pork intake were obtained from the Dietitians

Association of Australia, The Royal Australian College of General Practitioners and the social media platform, #EatKit.

3. Outcomes

Based on the available literature, the narrative review was constructed to focus on areas where there was sufficient evidence of a health outcome associated with fresh pork consumption (Appendix 1). The areas that pork was associated with favourable health effects included body composition and cardiovascular health. A discussion of the important contribution of pork to nutrients was also included.

A brief summary of the review is as follows:

This exploratory, narrative review aimed to explore the evidence base surrounding the effects of fresh pork on body composition and markers of cardiovascular health. Fresh pork consumption may be associated with favourable effects on body composition including waist circumference and waist-to-hip ratio, although it is not clear if this differs from other meats. Improvements in body composition may be mediated by increases in energy expenditure and markers of satiety compared to other protein sources. Effects on satiety should however be considered in the context of human behaviour as they failed to consistently result in decreases in subsequent energy intake. Fresh pork intake was also reported to have favourable effects on markers of cardiovascular health including LDL and VLDL cholesterol and serum triglycerides, however this effect did not consistently differ from the results for other meats. Population research also suggests that fresh pork contributes to the dietary intake of a range of essential nutrients including thiamin, long chain omega-3 polyunsaturated fatty acids, potassium, niacin, protein, zinc, niacin, vitamin B6, vitamin B12 and selenium. This body of evidence relating to the consumption of fresh pork and effects on both body composition and markers of cardiovascular health challenges the consumer perception of pork as a fattier and less healthy meat variety. However there was a paucity of literature including fresh pork as an isolated meat suggesting the need for future research in this area, particularly randomized controlled trials to explore these health parameters more thoroughly.

Two summary documents were developed, suitable for communicating the findings of the narrative review and other pertinent information about the health benefits of pork to health professionals, and to the general population (Appendices 2a and 2b). Application of the SMOG index to the consumer summary document resulted in a score of 9.1, which corresponds to a ninth grade reading level and is considered to indicate an average level of readability. In comparison, the health professional summary document was scored at 11.3, which corresponds to an eleventh grade reading level, suitable for health professionals.

The scoping study identified several opportunities for communicating the health and nutrient benefits of pork consumption, including communication to the Dietitians Association of Australia and Royal Australian College of General Practitioners memberships, partnership opportunities, conference sponsorship, and communication via social media. Included in the results of the scoping study are quotes and contact details for each option, allowing Pork CRC to proceed with preferred options.

Each of the components of this project are included as appendices within this report.

Appendix 1 is the narrative style literature review on the health benefits of fresh pork, currently written in a format suitable for scientific publication. Please note as this document will be submitted to a journal for publication, the full text of the literature review should not be uploaded on the internet prior to manuscript acceptance.

Appendix 2a is the summary document of the health benefits of fresh pork suitable for health professionals.

Appendix 2b is the summary document of the health benefits of fresh pork suitable for the general population

Appendix 3 is the scoping study of potential options for marketing the health benefits of fresh pork to health professionals

4. Application of Research

Application of the research findings in the commercial world

This project has generated important intellectual property to inform Pork CRC of the current health effects of fresh pork, particularly in relation to body composition and cardiovascular health. Outcomes from this project, including the summary documents in particular, may be used to communicate these health effects to a range of stakeholders to inform consumers about the important positioning of fresh pork as part of a balanced, omnivorous diet. It is anticipated that the appropriate dissemination of such information may assist with consumer demand for fresh pork, potentially driving an increase in sales.

Opportunities uncovered by the research

Several opportunities have been identified as a result of this project which should directly benefit the pork industry. The literature review has identified that fresh pork may have beneficial effects on both body composition and cardiovascular health, although the evidence is still preliminary in nature. In particular, pork was not found to have detrimental effects compared to other protein sources. This is an important finding and should be communicated to consumers and health professionals to assist in dispelling the myth that fresh pork may be less healthy and fattier than other meat sources. The literature review and associated summary documents may also assist consumers to identify fresh pork's many nutrition benefits including ways to incorporate fresh pork in the diet in

accordance with the latest dietary guidance, previously identified as a potential barrier to consumption in Pork CRC funded research (project 3B-108) [4].

There is also a significant opportunity to utilize the resources created in this project to create a marketing program, targeted at health professionals - as providers of nutrition information to consumers, to communicate the health effects of fresh pork consumption. The scoping study included within this project highlights key channels for consideration in the implementation of such a campaign. It is anticipated that such a marketing strategy is an important opportunity to increase consumer demand for fresh pork.

Impact of the research

This research has consolidated the evidence base surrounding the positioning of fresh pork as a healthy meat that may have favourable effects on both body composition and cardiovascular health when consumed as part of a healthy diet. The literature review will be submitted for publication to a scientific journal, adding credibility to its findings. The dissemination of information summaries created within this project will help inform consumers and health professionals of the health benefits of fresh pork consumption as part of a balanced diet and may help to dispel the myth that pork is a less healthy meat than other meats. Such an approach will also help to positively raise the profile of fresh pork; a key factor involved in driving consumer demand.

5. Conclusion

Completion of the narrative style literature review identified that fresh pork may infer health benefits in relation to body composition and markers of cardiovascular health in addition to providing key nutrients. In particular, fresh pork may be associated with improvements in waist circumference and waist to hip ratio, although it is not yet clear if this effect differs from other types of meat, with more research needed in this area. Potential mechanisms to explain improvements in body composition may relate to the increase in energy expenditure and markers of satiety associated with fresh pork intake in comparison to other protein sources. Fresh pork was also reported to have favourable effects on markers of cardiovascular health including LDL and VLDL cholesterol and serum triglycerides however this effect did not consistently differ from the results for other meats. Overall, this review challenges the perception that pork is a less healthy meat and provides evidence to support the inclusion of fresh pork as part of a balanced, omnivorous diet.

Completion of summary documents have provided information that may be used in the development of marketing materials seeking to communicate the health effects of fresh pork to both consumers and health professionals.

Finally, completion of a scoping study has identified several opportunities for the development of a marketing campaign to communicate the health effects of fresh pork consumption to health professionals for translation to consumers.

6. Limitations/Risks

Some limitations of this research should be considered when applying the findings:

- The literature review included within this project was a narrative style review, which differs from a systematic literature review in that it does not answer a specific research question and employs different scientific methods. This style was selected purposefully, to ensure that any associated health benefits could be identified and the results were not limited to one specific area, allowing a greater breadth of research to be included.
- Based on search results, there was evidence that pork may have favourable effects on both body composition and cardiovascular health. As with any scientific search, there is a risk that the search strategy employed may have missed particular studies that may also demonstrate favourable health effects, this may also include studies published after August 2015 when the search was completed. Whilst every effort has been made to ensure as many studies possible were captured, including sourcing relevant articles from the reference lists of studies identified in the review and including unpublished Pork CRC reports, the possibility that some informative articles were missed cannot be ruled out.

7. Recommendations

As a result of the outcomes in this study the following recommendations have been made:

- Pork CRC could utilize the summary document materials created as a result of the narrative literature review to develop a marketing campaign to educate both consumers and health professionals on the health effects of fresh pork consumption
- Pork CRC could utilize the information provided within the scoping study to engage with health professionals involved in the dissemination of nutrition and food related advice to consumers and increase the profiling of fresh pork as a healthy meat choice
- Once published within a scientific journal, Pork CRC could publicize the narrative review created for this project to build credibility of pork's positioning as a healthy meat within the scientific community and to further enhance its profile

8. References

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Appendices

Appendix 1: Narrative literature review on the health benefits of fresh pork consumption

A narrative review of the health effects of fresh pork: where does the evidence sit in terms of body composition and markers of cardiovascular health?

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Abstract

Pork represents a core food in many diets globally. Despite its nutrient density, pork is often perceived as less healthy than other foods within the meat category. It is worthwhile to explore the health positioning of fresh pork in relation to key areas of public health concern including cardiovascular disease and obesity, as a key risk factor. The aim of this narrative review was to examine the available scientific evidence relating to the effects of fresh pork consumption on body composition and markers of cardiovascular health.

Overall, fresh pork consumption may be associated with favourable effects on body composition, including waist circumference and waist-to-hip ratio, although it is not clear if this differs from other meats. Improvements in body composition may be mediated by increases in energy expenditure and markers of satiety compared to other protein sources. Fresh pork intake may also have favourable effects on markers of cardiovascular health including LDL and VLDL cholesterol and serum triglycerides however this effect may not consistently differ from the results for other meats. Population research also suggests that fresh pork contributes to the intake of a range of essential nutrients including thiamine, long chain omega-3 polyunsaturated fatty acids, potassium, niacin, protein, zinc, niacin, vitamin B6, vitamin B12 and selenium. The body of evidence within this review challenges the consumer perception of pork as a less healthful meat variety. However the paucity of literature

including fresh pork in comparison to either other meats or other sources of protein highlights the need for further research in this area.

Introduction

Pork represents a core food in many diets globally. The consumption of fresh pork contributes to the dietary intake of a range of essential nutrients including thiamin, long chain omega-3 polyunsaturated fatty acids, potassium, niacin, protein, zinc, niacin, vitamin B6, vitamin B12 and selenium [5, 6, 12]. Despite this nutrient contribution, pork is often perceived less favourably than other foods within the meat category. In particular, consumer research suggests that fresh pork is perceived as less healthful and fattier in comparison to beef and chicken [1-3]. It is difficult to determine whether negative consumer perceptions about pork translate to reduced intakes, but the consumption of fresh pork remains lower than other meats in several Western countries. In particular, mean intakes of fresh pork are lower than beef and chicken in Australia [13, 14], New Zealand [15] and the United States [16].

As such, it is worthwhile to explore the health positioning of pork in relation to areas of public health concern. One such area is cardiovascular disease, with recent health surveys suggesting that current rates of total heart disease are 5.2% in Australia [17], with ischaemic heart disease at 4.6% in New Zealand [18]. While rates of these diseases are lower than in previous surveys, risk factors for heart disease, such as elevated cholesterol, remain prevalent in these populations [18, 19]. Being overweight or obese is also a key factor implicated in the aetiology of

cardiovascular disease, highlighting the importance of also considering the effect of pork consumption on anthropometric measures.

Pork is a unique meat in that it may be dichotomized into fresh and processed forms. Frequently consumed varieties of processed pork include ham and bacon [5]. A greater consumption of processed pork in comparison to fresh, lean pork has been widely reported [5, 14]. This contradicts dietary guidance which recommends limiting the consumption of processed meat [10, 20]. Consumers have also reported a lack of understanding about the unique health benefits of fresh pork as a potential barrier to increasing its consumption [4]. Given the disparity between dietary guidance and consumer practice, exploration of the literature in relation to fresh pork may be informative when considering its position as part of a balanced, omnivorous diet. It should be noted that a recent meta-analysis reported that consumption of both red and processed meats was associated with increased risk of colorectal cancer [20]. In that report, fresh pork was defined within the red meat category. This is an area that has been widely reported and thus is not the focus of this review.

The aim of this narrative review was to explore the available scientific evidence relating to the effects of fresh pork consumption on body composition and markers of cardiovascular health. An exploration of the nutrient contribution of fresh pork was also conducted.

Effects of fresh pork on body composition

The high prevalence of obesity continues to be an important public health issue across many parts of the world. Recent estimates of

overweight or obesity amongst Western societies include 63.4% of adults in Australia [17], 65.6% in New Zealand [18], 68.5% in the United States [21], and 67% and 57% in the United Kingdom for males and females, respectively [22]. Randomized controlled trials are necessary to accurately assess the potential role for fresh pork in weight management diets. Murphy et al. [7] reported results from a six month randomized controlled parallel intervention study whereby n=144 overweight adults were randomized to either consume up to 1kg of pork a week (approximately 750 grams was provided for females and 1kg was provided for male participants) or to continue with their habitual diet (control group) without energy restriction. Following six months of intervention, participants in the pork consuming group significantly improved measures of body composition including body mass index (BMI), waist circumference, percent body fat, fat mass and abdominal fat in comparison to the control group ($P < 0.01$ for all). In particular, body weight was reduced by 0.8 ± 0.3 kg in the pork group compared to the control group which significantly increased body weight by 0.4 ± 0.4 kg after 6 months ($P < 0.01$). This pilot study is one of the few to specifically assess the effects of pork on body composition and cardiovascular risk factors and suggests that fresh, lean pork may be successfully incorporated into a balanced diet with no apparent metabolic risk, and may in fact infer a benefit.

Despite these favourable results, it is unclear whether similar health benefits may be obtainable from the dietary inclusion of other fresh, lean meats such as beef or chicken. Murphy et al. [23] reported a lack of difference between change in markers of adiposity in a crossover study of

n=49 overweight and obese adults (mean age: 50 ± 2 years, mean BMI: $30.5\pm 3.6\text{kg/m}^2$) who were randomized to consume either 150 grams of beef, 150 grams of chicken, or 140 grams of pork (matched for energy content) for three months each. Whilst pork consumption was associated with a significant reduction in both waist circumference and waist-to-hip ratio in comparison to other meats ($P=0.046$), this reduction was no longer present after statistically adjusting for multiple comparisons.

It is also important to consider the effects of pork consumption when combined with other lifestyle interventions. Wycherley et al. [24] compared the effects of an energy restricted high pork protein diet and a control diet, with and without resistance exercise training in a group of adults with type 2 diabetes for 16 weeks. Individuals randomized to the high protein diet with resistance exercise experienced the greatest reductions in weight, waist circumference and fat mass ($P<0.05$). A trend towards a greater reduction in BMI was also reported for the group receiving both the high protein diet and resistance exercise; however this was not statistically significant.

A possible mechanism by which pork may favourably influence body composition may be via increasing energy expenditure. Mikkelsen et al. [8] reported that the consumption of a low-fat, higher protein pork diet (consisting of 29% of energy as fat and 29% protein, of which 19.6% came from pork) increased 24 hour energy expenditure in n=12 overweight/obese men (BMI range: $26\text{-}32\text{kg/m}^2$) in comparison to either an isoenergetic higher protein soy diet or a lower protein carbohydrate rich diet (with the pork meat diet increasing energy expenditure by 248 kJ/d, 1.9%; $P=0.05$

and 492 kJ/d, 3.9%; $P < 0.0001$ compared to the soy diet and carbohydrate rich diet respectively). Energy intake was also lower for participants consuming either of the higher protein diets (pork and soy diets) compared to baseline.

Another proposed mechanism by which fresh pork may favourably influence body composition is the hypothesized effect of pork on satiety. Sufian et al. [25] initially explored this issue in an animal model, reporting that pork peptones may increase the release of cholecystokinin (CCK), a peptide hormone known to act as a hunger suppressor, and suppress the appetite of rats in comparison to chicken peptones. In a human trial, Leidy et al. [26] reported that a pork-based breakfast may decrease daily hunger and increase satiety in a study of $n=57$ overweight adolescents who routinely avoided breakfast. In the 12 week randomized trial, participants provided with a pork meal for breakfast consumed significantly less energy throughout the rest of the day than at baseline (with a mean reduction of $1,724 \pm 954$ kJ/day). Participants who were randomized to consume either a cereal based breakfast or no breakfast did not demonstrate a reduction in total caloric intake throughout the rest of the day. This study demonstrates that a higher protein meal, delivered in the form of pork, may be beneficial in terms of reducing energy intake in overweight individuals.

The effect of pork consumption on subsequent energy intake in comparison to other meats was examined by Charlton et al. [9] who conducted an acute feeding study whereby $n=30$ pre-menopausal women (BMI range 18-39kg/m²) were instructed to consume a breakfast meal containing either pork, beef, or chicken in a within-subject crossover

design. No difference between test meals was observed in either the participant's subjective assessment of hunger and satiety (as determined using a visual analogue scale) or subsequent energy intake from an *ad libitum* buffet lunch consumed 180 minutes after the test meal. To determine whether any physiological differences between test meals in markers of hunger and satiety were present, CCK, Peptide YY (PYY), ghrelin and insulin were assessed. Overall, there were no between meal differences in CCK, ghrelin or insulin, however a higher area under the curve for PYY was observed for the pork meal compared with the chicken test meal ($P=0.027$), suggesting that, at least physiologically, pork may be more satiating than chicken. However, the failure of this observation to correspond with a difference in later energy intake between individuals who had consumed the pork and chicken meals limits the applicability of this finding. The authors cited the inclusion of obese women in the study as a potential limitation of the study, given that obesity may alter post-prandial hormonal responses [27].

Similar outcomes were reported by Meinert et al. [28] whereby the consumption of either a high or medium dosage of pork protein (in the form of pork sausages) at breakfast decreased subjective perceptions of hunger prior to lunch in comparison to a control breakfast in a study of $n=136$ students (aged between 15-17 years). Despite this decreased perception of hunger, there was no difference in energy intake at lunchtime between any of the groups.

Overall, the literature in this area challenges the perception that fresh pork is fattier and unhealthier than other meats [1, 2], and suggest

that at worst, eating fresh pork as part of a balanced diet may have a neutral effect on body composition, and at best, fresh pork consumption may assist with improving body composition, potentially through increasing energy expenditure in comparison to other protein sources. Despite preliminary evidence suggesting that pork may favourably influence satiety from both a subjective and physiological perspective, there seems to be minimal effects of pork consumption on subsequent energy intake. The lack of effect reported in the aforementioned feeding studies suggests that dietary intakes are driven by factors in addition to perceived or physiological hunger, a phenomenon that has been widely reported [29]. The paucity of literature in this area however suggests a need for further research before any definitive conclusions can be drawn.

Effects of fresh pork on markers of cardiovascular health

Markers of cardiovascular disease health are many and varied. The evidence base in relation to fresh pork is predominantly related to its effects on serum lipids, in both the acute and chronic setting. The impact of acute pork consumption on plasma lipids was explored in a crossover intervention study [30]. Twenty eight healthy adults were randomly allocated to consume either 140 grams of pork or 200 grams of lamb mince (each providing 24 grams of fat). Blood lipid measurements were collected at baseline, and two, four and six hours post-consumption of the meat. The study was repeated at least one week later with the alternate meat. The lipemic index (the area under the curve for the change in plasma triglycerides following consumption of the test meal) tended to be lower

for pork than lamb, however this effect did not reach statistical significance. Overall, these effects suggest that the acute effect of pork consumption on plasma lipids may be lower than that of lamb, however replication in larger sample studies is required to substantiate these effects.

The acute response to pork consumption was also explored by Samman et al. [31], who compared the acute metabolic response of consuming a meal made with pork or chicken, both providing approximately 30 grams of protein. Ten adults were randomly assigned to consume either the pork or chicken meal, with blood samples collected at baseline, 0.5, 1, 1.5, 2, 2.5, 3, 4, and 5 hours post-prandially. Participants repeated the study approximately two to three weeks later with the alternate meat. Inclusion of pork or chicken in the meal did not result in differences in post-prandial plasma glucose, insulin, triglyceride or non-esterified fatty acids. In comparison, significant differences were found in the amino acid response between meals. Histidine concentrations were found to be significantly higher following consumption of pork than after consumption of chicken, whilst plasma valine and leucine + isoleucine were higher after consumption of chicken. Previous research [32] has reported histidine levels to be negatively associated with inflammation and oxidative stress. Whilst this study failed to find an association between histidine levels and glycaemic control, the authors concluded that the effect of pork consumption on histidine could be a mechanism for the beneficial cardio-metabolic effects of pork intake reported in other studies. In contrast, the amino acids found to be significantly higher following chicken intake were

branched chain amino acids. Preliminary research suggests these amino acids may act as an early marker of insulin resistance [33]; however the evidence base is currently limited.

There is limited published data on the longer term effects of fresh pork consumption. Brandsch et al. [34] conducted an animal study involving a dietary intervention whereby n=60 rats were assigned to either isolated pork, beef, or turkey protein, casein (which served as the reference protein of animal origin), or soy protein at a dosage of 200g/kg (n=12 rats per group) for 20 days. The study found that isolated pork protein fed to rats reduced ($P<0.05$) plasma, very low density lipoprotein (VLDL) fraction and liver triglyceride concentrations (28%, 31% and 46% for concentrations of triglyceride in plasma, VLDL fraction and liver, respectively) compared with rats fed isolated casein. The authors hypothesized that pork protein may have been more effective in lowering fatty acid synthesis in the liver in comparison to casein.

Very few human studies have explored the effects of consumption of fresh pork alone on markers of cardiovascular risk, with most studies grouping pork with other meats. Of the few studies identified, Rubio et al. [35] reported results of a crossover trial whereby n=44 healthy individuals were randomized to consume either lean pork or lean veal (150g/day) over a six week intervention period as part of a dietary plan aimed at reducing cholesterol. Whilst both intervention periods were associated with a -6.5% and -4.1% reduction in low density lipoprotein (LDL) cholesterol for pork and veal, respectively, there was no significant difference between the two meat varieties ($p=0.294$) for LDL cholesterol. Similarly, in the study

conducted by Wycherley et al. [24], no significant differences in changes in total cholesterol, LDL cholesterol and triglycerides were found between consumers of a high protein pork diet and a control diet with and without resistance training. Further, no significant differences were found in either the mean serum total cholesterol or serum triglycerides between groups of free-living healthy adults (n=76) randomly assigned to consume a self-selected diet containing either beef, chicken and fish or pork for a three month period [36].

Whether pork products that have been modified at the production level can elicit health benefits to consumers over and above those seen with regular pork products remains an important area of interest in the current functional food era. Stewart et al. [37] demonstrated the potential health benefits of the dietary modification of pork, in a crossover study of n=24 healthy females (aged 19-24 years). Participants were provided with either a standard pork-containing diet or a modified pork-containing diet inclusive of pork from pigs that had been ration supplemented with soy bean oil to produce a meat that was lower in saturated fat and higher in polyunsaturated fat. The modified pork diet was associated with a significant reduction in both total plasma and LDL cholesterol (P=0.008 and P=0.038 for plasma and LDL cholesterol, respectively). This dietary intervention was also associated with an increase in the polyunsaturated fatty acid concentrations of both plasma and erythrocytes with a concurrent decrease in both saturated and monounsaturated fatty acid concentrations. Similar results were reported by Yeo et al. [38], whereby n=20 females reported a significant reduction (P<0.05 for both) in plasma

LDL cholesterol associated with the intake of either docosahexaenoic acid (DHA) enriched pork loin or chicken (derived from supplementing animal feed with fish oil) following consumption of 200g/day of either meat for four weeks in a crossover study.

Beneficial effects on serum lipids associated with the omega-3 supplementation of pig meat were also reported in a 12 week double-blind intervention trial involving 33 healthy adult participants randomized to consume 1000g/week of either traditional pork products (control) or an equivalent amount of pork obtained from pigs that had consumed a finishing diet containing 15% PorcOmega (a fortified tuna fish meal product). Coates et al. [39] found a 15% increase in erythrocyte DHA concentrations in individuals assigned to the intervention group ($P=0.001$), whilst erythrocyte DHA concentration decreased by 5% in the control group. In terms of clinical outcomes, a significant reduction in serum triacylglycerol was observed for the intervention group when compared to the control group (-0.3 (SEM 0.1) mmol/L for the intervention group vs. 0.00 (SEM 0.1) mmol/L for the control, $P<0.05$). When considering methods to improve the healthfulness of fresh pork at the production level, attention must be paid to the consumer acceptance of the end-product. Evidence suggests that consumers prefer natural methods of meat production and processing, with the avoidance of excessive manipulation [40]. As the omega-3 enriched pork products were well accepted by participants of this study, dietary fortification of pork at the farm level may present an attractive opportunity to further enhance the nutrition and health benefits of pork. Such dietary manipulations may offer a valid option

to assist with compliance to dietary guidance to reduce total saturated fat intake in those wishing to consume meat products.

The fatty acid content of red meat products (of which pork is categorized) has been attributed to increasing cholesterol levels [41], particularly in comparison to white meats. Whether this is the case for lean red meats is an important area for examination, to ensure that advice relating to the dietary treatment of hypercholesterolemia reflects the best scientific evidence. Davidson et al. [42] reported results from a 36 week randomized controlled trial, whereby n=191 adults with hypercholesterolemia were randomly assigned to consume either 80% of their total meat intake as lean white meats (including chicken or fish) or lean red meats (including beef, pork and veal) in the context of a cholesterol lowering diet. No difference in serum lipid responses was observed between the groups. In a follow up publication, reporting phase two of this study, whereby participants crossed over to consume either the lean red or lean white meat for an additional 36 weeks, no significant differences in serum lipids including LDL cholesterol, HDL cholesterol and triglycerides were observed between the two meat phases ($P>0.05$) [43]. This lack of effect reported for both phases suggests that there may be scope to include fresh lean red meats in the context of a balanced diet aimed at reducing cholesterol levels. Such advice may increase the nutritional variety and dietary compliance of individuals seeking to follow a cholesterol lowering diet in the long term.

As was the case with body composition, the consumption of fresh pork appeared to have either a neutral, or potentially favourable effect on

markers of cardiovascular health including LDL and VLDL cholesterol and serum triglycerides, in comparison to other meats. More consistent beneficial effects may be seen for fresh pork products that have undergone production-level modifications to improve their fatty acid profiles.

Fresh pork as a source of nutrients

As with any core food, it is prudent to explore the nutrient contribution of fresh pork to the diet when discussing any potential health effects. Australian research suggests that fresh pork contributed to intakes of thiamine, long chain omega-3 polyunsaturated fatty acids, potassium, niacin and protein in national surveys [5, 6]. Similar results have been reported in other populations, with secondary analysis of the NHANES survey in the United States suggesting that lean fresh pork contributed to intakes of protein, selenium, thiamine, zinc, niacin, vitamin B6, and vitamin B12 [12].

Iron is often a nutrient of interest in relation to pork, given the role of meat in contributing haem iron to the diet. Pork has been stated to have an intermediate iron content between that of beef and chicken [44, 45]. Despite having lower iron levels than beef, pork consumption may play an important role in terms of contributing to iron intakes and absorption. Bøech et al. [46] conducted a randomized feeding study to examine the effect of the addition of meat on non-haem iron absorption in n=45 healthy women. Participants were provided with a basic phytate rich meal with and without the addition of pork (randomly assigned to include 25, 50 or 75 grams of meat). Whilst the meal supplemented with 25 grams of pork did

not increase non-haem iron absorption, significant increases in absorption were found in participants consuming the meals containing 50 or 75 grams of pork. These results suggest that a moderate amount of pork can increase non-haem iron absorption in the context of a phytate rich meal. There does appear to be a threshold effect, with more than 25 grams of pork required to see the effect.

A longer term randomized cross-over study conducted by Bach Kristensen et al. [47] evaluated the effects of pork on iron absorption in the whole of diet context. Consumption of pork meat (delivered as a 60g/day serving over five days and part of a daily meal plan) significantly increased both fractional non-haem iron absorption ($P=0.02$) and total iron absorption by 54-69% (depending on country of origin of the pork product) when compared to a vegetarian diet in healthy females ($n=19$, BMI 22.6 (SE 3.5) kg/m^2). Similarly, dietary supplementation with pork meat (whereby participants were instructed to consume pork provided for at least three meals/week throughout a 12 week period) maintained haemoglobin status to the same extent as iron supplementation in a parallel, randomized controlled trial of $n=65$ healthy-weight young women (mean age 24.6 ± 4.4 years) [48]. The favourable effects of pork seen for increasing iron absorption may relate to the high proportion of haem iron within pork. Recent food composition analyses conducted in South Africa suggested that whilst pork had a lower total and haem iron content than beef and lamb, a greater proportion of the iron contained within pork was haem iron, with 88% of total iron in the pork cuts examined being in the haem iron form [45]. Thus fresh pork may be an important dietary component to contribute

to a range of essential nutrients including iron amongst the healthy population.

Conclusion

This narrative review aimed to explore the evidence base surrounding the effects of fresh pork on body composition and markers of cardiovascular health. Fresh pork consumption may be associated with favourable effects on body composition including waist circumference and waist-to-hip ratio, although it is not currently clear whether these effects differ from those of other meats. Improvements in body composition may be mediated by increases in energy expenditure and markers of satiety compared to other protein sources. Effects on satiety should however be considered in the context of human behaviour as they failed to consistently result in decreases in subsequent energy intake. Fresh pork intake was also reported to have favourable effects on markers of cardiovascular health including LDL and VLDL cholesterol and serum triglycerides, however this effect did not consistently differ from the results for other meats. This body of evidence relating to the consumption of fresh pork and effects on both body composition and markers of cardiovascular health challenges the consumer perception of pork as a fattier and less healthy meat variety. However there was a paucity of literature including fresh pork as an isolated meat suggesting the need for further research in this area, particularly randomized controlled trials, to explore these health parameters more thoroughly.

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Appendix 2a: Summary document of the health effects of fresh pork consumption for health professionals

Including fresh pork in the diet: where does the evidence sit?

Fresh lean pork is a source of many essential nutrients [1]. Despite Australians consuming less fresh pork than other meat varieties [2, 3], recent evidence has highlighted that fresh pork can be an important addition to a healthy balanced diet.

Fresh pork as a source of nutrients - including iron

Fresh pork contributes a wide variety of key nutrients, making it an ideal meat choice as part of a balanced, omnivorous diet. Australian research suggests that fresh pork contributed to intakes of thiamine, long chain omega-3 polyunsaturated fatty acids, potassium, niacin and protein in national surveys [4, 5]. Similar results have been reported in other populations, with secondary analysis of the NHANES survey in the United States suggesting that lean fresh pork contributes to intakes of protein, selenium, thiamine, zinc, niacin, vitamin B6, and vitamin B12 [6]. Iron is often a nutrient of interest in relation to pork, given the role of meat in contributing haem iron to the diet. Consuming fresh pork not only contributes to dietary intakes of iron but may also help with the absorption of this important nutrient. Pork has an intermediate iron content between that of beef and chicken [7, 8].

A scientific study found that consuming pork meat (60g/day over five days) significantly increased both non-haem iron (P=0.02) and total iron absorption by 54-69% (depending on country of origin of the pork product) when compared to a vegetarian diet in healthy females [9]. Similarly, eating pork meat at least three times a week over a 12 week period maintained haemoglobin status to the same extent as iron supplementation in a parallel, randomised controlled trial of healthy young women [10]. The beneficial effects of pork seen for increasing iron absorption may relate to the high proportion of haem iron within pork. Recent food composition analyses found the proportion of the more easily absorbed haem iron to be as high as 88% [8].

Fresh pork and body weight

A recent study suggested that eating fresh pork may help improve measures of body composition including body weight, body mass index (BMI), waist

circumference, percent body fat, and fat mass and abdominal fat [11]. When fresh pork was provided to overweight adults as part of a six month dietary intervention study, their body weight was reduced by 0.8 ± 0.3 kg, while a control group eating their habitual diet significantly increased body weight by 0.4 ± 0.4 kg ($P < 0.01$) [11]. An energy restricted diet high in pork protein combined with resistance training also reduced body mass, waist circumference and fat mass ($P < 0.05$) in a group of individuals with type 2 diabetes compared to individuals on an isocaloric control diet completing the same exercise regime [12].

What are the possible mechanisms behind these effects?

Fresh pork may increase energy expenditure. Mikkelsen et al. [13] reported that consumption of a low-fat, higher protein pork diet increased 24 hour energy expenditure in overweight/obese men in comparison to either an isoenergetic higher protein soy diet or a lower protein carbohydrate rich diet (with the pork meat diet increasing energy expenditure by 248 kJ/d, 1.9%; $P = 0.05$ and 492 kJ/d, 3.9%; $P < 0.0001$ compared to the soy diet and carbohydrate rich diet respectively).

Fresh pork has also been demonstrated to increase satiety. Sufian et al. [14] reported that pork peptones were more effective at increasing the release of the hunger suppressing peptide hormone cholecystokinin (CCK), and suppressing the appetite of rats in comparison to chicken peptones. In a human trial, a pork-based breakfast was found to decrease daily hunger and increase satiety overweight adolescents that routinely avoid breakfast. In the 12 week randomised trial, participants provided with a pork meal for breakfast consumed significantly less energy throughout the rest of the day than at baseline (with a mean reduction of $1,724 \pm 954$ kJ/day). Participants who were randomised to consume either a cereal based breakfast or no breakfast did not demonstrate a reduction in total caloric intake throughout the rest of the day [15].

Fresh pork and heart health

Consumer research suggests that fresh pork is perceived as less healthful and fattier in comparison to other meats [16-18]. Overall, the scientific evidence does not support this idea. Rubio et al. [19] reported that individuals randomised to consume either lean pork or lean veal (150g/day)

over a six week period as part of a cholesterol-lowering dietary plan, reduced their low density lipoprotein (LDL) cholesterol by 6.5% and 4.1% for pork and veal, respectively. There was no significant difference between the two meat varieties (P=0.294). No significant differences were reported in either the mean serum total cholesterol or serum triglycerides between groups of free-living healthy adults (n=76) randomly assigned to consume a self-selected diet containing either beef, chicken and fish or pork for a three month period [20].

Ways to include fresh pork as part of a healthy diet

In the 2013 Australian Dietary Guidelines, pork is categorised as a red meat along with beef, lamb, veal, venison, and kangaroo. This was done to ensure consistency with the definitions of red meat currently used in epidemiological research [21, 22]. In the Australian Dietary Guidelines, one serve of cooked red meat (inclusive of pork) is considered to be 65 grams (corresponding to approximately 90 - 100 grams raw weight), with recommendations to enjoy up to 455 grams of cooked lean red meat per week. The Australian Dietary Guidelines recommends limiting consumption of processed meats, so selecting fresh meat varieties is preferable to processed meats.

Consumers can enjoy fresh pork in range of ways, for example:

- Pork strips can be added to a vegetable stir-fry for a high-protein and satisfying meal
- Fresh pork mince can be included in a bolognese sauce, as part of a delicious san choy bau, or as taco filling
- Simply enjoy a traditional pork roast with carrots, pumpkin, sweet potato and mixed greens
- Grill lean, pork medallions on the barbecue and serve with a green salad and fresh corn on the cob
- Add fresh pork fillet to a fragrant Thai curry and serve with plenty of vegetables and fresh coriander

For more recipe ideas, visit: www.pork.com.au

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Appendix 2b: Summary document of the health effects of fresh pork consumption for the general population

Enjoying fresh pork as part of a healthy diet

Fresh, lean pork is a source of many nutrients that are vital to the body. Although Australians currently eat less fresh pork than other meats [1, 2], research suggests that fresh pork can be an important part of a healthy balanced diet.

What nutrients does fresh pork provide?

Fresh pork contains many important nutrients [3] such as:

- Protein: which helps with the growth, maintenance and repair of muscles
- Thiamine: a vitamin that helps support a healthy mind
- Niacin: a vitamin that helps the body fight fatigue
- Vitamin B12: helps reduce tiredness and keep the blood and nervous system healthy
- Selenium: a mineral that helps support a healthy immune system and fight free radical damage
- Zinc: an important mineral that helps to keep the body healthy, assists with wound healing and helps maintain healthy hair and nails [4]

What about iron?

Eating fresh pork not only provides iron in the diet, but may also help you to absorb this important nutrient. Pork has an iron content between that of beef and chicken [5, 6].

A scientific study [7] found that a diet containing pork meat increased the amount of iron absorbed by the body by as much as 69% when compared to a vegetarian diet. Pork also contains a high proportion of haem iron, the type of iron that is more easily absorbed by the body [6].

Fresh pork and body weight

Obesity continues to be a big health issue in Australia [8]. A recent study found that eating fresh pork as part of a healthy diet plan may help to

manage body weight, fat mass and stomach fat [9]. Other research has also shown that a diet high in fresh pork reduced body weight, waist size and fat mass when combined with weight training compared to a diet which was lower in protein [10]. However there is still a need for more scientific research on these effects.

What is the science behind fresh pork and body weight?

Fresh pork may increase feelings of fullness. A study found that eating pork for breakfast reduced hunger and the amount of food eaten later that day in a group of young adults who regularly skipped breakfast [11]. This may be explained by an increase in hunger suppressing hormones found to be related to eating pork [12]. A diet high in fresh pork was also found to help the body to burn more energy when compared with either a high protein soy diet or a lower protein diet [13].

Fresh pork and your heart

Research suggests that fresh pork may be viewed as less healthy and fattier than other meats [14-16]. Overall, the scientific evidence does not support this idea. When healthy adults were asked to eat a diet containing either beef, chicken and fish, or pork over three months, there was no difference in total cholesterol, or triglycerides (both markers of heart disease risk) between each of the meat types [17]. Likewise, a study reported that adults who ate lean pork for six weeks as part of a cholesterol lowering diet, reduced their bad cholesterol by over 6 percent, which was similar to the reduction found when eating veal [18].

Overall, the scientific evidence suggests that fresh, lean pork can be included as part of a healthy, balanced diet if you enjoy eating meat.

Ways to include fresh pork as part of a healthy diet

Although it can be confusing, pork is actually considered a red meat, along with beef, lamb, veal, venison and kangaroo. According to the Australian Dietary Guidelines, one serving of cooked pork (or any red meat) is equal to 65 grams (or 90-100 grams raw weight), or about the size of the palm of your hand. These dietary guidelines suggest that Australians can enjoy up to 455 grams of cooked lean red meat per week [19, 20]. If you choose to

eat meat you should aim to eat fresh, lean meat such as pork strips, pork mince or pork roast rather than processed meat such as ham or bacon.

You can enjoy fresh pork in a variety of ways:

- Pork strips can be added to a vegetable stir-fry for a high-protein and satisfying meal
- Fresh pork mince can be included in a bolognese sauce, as part of a delicious san choy bau, or as taco filling
- Simply enjoy a traditional pork roast with carrots, pumpkin, sweet potato and mixed greens
- Grill lean, pork medallions on the barbecue and serve with a green salad and fresh corn on the cob
- Add fresh pork fillet to a fragrant Thai curry and serve with plenty of vegetables and fresh coriander

For more recipe ideas, visit: www.pork.com.au

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Appendix 3: Scoping study of potential options for marketing the health effects of fresh pork consumption to health professionals

Whilst the Australian pork industry has been running a successful campaign to market fresh pork to consumers, evidence suggests that dietary choices may be largely influenced by recommendations from health professionals [1,2]. Individuals trusted to provide nutrition information include Accredited Practising Dietitians and general practitioners. As such, opportunities to communicate the health benefits of fresh pork to these individuals may be a valuable addition to current marketing efforts. The following scoping study presents outcomes from a review of opportunities to promote the health benefits of fresh pork to relevant health professionals. Information on pricing and expected impact in terms of circulation was current as of December 2015.

1. Dietitians Association of Australia (DAA)

DAA is Australia's professional organisation of Accredited Practising Dietitians and currently has over 5800 members (with growth of 7.8% approximated per year). Advertising and brand affiliation with DAA may support the communication of the health benefits of fresh pork in one of two ways:

- Increasing dietitians' knowledge about the unique health benefits of fresh pork consumption, to ensure that advice provided to consumers is based on the most current scientific research
- Increasing the credibility of strategies to communicate the health benefits of fresh pork throughout both the dietetic community and the general population

Following extensive consultation with DAA marketing and sponsorship coordinators, the following options were considered to have the most potential benefit to Pork CRC:

Direct mail to membership

The mailing of materials/information to DAA members through DAA channels will result in approximately 5000 dietitians receiving printed information on the health benefits of fresh pork.

Cost: \$3155 (GST inclusive)

Other associated costs - mailing house charges and Australia Post charges to be paid in addition to above cost, with a quote available once the final material for distribution has been developed. Please note, all items must be approved by DAA and should fit within standard post delivery options to avoid the need for members to collect items from Australia Post.

Contact for this option:

Samantha Chambers - marketing@daa.asn.au

Partnership with the Dietitians Association of Australia

A potential partnership with DAA may further provide brand credibility and important opportunities to promote the health benefits of fresh pork to both the membership and the broader Australian population. DAA partners also receive copies of DAA publications including members' newsletter, *Nutrition and Dietetics* journal and *DAA Directions* (business to business newsletter). Partners are also officially recognized at DAA events and receive a standard at the national conference in addition to being profiled to the membership in many other ways. Partnerships are tailored to the business and marketing needs of the organisations. There are several levels of partnerships including major partners and associate partners. The following are current major partners of DAA: *Almond Board of Australia, Australian Avocados Nutrition, Jalna Dairy Foods, Meat and Livestock Australia, Campbell Arnotts, and Nestle*. Current associate partners of DAA include: *Australian Breakfast Cereal Manufacturers Forum, AIA Vitality (insurance), Cobram Estate, Egg Nutrition Council, Nutricia Advanced Medical Nutrition, and Guild Insurance*.

Cost: partnerships start from \$30,000 each year for two years (with fees discussed with DAA upon development of business and marketing needs and level of partnership required).

Contact for this option:

Sara Grafenauer - sarag@daa.asn.au

Surveys distributed online to DAA members

A survey evaluating dietitian's knowledge of the health benefits of pork both before and after communication strategies to increase awareness may provide an important opportunity to measure the success of the marketing campaign.

Surveys are distributed online via an email alert to DAA members.

Cost: \$2965 (GST inclusive) for each survey (it may also be beneficial to provide a prize such as a gift voucher etc. to encourage completion of the survey). Additional costs associated with the creation of the survey may also be incurred.

Contact for this option:

Samantha Chambers - marketing@daa.asn.au

DAA conference sponsorship options

The DAA holds a national conference every year throughout different locations within Australia. The 2016 DAA National Conference will be held in Melbourne (at the Melbourne Convention & Exhibition Centre) on the 19-21 May 2016, with the theme 'On track for the future' with an anticipated attendance of 900-1000 delegates. There are many opportunities for brand promotion and advertising at DAA conferences, however the following 3 options were considered most relevant/potentially beneficial to Pork CRC:

Exhibition Stand

Attend the conference and meet delegates to communicate recent research relating to the health benefits of fresh pork consumption. Networking opportunities to meet dietitians working across a range of discipline areas and foster potential collaborations in the future. Each stand consists of a 3m x 3m area, with exhibition staff registrations provided for 2 individuals (inclusive of morning tea, lunch and afternoon tea each day, conference materials, attendance at the Welcome Cocktail Party and all conference sessions (excluding workshops, breakfast seminars and the Conference Dinner)

Cost: \$4,454.54 (+ \$445.46 GST) per 9m² stand

Contact for this option:

Drew Whait - dwhait@arinex.com.au

Satchel inserts

Provide printed material on the health benefits of fresh pork consumption to be distributed in conference satchels to all delegates. Approved material formatting includes an A4 double sided brochure or a maximum of 4 single pages

Cost: \$1900 (+\$190 GST)

Contact for this option:

Drew Whait - dwhait@arinex.com.au

Sponsored breakfast seminars

Sponsored breakfast seminars/presentations provide an invaluable opportunity to present recent advances in research relating to the health benefits of fresh pork in an exclusive, breakfast session whereby the sponsor generally provides breakfast (including fresh pork) for delegates to consume whilst listening to Pork CRC presentations. A recent example of a successful breakfast seminar was hosted by the Australian Mushroom Growers Association, where a nutrition scientist presented the latest information the vitamin D content of mushrooms and health benefits which

was followed by a cooking demonstration of mushrooms from celebrity chef 'Fast Ed'. Mushrooms were also provided as part of the breakfast. These seminars are very popular and provide an opportunity to showcase fresh Australian pork in a more intimate setting. Please note, applications for 2016 conferences are limited in number, should places be filled for the 2016 conference, the same contact can be used for the 2017 conference.

Cost: \$6000 (+\$600 GST)

Contact for this option:

Drew Whait - dwhait@arinex.com.au

2. *#EatKit social media event*

#Eat Kit - Sponsored social media event

#EatKit is a monthly, hour long twitter chat event, moderated by Accredited Practising Dietitians. The purpose of the event is to allow an open discussion/question and answer session with both members of the general population and nutrition and health professionals. There is an opportunity to sponsor a monthly topic so that it may be discussed by the group, raising awareness and providing an opportunity to direct individuals to the Pork CRC website and research profiling fresh pork as a healthy component of the Australian diet. Sponsoring the social media event will involve working with organizers on the strategic topic, best spokespeople/twitter handles to use, script, promotion, twitter coaching, the live chat, archival of the chat on the widely visited website (www.scoopnutrition.com) and follow up evaluation.

Cost: \$2000 (excluding GST)

Contact for this option:

Emma Stirling - emmastirling@scoopnutrition.com

3. *Royal Australian College of General practitioners (RACGP)*

Royal Australian College of General Practitioners advertising opportunities

Consumers consider GPs an important source of nutrition information. As recent media attention has highlighted potential associations between red meat (particularly processed red meat) and cancer risk, it is important to educate GPs on the health benefits of fresh pork so that they may provide their patients with balanced information on the topic.

Advertising in RACGP publications

Good Practice is a news magazine, distributed to over 32000 GPs on a monthly basis. There is an opportunity to communicate the health benefits of fresh pork directly to GPs through targeted advertising campaigns.

Cost: \$3600 (+GST) for a full page advertisement

Contact for this option:

Kate Marie - kate.marie@racgp.org.au

The *Australian Family Physician (AFP)* is a general practice medical journal that is Australia's highest circulating medical title.

Cost: ranges from \$2550 (+GST) for a quarter page advertorial, \$7080 (+GST) for a full page advertorial, \$13740 (+GST) for a double page spread

Contact for this option:

Jonathon Tremain - jonathon@tremedia.com.au

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