CARDIOVASCULAR DISEASE FOOD ALGORITHM

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Introduction

Pulse passion is committed to the Canadian consumer, economy, and environment through innovation of better-for-you food products from pulses – an important Canadian crop which includes chickpeas, beans, split peas, and lentils. To complement our product line, we have developed a powerful evidence based app called 'MyPulse' that assists consumers by helping them make more educated purchases at the grocery store in relation to their CVD risk. Together, our product line and nutritional guidance app will work synergistically to provide Canadians with enhanced cardio-protection by promoting a diet that is based on current literature and dietary guidelines.

MyPulse and a System of Categorization

Conceptualization of the MyPulse app led to the task of creating a scientifically-based food product algorithm to categorize all food products in an un-biased manner. To complete this extensive task, the following steps were taken:

1. A review of current and previous Front-of-Pack labelling systems was made with the purpose of gathering intel regarding structure and organization of product categorization.
2. A comprehensive search of all regulatory statements regarding food ingredients related to the risk of cardiovascular disease was made. This included documents and statements form the American Heart Association, Heart and Stroke Foundation, Harvard Healthy Eating Plate, and Health Canada.
3. A thorough review of all ingredients related to the risk of cardiovascular disease, including meta-analyses, randomized controlled trials, and prospective cohort studies.

The above procedures led to the development of a cardiovascular protective food algorithm, whereby applicable ingredients and their associated thresholds were established.

Scoring of Food Products

The 'MyPulse' app will generate a score for food products to determine if a product should receive a green, yellow or red rating. Each of these thresholds will translate to the user that they should consume this food product 'often', 'sometimes', or 'seldom', respectively. Cardiovascular protective food ingredients contribute positive points to the overall score of a food product, while nutrients that are associated/involved with CVD risk contribute negative points. The overarching score of a food product is the sum of its points, with a high positive summation being labelled as green, zero to medium summation being yellow, and a negative summation being red. In this scoring system, the weight of points or the set thresholds can be modified according to emerging scientific evidence to provide consumers with a highly accurate categorization.

Substantiation of Cardiovascular Protective Ingredients

Omega-3 Fatty Acid

- When considering diets that have been shown to be cardioprotective, such as the Mediterranean diet, there is an increased intake of ALA (Widmer *et al.* 2015)
- International Society for the Study of Fatty Acids and Lipids (ISSFAL) concluded with a recommendation of 1.5g/d or 0.7% of daily energy intake for a CV healthy intake of ALA (Cunnane, 2004)

Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA)

- Recommended amounts of EPA and DHA for healthy individuals at risk for CVD was at least 500mg/d of EPA and DHA combined (Global Recommendations for EPA and DHA Omega-3s 2014)
- This amount was also recommended by ISSFAL for cardiovascular health, who based their recommendations off of data from eight large population based prospective cohorts (Cunnane *et al.* 2004).

Total Dietary Fibre

- Both soluble and insoluble fibre types are associated with decreased cardiovascular risk, as well as slower rate of progression of the disease in high-risk individuals (AHA, 2015).
- A recent meta-analyses by Kim and Je analyzed 15 prospective studies and found that dietary fibre intake is inversely associated with mortality from CVD, and CHD (Kim and Je, 2016)

Whole Grains

- The consumption of whole grain products is promoted by several dietary guidelines: Canada's Food Guide promotes the consumption of a variety of whole grains, while my Healthy Eating Plate recommends filling a quarter of a consumer's plate with whole and intact grains (Health Canada, 2011) (Harvard University, 2011).
- Fibre as a key nutrient, was scanned when determining the whole grain profile of a food product, as it has been suggested that this component is the determining factor in physiological response (Newby *et al*., 2004)

Soy protein

- Regular consumption of 1-2 servings of soy protein, 15-30g/d, has favorable impacts on serum lipoprotein risk factors for CVD (Anderson and Bush 2011).
- In Canada, there is an approved health claim relating to soy protein and cardiovascular health, specifically in the context of cholesterol lowering (Health Canada 2015).

Phytosterols

- Health Canada's assessment of the claim that phytosterols lower blood cholesterol states that there is sufficient evidence to support an 8.8% reduction in LDL-C with an average intake of ~2g/day phytosterols.

Ground Flaxseed, Barley, Psyllium & Oat Products

- Consistent with Health Canada approval of health claims relating to ground whole flaxseed and blood cholesterol lowering, barley products and blood cholesterol lowering, psyllium products and blood cholesterol lowering, and oat products and blood cholesterol lowering, a positive rating will be attributed to products that contain sufficient amounts of one of these ingredients

Potassium

- Potassium is an essential nutrient involved in muscle function, cardiac function and regulation of blood pressure
- Furthermore, potassium deficiency has been shown to have many adverse effects on the cardiovascular system (DGAC, 2015).

Magnesium

- Magnesium has long been proposed to help lower blood pressure, a major risk factor for CVD
- Magnesium has been suggested to play a role in inhibiting platelet aggregation, modulating inflammation, and improving endothelial function (Guasch-Ferre et al, 2013).

Niacin

- Canner *et al.* determined that treatment with niacin (3g/day) led to significant reductions in CVD death (14%), stroke (26%), and mortality (11%) over a 15 year time period (Canner et al, 1986)
- 'Arterial Biology for the Investigation of the Treatment Effects of Reducing Cholesterol' (ARBITER 2) and 'ARBITER 6-HDL and LDL Treatment Strategies in Atherosclerosis' (ARBITER 6-HALTS) clinical trials showed that niacin in combination with statin lead to increased stability of the carotid intimal-media thickness (CIMT) – a surrogate end point for CVD – compared to patients on statin and ezetimibe or statin alone (Taylor et al, 2004 & Villines et al, 2010).

Folic Acid

- A recent meta-analysis of 12 prospective studies, which compared the highest to lowest circulating homocysteine level categories, found a 66% and 68% increase risk of CHD and CVD mortality respectively (Peng et al. 2015)
- Folic acid supplementation has been shown to decrease homocyteine, with 5 mg of folic acid per day resulting in a 25% decrease in homocysteine levels (Qin et al. 2012).

Ingredients not Included:

Omega-6 Fatty Acid

- Evidence for the benefits of omega-6 fatty acids are controversial and therefore this nutrient was not included in the algorithm

Substantiation of Cardiovascular Harmful Ingredients

Saturated Fat

- The 2015 US Dietary Guidelines lists Saturated Fat as a nutrient of concern for overconsumption - primarily due to its association with increased LDL-C
- Consistent with a 2013 NHLBI Report on Lifestyle Interventions to Reduce CVD, the 2013 AHA & ACC Report on lifestyle management to reduce CVD risk recommends a dietary pattern that consists of 5-6% of calories from SFA
- Based on the 2015 US Dietary Guidelines, the AHA Heart-Check certification and current available evidence, in addition to a general recommendation for SFA intake Pulse Passion has created 6 SFA source categories. These categories are based off foods that have been positively or negatively associated with CVD risk.

Trans Fat

- The 2015 US Dietary Guidelines state that the intake of trans fat (TFA) from partially hydrogenated vegetable oils are associated with an increased risk of CVD.
- Trans fats intake has been associated with increased levels of LDL-C and HDL-C.

Sodium

- A reduction of sodium to 1,500 mg a day may result in a greater reduction in blood pressure (Eckel et al., 2014)

Added Sugar

- Added Sugar in the diet can increase the risk of cardiovascular disease mortality. A diet with 10-25% of Calories from added sugar can increase the risk of death from cardiovascular disease by 30% and a diet with greater than 25% can triple the risk (Yang et al., 2014)

Ingredients not Included:

Cholesterol

- The 2015 US Dietary Guidelines rescind previous recommendations for cholesterol intake of less than 300mg per day.
- The DGAC states that the 2015 guidelines do not make this recommendation, as available evidence has not been able to show a relationship between consumption of dietary cholesterol and serum cholesterol.

Score Validity

To ensure the validity of scores generated by the ingredients listed above, all researchers first generated individual scores for select example food products. Researcher scores were pooled, and then compared to the score generated by the CVD Food Algorithm. The correspondence between these two scores was analyzed, with large deviations compelling adjustment of the food algorithm. A wide range of food products were tested during this period which considered all major food product categories of the grocery store, including produce, meat and poultry, baked items, cereals and grains, breakfast cereals, and dairy.

Algorithm in Context to Nutrition Scoring Systems

The CVD Food Algorithm is a novel and sophisticated nutrition scoring system. Food items are ranked according to their associated risk of cardiovascular disease in an unbiased, and scientifically based manner. Additionally, this algorithm is implemented as the app 'MyPulse', which capitalizes on the growing use of mobile devices over laptops or other sources to access information. Collectively, these aspects lend this nutrition scoring system several advantages over conventional systems, and when implemented, will improve the health and wellbeing of Canadians at risk for CVD.

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