

Carbohydrates

Rapporteur's report

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Presentations

Dietary Effects on Dental Diseases

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Carbohydrates guidelines based on food consumption. Losing ground to fats?

Lluis Serra-Majem, University of Las Palmas de Gran Canaria, Gran Canaria

Promoting carbohydrates (including Fibre)

Johan De Rycker, Université Libre de Bruxelles (ULB), Belgium.

Barriers and opportunities at a European level for the implementation of dietary guidelines in relation to carbohydrates

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Keywords

Carbohydrate, sugar, dental caries, EU diets, food and nutrition policy

The workshop was opened by four speakers who were nominated by each working group to portray the basis for the carbohydrate recommendations in nutrient terms, the translation of these goals into food-based dietary guidelines, the evidence for different societal strategies for achieving these goals and, finally, the policy implications of these goals.

Prof. Sheiham first provided an overview of why, within the total carbohydrate goal of >55% energy, it was appropriate to specify a separate goal for sugar. The issue related to the causal role of sugar in inducing dental caries and the fact that caries is a major public health burden within the EU. Throughout the EU dental caries was observed in most children in all EU countries by 5 years of age, with new evidence of the progressive nature of this disease throughout life. Thus the average 12 year olds' number of carious lesions doubled to 7 lesions ten years later and caries scores became markedly worse, particularly in older adults. The gradual EU decline in caries incidence in North European countries, induced by the use of fluoride toothpaste had now stopped, with fluoride simply slowing the development of the disease. Caries-induced pain affected nearly half the 8 year olds in some communities and induced crying in 18% of children. Dental costs were huge, accounting for 10% of the West German health budget in 1994.

Caries is a particular burden for disadvantaged and immigrant groups across the EU.

Sucrose was now accepted as the principal cause of dental caries; although other fermentable carbohydrates such as some processed starches and the intrinsic sugars found naturally, e.g. in fruits and milk sugars, could be shown to be fermentable and therefore capable of inducing caries. In practice, however, the impact of starches and the intrinsic sugars was negligible¹⁻³. The cause of dental caries should not be confused with the causes of dental erosion, a new disease of widespread enamel erosion induced not by carbohydrates but by acids such as those found in soft drinks. Their frequent consumption seems to be leading to major dental problems based on national surveys in the UK and a few studies in other EU member states. Frequency of sugar intakes was a crucial factor promoting dental caries with evidence that four or more intakes per day doubled the risk of caries⁴⁻⁷. Originally the best national data on the relationship between sugar consumption and caries rates had come from changing total sugar consumption figures in Japan during the Second World War⁸ but more recent epidemiological analyses had shown that in practice frequency of consumption correlated very highly ($r=0.75 - 0.97$) with total intakes and Downer^{9,10} has shown a correlation between sucrose consumption and mean DMFT in the populations of 5-year-olds to

be 0.62 and for DMFT of 12 year olds, 0.84. The relationship between sucrose availability and mean DMFT at 12 years was linear. So it was not surprising that the UK and Nordic countries had recommended an upper limit of 10% from "fabricated" or "purified" sugars, the recent Nordic specifications being applied particularly to children and adults on low energy intakes. Finally, with some dentists becoming concerned exclusively with dental hygiene and the use of fluoride, Sheiham emphasised, based on reviews by Sutcliffe¹¹ that brushing teeth alone was not effective in reducing caries and that substantial caries rates persisted in countries with fluoridated water supplies, fluoride toothpaste use and good dental services and health promotion schemes aimed at dental hygiene. For example, in fluoridated areas of Ireland the DMFT was very high, 19 in 35-44 year olds¹². Sugar must therefore remain a major target in dental caries prevention strategies.

Prof. Serra-Majem then outlined recent dietary survey findings which should help in developing food-based dietary guidelines for promoting carbohydrate-rich diets. He took as an example the Catalonian data which showed a marked fall in carbohydrate intake from 52% to 41% over a 25 year period. Current cross-sectional analyses highlighted the need to establish the foods contributing to the diet of those adults still on a relatively high carbohydrate intake. Whereas fibre-rich cereals and fruit intakes were clearly greater in the high carbohydrate consumers, potato intake was little different across the quartiles of intake and vegetable intake was greatest in those on a high fat, low carbohydrate diet! Sugar intakes did not necessarily correlate tightly with total carbohydrate consumption but there was a clear inverse relationship between sugar and fat intakes. Concern that high sugar diets might be poorer in nutrients revealed that Catalans on high sugar intakes had much higher vitamin C intakes, a modest increase in dietary folate but a clear reduction in vitamin B₁₂ and a small fall in retinol intakes. Thus the sugar-nutrient relationship were not straightforward.

Further analyses showed that high sugar consumers tended to have, as in the rest of the EU, lower BMIs, particularly in men. Changes within the current Catalan diets should be possible to meet the suggested goals because those in the lowest quartile of fat consumption had an intake of 32% energy which was within the targeted range of fat intakes.

Mr. van De Rycker, from Working Party 3, then outlined the possible strategies for promoting fibre-

rich carbohydrates. First, if consumers were unaware of what constitutes desirable behaviour then little can be achieved, so there is a need for clear and pervasive information and educational programmes. The next step is to ensure that the desired options are available in the numerous practical settings within which people purchase or eat their food. Well-informed consumers can hardly be expected to achieve better carbohydrate intakes if they do not have access within schools, workplaces or elsewhere to the appropriate options in as attractive a form as possible. The third issue is to consider the strategy for promoting the intakes of pastas, bread, vegetables or other fibre-rich foods. Measures to promote a specific food commodity met with less success than was achieved when there was a large variety of options. So the enormous increase in the types of pasta available, the remarkably diverse range of breads in many settings and the competitive marketing of many different vegetables were mechanisms for promoting the overall intakes of these three categories of desirable options. This emphasis on the desirable seemed preferable to attempts to ban undesirable options because a clear prohibition on some foods and drinks provoked an appreciable proportion of consumers to counteract this. Despite their sense of guilt, they displayed risk associated behaviour. Finally, there were clear benefits to be gained by overcoming the unhelpful or unpleasant aspects of the foods which, from a health perspective, are desirable components of the diet. Thus some vegetable dishes supplied for children could be improved by reducing the strength of some of the undesired tastes by a variety of means. Overall therefore we were now learning how to help consumers to achieve a diet closer to the optimum.

Dr. Rayner then briefly dealt with some of the policy issues. Not only should health promotion itself be considered at an EU level, but the health impact of other EU policies on dietary behaviour now need to be considered. Four contentious issues were likely to arise: how one defines the different components of carbohydrates in a legal, technical and consumer-friendly fashion for all the populations of Europe; what the policies should be in relationship to health claims for items such as functional foods; the issue of food advertising - for example, the intense advertising of high sugar drinks, snacks and other foods aimed at children; and, finally, the impact of the Common Agricultural Policy and how best to reform it so that it would help, and not hinder, the population's attempts to meet the European goals.

Discussion

The workshop discussion was wide-ranging but concentrated on the sugar issue. Caries rates had fallen, despite small or no changes in sugar intakes, as fluoride toothpaste use had increased; the issue was not only the size of the residual burden of disease relating to sugar, but whether there were options for now concentrating, in dental caries terms, on a high risk rather than on a population strategy. Sheiham highlighted the anomaly that, although now delayed by fluoride, the rates of caries were still epidemic in older children and adults, with a likely increased burden as the population aged. The proposition that water or alternative fluoridation schemes and other desirable strategies, could be targeted at the caries-prone disadvantaged groups within cities and immigrant communities was rejected by those who specified that water fluoridation was not a political option within the EU; likewise, discrimination in favour of the disadvantaged or immigrant communities on a geographical or even a socio-economic basis, was not feasible.

The need to focus on absolute intakes, or sugar intakes as % energy as well as frequency, provoked intense debate. The 1950s study by Gustafsson et al.¹³ which showed the irrelevance of total intake and was the only one cited in the recent 1998 FAO/WHO¹⁴ report on carbohydrates and caries, was described by the dentists present as a contrived study on mental patients with poor dental hygiene and on medication which reduced salivary flow. They were given 24 sticky toffees daily or just sugar in meals. Such a study would now be considered not only questionable ethically, but irrelevant to the issue of whether or not total intake was important. In practice, as total intake of sugars rose,^{7,15} so did frequency but the primary determinant of caries was the frequency of sugar intakes.

Given the recent debate on the implications of the cross-sectional data on the see-saw effect or inverse relationship between fat and sugar intakes, several contributors perceived that the obesity-inducing effect of fat should be targeted as a much greater public health problem than dental caries which was rarely life-threatening. Thus, if obesity was reduced but led to a higher sugar intake, then this was the acceptable option.

The nature of the message was then considered: some proposed that Table 1 refer to fermentable carbohydrates and not to sugar, extracted sugars, non-milk extrinsic sugars or other terminology. One

proposal was that one could gain concordance with the five fruit and vegetable per day target by having a similar target for the fermentable carbohydrate fraction of the diet.

Brief mention was also made of the now European-wide acceptance of the AOAC method of measuring fibre.

Finally, the emerging issues were portrayed as that of dental erosion, which needed to be assessed in more EU countries, and the glycaemic index of carbohydrate foods. This index needed to be evaluated and related to the propensity of different carbohydrate sources to alter insulin sensitivity. Food structure could also affect the glycaemic response and might well prove to be of increasing importance.

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Abstracts

Dietary effects on dental diseases

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Keywords

dental caries, sugars, frequency

Dental caries is a highly prevalent and costly chronic disease and its consequences cause a lot of pain and suffering. Both the frequency of consumption and total amount of sugars, particularly sucrose, are the most important dietary cause. *"The evidence establishing sugars as an aetiological factor in dental caries is overwhelming. The foundation of this lies in the multiplicity of studies rather than the power of any one."*¹ There is no evidence that sugars naturally incorporated in the cellular structure of foods (intrinsic sugars) or lactose in milk or milk products (milk sugars) have adverse effects on health. Foods rich in starch, without the addition of sugars, play a small role in coronal dental caries. The intake of extrinsic sugars beyond four times a day leads to an increase risk of dental caries.

Fluoride, particularly in toothpastes, is a very important preventive agent against dental caries. Toothbrushing without fluorides has little effect on

caries. As additional fluoride to that currently available in toothpaste does not appear to be benefiting the teeth of the majority of people, the main strategy to further reduce the levels of caries, is reducing the frequency of sugars intakes in the diet.

Dental erosion rates are increasing. The aetiology is acids in foods and drinks and to a much lesser extent from regurgitation.

Conclusions

Reducing sugars intakes to four or less times a day plus using fluoridated toothpastes, will reduce dental caries for all age groups.

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Carbohydrates guidelines based on food consumption. Losing ground to fats?

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Keywords

carbohydrates intake, dietary guidelines, sugars, fibre.

A recent report of a Joint FAO/WHO Expert Consultation¹ reviewed in 1997 the main topics concerning carbohydrates (CHO) in human nutrition, and among recommendations included *"an optimum diet of at least 55% of total energy from CHO"*, without distinctions between the major dietary CHO. On the other hand, in 1995, a joint FAO/WHO Consultation on Food-based dietary guidelines (FBDG) was convened and its report² recommends, among other things, *"the identification of potential target foods in specific public health nutrition*

programmes based on dietary patterns of consumers with low and high dietary intakes of target nutrient?".

Having all this in mind, we analysed the food patterns of low (1st quartile) versus high consumers (4th quartile) of different dietary CHO, including fibre, in Catalonia, Spain. High consumers of total CHO, sugars and oligo and polysaccharides had intakes of more than 46%, 21.5% and 24.5 % of energy respectively, and high fibre consumers had an intake of more than 2.2 g/mJ/day. The major dietary contributors to the CHO gap were cereals and bread, fruits, legumes and sweets, but not potatoes and dairy

products. Low CHO eaters had higher amounts of meat and vegetables in their diet. The consumption of carbohydrates – sugars, oligo-polysaccharides and fibre- but not added sugar, were associated to a more balanced and nutrient dense diet and also to better anthropometric values. Promoting a diet with a % of energy around the 4th quartile of total CHO (without distinctions between the major dietary CHO) of the same population is realistic and may be achieved in a reasonable period of time. In addition, this approach allows to select the most important food contributors to the gap between low and high consumers, avoiding inappropriate dietary guidelines.

The FBDG approach may better identify and select reliable short and mid term nutrition objectives and dietary guidelines than “scientifically-based ultimate goals”.

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Promoting carbohydrates (including fibre)

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Keywords

direct and indirect techniques, effectiveness, carbohydrates

Objectives:

Taking decision making theory as the starting point, the purpose is to illustrate with regard to carbohydrates (and fibre) direct and indirect “promotion” techniques that work effectively (i.e. that do change behaviour) and to consider also why other techniques are ineffective.

Promotion Techniques

These promotion techniques are structured as follows:

1. Increasing awareness of desired behaviour, i.e. bringing them into the choice-set (versus eliminating undesired behaviour from the choice-set).
- Given poor understanding, even among health professionals, it is preferable to use food categories that contain carbohydrates, rather than using the term ‘carbohydrates’.
- Indirect measures, such as promoting breakfast (even including vegetables in breakfast) work better than promotion models such as pyramids, triangles, circles or plates.
- Eliminating undesired behaviour via e.g. taxes or price-setting does not take account of cross-price elasticities, inciting worse behaviour than

originally intended via risk-compensatory behaviour.

2. Changing the choice structure, either by increasing the choice-set, increasing the benefits of desired behaviour, or decreasing the disadvantages of desired behaviour.
 - Rather than promoting “categories” as such (e.g. bread or pasta), the competitive promotion of competitive products within categories enlarges the total category more so than generic campaigns have ever been able to.
 - Indirect measures such as “Fruits & vegetables five times a day” (instead of 5 portions!) are again preferable.
 - Improving taste e.g., as evidenced in tastier toothpastes as one indirect means of encouraging dental care. Another indirect measure is the provision of a 3-monthly toothbrush subscription scheme. Smoking cessation programmes could also have an indirect effect since the incidence of caries in lower social classes is strongly correlated with mothers’ smoking behaviour.¹
3. Providing desired alternatives (versus discrediting undesired alternatives).

- Instead of eliminating tuckshops in schools, include fruits and vegetables in vending machines.
- Provide fat-replacers that are carbohydrates (such as inulin or oligofructose).
- Promote variety for in-between meal snacks, via a simple “week-calendar” algorithm:

A) always choose something different in the afternoon from what you had in the morning. B) Always opt for something different tomorrow from what you had today.

This last scheme, together with a breakfast promotion scheme in primary schools, increased children’s consumption of carbohydrates (% energy) by 7-8%. This was without ever talking specifically about “carbohydrates”.

Conclusion

Indirect approaches invariably are more effective than direct approaches, positive ones more effective than negative ones, and foods more effective than nutrients such as carbohydrates. Simultaneously, using these approaches bypasses the perverse effects otherwise engendered via obsessive restrictive behaviours.

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Barriers and opportunities at a European level for the implementation of dietary guidelines in relation to carbohydrates

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There are various barriers and opportunities at a European level in relation to the recommendations of Working Party 1 of the Eurodiet Project regarding total intake of carbohydrate; intake of free, refined sugars; consumption of sugary snacks, confectionery and sugary drinks; and intake of dietary fibre and the recommendations of Working Party 2 in relation to intake of dietary fibre.

European Union (EU) policies which might directly affect carbohydrate (including fibre) consumption - include health promotion policy but also health monitoring and food-related research policy. There are also EU policies with possible indirect effects on carbohydrate consumption - principally in the areas of consumer protection (particularly food labelling) and agriculture.

There are various controversies which will need to be resolved if EU policies (either direct or indirect) are to be revised in order to facilitate compliance with the recommendations of Working Parties 1 and 2. The main controversies seem to be about: (i) the definition of carbohydrate fractions (including fibre) for the purposes of food labelling legislation, monitoring dietary intakes, etc.; (ii) the validity of the evidence in relation to the health effects of consuming different carbohydrate fractions e.g. for the purpose of legislation on health claims (iii) the effects of advertising of sugary snacks, confectionery and sugary drinks on consumption - particularly consumption by children; and (iv) the effects of the Common Agriculture Policy on carbohydrate consumption.