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## **CEFS Position Paper on the FAO/WHO Scientific Update on Carbohydrates in Human Nutrition**

### **Summary**

The FAO/WHO Scientific Update on Carbohydrates in Human Nutrition, which was released in November 2007, is meant to be an intermediate step towards a second FAO/WHO Expert Consultation to be convened to update the work of the 1997 Expert Consultation on Carbohydrates in Human Nutrition.

While acknowledging the need to take into account recent scientific developments and, if necessary, to integrate them into nutrition recommendations on carbohydrate intake, CEFS (Comité Européen des Fabricants de Sucre), on behalf of all sugar manufacturers in the EU and Switzerland, can only regret that not all the available scientific evidence was considered by FAO/WHO for that purpose. On the contrary, the FAO/WHO Scientific Update on Carbohydrates in Human Nutrition relies on a selective and partial review of the scientific evidence.

First of all, the general recommendation to avoid using terms such as “free” or “added” sugars, which is made in the first review chapter on “*Carbohydrate terminology and classification*”, is completely ignored in the subsequent chapters of the Scientific Update that continue distinguishing between sugars from various sources.

Secondly, while it has been widely demonstrated that nutrient adequacy can be achieved across a wide range of dietary sugar, the Scientific Update fails to acknowledge this fact. Furthermore, it completely ignores a large body of evidence having highlighted an inverse relationship between BMI and sugars intake.

The available scientific evidence does not suggest any direct link between sugars intake and obesity. In addition, evidence to date of any link between soft drinks and obesity or weight gain is equivocal. Therefore, it is unfortunate that the FAO/WHO Scientific Update endorses the (arbitrary) 10% limit for “free sugars” intake that was first referred to in the WHO TRS Report 916, especially while extending the rationale justifying this limit beyond its original focus on dental health to obesity.

In conclusion, CEFS would appreciate if the scientific issues discussed in the present position paper would be considered appropriately by any future Expert Consultation on Carbohydrates in Human Nutrition.

# CEFS Position Paper on the FAO/WHO Scientific Update on Carbohydrates in Human Nutrition

## Introduction

The FAO/WHO Scientific Update on Carbohydrates in Human Nutrition was released a few days before the 29<sup>th</sup> Session of the Codex Committee on Nutrition and Food for Special Dietary Uses (CCNFSDU) in November 2007. It is meant to be an intermediate step towards a second FAO/WHO Expert Consultation to be convened to update the work of the 1997 Expert Consultation on Carbohydrates in Human Nutrition.

While acknowledging the need to take into account recent scientific developments and, if necessary, to integrate them into nutrition recommendations on carbohydrate intake, CEFS (Comité Européen des Fabricants de Sucre), on behalf of all sugar manufacturers in the EU and Switzerland, can only regret that not all the available scientific evidence was considered by FAO/WHO for that purpose. Indeed, the recommendations with regard to population average free sugar consumption are arbitrary; are derived from a selective and partial view of the evidence; and will not benefit public health in the manner posited.

Where the 1997 Expert Consultation cautiously avoided providing recommendations on issues for which the scientific evidence was inconclusive, the Scientific Update draws certain conclusions that either do not entirely reflect the scientific references quoted in the report or are based on a selective review of science.

Considering the above aspects, we fully share FAO/WHO's hope that the Scientific Update on Carbohydrates in Human Nutrition "*will stimulate discussion among the scientific community and relevant health professions*" since such a debate may lead to a more comprehensive picture of the scientific literature on carbohydrates to be presented to the second Expert Consultation. In particular, CEFS would appreciate if the scientific issues discussed hereunder would be considered appropriately in the future.

### **1- Introductory remarks**

CEFS is generally concerned with the lack of transparency behind the selection of the authors involved in the drafting of the FAO/WHO Scientific Update on Carbohydrates in Human Nutrition. It is notably regrettable that the selected authors all originate from restricted regions (4 countries: the UK (7), New Zealand (3), The Netherlands (2) and the USA (1)), whereas the previous FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition (1997) involved scientists from all over the world.

In addition, CEFS questions the methodological prejudice not to take observational studies into account when assessing the effects of the macronutrient composition of the diet on body weight. It is certainly true that observational studies are subject to random and systematic errors which may render the interpretation of their results difficult (e.g. misreporting of food intake; inadequate distinction between causality and reverse causality; and confounding non-dietary influences). However, observational studies usually correct reporting biases by excluding underreporters, so that data collected e.g. from nationally representative dietary surveys cannot be ignored. Interestingly, when looking into soft drinks and body weight, the authors of the Scientific Update did not rule out data obtained from studies that used similar methodology (or even less reliable reporting schemes).

The major uncertainty in the reliability of observational studies relates to our inability to measure the habitual dietary intake of free living individuals accurately. This uncertainty applies equally to all studies of free living individuals and has led to an enormous gap in our knowledge of the relation between diet and chronic disease. Laboratory studies, especially since these must of necessity be of short duration, do not provide a substitute for naturalistic observations in free living individuals and should not be presented as doing so. It is therefore relevant that several observational studies, when providing suggestive evidence that is consistent, highlight certain associations that should not be totally ignored. For instance, numerous observational studies from all over the world have shown an inverse relationship between BMI and sugars intake. To wholly discount this evidence, as the Scientific Update does in the chapter on “*Carbohydrate intake and obesity*”, represents a reprehensible selectivity in the use of the science.

CEFS therefore requests that those studies relating to the impact of dietary carbohydrate on body fatness, which were not considered in the FAO/WHO Scientific Update because of their observational nature, are taken into account appropriately in any future Expert Consultation.

## **2- Terminology: “Free sugars”**

The Chapter on “*Carbohydrate intake and obesity*” of the FAO/WHO Scientific Update includes a specific section on “*free sugars*”, which are defined as “*added sugars plus concentrated sugars in honey, syrups and fruit juices*”.

The first review chapter in the Scientific Update on Carbohydrates in Human Nutrition on “*Carbohydrate terminology and classification*” concluded that, among the various terms used to describe sugars in the diet, “*the most useful are total sugars and their division into mono- and disaccharides*” and that “*the use of other terms creates difficulties for the analyst, confusion for the consumer and suggests properties of foods that are not related to sugars themselves, but to the food matrix*”. As rightly pointed out in the FOA/WHO Scientific Update, “*free sugars*” is merely an alternative term to designate “*non-milk extrinsic sugars*”, whose use was recommended against by the FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition in 1997<sup>1</sup>. It is therefore unfortunate that these recommendations for the description of dietary sugars were simply ignored in the subsequent review chapters.

There is indeed no convincing scientific justification for a distinction between “free” and “other” sugars<sup>2</sup> and neither is there any practical, easily enforceable analytical method to distinguish between them<sup>3</sup>. This is clearly acknowledged in the Chapter on “*Carbohydrate terminology and classification*” of the FAO/WHO Scientific Update, which states that “*while ingredient lists can be used to identify the source of sugars in foods, analytically it is not readily possible to distinguish their origin in a processed foods*”.

Sugars, either “added” to foods or “naturally occurring” in fruits or vegetables, contribute with the same amount of calories (4 kcal/g) and can all potentially be cariogenic in absence of proper oral hygiene<sup>4,5</sup>, which, besides, is also true for starches<sup>6</sup>.

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### **3- Micronutrient dilution**

Although pointing out that “*regular consumption of foods high in free sugars does not have to be associated with micronutrients deficiencies*”<sup>1</sup>, the FAO/WHO Scientific Update nevertheless insinuates that “*the energy intake [...] compatible with avoiding weight gain in modern societies with little occupational physical activity [being] limited, a high intake of energy as free sugars will generally make it more difficult to achieve optimal intake of micronutrients, phytochemicals, fiber and fruit and vegetables*”.

Evidence relating to the “empty calorie” concept has been carefully examined and the idea refuted by several comprehensive analyses into the relationship between micronutrient intakes and sugar intakes level of various population groups, including children, toddlers, adolescents, adults and elderly people<sup>2,3,4,8,9</sup>. None of these analyses support the assumption that a higher consumption of sugar necessarily leads to a lower intake of micronutrients. On the contrary, these studies have all shown that reasonable sugar intake levels have no adverse impact on micronutrient intakes. Two recent reviews<sup>13,14</sup> have further confirmed these findings, concluding that relationships between sugars (whether “total” or “added”) and micronutrient intakes are inconsistent and that there is no evidence of micronutrient dilution, or of a threshold effect. Moreover, to consider “free” or “added” sugars separately from the products into which they are incorporated has little if no utility, either for scientific purposes or in policy making, in particular as other components in the diet may be adversely affecting micronutrient intakes<sup>13</sup>.

It has been shown that subjects having a high-carbohydrate, reduced-fat diet (be it a starch-rich or sugar-rich diet) are at no greater risk of micronutrient inadequacy than control subjects consuming a normal-fat diet<sup>2,5</sup>. Only slight variations in terms of dietary micronutrient intake could be observed in a study by Bowman and Spence (both positive and negative variations), depending on the carbohydrate content of the diet<sup>2</sup>. However, these apparent variations in micronutrient intake depending on the nature of the diet were mostly due to variations in total energy intake, as the high-carbohydrate diet was lower in energy<sup>2</sup>. Total energy intake is indeed the main predictor of micronutrient intake<sup>14</sup>. For general populations with an adequate caloric intake, nutrient adequacy can be achieved across a wide range from low to high dietary sugar<sup>6</sup>. A non-linear (inverse U-shape) relationship has been identified between the dietary micronutrient density and the dietary energy coming from sugars (whether added or total), with the highest nutrient intakes among average sugar consumers<sup>8</sup>. This has been confirmed by other studies, which have found that the consumption of added sugars has little or no association with diet quality<sup>3</sup>.

The estimated acceptable range of “added” sugars intake cited in the Institute of Medicine (IOM) 2002 Report<sup>7</sup> is max. 25 % of daily energy. This report only identifies a possible (but inconsistent) decline in micronutrient intake at approximately 25 percent of calories coming from “added” sugars alone.

It is widely believed<sup>11</sup> that nutrient inadequacies might occur in susceptible groups (generally women and children) who have a low total energy intake, but incorporate a high proportion of sugars in their diet. However, there is again little evidence to support this belief and studies

in very young children and the elderly (both groups with low energy intakes) do not support this notion<sup>4,9</sup>. The Nordic Recommendations<sup>11</sup> are based on a hypothetical risk (low energy, high sugars diet), which is hardly seen in practice.

Finally, it is also often argued that dietary micronutrient needs would be better covered within diets containing less sugar than currently consumed. As mentioned above, not only this assertion is incorrect, but consuming less sugar will not necessarily guarantee that a person meets all dietary guidelines. As stated in the FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition (1997), “moderate intake of sugar-rich foods can also provide for a palatable and nutritious diet”<sup>12</sup>. Thus, many foods with “added” sugars contribute significantly to a healthful diet, such as yogurts or cereals. Sugars can indeed add appeal to nutritious foods that might otherwise be less consumed or even avoided by certain population groups (in particular children). Moderate amounts of “added” sugars can enhance the flavour and acceptance of many foods without increasing energy density (even in vulnerable population groups<sup>10</sup>), making it easier to follow dietary guidelines and to improve intake of important micronutrients.

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#### **4- Carbohydrates (including sugars) intake and obesity**

##### **4.1. Inverse relationship between sugars and BMI**

As previously mentioned under item 1, it is regrettable that observational studies assessing the effects of sugars and carbohydrates on body weight were simply ruled out by the authors of the Scientific Update. Whereas numerous observational studies from all over the world have shown an inverse relationship between BMI and sugars intake (from whatever sources), most of the chapters of the Scientific Update (e.g. on “*Nutritional characterization and measurement of dietary carbohydrates*”, on “*Carbohydrates intake and obesity*” or on “*Cardiovascular diseases and diabetes*”) actually presuppose that “added” sugars are linked to obesity and other chronic diseases.

However, numerous observational studies have consistently shown that people who consume more sugar in their diet tend to be thinner than those that consume less sugar<sup>1,2,3</sup>. Studies have highlighted that people who eat less sugar tend to eat more fat, are less active and have higher body weight<sup>2,4,6,7,8,9,10</sup>. Whilst concluding on mixed effects of increased intakes of total sugars on energy intake, the Institute of Medicine (IOM) 2002 Report<sup>5</sup> nevertheless indicated that a negative correlation between total sugar intake and body mass index (BMI) has been consistently reported for children and adults. Although based on observational studies, this phenomenon, also known as the “sugar-fat see-saw”, cannot be totally ignored. The Scientific Update speculates that “*an association between the proportion of carbohydrates in the diet with lower weight or less weight gain may well be confounded by the ability to control energy intake*”, arguing that “*a person’s ability to adhere to the macronutrient composition of a [given] diet is likely to be associated with a person’s ability to control total energy intake*”. This convoluted attempt to justify disregarding a large body of evidence accepted as relevant by all other recent expert reviews relies on two speculations, one built upon another. It cannot therefore be accepted as a reasonable argument on which to base important public health recommendations.

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#### 4.2. Solid foods high in free sugars and body weight

The FAO/WHO Scientific Update also suggests that “*reduction of solid foods high in free sugars can contribute to weight loss*”, whilst admitting that findings supporting this theory may lack consistency.

Indeed, when carefully reading the section on “*Studies of mostly solid sugary foods*” in the Chapter on “*Carbohydrate intake and obesity*”, it appears that among the six studies referred to in order to substantiate the above, three are either inconclusive or highlight an opposite tendency<sup>2,3,4</sup>. One of these studies (Poppitt *et al* 2002) should not have been included at all, since it relates to a small study of individuals with metabolic syndrome, not normal healthy individuals. In addition, the results of this study by Poppitt *et al* (2002)<sup>5</sup> are only partially reported: certain biases related to the respective energy intake of the high-starch and high-sugar groups were underlined by the authors themselves, which were actually due to the fact that the “*subjects in the high-sugar group found it difficult to incorporate the very high sugar component into their diet, and encouragement by the dieticians resulted in supplementation of, rather than substitution for, both fat and complex carbohydrates*”. Further doubts on the relevance of this study to the topic of solid foods arise from the fact that it was an adjunct to the CARMEN study<sup>3</sup> in which the use of drinks provided an appreciable contribution to sugar intake.

Several recent international expert committees have concluded that there is no scientific evidence for the supposed link between sugar consumption and obesity<sup>1,8,12</sup>. For instance, the WHO Technical Report 916 on Diet, Nutrition and the Prevention of Chronic Diseases (2003)<sup>8</sup> provided no evidence to support any connection between sugar consumption and obesity. This is demonstrated in the annex detailing the strength of evidence for any influence of dietary factors on the diseases considered. As regards obesity, no convincing or even probable evidence for any relation between free sugars (frequency or amount) and obesity is cited<sup>8</sup>. A similar conclusion was reached by the Institute of Medicine in 2002<sup>12</sup>, by the FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition<sup>1</sup> in 1997 and by a consultation convened by the EU in 2001<sup>13</sup>.

In general, it should be recalled that obesity is the result of a positive energy balance over a longer period. When food intake is considered in respect to weight management, the primary focus must be on total energy intake, rather than on individual macronutrients such as sugar(s). The FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition (1997) concluded that “*there is no direct evidence to implicate either [starches or sugars] in the etiology of obesity*”<sup>1</sup>. For the excessive calories, no distinction is to be made between calories provided by carbohydrates (be it starches or sugars), proteins, fats or alcohol in our diet<sup>2</sup> as “*excess energy in any form will promote body fat accumulation*”<sup>1</sup>.

On the other hand, studies have compared the effects of different levels of carbohydrates in the diet on energy restriction, dietary nutrient quality and body mass index. High carbohydrate diets (>55% calories from carbohydrates) are generally more energy restrictive than diets with a lower carbohydrate content, whatever the type of carbohydrates consumed (i.e. starchy or sugary foods)<sup>10</sup>. Therefore, a diet which contains a high percentage of energy from carbohydrates (starches and sugars) may assist in weight loss to some extent<sup>11</sup>. The FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition (1997) itself mentioned that “*diets high in carbohydrates, as compared to those high in fat, reduce the likelihood of developing obesity and its co-morbid conditions*”<sup>1</sup>.

The randomized controlled multicentre CARMEN trial<sup>3</sup> further suggested that a low-fat, high-carbohydrate (starches or sugars) diet results in a modest but significant reduction in body weight and body fatness. It demonstrated that specific, although simple and easily acceptable, changes in the macronutrient composition of the diet can favourably affect body weight and body fat mass in moderately obese adults. Referring to the Poppitt *et al.*<sup>5</sup> study (2002), the FAO/WHO Scientific Update argues that a greater weight reduction is achieved for a high-starch diet as compared with a high-sugar diet. It should be pointed out, however, that the Poppitt *et al.*<sup>5</sup> study used a small number of patients with metabolic syndrome, whereas the much larger CARMEN trial concerned healthy overweight individuals free of endocrine, liver, kidney or haematological disease assessed by medical history, clinical blood and urine biochemistry. Subjects in the Poppitt *et al.* study had impaired glucose metabolism; thus, results of this study are irrelevant to the general population and are less reliable and less relevant than those of the CARMEN trial. Furthermore, several studies have shown that weight reduction is possible also with high dietary sugar<sup>14,15</sup>. High-sucrose consumption in a low-fat, hypocaloric diet does not have any adverse metabolic or behavioural effects and can contribute to weight loss as long as total energy is restricted.

Finally, and despite the popular “reformulation” trend, substituting other nutrients for sugar in solid foods has little influence on energy density<sup>9</sup>. If energy reduction in foods is an important objective when it comes to obesity prevention, substitution for sugar is, in practice, often counterproductive. For instance, substituting starch for sugars in breakfast cereals does not offer any advantage in terms of energy reduction as starch has the same caloric value as sugars (i.e. 4 kcal/g). The fat content of a food, on the other hand, determines its energy density more than any other nutrient<sup>9</sup>. Besides, taking sugars out in foods where fat is a major ingredient (e.g. chocolate products) can lead, in certain cases, to an increase in the overall energy density of the reformulated product.

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#### 4. 3. Sugar-sweetened beverages and bodyweight

The FAO/WHO Scientific Update reports that “*short-term experiments suggest that satiety and satiation may be lower for carbohydrates consumed as beverages as compared with [those] consumed as solid foods*”. It also suggests that “*reduction of consumption of sugar-sweetened beverages is beneficial for weight management*”, whilst acknowledging that “*long-term randomized controlled trials of sugar-sweetened beverages are lacking*”.

Whether people compensate for the energy consumed in liquids by reducing their subsequent food energy intake has been the subject of a number of reviews<sup>1,2,3,4</sup> but with contradictory results.

The notion that liquid calories are not perceived by the body rests on inconclusive evidence<sup>1,2</sup>. In a review by Almiron-Roig<sup>2</sup>, some studies showed that liquids were less satiating than were solids, whereas other studies showed the exact opposite. In one study, jelly beans led to energy compensation at a subsequent meal (indicating that they were satiating), but beverages did not. In contrast, in another study, cookies and cola mid-morning had identical effects on hunger ratings and energy intakes at lunch. In another study, orange juice, caloric cola and 1% fat milk had identical effects on hunger, fullness and desire to eat and were thus equally satiating. A further study by Soenen and Westerterp-Plantenga<sup>20</sup> that compared the satiating effects of a sucrose-sweetened beverage with those of isoenergetic

drinks (namely a HFCS-sweetened beverage and milk) could not find any difference in terms of satiety and energy compensation.

Recently, an article by Almiron-Roig *et al.*<sup>5</sup> has provided evidence to suggest that, when it comes to energy compensation, the occasion of consumption is actually more important than the physical form (solid or liquid) in which the food is consumed. This has also been underlined in a review by Anderson<sup>4</sup>, which concludes that sugars in solution reduce subsequent food intake to an extent that depends both on the quantity of sugars consumed and on the time interval before the next meal.

On the other hand, a number of experimental studies have suggested that people's ability to compensate during subsequent meals was lower when food energy was consumed in liquid form, compared with the same calorie intake in the form of solid foods<sup>7,8,9</sup>. However, certain methodological biases should be mentioned, which might explain these contradictory results. Notably, protocols designed to study satiety include a "dietary pre-load" phase, which is followed, at varying time intervals, by a "test meal" to assess the satiating power of those foods that have previously been ingested. For satiety studies in relation to liquid foods, time intervals between the "dietary pre-load" and the "test meal" are usually long (2 to 4 hours), based on those typically observed in satiety studies on solid foods. It appears, however, that the satiating effect of a given beverage might be influenced by the time interval separating its consumption from the next meal<sup>4</sup>. This time interval might be even more determinant for calorie compensation than the liquid or solid form of the food. In addition, among other factors having a positive effect on satiety, the volume ingested – which prevails over the amount of energy consumed<sup>-10</sup> and the composition of the drink (e.g. the viscosity of the liquid or the possible presence of insoluble fibres that have an impact on gastric emptying and, thus, on intestinal absorption) also participate in the overall satiating power.

Moreover, theoretically, a liquid food intake could be said to answer a hydration need, whereas a solid food intake should answer an energy need. Thus, the hypothesis has been formed that interaction between regulatory systems for hunger and thirst induced by the ingestion of a caloric beverage might disturb energy balance. Anderson's review<sup>4</sup> has shown that experimental studies do not support this hypothesis.

Considering the above, the effects of drinks in general on appetite and overall energy intake are extremely complex and unlikely to be understood on the basis of current evidence, derived almost wholly from short term laboratory evidence. In that regard, it should be noted that short term studies cannot take adequate account of a major factor influencing habitual dietary habits, that of learned behaviour. It is therefore highly questionable whether these studies provide reliable evidence on which to base public health recommendations.

A number of observational studies have implied that there is an ecological link between the consumption of sugars-sweetened beverages and obesity<sup>15</sup>. The increased prevalence of obesity in the USA, especially among children and adolescents, has coincided with increased availability of energy-containing sweetened beverages. Consequently, sugars-sweetened beverages have been proposed to be of particular influence in the promotion of obesity (at least in the USA) as a result of their low satiation and high energy content. This simple theory, however, lacks clear evidence<sup>6</sup>, and does not explain the rise in obesity seen in other countries that have not experienced increases in soft drinks consumption comparable to the USA.

Many studies on the subject have been poorly designed and the results have not been consistent. This has been highlighted in a review by Pereira<sup>3</sup>, who also noted the lack of high-quality intervention studies. There are also technical difficulties in assessing whether individual components of the diet may be responsible for obesity, or that obesity results from a general over-consumption of all sources of food energy. Thus, any reduction in energy

intake could be beneficial for weight management, whatever the nature (liquid or solid, carbohydrate-rich or fat-rich, etc.) of the food whose consumption is reduced, but experience shows that effective weight management requires changes to lifestyle<sup>17</sup>, not merely substituting one food or drink for another.

A recent study conducted in children in the USA<sup>11</sup> has suggested a causal link between weight gain and sugars-sweetened beverages consumption. Such a correlation, observed among obese children with impaired intake regulatory mechanisms, would require further confirmation in normal weight children<sup>12</sup>, in particular as another study, again in children, did not show any consistent relationship between consumption of sweetened beverages and body mass index (BMI) or energy intake<sup>14</sup>.

Furthermore, a UK intervention study<sup>13</sup> reported on a school-based educational programme aimed at reducing consumption of carbonated drinks to prevent excessive weight gain in children aged 7 -11 years old. A modest reduction in the number of carbonated drinks consumed was observed after one year, which was associated with a reduction (0,2%) in the number of overweight and obese children in the intervention group. This leads the authors to conclude that a simple reduction in soft drinks consumption can prove efficient in terms of weight reduction. However, the lack of data regarding potential biases (e.g. changes in the overall diet or modifications of the levels of physical activity) undermines confidence in the causal link suggested by this study. Moreover, a follow up study showed that the differences in the number of overweight children between the intervention and control groups disappeared over the subsequent two year period<sup>18</sup>.

In a longitudinal study (5 years) with German children and adolescents aged 9-18 years old, BMI standard deviation scores (BMI-SDS) of boys and girls as well as percent body fat were not associated with intake of sugars-sweetened soft drinks, neither cross-sectionally nor prospectively<sup>19</sup>. In girls, there was no association between change in consumption of energetic beverages (sugars-sweetened soft drinks plus fruit juices) and change in percent body fat. The only association that could be observed among the several variables tested was, in girls, an increase in energetic beverage consumption associated with an increase in BMI-SDS but this only when the total consumption of fruit juices plus sugars-sweetened soft drinks was considered in the calculation. If the beverages were considered separately, only a change in fruit juice consumption was associated with a change in BMI-SDS. On the other hand, no association was observed between change in percent body fat and change in the consumption of one of both beverages in the same time period. No such associations were observed in boys, although boys in the sample consumed even more regular soft drinks than the girls.

Thus, many cross-sectional and prospective studies into the relationship between sugars-sweetened soft drink consumption and body weight status or body fat provide contradictory results, showing that the evidence is inconclusive.

Finally, several studies have investigated the possible association between soft drinks consumption and weight gain and obesity. A recent systematic review<sup>16</sup> of 4 proposed mechanisms that could explain a link between soft drinks and obesity (excess calorie intake; glycaemic index and glycaemic load; lack of effect of liquid calories on satiety; and displacement of milk) also concluded that current evidence is inconclusive.

Considering the above, it seems that evidence to date of any link between soft drinks and obesity or weight gain is equivocal.

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## **5- 10% energy recommendation for “free sugars” intake**

Arguing that “*solid foods high in free sugars tend to be energy dense and [that] there is some evidence from intervention studies that reduction of solid foods high in free sugars can contribute to weight loss*”, the FAO/WHO Scientific Update endorses the “*population nutrient intake goals on free sugars (that is, <10% of total energy) that were recommended by the 2002 WHO/FAO Expert Consultation (WHO, 2003)*” but extends the rationale justifying this limit beyond its original focus on dental health to obesity.

The WHO Technical Report 916 (2003)<sup>1</sup> made it clear in the annex detailing the strength of evidence for any influence of dietary factors on the diseases considered that there is no “convincing”, “probable” or even “possible” evidence for a link between free sugars (frequency or amount) and obesity. As previously mentioned, the FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition also indicated that “*there is no direct evidence to implicate either [sugars or starch] in the etiology of obesity*”<sup>2</sup>. The Institute of Medicine (IOM) 2002 Report<sup>3</sup> similarly concluded that “*based on the data available [...], there is insufficient evidence to set an Upper Limit for total or added sugars*”. Finally, neither the Eurodiet Report (2000)<sup>4</sup> nor the Dutch Guidelines for a Healthy Diet<sup>5</sup> proposed a recommended sugars intake but, instead, simply suggested that frequency of sugars consumption should be limited to respectively 4 and 7 occasions per day to avoid dental decay.

The 10% limit for “free sugars” intake is a purely arbitrary one, which was proposed as a means to limit dental caries, ignoring the confounding effect of frequency. The Eurodiet report reflects current consensus on dental decay by setting a limit on frequency not amount of sugar consumed. An accurate quotation of the WHO Technical Report 916<sup>1</sup>, would have included the caveat which “*recognized that a population goal for free sugars of less than 10% of total energy is controversial*”.

It should be recalled that this value was first derived from data purporting to show a relationship between caries prevalence in 12 year olds and sugar supply in different countries. Apart from the fact that such ecological comparisons are recognized to be the weakest of all forms of epidemiological evidence, choosing 10% as the “cut off” was completely arbitrary as the suggested positive correlation between the per capita availability of sugar and dental caries was represented by a straight line. Furthermore, there seems to be a clear consensus that frequency of consumption and not the amount of fermentable CHO (not only “free sugars”) is relevant with regard to caries.

In addition to the above and as previously demonstrated in this paper, neither the evidence for a link between sugars intake and micronutrient dilution nor the evidence for a direct link between the consumption of sugars-sweetened beverages and/or foods high in sugars and obesity is conclusive. Thus, we strongly question the “*Public health application of carbohydrate measurements*” section in the Chapter on “*Nutritional characterization and measurement of dietary carbohydrates*”, which notably promotes the UK FSA profiling criterion for sugars from manufactured food products (60 g) as “*a pragmatic approach that is consistent with the dietary guidelines for a selective restriction of free sugars*”. Such a “consumption target” for sugars intake is anything but science-based. On the other hand, we

believe that the scientific basis behind this 10% recommendation should be further reviewed by the second FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition in the light of all the available scientific evidence.

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### Conclusion

- The FAO/WHO Scientific Update on Carbohydrates in Human Nutrition relies on a selective and partial review of the scientific evidence.
- The general recommendation to avoid using terms such as “free” or “added” sugars, which is made in the first review chapter on “*Carbohydrate terminology and classification*”, is completely ignored in the subsequent chapters of the Scientific Update that continue distinguishing between sugars from various sources.
- It has been widely demonstrated that nutrient adequacy can be achieved across a wide range of dietary sugar, which the Scientific Update fails to acknowledge.
- The inverse relationship between BMI and sugars intake, while based on observational studies, relies on a large body of evidence. This cannot be simply ruled out in the Scientific Update that, besides, does not hesitate to take observational studies into account when it comes to sugars-sweetened beverages consumption and body weight.
- The available scientific evidence, including WHO TRS Report 916, does not suggest any direct link between sugars intake and obesity. The conclusions of the FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition (1997) in that regard, i.e. “*there is no evidence of a direct involvement of sucrose, other sugars and starch in the etiology of lifestyle-related diseases*”, are thus still valid.
- Evidence to date of any link between soft drinks and obesity or weight gain is equivocal; further research is necessary in relation to bodyweight and liquid calories in general.
- The 10% limit for “free sugars” intake is purely arbitrary and the scientific basis behind this 10% recommendation should be further reviewed by the second FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition in the light of all the available scientific evidence.

In conclusion, CEFS would like to reiterate its call for the above aspects to be considered appropriately in the future. We would also appreciate if any FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition to come would involve a more transparent process

than the one involved in the context of the Scientific Update as that this would most likely lead to a less partial and selective review of the scientific evidence.