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**SUMMARY OF MAIN POINTS OF SCIENTIFIC BASIS OF THE DIETARY
RECOMMENDATION FOR DIABETICS**

SUMMARY OF MAIN POINTS OF SCIENTIFIC BASIS OF THE DIETARY RECOMMENDATION FOR DIABETICS

This document's aim is to contribute to comprehension of document COM(2008)392

In 2004 a group coordinated by Mannⁱⁱ on behalf of the Diabetes and Nutrition Study Group of the European Association for the Study of Diabetes (DNSG of the EASD) reviewed the evidence for nutritional approaches to the treatment and prevention of diabetes mellitus and made recommendations based on evidence for dietary advice to people with diabetes. The strength of evidence for each of the recommendations was graded according to the nature of the studies on which they were based. Below is a summary of some of the main points of the review.

Energy balance and body weight

The review concluded that those who are overweight (BMI above 25 kg/m² should lose weight so that the BMI moves towards the recommended range of between 18.5 and 25 kg/m². The prevention of weight gain and the maintenance of a desirable weight is important. While it may not always be possible for individuals to achieve or maintain a desirable BMI, modest weight loss (under 10% body weight) improves insulin sensitivity and glucose tolerance and reduces lipid levels and blood pressure.

Dietary fats

People with diabetes mellitus have an increased risk of cardiovascular disease, which is around 2-4 times greater than for people without diabetes. The evidence supporting the recommendations for dietary fat intake is mainly based on studies involving non-diabetic subjects. There are no controlled dietary intervention studies of sufficient power among people with diabetes. There are some studies on people with diabetes comparing the effects of diets with different fatty acid composition that support the evidence in respect of non-diabetic subjects. It is recommended that **total fat intake** should not exceed 35% of total energy due to the increased body weight of people on high-fat diets. In addition, high fat intakes may have adverse effects on insulin sensitivity.

The evidence in the case of non-diabetic subjects that exchange of **saturated fatty acids** with unsaturated fatty acids or carbohydrates reduces plasma LDL cholesterol is supported by a few controlled studies on subjects with diabetes. In contrast to other saturated fatty acids, though, stearic acid does not increase cholesterol. The consumption of saturated fatty acids and trans fatty acids causes an increase in blood insulin levels. In two prospective studies on subjects with diabetes, the ratio of polyunsaturated to saturated fatty acids in the diet was significantly associated with coronary heart disease events. The recommendation is that saturated and trans fatty acids should provide less than 10% of total energy.

Regarding **monounsaturated fatty acids** (MUFA), Mann notes controlled studies, mainly on subjects with diabetes whose weight is within the normal range, indicating that serum lipid levels may be improved by the substitution of a certain amount of MUFA for carbohydrates. The effects were seen when the substituted carbohydrates were mainly starch-rich foods with a low content of dietary fibre and high glycaemic index. The dietary recommendation is that oils rich in MUFA are useful fat sources and, depending on individual preferences, may provide 10-20% of total energy, provided the total fat content of the diet is less than 35% total energy.

The replacement of saturated fatty acids with **polyunsaturated fatty acids** has positive effects on serum lipid levels, lipoprotein concentration and composition and insulin sensitivity. The effects of mono- and polyunsaturated fatty acids on blood glucose and blood lipid levels appear similar. A high polyunsaturated to saturated fatty acid ratio has been associated with a low risk of fatal cardiovascular events in people with diabetes. It is recommended that polyunsaturated fatty acid intake should not exceed 10% of total energy.

With respect to n-3 polyunsaturated fatty acids there are no published controlled studies to suggest that supplementation with n-3 fatty acids improves insulin sensitivity. There are insufficient data to make specific recommendations on the optimal ratio of n-3:n-6 fatty acids. However, in line with the recommendations for the general population, it is recommended that dietary intake of n-3 fatty acids be encouraged through consumption of fish and plant sources of n-3 fatty acids.

On the basis of data relating to non-diabetic people and people with type 1 diabetes, it is recommended to restrict dietary intake of **cholesterol**, as increased plasma cholesterol levels are associated with increasing intake of cholesterol. The recommendation is that daily intake of cholesterol should not exceed 300mg.

Carbohydrates

The recommended range of **carbohydrate** intake of 45-60% of total is based on the limits for the intake of fats and protein. The review notes a meta-analysis comparing the effects of high-carbohydrate diets with diets higher in MUFA and lower in carbohydrates. It concluded that the long-term effects on glycaemic control of the different diets were comparable. In some of the high-carbohydrate studies there were untoward effects on the fasting triglyceride levels which can be avoided if the carbohydrate foods are rich in dietary fibre and/or have a low glycaemic index. The review notes that when choosing carbohydrate-containing foods their effect on insulin sensitivity, serum lipids and energy balance should be considered and that people with diabetes should regularly consume vegetables, legumes, intact fruits and wholegrain cereals.

The review notes that controlled studies have indicated that increased intake of **dietary fibre** is associated with improved blood glucose levels. Ideally the intake of dietary fibre should be 40g/day or more, of which half should be soluble fibre. In addition, several but not all studies of diets rich in soluble fibre have found an association between high-fibre diets and lower levels of total and LDL cholesterol. The review recommends that people with diabetes should consume foods naturally rich in dietary fibre and that the daily intake should ideally be more than 40g. It suggests that daily consumption of at least five servings of fibre-rich vegetables or fruit and at least four servings of legumes each week can help to provide the minimum recommended intake of fibre, whilst cereal-based foods should wherever possible be wholegrain.

The **glycaemic index** (GI) was proposed in the early 1980s as a method to guide food selection. A meta-analysis of controlled dietary intervention studies comparing diets containing high GI and low GI foods noted an improvement in mean blood glucose control. The effect of the GI of foods on blood glucose is independent of the effects of other dietary interventions. The review makes certain caveats about the use of GI for the selection of foods but concludes that carbohydrate-rich, low GI foods are suitable as carbohydrate-rich choices provided other attributes of the foods are appropriate.

Regarding **sucrose**, the review notes that in the 1980s several randomised controlled trials demonstrated no adverse effects on glycaemic control, lipids and lipoproteins when diets containing small amounts of sucrose were compared with “sucrose-free” diets. There are no studies available to make specific recommendations for the maximum intake of sucrose or free sugars by people with diabetes. The recommendation of limiting intake to less than 10% of total energy is based on experts' recommendations for the general population.

Protein

The review makes the following recommendations in relation to protein based on the available evidence. In people with diabetes with no evidence of nephropathy, protein intake may provide 10-20% of total energy; in people with type 1 diabetes with established nephropathy, protein intake should be at the lower end of the acceptable range, which is around 0.8g/kg normal body weight per day.

Antioxidant nutrients, vitamins, minerals and trace elements

Evidence in relation to non-diabetic people suggests that a range of **antioxidant nutrients, vitamins**, and foods rich in them protect against cardiovascular disease. Short-term studies involving the consumption of foods rich in these nutrients and supplementation studies confirm that markers of oxidative stress can be favourably influenced by substantial intakes. However, studies with clinical endpoints, principally involving non-diabetic people, have not demonstrated beneficial effects. The group recommended people with diabetes to eat foods rich in such nutrients but did not recommend supplements.

Moderate dietary **sodium** restriction produces a substantial reduction in systolic blood pressure in mildly hypertensive people with type 2 diabetes. It is recommended that, as for the general population, people with diabetes should restrict their daily salt intake to under 6g.

The review noted that there is evidence that some people with diabetes have low levels of circulating **magnesium** and that magnesium depletion of muscle and bone has been observed and linked to retinopathy and polyneuropathy. In addition, it has been suggested that there is a role for magnesium supplementation in halting the progression of these conditions. However, the group concluded that confirmation of the observations would need to be available before firm recommendations could be made.

The review notes that low levels of zinc and chromium and high levels of copper have been reported in people with diabetes but concluded that there was no evidence to suggest that these observations should influence nutritional dietary recommendations.

Alcohol

Moderate amounts of alcohol may be associated with improved insulin sensitivity and, in non-diabetic subjects, is linked to reduced risk of cardiovascular disease. However, alcohol can be an important energy source and can also be associated with raised levels of blood pressure, increased triglycerides and an increased risk of hypoglycaemia. There are no conclusive data on an appropriate upper limit of alcohol intake for people with diabetes, so the recommendation is based on what is suggested for the general population – a moderate intake (up to 10g/day for women and 20g/day for men).

The above summary reflects the conclusions included in the review by Mann, although it should be noted that there is no evidence of arguments contradicting their main conclusions with regard to dietary advice. The technical review by Franz that formed the basis of the American Diabetes Association position statement^{vi} draws similar conclusions.

REFERENCES

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