Overview of the “Sugar” Issues

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1950s .....

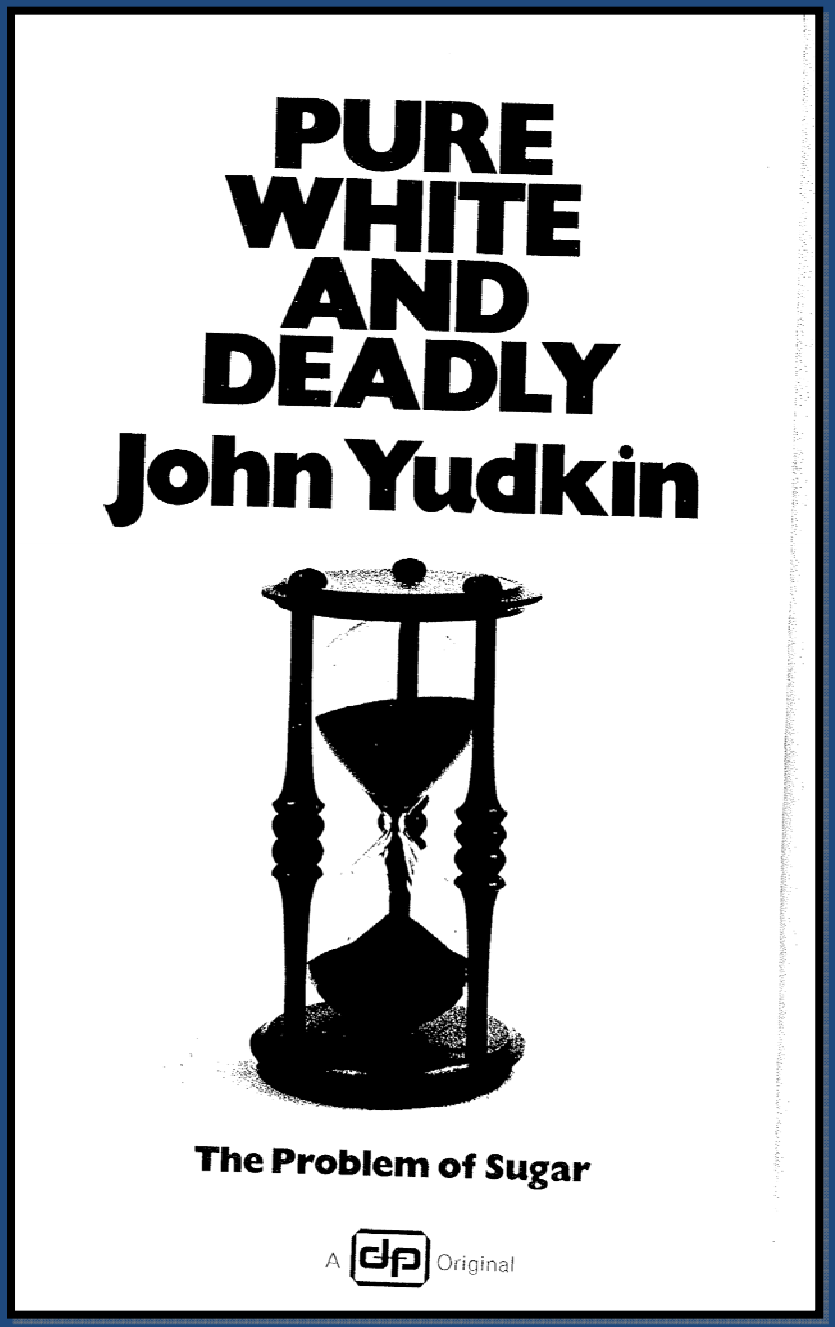
THE VIPEHOLM DENTAL CARIES STUDY

The Effect of Different Levels of Carbohydrate Intake on Caries Activity in 436 Individuals Observed for Five Years [1]

BENGT E. GUSTAFSSON, M.D., CARL-ERIK QUENSEL, PH.D.,
LISA SWENANDER LANKE, M.D., CLAES LUNDQVIST, M.D. L.D.S. D.D.S.,
HANS GRAHNÉN, L.D.S., BO ERIK BONOW, L.D.S., BO KRASSE, L.D.S.

This paper is a revised edition of a publication in Swedish in Svensk Tandläkare-Tidskrift vol. 45 Suppl. 1952

1960s .....


PURE WHITE AND DEADLY
John Yudkin
The Problem of Sugar
A dp Original

1970s .....

EFFECTS ON SERUM-LIPIDS IN NORMAL MEN OF REDUCING DIETARY SUCROSE OR STARCH FOR FIVE MONTHS

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Preliminary Communication

reprinted from THE LANCET, *April* 25, 1970, *pp.* 870–872

“Restricting sucrose results in fall in tryglycerides associated with weight loss despite encouragement to substitute with starchy foods”

Mann et al, Lancet 1970

“Sucrose restriction with no weight loss appears to be hypertriglyceridaemic only when consumed in large amounts & when dietary fat is predominantly saturated”

Mann et al, BJN 1972

Mann et al, Clin Science, 1973

The effect of reduced intake of sucrose and other free sugars on plasma triglyceride levels

JB Smith, BE Niven, JI Mann. Eur J Clin Nutr (1996) 50: 498-504

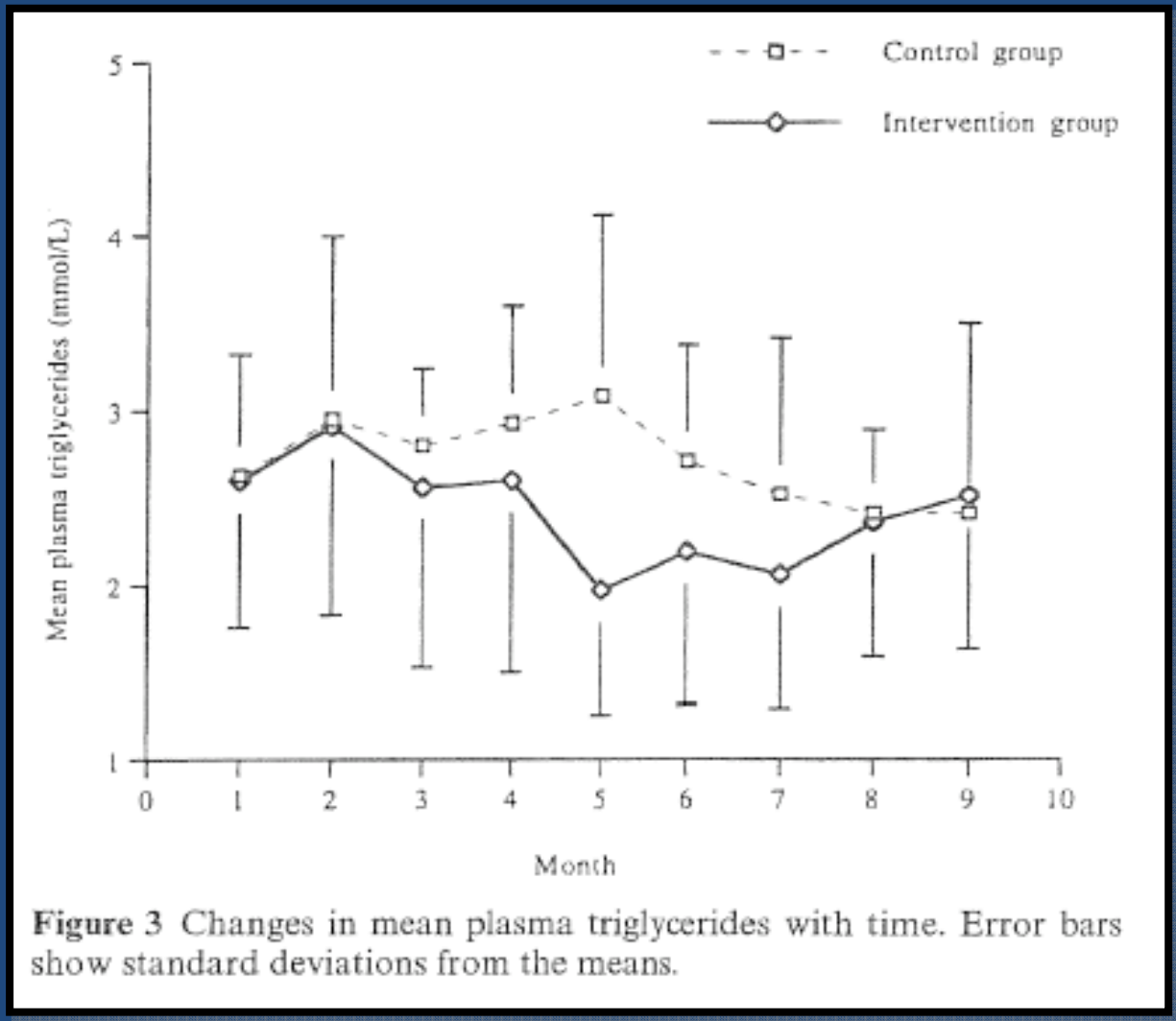
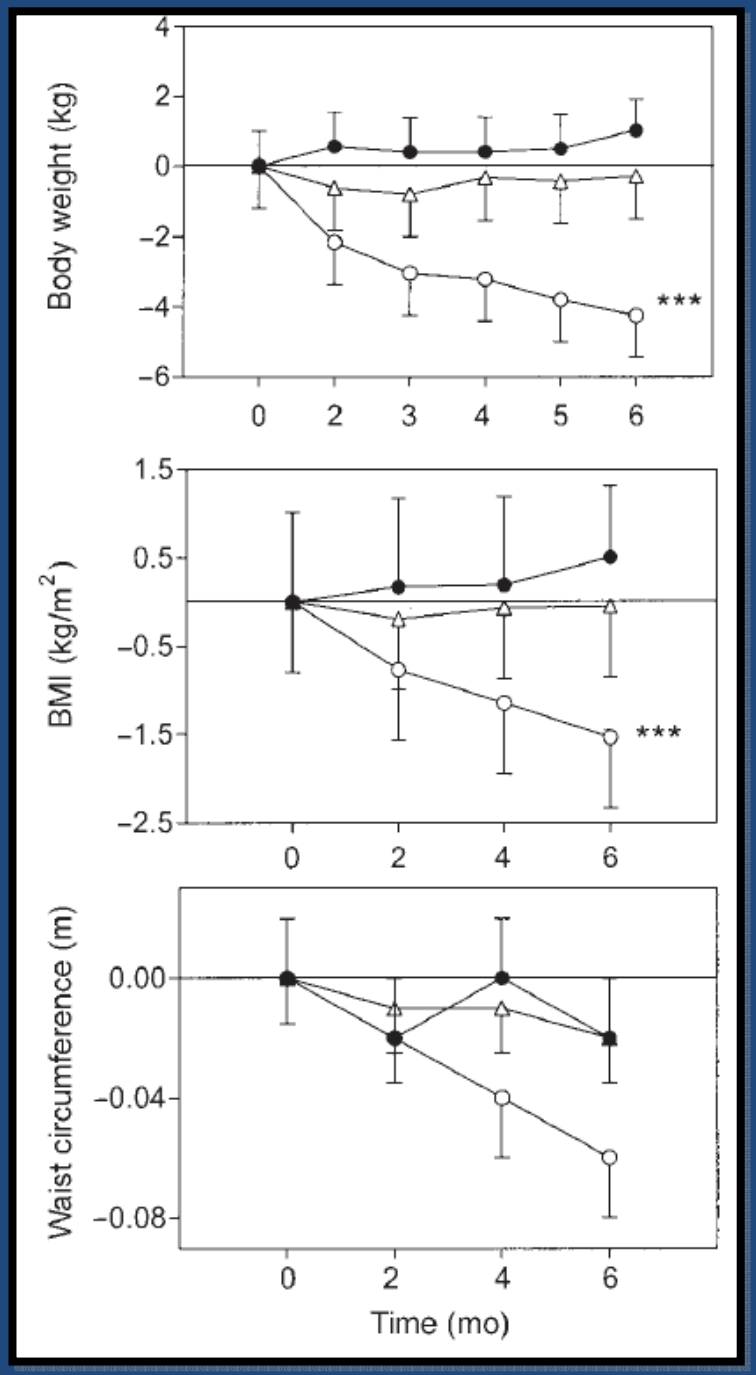


Figure 3 Changes in mean plasma triglycerides with time. Error bars show standard deviations from the means.



Long-term effects of ad libitum low-fat, high carbohydrate diets on body weight and serum Lipids in overweight subjects with metabolic syndrome

Poppitt et al, 2002

Fig 1.Mean (± SEM) changes relative to Baseline (month 0) in body weight, BMI and Waist circumference during the 6-mo intervention

Poppitt et al, 2002

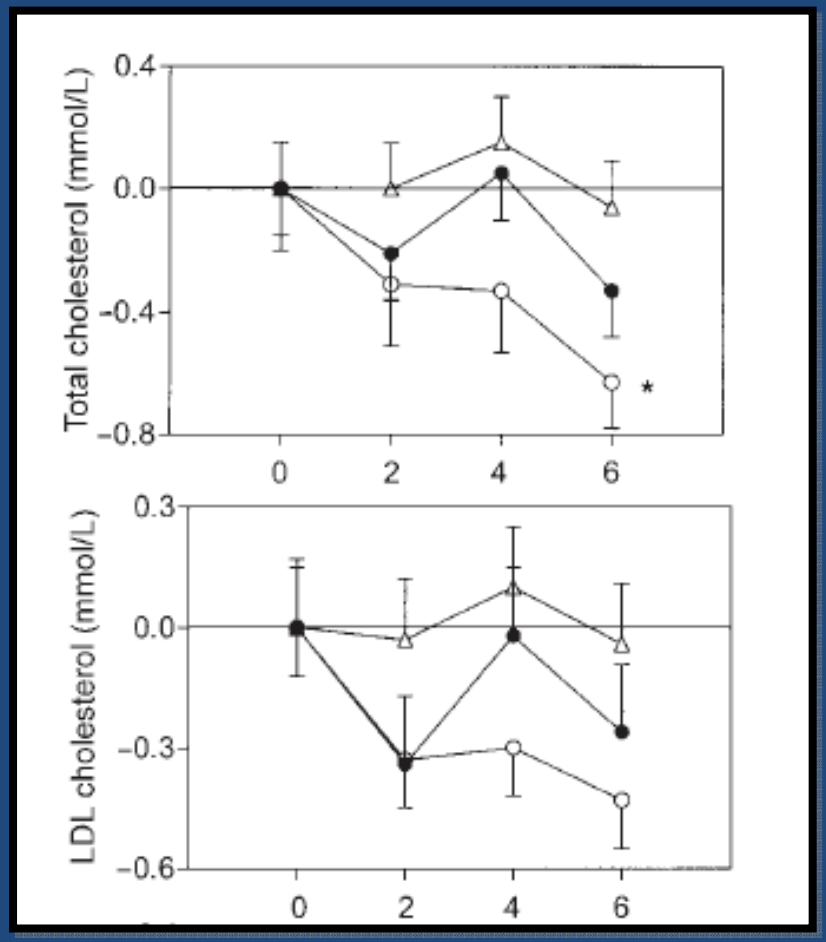


Fig 2. Mean (± SEM) changes relative to baseline (month 0) in the lipoprotein profile during the 6-mo intervention

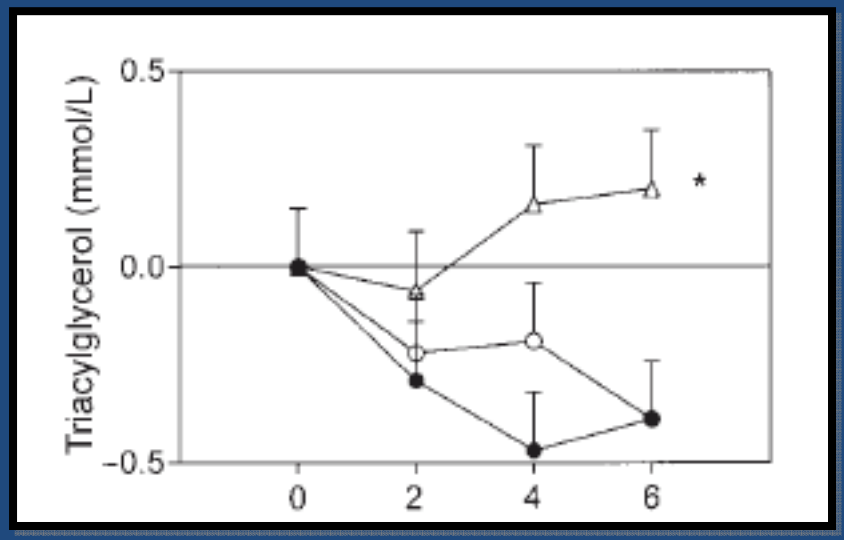


Fig 3. Mean (± SEM) changes relative to baseline (month 0) in triacylglycerol profile during the 6-mo intervention

Issues in the Past Five Years:

1. Does sugar (sugars), sugar sweetened beverages predispose to excessive weight gain?

2. What is the role of sugar, as a component of energy dense food, in the aetiology of obesity?

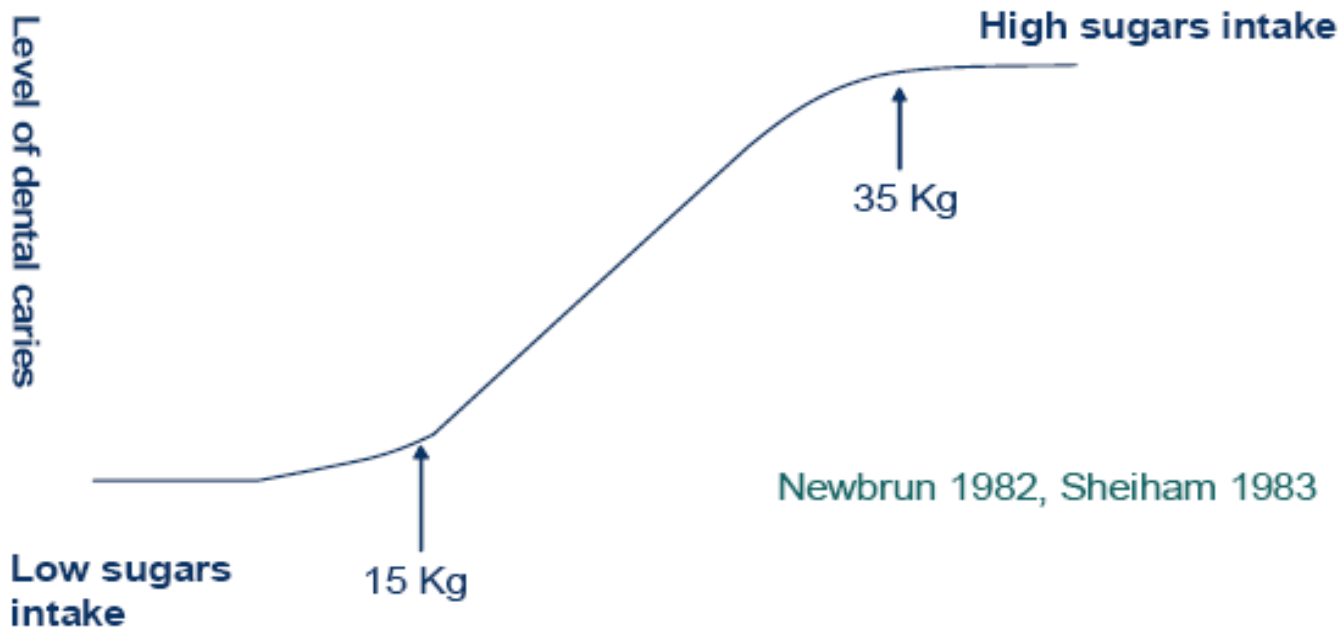
3. Does sugar (sugars) have a special/different role in people with the metabolic syndrome/insulin resistance (± 25% of the population in many countries)?

Summary of strength of evidence linking diet to dental caries

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Fluoride exposure (local and systematic)	Starch intake (cooked and raw starch foods, such as rice, potatoes and bread; excludes cakes, biscuits and snacks with added sugars)	Amount of free sugars Frequency of free sugars
Probable	Hard cheese Sugars-free chewing gum	Whole fresh fruit	
Possible	Xylitol Milk Dietary fibre		Undernutrition
Insufficient	Whole fresh fruit		Dried fruits

Diet, Nutrition and the Prevention of Chronic Diseases: Report of a joint WHO/FAO Expert Consultation, TR 916, Geneva, 2003

The dose/response relationship



Moynihan P. The scientific basis for diet, nutrition & the prevention of dental diseases (Jnt WHO/FAO Expert Consultation on diet, nutrition and the prevention of chronic diseases, Geneva, 2002)

Summary of the strength of evidence for obesity, type 2 diabetes, cardiovascular disease (CVD), cancer dental disease & osteoporosis

	Obesity	Type 2 diabetes	CVD	Cancer	Dental disease	Osteoporosis
Carbohydrate						
High intake of NSP (dietary fibre)	C↓	P↓	P↓			
Free sugars (frequency & amount)					C↑	
Sugar-free chewing gum					P↓	
Starch					C-NR	
Wholegrain cereals			P↓			

Source: WHO/FAO: WHO Technical Report (TR 916)

C: Convincing,
P: Probable
NR: No Relationship

Second Expert Report from WCRF/AICR: (2007)

Food, Nutrition, Physical Activity & and the Prevention of Cancer

Determinants of Obesity:

	Decreases risk	Increases risk
Convincing	Physical activity	Sedentary living
Probable	Low energy-dense foods Being breastfed	Energy-dense foods Sugary drinks Fast foods Television viewing

AHA Scientific Statement

Dietary Sugars Intake and Cardiovascular Health

A Scientific Statement From the American Heart Association

Rachel K. Johnson, PhD, MPH, RD, Chair; Lawrence J. Appel, MD, MPH, FAHA;
Michael Brands, PhD, FAHA; Barbara V. Howard, PhD, FAHA;
Michael Lefevre, PhD, FAHA; Robert H. Lustig, MD; Frank Sacks, MD, FAHA;
Lyn M. Steffen, PhD, MPH, RD, FAHA; Judith Wylie-Rosett, EdD, RD;
on behalf of the American Heart Association Nutrition Committee of the Council on Nutrition,
Physical Activity, and Metabolism and the Council on Epidemiology and Prevention

Circulation 2009; 120;1011-1020

- Glucose insulin response
- Effect of dietary sugars on blood pressure, lipids & inflammation
- Dietary sugars & obesity

Definition of “Sugars”

Total sugars	**All monosaccharides & disaccharides, other than polyols**
Added sugars	Sugars added to foods & beverages during processing or home preparation. Would include honey, molasses, fruit juice concentrates, brown sugar, corn sweetener, sucrose, lactose, glucose, high fructose corn syrup, malt syrups **BUT** ? Fruit, fresh fruit, fruit pulp, tinned fruit, dried fruit, fruit concentrate (< 2x concentration) (CIP suggests these are not added sugars)
Free sugars	All mono- & disaccharides added to foods by manufacturer, cook & consumer, plus sugars naturally present in honey, syrup & fruit juices

Definition of “Sugars”

Extrinsic sugars	Not located within the cellular structure of a food. Sugars added to foods & beverages during processing or home preparation & fruit juice
Non-milk extrinsic sugars (NMES)	All extrinsic sugars which are not from milk.
Intrinsic sugars	Sugars forming an integral part of certain unprocessed foodstuffs enclosed in the cell, the most important being whole fruits & vegetables
Discretionary sugars **Refined sugars** **Natural sugars**	No specific definition – appear to equate to *sucrose &* have been used in publications for intakes, often with little reference to what components they include. No justification for these terms

Table 1 The major dietary carbohydrates

Class (DP[a])	*Subgroup*	*Principal components*
Sugars (1–2)	Monosaccharides	Glucose, fructose, galactose
	Disaccharides	Sucrose, lactose, maltose, trehalose
	Polyols (sugar alcohols)	Sorbitol, mannitol, lactitol, xylitol, erythritol, isomalt, maltitol
Oligosaccharides (3–9) (short-chain carbohydrates)	Malto-oligosaccharides (α-glucans)	Maltodextrins
	Non-α-glucan oligosaccharides	Raffinose, stachyose, fructo and galacto oligosaccharides, polydextrose, inulin
Polysaccharides (⩾10)	Starch (α-glucans)	Amylose, amylopectin, modified starches
	Non-starch polysaccharides (NSPs)	Cellulose, hemicellulose, pectin, arabinoxylans, β-glucan, glucomannans, plant gums and mucilages, hydrocolloids

The major dietary carbohydrates:

FAO/WHO 1998 Expert Consultation, endorsed by FAO/WHO Scientific Update, 2006

Recommendation		Population group	Reason
Non-milk extrinsic sugars (NMES)	No more than 11% food energy or about 60g/day	All	NMES contributes to dental caries

Source: "The Nutritional Wellbeing of the British Population"
2006 SACN

Simple sugars should not exceed 10 – 12%

(or 15 -16% for children) TE

ITALY : LARN (Levels of Recommended Intakes) 1996

Nordic Nutrition Recommendations: (2004)

Refined sugars:

Refined sugars* *should not exceed 10% E to ensure adequate nutrient density.*

Frequent consumption of sugar rich foods should be avoided in order to reduce the caries risk.

* sucrose, glucose, fructose, starch hydrolysates & other carbohydrates that do not carry essential nutrients

Institute of Medicine, 2002:

Added sugars should comprise no more than 25% total cal

Dietary guidelines for Americans 2005 (updated 2006)

2000 calories for sedentary males 51 – 70, females 19 - 30 years

Food Groups & Subgroups	USDA Food Guide Amount	DASH Eating Plan Amount	Equivalent Amounts
Discretionary Calorie allowance, example	267 cals		
Solid fat	18g		
Added sugars	8tsp	~ 2tsp of added sugar (5 Tbsp/week)	1Tbsp added sugar equivalent to: • 1 Tbsp jelly or jam • ½ cup sorbet • 1 cup lemonade

Table 3: Discretionary calories allowance

	1200	1400	1600*	1800	2000
Discretionary calories†	171	171	132	195	267
Discretionary calories as a % of total calories	14	12	8	11	13
Solid fats, g‡	14	14	11	15	18
Added sugars, g (tsp)§	16 (4)	16 (4)	12 (3)	20 (5)	32 (8)

Circulation 2009; 120;1011-1020

South Africa (& many other countries):

Food based dietary guidelines:

1. Use food & drinks containing sugar sparingly & not between meals
2. Use little or no sugar
3. Enjoy foods that contain sugar as a treat on special occasions
4. Try not to use sugar and sugary drinks more than four times a day and only during mealtimes
5. Brush teeth twice a day with fluoride toothpaste
6. Rinse the mouth after eating or drinking sweet things

Free sugars	**<10% TE**
Total CHO	**55 – 75% TE***

* Suggested modification in Scientific Update (2007): 50 – 75%

Source: WHO/FAO: WHO Technical Report (TR 916)

European Food Safety Authority

EFSA Journal 2010; 8(3):1462

SCIENTIFIC OPINION

Scientific Opinion on Dietary Reference Values for carbohydrates and dietary fibre[1]

EFSA Panel on Dietetic Products, Nutrition, and Allergies (NDA)[2, 3]

European Food Safety Authority (EFSA), Parma, Italy

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

This Opinion of the EFSA Panel on Dietetic Products, Nutrition, and Allergies (NDA) deals with the establishment of Dietary Reference Values for carbohydrates and dietary fibre. Nutritionally, two broad categories of carbohydrates can be differentiated: "glycaemic carbohydrates", i.e. carbohydrates digested and absorbed in the human small intestine, and 'dietary fibre', non-digestible carbohydrates passing to the large intestine. In this Opinion, dietary fibre is defined as non-digestible carbohydrates plus lignin. The absolute dietary requirement for glycaemic carbohydrates is not precisely known but will depend on the amount of fat and protein ingested. The Panel proposes 45 to 60 E% as the reference Intake range for carbohydrates applicable to both adults and children older than one year of age. **Although high frequency of intake of sugar-containing foods can increase the risk of dental caries, there are insufficient data to set an upper limit for (added) sugar intake.** Based on the available evidence on bowel function, the Panel considers dietary fibre intakes of 25 g/day to be adequate for normal laxation in adults. A fibre intake of 2 g/MJ is considered adequate for normal laxation in children from the age of one year. Although there is some experimental evidence that a reduction of the dietary glycaemic index and glycaemic load may have favourable effects on some metabolic risk factors such as serum lipids, the evidence for a role in weight maintenance and prevention of diet-related diseases is inconclusive.

EFSA Journal 2010; 8(3): 1462

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

This Opinion of the EFSA Panel on Dietetic Products, Nutrition, and Allergies (NDA) deals with the establishment of Dietary Reference Values for carbohydrates and dietary fibre. Nutritionally, two broad categories of carbohydrates can be differentiated: "glycaemic carbohydrates", i.e. carbohydrates digested and absorbed in the human small intestine, and 'dietary fibre', non-digestible carbohydrates passing to the large intestine. In this Opinion, dietary fibre is defined as non-digestible carbohydrates plus lignin. The absolute dietary requirement for glycaemic carbohydrates is not precisely known but will depend on the amount of fat and

Although high frequency of intake of sugar-containing foods can increase the risk of dental caries, there are insufficient data to set an upper limit for (added) sugar intake.

EFSA (February 2010)

Frequent consumption of sugar containing foods ***CAN*** increase risk of dental caries.

SOME evidence that sugar sweetened beverages ***MIGHT*** contribute to weight gain.

SOME evidence that high intakes (>20 %TE) of sugars ***MAY*** increase TG and cholesterol concentration and that 20 – 25% E ***MIGHT*** adversely affect glucose and insulin response.

BUT

The available data are not sufficient to set an upper limit for intake of added sugars

Annex 3b. Intake of sucrose among adults aged ~19-65 years in EU countries.

Source: EFSA Journal 2010

Country	Age *Yrs*	Sucrose (E%) Males *Mean (SD)*	Sucrose (E%) Females *Mean (SD)*
AT	19.64	8.7 (6.4)	10.9 (6.6)
DK	18-74	8.0	9.0
FI	25-64	9.7 (5.9)	10.5 (5.1)
HU	>18	7.6 (5.2)	8.6 (4.8)
LT	19-65	10.8 (5.6)	
NO	19-64	9.0 (6.0)	9.0 (6.0)
PL	19-64	11.0 (5.2)	13.7 (6.6)
SE	18-74	9.0 (4.0)	9.0 (4.0)

Public Consultation on Draft Report

AGREE	DISAGREE	CONFUSION
• CEFS (Comité Européen des Fabricants de Sucre)	• BEUC	• BEUC
• Food & Drink Federation	• Food Standards Agency (FSA) UK	• National Centre of Public Health Protection
•World Sugar Research Organisation (WSRO	• German Nutrition Society	
	• Heart Mersey	
	• International Diabetes Federation	
	• National Heart Forum	
	• Safe Foods (Ireland – N&S)	
	• SACN (UK) (Scientific Advisory Committee on Nutrition)	
	• WHO	

1. Disregard of existing reports & DRVs
2. Selective use of existing literature
3. No clear statement regarding hierarchy of evidence
4. Why not a guidance level if it is not possible to set an UL?
5. EFSA appears to have endorsed a level of 90g/day for labelling purposes
6. Terms “**MAY**” and “**MIGHT**” confusing

EFSA Response:

"EFSA clearly states in its final Opinion that there is evidence of adverse health effects associated with certain patterns of intake of foods containing (added) sugars (e.g. strong evidence for high frequency of intake and tooth decay, some evidence for high intakes of beverages & weight gain) & that limiting the intake of (added) sugars should be considered (by relevant authorities) when establishing nutrient goals & recommendations, whereas dietary patterns of intake of foods containing added sugar should be considered when developing food-based dietary guidelines"

ISSUE No 1

Discrepant terminology leads to discrepant recommendations &

potential confusion for manufacturers, health professionals &

consumers

ISSUE No 2

Just how strong is the evidence relating to "sugars" to adverse human health outcomes and are all or only some sugars involved

ISSUE No 3

What is happening to consumption of sugars?

codex alimentarius commission

FOOD AND AGRICULTURE
ORGANIZATION
OF THE UNITED NATIONS

WORLD
HEALTH
ORGANIZATION

CCFL, 2009 (*Codex Committee on Food Labelling)*

"Labelling provisions dealing with food ingredients identified

in the global strategy on diet, physical activity and health"

What is needed?

1. Formal SLRs regarding possible health consequences of sugars

2. Establish wherever possible which sugars are implicated

3. Is it possible to identify upper limits with any certainty?

4. Agree terminology

Criteria for categorising associations between lifestyle variables and chronic diseases as defined by WCRF and used in WHO TR 916, 2003

Convincing	Probable
Evidence from more than one study & at least 2 cohort studies	Evidence from at least 2 cohort studies or 5 case control studies
No substantial unexplained heterogeneity, random or systematic error, confounding, measurement error & selection bias excluded	No substantial unexplained heterogeneity, random or systematic error, confounding, measurement error & selection bias excluded
Plausible biological gradient	Biological plausibility
Confirmatory experimental evidence	

GRADE Process for Developing Guidelines

First steps:

1. Select panel, conflict of interests

2. Formulate structured questions

P Population, participants
I Intervention (s)
C Comparison (s)
O Outcome (s)
T Time-frame

3. Agree process

Preparation steps:

1. *Systematic literature review*
2. Prepare evidence profiles

Final steps:

GRADE Evidence & Determine Strength of Recommendations.

(BMJ, 2004;328: 1494-96)

Quality of evidence	Study design	Lower if……	Higher if ……
High (*further research is very unlikely to change our confidence in the estimate of effect)*	Randomised trial	Study imitations	Large effect (R.R. 05) Very large effect (e.g. RR 0.2)
Moderate (*further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate)*		Inconsistency	Evidence of dose-response gradient
Low (*further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate)*	Observational study	Indirectness	All plausible confounding would reduce a demonstrated effect
Very low (*any estimate of effect is very uncertain)*		Imprecision	
		Publication bias	

Strong Recommendation:

Panel is confident that the desirable effects of adherence to the recommendation outweigh possible undesirable effects.

(*usually based on high quality evidence*)

Weak Recommendation:

Panel concludes that desirable effects of adherence to the recommendation probably outweigh the undesirable effects, but is not confident about the trade-offs.

(*Absence of high quality evidence, imprecise estimates of benefits or risks, variation regarding outcome in different groups, benefits may not be worth the costs*)

First Meeting of the WHO Nutrition Guidance Advisory Group (NUGAG)
22 – 25 February 2010, Geneva, Switzerland

Diet & Health Sub-Group

1.Effects of the level of total fat intake on obesity & other related NCDs
2.Effects of sugars intake on health

Fructooligosaccharide

Inulin

"The Lord spoke to Moses and Aaron, saying to them: Speak to the people of Israel saying:

From among all the land animals, these are the creatures you may eat.

Any animal that has divided hoofs and is cleft footed and chews the cud - such you may eat.

But among those that chew the cud or have divided hoofs, you shall not eat the following: the camel, for even though it chews the cud, it does not have divided hoofs; it is unclean for you …..

Leviticus 11:1-4

Peter saw the heaven opened & something like a large sheet coming down. In it were all kinds of four footed creatures, & reptiles & birds. Then he heard a voice saying:

"Get up, Peter, kill & eat". But Peter said:

"By no means, Lord; for I have never eaten anything that is profane & unclean".

Then the voice said to him again:

"What God has made clean, you must not call profane".

Acts 10: 11 - 15