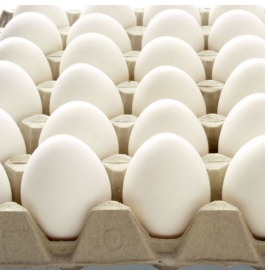

AUSTRALIAN EGG CORPORATION LIMITED

AECL Research Update February 2013

RESEARCH UPDATE

EGG CONSUMPTION AND HEART DISEASE RISK

Source: Rong, Y., et al. Egg consumption and risk of coronary heart disease and stroke: dose-response meta-analysis of prospective cohort studies. BMJ 346, e8539 (2013).

This meta-analysis of prospective cohort studies investigated and quantified the dose-response association between egg consumption and risk of coronary heart disease and stroke. In the analysis, 8 articles reporting on heart disease and stroke risk were included. The researchers found no evidence of an association between egg consumption and risk of coronary heart disease or stroke. When analyzing only people with diabetes (based on 2 published studies) however, those with the highest egg consumption compared with the lowest had a 54% increased risk of coronary heart disease but a 25% decreased risk of stroke. Overall, up to one egg per day is not associated with CHD or stroke. Increased risk of CHD in people with diabetes requires further research. The researchers did caution "These subgroup results should be interpreted with caution, because only a few studies focused on diabetic participants and particular stroke subtypes".

KEY FINDING: Up to one egg per day is not associated with coronary heart disease or stroke. In people with diabetes, increased egg consumption is associated with a 54% increased risk of heart disease.

APPLICATION: Supports evidence that up to one egg per day is not associated with heart disease risk. Further research is required in the diabetes subpopulation. [Suitable for eDM]
Levels of Evidence:III-2

ENRICHING EGG YOLK WITH VITAMIN D

Source: Yao L, Wang T, Persia M, Horst RL, Higgins M. Effects of Vitamin D(3) -Enriched Diet on Egg Yolk Vitamin D(3) Content and Yolk Quality .J Food Sci. 2013 Jan 18. doi: 10.1111/1750-3841.12032. [Epub ahead of print]

This study investigated the impact of feeding 19 week old hens vitamin D (cholecalciferol) enriched diets for 40 weeks on egg yolk quality. Feed levels of vitamin D included in the study were 9700 (diet 2), 17200 (diet 3), 24700 (diet 4), and 102200 (diet 5) IU/kg feed and a control (diet 1) containing 2200 IU/kg feed. The vitamin D content of egg yolk from the enriched diets increased rapidly during the first 3 wk. The peak vitamin D concentrations in egg yolk that occurred at week 3 were 21, 41, 60, and 870 ug vitamin D/100g egg yolk (wet basis) from diet 2 to 5. This would equate to approximately 7ug, 14ug, 21ug and 295ug vitamin D per serve of eggs. Since the RDI for adults aged 19-50 years is only 5ug per day (10-15ug for older adults), this suggests that smaller amounts of vitamin D in the feeds are required to provide sufficient vitamin D enrichment of yolks. The egg yolk lipid profile (total lipid content, fatty acid composition, phospholipid composition, and unsaponifiables), physical and functional properties (yolk viscosity and emulsifying property), and sensory quality of hard-boiled egg yolk were not affected by the vitamin D enrichment in the feed. This study suggests vitamin D content of egg yolks can be increased effectively with enrichment of the hen's diet. Furthermore, high vitamin D yolk showed no difference from the conventional yolk in other compositional, functional, and sensory properties.

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KEY FINDING: Egg yolks can be effectively enriched with vitamin D through feeding hens a vitamin D enriched diet.

APPLICATION: May be of interest to egg producers. **[Suitable for eDM]**

LOW VITAMIN D IN PREGNANCY AND ADVERSE OUTCOMES

Source: Wei SQ, Qi HP, Luo ZC, Fraser WD. Maternal Vitamin D Status and Adverse Pregnancy Outcomes: A Systematic Review and Meta-Analysis.J Matern Fetal Neonatal Med. 2013 Jan 13. [Epub ahead of print]

This was a review and analysis of literature to investigate whether vitamin D status during pregnancy is associated with adverse pregnancy outcomes. The review included 24 observational studies (published up to October 2012) that reported the association between maternal blood vitamin D levels and adverse pregnancy outcomes including preeclampsia, gestational diabetes mellitus, preterm birth or small-for-gestational age births. The researchers found that women with blood levels of vitamin D less than 50 nmol/l in pregnancy experienced an increased risk of preeclampsia, gestational diabetes, preterm birth and small for gestational age babies. This review of current available literature suggests that lower vitamin D levels in pregnancy are related to a number of adverse pregnancy outcomes.

KEY FINDING: Pregnancy vitamin D levels less than 50mmol/L are associated with a higher risk of preeclampsia, gestational diabetes, preterm birth and small for gestational age births.

APPLICATION: Highlights the importance of vitamin D in pregnancy. Eggs can contribute some vitamin D in the diet of pregnant women. **[Suitable for eDM]**
Levels of Evidence: III-2

VITAMIN D AND BODY WEIGHT

Source: Saneei P, Salehi-Abargouei A, Esmaillzadeh A. Serum 25-hydroxy vitamin D levels in relation to body mass index: a systematic review and meta-analysis. Obesity Reviews 18 Jan [Epub ahead of print] DOI: 10.1111/obr.12016

This study is a systematic review and analysis of data summarising the link between vitamin D levels and BMI in apparently healthy adults. The research included 34 papers and found a weak but significant relationship between blood vitamin D levels and BMI. Higher vitamin D levels were associated with lower BMI. This relationship was found in the whole population and remained when assessing developed countries but when assessing the results for developing countries the relationship did not hold true for women. Overall this study found a significant but weak association between vitamin D levels and BMI in adults except for women living in developing countries. Further research is needed to understand this finding.

KEY FINDING: A significant, but weak, inverse association between vitamin D levels and BMI.

APPLICATION: Adds to a body of evidence suggesting a link between vitamin D status and weight.
[Suitable for eDM]
Levels of Evidence: III-2

THE 'UGLY' CHOLESTEROL

Source: Varbo A, Benn M, Tybjaerg-Hansen A, Jorgensen AB, Frikke-Schmidt R, Nordestgaard BG. Remnant cholesterol as a causal risk factor for ischemic heart disease. Journal of the American College of Cardiology 2013; 16 (4): 427-436.

This study tested the hypothesis that elevated remnant cholesterol (the cholesterol content of the triglyceride-rich lipoproteins known as very low-density lipoproteins and intermediate-density lipoproteins together with chylomicron remnants) is a causal risk factor for ischemic heart disease independent of reduced HDL cholesterol. The study included 73,513 Danish adults and investigated 15 genetic variants known to effect cholesterol levels. The researchers found that a 1 mmol/litre increase in nonfasting remnant cholesterol is associated with a 2.8 fold causal risk for ischemic heart disease, independent of reduced HDL cholesterol. The researchers claim these are novel findings and suggest the mechanism for action may be similar to what happens with LDL particles. The remnants (triglyceride rich lipoproteins) enter and get trapped in the lining of the arterial wall. Unlike LDL, however, these remnants may not need to be oxidised to result in atherosclerosis. This study builds on other observational findings that remnant cholesterol may be linked with heart disease risk. Further research is needed in other genetic variants not used in this study and/or randomised intervention studies.

Non-fasting remnant cholesterol can be calculated by non-fasting total cholesterol minus HDL cholesterol minus LDL cholesterol.

KEY FINDING: A 1mmol/litre increase in non-fasting remnant cholesterol is associated with a 2.8 fold causal risk for ischemic heart disease, independent of reduced HDL cholesterol.

APPLICATION: Adds further to the knowledge regarding cholesterol's role in heart disease risk. Further evidence is needed to better understand remnant cholesterol and its impact. [Suitable for eDM]
Levels of Evidence: III-2

FACTORS AFFECTING BLOOD CHOLESTEROL

Source: Kanter MM, Kris-Etherton PM, Fernandez ML, Vickers KC, Katz DL. Exploring the Factors That Affect Blood Cholesterol and Heart Disease Risk: Is Dietary Cholesterol as Bad for You as History Leads Us to Believe? Adv Nutr vol. 3: 711-717, 2012

This paper is a summary of presentations given at the 2011 Experimental Biology meetings in the US and focuses on the current dietary cholesterol recommendations, the evidence for dietary cholesterol's impact on health and the role of eggs in this debate. In the US, current recommendations are for individuals at high risk of heart disease to limit cholesterol intake to <200mg/day and for healthy individuals to limit to 300mg cholesterol per day. Furthermore, a recent Institute of Medicine report recommends that dietary cholesterol intake "be as low as possible". There is recent data, however, to question these recommendations including a lack of association between egg intake and heart disease risk. Furthermore, there are many important biological roles for cholesterol including cell membrane structure and steroid hormone synthesis, bile acid synthesis and others. The vital role of cholesterol in the human body as well as the established place of dietary cholesterol in the human diet provide a robust challenge to the view that dietary cholesterol poses a threat to human health. When it comes to eggs the evidence is that egg intake results in the formation of fewer cholesterol lipoproteins known to increase heart disease risk (eggs increase large LDL and HDL particles). It is increasingly being recognised that increasing HDL is particularly important for protection against heart disease. Of note, many countries including the European Union, Korea, India, Canada and New Zealand do not have recommendations for cholesterol intake. The researchers also suggest that advice to restrict cholesterol may contribute to increased consumption of alternatives such as simple sugars and refined carbohydrates so the overall dietary impact may be negative. The researchers conclude that the current evidence indicates that dietary cholesterol (at current intakes) does not increase the risk of heart disease in healthy individuals. With respect to eggs, given they are a good source of many nutrients, there is a growing awareness about how consumers can incorporate them into a healthy diet that meets current food-based recommendations. There is a need to re-consider the recommendations for dietary cholesterol for the healthy population.

KEY FINDING: Evidence is accumulating which questions the validity of dietary cholesterol intake recommendations in the US.

APPLICATION: A good summary of the evidence for cholesterol, eggs and heart disease risk.
[Suitable for eDM]

MICRONUTRIENTS IN PREGNANCY

Source: Blumfield ML, Hure AJ, Macdonald-Wicks L, Smith R, Collins CE. A systematic review and meta-analysis of micronutrient intakes during pregnancy in developed countries. Nutr Rev. 2013 Feb;71(2):118-32. doi: 10.1111/nure.12003. Epub 2013 Jan 7.

This study was a review and meta-analysis of all literature regarding the micronutrient intakes of pregnant women from developed countries. A comparison of the intakes with national recommendations was also undertaken. The researchers found that pregnant women in developed countries are at risk of suboptimal micronutrient intakes. Folate, iron, and vitamin D intakes were consistently below nutrient recommendations in each geographical region, and calcium intakes in Japan were below the Japanese recommendations and the average intake levels in other developed countries. Folate was found to be 13-63% lower than recommendations and zinc was found to be 17-105% greater than recommendations. Both riboflavin and vitamin B12 intakes increased over the course of the pregnancy. The table below shows the nutrient intake data for Australia/NZ and the Australian/NZ RDI during pregnancy.

Micronutrient	Median Intake Aust/NZ	RDI
Vitamins		
Vitamin A (ug RE/day)	949	700-800
Thiamin (mg/day)	1.1	1.4
Riboflavin (mg/day)	1.8	1.4
Niacin (mg NE/day)	20.1	18
Vitamin B12 (ug/day)	not reported	2.6
Folate (ug/day)	190	600
Vitamin C (mg/day)	98	55-60
Vitamin D (ug/day)	1.3	5
Minerals		
Calcium (mg/day)	806	1000-1300
Iron (mg/day)	12.1	27
Magnesium (mg/day)	265	350-400
Zinc (mg/day)	10.5	`10-11

KEY FINDING: Folate, iron and vitamin D intakes during pregnancy were below nutrient recommendations.

APPLICATION: A serve of eggs provides some vitamin D, iron and folate to contribute towards meeting nutrient recommendations in pregnancy. **[Suitable for eDM]**

ORGANIC, LOCAL AND SUSTAINABLE LINKED TO DIET QUALITY IN YOUNG ADULTS

Source: Pelletier JE, Laska MN, Neumark-Sztainer D, Story M. Positive attitudes toward organic, local, and sustainable foods are associated with higher dietary quality among young adults. J Acad Nutr Diet. 2013 Jan;113(1):127-32. doi: 10.1016/j.jand.2012.08.021.

This US study assessed the relationship between preferences for organic, local, sustainable and unprocessed foods and diet quality in young adults. The study assessed dietary behaviours of young adults who reported placing low, moderate or high importance on these characteristics. A sample of college students (1201 students) completed the study and researchers found about half of young adults placed moderate to high importance on these production practices. Those that placed high importance on organic, local, sustainable and unprocessed foods consumed 1.3 more servings of fruit and vegetables, more dietary fibre and fewer added sugars, fewer sugar-sweetened beverages and less fat that those who placed low importance on these practices. They were also more likely to consume breakfast more often and consume fast food half as often. These findings suggest that nutrition messaging around social and environmental implications of food production may be well received by this age group and may contribute to better overall diet quality.

KEY FINDING: Approximately 50% of young adults placed moderate to high importance on organic, local, sustainable and unprocessed food production. These attitudes were related to better overall diet quality.

APPLICATION: Nutrition messaging which focuses on these food production methods may be suitable for this age group.

[Suitable for eDM]

Levels of Evidence: III-2

For further advice regarding the content of this research update, contact Bronwyn Eisenhauer - Research Dietitian at Food & Nutrition Australia directly on beisenhauer@foodnut.com.au

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