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Scientific Advisory Committee on Nutrition (SACN) Consultation

RE: DRAFT SACN Carbohydrates and Health Report – June 2014

The Alliance for Potato Research and Education (APRE) appreciates the opportunity to submit comments for consideration by the Scientific Advisory Committee on Nutrition (SACN) consultation on its draft report on carbohydrates and health – June 2014.

APRE is a non-profit organization supported by potato growers and manufacturers in the United States and Canada. The mission of APRE is to support scientific research on the human consumption of potatoes and translate findings into educational initiatives for the scientific community and health professionals.

APRE submits the following comments to the SACN and respectfully requests the SACN re-consider its proposed summary statement on the relationship between potatoes and health.

I. The Proposed Statement on Consumption of Potatoes and Risk of Type 2 Diabetes Is Not Supported by a Sufficient Body of Scientific Evidence

The SACN reviewed hundreds of studies that examine the association and/or effect of carbohydrates and carbohydrate-containing foods on various markers and health outcomes, including cardiovascular disease, type 2 diabetes mellitus, obesity and colorectal health. The findings, in general, are striking in that there is little to no effect or association between these health outcomes and consumption of carbohydrates and/or high-carbohydrate diets (see Appendix, Tables 1-4). Of the few health outcomes that do show an effect or an association, the committee proposes a measured summary statement with sufficient caveats to fully explain the body of evidence. For example, based on six randomized controlled trials (RCTs), the committee concludes:

> *"A higher carbohydrate, average protein diet **may** result in **less of a reduction** in fasting cholesterol concentration **as compared with** a lower carbohydrate, higher protein diet, **but it is not possible to exclude confounding by other variables**, e.g. **less weight loss** in one of the experimental groups."* (Section 5.43, pg. 46)

The above statement accurately reflects the findings of a larger, more rigorous body of evidence related to carbohydrate consumption and carbohydrate-containing foods. It, therefore, defies explanation for the very strong statement proposed by the committee concluding that greater consumption of potatoes "*is detrimental to health*" proposed in the type 2 diabetes section 7.21 and 7.22, pages 110-111. Based on the limited body of evidence, inconsistent results, weak or no associations, high degree of heterogeneity, this statement is overly broad, inaccurate on its face and misrepresents the strength, totality and preponderance of the available science on this topic (see Appendix, Table 5).

This proposed statement is overly broad because all health outcomes were not examined. First, there appear to be no RCTs examining potatoes and any health outcomes. Second, of the health outcomes that were examined – cardiovascular disease, obesity and colorectal cancer and type 2 diabetes mellitus – the body of evidence is limited to a few cohort studies that exhibit a high degree of heterogeneity; show no consistent results; and cannot show a cause-and-effect relationship. For example, there is no association and limited evidence between potato consumption and cardiovascular disease. There is insufficient evidence on the relationship between potato consumption and stroke, impaired glucose tolerance, glycaemia and coronary events. Finally, the few cohort studies examining total cardiovascular disease and potatoes are inconsistent.

II. The Limited Body of Evidence from Cohort Studies Does Not Support the Proposed Conclusion Regarding Potatoes and Risk of Type 2 Diabetes Mellitus

Four cohort studies were identified that examined the potential relationship between intake of potatoes and incidence of type 2 diabetes mellitus. No RCTs are listed in the draft report.

The study by Hodge et al. examined the associations between type 2 diabetes and fiber, glycemic index, glycemic load and fiber-rich foods.[1] In this cohort study, potatoes were consumed 3-4 times a week and potato fiber intake ranged from 0.6-0.8 grams per day across the quartiles of glycemic index. The most outstanding feature across the quartiles were the differences in bread consumption with the highest GI quartile consuming white bread 17.5 times per week compared with 0.5 times per week consumed by the lowest GI quartile. Conversely, the lowest and highest GI quartiles consumed whole-meal bread 0.5 and 5.5 times per week. The results showed no association between potato fiber (g/d) and type 2 diabetes (OR 1.04; CI 0.92-1.17, p = 0.57) in the multivariate adjusted model and no association or trend

in potato consumption across quartiles of consumption. The author concluded "that a diet with high carbohydrate content and a low GI may reduce the risk of type 2 diabetes. White bread was the food most strongly related to diabetes incidence and was also the most strongly associated with GI."

A cohort study conducted by Montonen et al. has serious limitations.[2] The researchers examined consumption of different foods in predicting incidence of type 2 diabetes based on pre-selected dietary patterns. Over a 23-year followup, out of approximately 4,300 men and women who completed a dietary history, 3,921 non-cases and 383 cases (164 males and 219 females) of type 2 diabetes were identified.

Relative risk of developing type 2 diabetes was estimated across quartiles of foods. Among the persons who developed type 2 diabetes, they had higher body mass index, were older, more likely to be hypertensive or female, less likely to be smokers and more often had a family history of diabetes. Differences in potato consumption were miniscule with non-cases and cases consuming 220 and 232 g potato per day, respectively. It seems implausible that a difference of 3.7 teaspoons of potato a day would have any effect on the relative risk of developing type 2 diabetes. In a multivariate regression analysis, the authors found an increased risk of type 2 diabetes and potato consumption. The fully adjusted model that included additional variables – smoking, family history of diabetes and geographic area – did not attenuate the association suggesting the models may have been misspecified or the variables were imprecise in measuring relative risk. Furthermore, although the researchers controlled for family history of diabetes, they did not control for weight gain in their adjusted model. Both of these variables are strongly associated with risk of type 2 diabetes. It, therefore, would appear that the regression models did not control for an important risk factor that could attenuate the weak trend observed in the analysis.

The study by Halton et al makes assumptions in their modeling that are hypothetical at best.[3] Using data from the Nurses' Health Study, the researchers examined the association between potato consumption and risk of type 2 diabetes. The participants in the study were placed into quintiles, according to frequency of potato consumption. Intake of potatoes ranged from 0.07 servings per day in quintile 1 to 0.63 servings per day in quintile 5. French fry consumption ranged from 0 to 0.14 servings per day from quintile 1 to quintile 5. This illustrates very low intake of potatoes and French fried potatoes even at the highest quintile of consumption. In this study there is no difference in body mass index, family history of diabetes, age, physical activity, or smoking status. Across the quintiles of potato consumption, participants also report greater consumption of energy, cereal fiber, fruit and vegetable servings, red meat, whole grains, and refined grains. This demonstrates the complexity of the diet and the many interactions between and among foods and food groups, making tenuous any predictions of disease risk. An additional analysis was conducted to estimate relative risk of a hypothetical consumption of potatoes and French fries. The authors

hypothesize that consuming one serving of potatoes per day would impose a relative risk of 1.18; however, the highest quintile of potato consumption was 0.63 servings per day. Similarly, the authors hypothesize that consuming two servings of French fries per week would lead to a relative risk of 1.16; the highest quintile of French fry consumption was 0.14 servings per day or about one serving per week. These predictions, therefore, are not based on actual consumption patterns. Further, in a stratified analysis of obese and non-obese women, the association between potato consumption was observed among obese women only. There was no association between French fry consumption and relative risk of type 2 diabetes among obese or non-obese women. Of interest is that even though the dataset tracks the participants over multiple years, the investigators did not control for weight gain in any of their statistical models. Weight gain is an important risk factor in type 2 diabetes.

Finally, a prospective study of middle-aged Chinese women examined the role of glycemic index, and glycemic load in development of type 2 diabetes.[4] The top contributor to glycemic load was rice (74%) whereas potatoes – with median intake of 8.1 g/d – contributed 0.6% to the glycemic load. In this study, high intake of rice, noodles and steamed bread and bread – staples in the Chinese diet – were associated with greater risk of developing type 2 diabetes. Similar to the Nurses' Health Study, the investigators did not control for weight gain, but they did control for body mass index. Contrary to the findings in the Nurses' Health Study, these researchers observed an inverse association between potato consumption and risk of type 2 diabetes.

The small number of cohort studies, inconsistent results, weak associations, implausible estimates of relative risk based on low consumption of French fried potatoes, in particular, and potatoes, in general, do not support the statement proposed by the SACN with regard to risk of developing type 2 diabetes or any other adverse health outcome.

III. Summary

In summary, APRE requests that the SACN consider the following:

1. The entire body of evidence related to any health outcome and specific to potato consumption is insufficient to draw any conclusions;
2. The cohort studies examining potato consumption and total cardiovascular disease events finds no association from the limited evidence available;
3. There were no reported studies that met the inclusion criteria specific to potato consumption and obesity or colorectal health;
4. The cohort studies relating greater potato consumption and type 2 diabetes mellitus are limited and the strength of the association is weak and not specific to potatoes;

5. The few cohort studies that are available on type 2 diabetes mellitus and greater potato consumption are inconsistent, have weak associations, were not properly controlled for weight gain over time and cannot show a cause-and-effect relationship;
6. The cohort studies are subject to confounding with other foods and food groups that may be consumed with potatoes, including fried potatoes.

IV. Conclusion

APRE commends the efforts of the SACN, however, the proposed statement regarding the association between greater potato consumption and health is not justified scientifically by the insufficient size of the body of evidence, the weakness of the association, the type of studies available (cohort only), misspecified or under-specified statistical models and in some cases, hypothetical and implausible consumption patterns related to potato and French fried potato consumption.

Respectfully submitted,

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Appendix

Table 1. Summary of relationship between carbohydrates and cardiovascular disease

Topic: Cardiovascular Disease	Overall Conclusion	Strength of the Evidence	Biologically Relevant?	Summary Statement
Total carbohydrate (g/d and % energy) and CVD events	No association	Moderate		none
Total carbohydrate (g/d and % energy) and coronary heart disease	No association	Limited		none
Total carbohydrate (g/d and % energy) and stroke	No association	Limited		none
Higher carbohydrate diets and vascular function	No effect	Limited		none
Higher carbohydrate, lower fat diets and systolic blood pressure	No effect	Adequate		none
Higher carbohydrate, lower fat diets and diastolic blood pressure	No effect	Adequate		none
Higher carbohydrate, average protein diets and systolic blood pressure	Effect	Limited	Yes	A higher carbohydrate, average protein diet may result in less of a reduction in systolic blood pressure as compared with a lower carbohydrate, higher protein diet, but it is not possible to exclude confounding by other variables, e.g. less weight loss in one of the experiment groups.
Higher carbohydrate, average protein diets and diastolic blood pressure	No effect	Limited		none
Higher carbohydrate, lower fat, average protein diets and systolic blood pressure	No effect	Adequate		none

Higher carbohydrate, lower fat, average protein diets and diastolic blood pressure	No effect	Adequate		none
Higher carbohydrate, lower fat diets and fasting total cholesterol concentration	Effect	Adequate	Yes	A diet higher in carbohydrate and lower in fat may decrease fasting total cholesterol concentration, but it is not possible to exclude confounding by other variables, e.g. a concomitant reduction in saturated fat intake and/or weight loss.
Higher carbohydrate, lower fat diets and fasting HDL-cholesterol concentration	No effect	Adequate		none
Higher carbohydrate, lower fat diets and fasting total cholesterol:HDL-cholesterol ratio	No effect	Moderate		none
Higher carbohydrate, lower fat diets and fasting LDL-cholesterol:HDL-cholesterol ratio	No effect	Moderate		none
Higher carbohydrate, average protein diets and fasting total cholesterol concentration	Effect	Limited	Yes	A higher carbohydrate, average protein diet may result in less of a reduction in fasting cholesterol concentration as compared with a lower carbohydrate, higher protein diet, but it is not possible to exclude confounding by other variables, e.g. less weight loss in one of the experimental groups.
Higher carbohydrate, average protein diets and fasting HDL-cholesterol concentration	No effect	Adequate		none
Higher carbohydrate, average protein diets and fasting LDL-cholesterol concentration	No effect	Adequate		none

Higher carbohydrate, average protein diets and fasting triacylglycerol concentration	Effect	Limited	Yes	A higher carbohydrate, average protein diet may results in less of a reduction in fasting triacylglycerol concentration as compared with a lower carbohydrate, higher protein diet, but it is not possible to exclude confounding by other variables, e.g. less weight loss in one of the experimental groups.
Higher carbohydrate, lower fat, average protein diets and fasting total cholesterol concentration	Effect	Adequate	Yes	A higher carbohydrate, lower fat, average protein diet may decrease fasting total cholesterol concentration, but it is not possible to exclude confounding by other variables, e.g. a concomitant reduction in saturated fat intake and/or weight loss.
Higher carbohydrate, lower fat, average protein diets and fasting HDL-cholesterol concentration	Effect	Moderate	Yes	A higher carbohydrate, lower fat, average protein diet may decrease fasting HDL-cholesterol concentration, but it is not possible to exclude confounding by other variables, e.g. a concomitant reduction in fat intake and/or weight loss.
Higher carbohydrate, lower fat, average protein diets and fasting LDL-cholesterol concentration	Effect	Adequate	Yes	A higher carbohydrate, lower fat, average protein diet may decrease fasting LDL-cholesterol concentration, but it is not possible to exclude confounding by other variables, e.g. a concomitant reduction in saturated fat intake and/or weight loss.
Higher carbohydrate, lower fat, average protein diets and fasting triacylglycerol concentration	Effect	Moderate	Yes	A higher carbohydrate, lower fat, average protein diet may result in less of a reduction in fasting triacylglycerol concentration as compared with a lower carbohydrate, average or higher fat and higher protein diet, but it is not possible to exclude confounding by other variables, e.g. a concomitant reduction in fat intake.
Higher carbohydrate, lower fat, average protein diets and fasting total cholesterol:HDL-cholesterol ratio	No effect	Moderate		none

Higher carbohydrate, lower fat, average protein diets and fasting LDL-cholesterol:HDL-cholesterol ratio	No effect	Limited		none
Higher carbohydrate diets and fasting non-HDL cholesterol concentration	Effect	Limited	Yes	A higher carbohydrate diet may result in more of a reduction in fasting non-HDL-cholesterol concentration as compared with a lower carbohydrate diet, but it not possible exclude confounding by other variables, e.g. a concomitant reduction in saturated fat intake and/or weight loss.
Higher carbohydrate diets and fasting non-esterified fatty acid concentration	No effect	Adequate		none
Higher carbohydrate diets and inflammatory markers	No effect	Limited		none
Higher carbohydrate, lower fat diets and CRP concentration	No effect	Adequate		none
Higher carbohydrate, average protein diets and CRP concentration	No effect	Limited		none
Higher carbohydrate, lower fat, average protein diets and CRP concentration	No effect	Adequate		none

Table 2. Summary of relationship between carbohydrates and type 2 diabetes mellitus

Topic: Type 2 Diabetes Mellitus	Overall Conclusion	Strength of the Evidence	Biologically Relevant?	Summary Statement
Total carbohydrate (% energy and g/d) and type 2 diabetes mellitus	No association	Moderate		none
Higher carbohydrate diets and impaired glucose tolerance	No effect	Limited		none
Total carbohydrate (% energy) and glycaemia	No association	Moderate		none
Higher carbohydrate diets and oral glucose tolerance test	No effect	Adequate		none
Higher carbohydrate, lower fat diets and fasting blood glucose concentration	No effect	Adequate		none
Higher carbohydrate, average protein diets and fasting blood glucose concentration	No effect	Adequate		none
Higher carbohydrate, lower fat, average protein diets and fasting blood glucose concentration	No effect	Adequate		none
Higher carbohydrate, lower fat diets and fasting blood insulin concentration	No effect	Adequate		none

Higher carbohydrate, average protein diets and fasting blood insulin concentration	No effect	Moderate		none
Higher carbohydrate, lower fat, average protein diets and fasting blood insulin concentration	No effect	Adequate		none
Higher carbohydrate, lower fat diets and insulin response to oral glucose tolerance test	No effect	Limited		none
Higher carbohydrate, lower fat, average protein diets and insulin response to oral glucose tolerance test	No effect	Limited		none
Higher carbohydrate, lower fat diets and insulin resistance/sensitivity	No effect	Limited		none
Higher carbohydrate, lower fat, average protein diets and insulin resistance/sensitivity	No effect	Moderate		none
Higher carbohydrate diets and haemoglobin A1c concentration	No effect	Adequate		none

Table 3. Summary of relationship between carbohydrates and obesity

Topic: Obesity	Overall Conclusion	Strength of the Evidence	Biologically Relevant?	Summary Statement
Higher carbohydrate diets and fat free mass	No effect	Moderate		none
Higher carbohydrate diets and waist to hip ratio	No effect	Limited		none
Higher carbohydrate, lower fat diets and body weight	No effect	Limited		none
Higher carbohydrate, average protein diets and higher carbohydrate, lower fat, average protein diets and body weight	No effect	Adequate		none
Higher carbohydrate, lower fat diets and body mass index	Effect	Limited	Yes	The direction of the effect demonstrates energy restricted, higher carbohydrate, lower fat diets may be beneficial to reducing body mass index.
Higher carbohydrate, average protein diets and higher carbohydrate, lower fat, average protein diets and body mass index	No effect	Limited		none
Higher carbohydrate, lower fat diets and fat mass	No effect	Limited		none
Higher carbohydrate, average protein diets and higher carbohydrate, lower fat, average protein diets and fat mass	No effect	Limited		none
Higher carbohydrate, lower fat diets and waist circumference	No effect	Limited		none

Higher carbohydrate, average protein diets and higher carbohydrate, lower fat, average protein diets and waist circumference	No effect	Limited		none
Higher carbohydrate, lower fat, average protein diets and energy intake	No effect	Adequate		none
Total carbohydrate intake (% energy) and body mass index and body fatness	No association	Limited		none

Table 4. Summary of relationship between carbohydrates and colorectal health

Topic: Colorectal Health	Overall Conclusion	Strength of the Evidence	Biologically Relevant?	Summary Statement
Total carbohydrate (g/d) and colo-rectal cancer	No association	Adequate		none
Total carbohydrate (g/d) and colon cancer	No association	Adequate		none
Total carbohydrate (g/d) and rectal cancer	No association	Adequate		none

Table 5. Summary table of evidence related to consumption of potatoes and health outcomes

Topics Potatoes and…	Number of Studies	Type of Studies	Conclusion	Strength of the Evidence
Total cardiovascular disease events	2*	Cohort	No association	Limited
Type 2 diabetes mellitus	4	Cohort	Association	Limited
Stroke				Insufficient
Type 2 diabetes mellitus				Insufficient
Impaired glucose tolerance				Insufficient
Glycaemia				Insufficient
Coronary events				Insufficient
Cardiovascular disease				Inconsistent

*1 study reported on 2 cohorts

References

[1] Hodge AM, English DR, O'Dea K, Giles GG. Glycemic index and dietary fiber and the risk of type 2 diabetes. Diab Care 2004; 27: 2701-6.
[2] Montonen J, Järvinen R, Heliövaara M, Reunanen A, Aromaa A, Knekt P. Food consumption and the incidence of type II diabetes mellitus. Eur J Clin Nutr. 2005;59: 441-8.
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[4] Villegas R, Liu S, Gao YT, Yang G, Li H, Zheng W, Shu XO. Prospective study of dietary carbohydrates, glycemic index, glycemic load, and incidence of type 2 diabetes mellitus in middle-aged Chinese women. Arch Intern Med. 2007;167: 2310-6.