Cosa sono i “grassi sani”, che cosa è “l’indice glicemico”

Alberto Battezzati
(ICANS - UNIMI)

Livelli di analisi

APPORTO ALIMENTARE

- Consumi di pololazione
- Dieta dell’individuo
- Alimenti
- Componenti alimentari

EFFETTO NUTRIZIONALE

- Popolazione
- Organismo in toto
- Cellule

3.

3. Grassi: scegli la qualità e limita la quantità

TABELLA 1 - CONTENUTO DI GRASSI TOTALI, GRASSI SATURI E COLESTEROLO IN ALCUNI ALIMENTI

Alimenti	g di grasso per 100 g di alimento[1]	Peso di una porzione	Contenuto per porzione		
			Grasso	Acidi grassi saturi	Colesterolo
	g	g	g	g	
Olio di oliva	100,0	10 (1 cucchiaio)	10,0	1,6	0
Burro	83,4	10 (1 porzione)	8,3	4,9	25
Noci secche	68,1	16[2] (4 noci)	4,1	0,3	0
Nocciole secche	64,1	16[2] (8 nocciole)	4,5	0,3	0
Cioccolata al latte	36,3	4 (1 unità)	1,5	0,9	0,4
Cioccolata fondente	33,6	4 (1 unità)	1,3	0,8	0
Salame Milano	31,1	50 (8-10 fette medie)	15,5	4,9	45
Groviera	29,0	50 (1 porzione)	14,5	8,8	9*
Parmigiano	28,1	10 (1 cucchiaio)	2,8	1,8	9
Mozzarella di mucca	19,5	100 (1 porzione)	19,5	10,0*	46
Prosciutto di Parma	18,4	50 (3-4 fette medie)	9,2	3,1	36
Cornetto semplice	18,3	40 (1 unità)	7,3	4,1*	30
Carne di bovino (punta di petto)	10,2	70 (1 fettina piccola)	7,1	2,2	46
Carne di maiale (bistecca)	8,0	70 (1 fettina piccola)	5,6	2,5	43
Uova	8,7	50 (1 unità)	4,3	1,6	186
Pizza con pomodoro	6,6	150 (1 porzione)	9,9	1,0*	0
Prosciutto di Parma (privato del grasso visibile)	3,9	50(3-4 fette medie)	2,0	0,7*	36
Latte intero	3,6	125 (1 bicchiere)	4,5	2,6	14
Carne di bovino (girello)	2,8	70 (1 fettina piccola)	1,9	0,6	42
Acciuga o alici	2,6	100 (1 porzione piccola)	2,6	1,3	61
Latte parzialmente scremato	1,5	125 (1 bicchiere)	1,9	1,1	9
Pane	0,4	50 (1 fetta media)	0,2	0,02*	0
Merluzzo o nasello	0,3	100 (1 porzione piccola)	0,3	0,1	50
Latte scremato	0,2	125 (1 bicchiere)	0,3	0,2	3

*N.B.: I valori riportati nelle tabella 1 sono tratti dalle Tabelle di Composizione degli Alimenti (INRAN – Aggiornamento 2000). Quelli contrassegnati con * derivano dalla Banca dati di composizione degli alimenti per studi epidemiologici in Italia, Istituto Europeo di Oncologia, 1998.*

[1] parte edibile, ossia al netto degli scarti

[2] peso lordo

Gli acidi grassi possono differire per:

1) <u>lunghezza della catena carboniosa</u> (da 2 a 24 atomi di carbonio)

2) <u>tipo di legame carbonioso:</u>

semplice = saturo doppio= insaturo

3) <u>numero di doppi legami (da 1 a 6)</u>

quando gli acidi grassi contengono un doppio legame parliamo di MONOINSATURI

quando gli acidi grassi contengono più di un doppio legame parliamo di POLINSATURI

4) posizione e struttura spaziale del doppio legame rispetto al metile terminale in base a questo gli acidi grassi polinsaturi possono essere classificati in serie:

omega 9 oleica

omega 7 palmitoleica

omega 6 linoleica

omega 3 linolenica

5) struttura stereochimica **cis o trans** rispetto al piano della molecola

acidi grassi cis : presentano una ginocchiatura della molecola che ne rende difficile l’impaccamento e quindi ne abbassa il punto di fusione e ne fa aumentare la fluidita’

acidi grassi trans: si formano in alcuni procedimenti usati nella preparazione alimentare

(es idrogenazione durante preparazione margarine)

gli oli di comune impiego alimentare contengono elevate quantità di acidi grassi insaturi in cis

- La maggior parte degli acidi grassi che si trovano in natura contiene un numero pari di atomi di carbonio.

- Se sono presenti dei doppi legami (insaturazione), essi si trovano generalmente in forma *cis*.

Idrogenazione

Definizione:

- Un processo chimico per mezzo del quale vengono aggiunti idrogenioni a grassi insaturi allo scopo di ridurre il numero di doppi legami

Vantaggi:

- Protegge dall'ossidazione e dall'irrancidimento
- Prolunga la scadenza degli alimenti
- Altera lo stato degli alimenti (liquidi → solidi)

Svantaggi:

- I grassi insaturi divengono più saturi
- Le molecole cambiano la configurazione dei doppi legami da "cis" a "trans"

Alcuni acidi grassi di importanza biologica

Acidi grassi saturi	Nome	Abbreviazione
	Caprico	10:0
	Laurico	12:0
	Miristico	14:0
	Palmitico	16:0
	Stearico	18:0
	Arachidico	20:0
	Beenico	22:0
	Lignocerico	24:0
	Cerotico	26:0
Acidi grassi monoinsaturi	Palmitoleico	16:1cΔ9
	Oleico	18:1cΔ9
Acidi grassi polinsaturi	Linoleico	18:2cΔ9,12
	Linolenico	18:3cΔ9,12,15
	Arachidonico	20:2cΔ5,8,11,14

Acidi grassi a 18 atomi di carbonio

Nome	Abbreviazione	Numero di doppi legami	Saturazione	Fonti alimentari più comuni
Acido stearico	18:0	0	saturo	Maggior parte dei grassi animali
Acido oleico	18:1	1	monoinsaturo	Olio di oliva
Acido linoleico	18:2	2	polinsaturo	Olio di girasole, mais
Acido linolenico	18:3	3	polinsaturo	Olio di soia

I grassi dei cibi ad elevato tenore di **acidi grassi saturi** tendono a far innalzare il livello di colesterolo nel sangue ancor più di quanto non faccia l'apporto alimentare del colesterolo stesso.

Fra questi alimenti rientrano soprattutto i

- ***prodotti lattiero-caseari*** (formaggi, latte intero, panna, burro)
- ***carni grasse e i loro derivati***
- ***certi oli vegetali*** (olio di palma e soprattutto olio di cocco)

Saturated fatty acids: simple molecular structures with complex cellular functions

Vincent Rioux and Philippe Legrand

Purpose of review
This review summarizes recent findings on the biological functions of saturated fatty acids. Some of these findings suggest that saturated fatty acids may have important and specific regulatory roles in the cells. Until now these roles have largely been outweighed by the negative impact of dietary saturated fatty acids on atherosclerosis biomarkers. Elucidated biochemical mechanisms like protein acylation (N-myristoylation, S-palmitoylation) and putative physiological roles are described.

Recent findings
The review will focus on the following topics: new aspects on the metabolism of saturated fatty acids; recent reports on the biochemical functions of saturated fatty acids; current investigations on the physiological roles (elucidated and putative) of saturated fatty acids; and a discussion of the nutritional dietary recommendations (amounts and types) of saturated fatty acids.

Summary
Dietary saturated fatty acids are usually associated with negative consequences for human health. Experimental results on the relationship between doses, physiological effects, specificities and functions of individual saturated fatty acids are, however, conflicting. In this context, this review describes emerging recent evidence that some saturated fatty acids have important and specific biological roles. Such data are needed to allow a balanced view in terms of potential nutritional benefits of saturated fatty acids, and, if necessary, reassessment of the current nutritional dietary recommendations.

Keywords
dietary saturated fatty acids, metabolism, myristic acid, N-myristoylation

Curr Opin Clin Nutr Metab Care 10:752–758.

Biochemistry and Human Nutrition Laboratory, Agrocampus Rennes, INRA USC 2012, Rennes, France

Correspondence to Pr. Philippe Legrand, Laboratoire de Biochimie-Nutrition Humaine, Agrocampus Rennes, INRA USC 2012, 65 rue de Saint-Brieuc, CS 84215, 35042 Rennes Cedex, France
Tel: +33 2 23 48 55 45; fax: +33 2 23 48 55 50;
e-mail: philippe.legrand@agrocampus-rennes.fr

Current Opinion in Clinical Nutrition and Metabolic Care 2007, 10:752–758

Abbreviations

DHA	docosahexaenoic acid
EPA	eicosapentaenoic acid
FA	fatty acid
NMT	myristoyl-CoA: protein N-myristoyltransferase
PUFA	polyunsaturated fatty acid
SCD	stearoyl-CoA desaturase
SFA	saturated fatty acid
VLDL	very low density lipoprotein

1363-1950

Introduction

Observational studies have shown that high intake (more than 15% of daily energy intake) of saturated fatty acids (SFAs) is positively associated with increased levels of blood cholesterol and high coronary heart disease mortality rates [1,2]. Among the SFAs, myristic acid (C14 : 0) is considered to be the most responsible for the increase in blood cholesterol level in animals and humans when provided at a high level [3,4], followed by lauric acid (C12 : 0) and palmitic acid (C16 : 0). The biological mechanisms involved in this increase are a decrease in hepatic low-density lipoprotein (LDL) receptor activity [5,6], thereby affecting plasma lipoprotein clearance; and an increase in LDL cholesterol production rate [7]. Consumption of a single high-fat meal containing SFAs was also shown to reduce the antiinflammatory potential of high-density lipoprotein (HDL) and to impair arterial endothelial function, compared with polyunsaturated FAs [8•].

When provided at moderate levels, however, no evidence for the deleterious effects of SFAs and especially myristic acid has been reported [9–12,13•]. The association of a moderate supply of myristic acid (1.8% of daily energy) with the recommended level of α-linolenic acid (0.9% of daily energy) was very recently shown to improve lecithin cholesterol acyltransferases (LCAT) activity in humans [14••]. Significant inverse associations were found between the dietary content of SFAs from milk fat (C4 : 0 to C15 : 0) and the serum concentration of cholesterol in 15-year-old Swedish adolescents [15]. Positive effects have also been suggested on the development of ischemic stroke in men and women [16,17], on insulin resistance [18] and on the metabolic syndrome [19]. In many countries, the recommended dietary intake of total

Tabella 1 Comuni acidi grassi saturi e relative fonti alimentari

Nomi Comuni	Numero degli atomi di carbonio	Fonte alimentare più commune (che può contenere anche altri acidi grassi)
Acido Butirrico	4	Burro, grasso dei prodotti caseari
Acido Laurico	12	Olio di cocco
Acido Miristico	14	Olio di cocco, grasso dei prodotti caseari
Acido Palmitico	16	Olio di palma, carne, prodotti caseari
Acido Stearico	18	Grasso della carne, burro di cocco

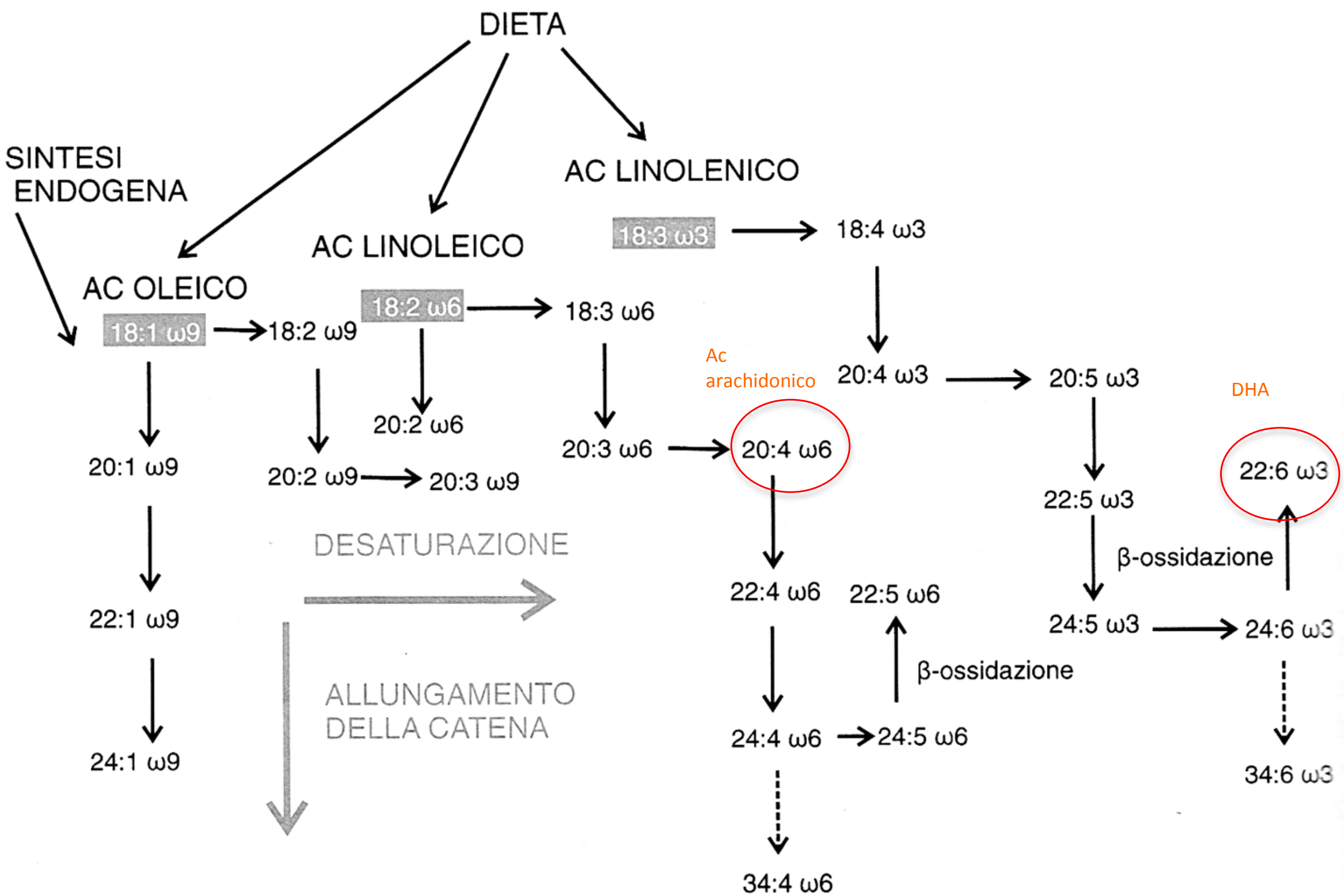
Funzioni biologiche:

- L'Acido Butirrico: regolazione dell'espressione genica, ruolo nella prevenzione del tumore al colon
- Acido Palmitico: regolazione ormonale
- Acidi Palmitico e Miristico: comunicazione cellulare, sistema immunitario

I grassi dei cibi ad elevato tenore di **acidi grassi insaturi** non fanno innalzare il livello di colesterolo nel sangue. Questi alimenti sono rappresentati soprattutto da oli vegetali (di semi e di oliva), noci, nocciole, olive e pesce.

Questi alimenti sono rappresentati soprattutto da

- ***oli vegetali*** (di semi e di oliva)
- ***noci, nocciole***
- ***olive***
- ***pesce***


DIETA
SINTESI ENDOGENA
AC OLEICO
AC LINOLEICO
AC LINOLENICO
18:1 ω9
18:2 ω9
20:1 ω9
22:1 ω9
24:1 ω9
20:2 ω9
20:3 ω9
18:2 ω6
18:3 ω6
20:2 ω6
20:3 ω6
Ac arachidonico
20:4 ω6
22:4 ω6
24:4 ω6
24:5 ω6
22:5 ω6
34:4 ω6
β-ossidazione
18:3 ω3
18:4 ω3
20:4 ω3
20:5 ω3
22:5 ω3
24:5 ω3
24:6 ω3
DHA
22:6 ω3
β-ossidazione
34:6 ω3
DESATURAZIONE
ALLUNGAMENTO DELLA CATENA

I **grassi insaturi** comprendono sia i *monoinsaturi* che i *polinsaturi*.

- ***L'olio di oliva è particolarmente ricco in monoinsaturi,*** soprattutto acido oleico, il quale presenta due vantaggi: fa diminuire il livello nel sangue delle LDL e VLDL e non modifica, o addirittura fa aumentare, i livelli di HDL
- ***L'olio di semi è generalmente ricco in polinsaturi del tipo omega-6***, efficaci anch'essi nel diminuire il livello delle LDL e delle VLDL nel sangue.
- ***I grassi del pesce sono ricchi in acidi grassi polinsaturi del tipo omega-3***, capaci di far diminuire nel sangue tanto il livello dei trigliceridi quanto la capacità di aggregazione delle piastrine

Gli **acidi grassi trans** tendono a far innalzare il livello di colesterolo nel sangue, favorendo inoltre l’aumento del colesterolo LDL rispetto al colesterolo HDL.

Sono presenti

- naturalmente nei prodotti ricavati dagli animali ruminanti (**carni e latte**)
- possono formarsi durante alcuni **trattamenti industriali dei grassi vegetali** e quindi trovarsi negli alimenti trasformati che li contengono

COSA DICONO LE LINEE GUIDA PER UNA SANA ALIMENTAZIONE?

Data di pubblicazione: **1 gennaio 2003** , ultimo aggiornamento **27 febbraio 2013**

COSA DICONO LE LINEE GUIDA PER UNA SANA ALIMENTAZIONE?

Secondo le più recenti raccomandazioni, è necessario che nella nostra alimentazione i grassi siano mediamente presenti in modo tale da apportare una quantità compresa tra il 20-25% e il 30-35% della quota calorica giornaliera complessiva.

Per quanto riguarda la loro qualità, la ripartizione suggerita è la seguente:

- Acidi grassi saturi non più del 7-10% delle calorie totali
- Acidi grassi monoinsaturi fino al 20% delle calorie totali
- Acidi grassi polinsaturi circa il 7% delle calorie totali con un rapporto Omega-6/Omega-3 intorno a 5:1

COSA DICONO I LARN?

Società Italiana di Nutrizione Umana-SINU, 2014

LARN - Livelli di assunzione di riferimento per la popolazione italiana: LIPIDI.

LARN PER LIPIDI				
		SDT Obiettivo nutrizionale per la prevenzione	**AI** Assunzione adeguata	**RI** Intervallo di riferimento per l'assunzione di nutrienti
LATTANTI	Lipidi totali		40% En	
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg + DHA 100 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
BAMBINI-ADOLESCENTI	Lipidi totali			1-3 anni: 35-40% En >4 anni: 20-35% En*
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg 1-2 anni +DHA 100 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
ADULTI E ANZIANI	Lipidi totali			20-35% En*
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
	Colesterolo	<300 mg		
GRAVIDANZA E ALLATTAMENTO	Lipidi totali			20-35% En*
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg +DHA 100-200 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
	Colesterolo	<300 mg		

Per intervallo d'età 6-12 mesi si intende il secondo semestre di vita.
% En: percentuale dell'energia totale della dieta; SFA: acidi grassi saturi; PUFA: acidi grassi polinsaturi; PUFA n-6: acidi grassi polinsaturi della serie n-6; PUFA n-3: acidi grassi polinsaturi della serie n-3; EPA: acido eicosapentanoico; DHA: acido docosaesaenoico.

*I valori più elevati dell'intervallo sono coerenti con diete in cui l'apporto di carboidrati sia vicino al limite inferiore del corrispondente RI; negli altri casi si raccomanda di mantenere valori ≤30% En. La quantità di acidi grassi monoinsaturi (MUFA) da assumere con la dieta viene calcolata per differenza, considerando l'SDT per gli SFA e l'RI per i PUFA. L'evidenza scientifica non consente di definire in alcun caso il livello massimo tollerabile di assunzione (tolerable upper intake level, UL).

Società Italiana di Nutrizione Umana-SINU, 2014

LARN - Livelli di assunzione di riferimento per la popolazione italiana: LIPIDI.

LARN PER LIPIDI				
		SDT Obiettivo nutrizionale per la prevenzione	**AI** Assunzione adeguata	**RI** Intervallo di riferimento per l'assunzione di nutrienti
LATTANTI	Lipidi totali		40% En	
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg + DHA 100 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
BAMBINI-ADOLESCENTI	Lipidi totali			1-3 anni: 35-40% En >4 anni: 20-35% En*
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg 1-2 anni +DHA 100 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
ADULTI E ANZIANI	Lipidi totali			20-35% En*
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
	Colesterolo	<300 mg		
GRAVIDANZA E ALLATTAMENTO	Lipidi totali			20-35% En*
	SFA	<10% En		
	PUFA			5-10% En
	PUFA n-6			4-8% En
	PUFA n-3		EPA-DHA 250 mg +DHA 100-200 mg	0,5-2,0% En
	Acidi grassi *trans*	Il meno possibile		
	Colesterolo	<300 mg		

Per intervallo d'età 6-12 mesi si intende il secondo semestre di vita.
% En: percentuale dell'energia totale della dieta; SFA: acidi grassi saturi; PUFA: acidi grassi polinsaturi; PUFA n-6: acidi grassi polinsaturi della serie n-6; PUFA n-3: acidi grassi polinsaturi della serie n-3; EPA: acido eicosapentanoico; DHA: acido docosaesaenoico.

*I valori più elevati dell'intervallo sono coerenti con diete in cui l'apporto di carboidrati sia vicino al limite inferiore del corrispondente RI; negli altri casi si raccomanda di mantenere valori ≤30% En. La quantità di acidi grassi monoinsaturi (MUFA) da assumere con la dieta viene calcolata per differenza, considerando l'SDT per gli SFA e l'RI per i PUFA. L'evidenza scientifica non consente di definire in alcun caso il livello massimo tollerabile di assunzione (tolerable upper intake level, UL).

COSA DICE L'EFSA?

Dietary Reference Values:

- *Population Reference Intakes (PRI)*: the level of (nutrient) intake that is adequate for virtually all people in a population group.
- *Average Requirement (AR)*: the level of (nutrient) intake that is adequate for half of the people in a population group, given a normal distribution of requirement.
- *Lower Threshold Intake (LTI)*: the level of intake below which, on the basis of current knowledge, almost all individuals will be unable to maintain "metabolic integrity", according to the criterion chosen for each nutrient.
- *Adequate Intake (AI)*: the value estimated when a Population Reference Intake cannot be established because an average requirement cannot be determined. An Adequate Intake is the average observed daily level of intake by a population group (or groups) of apparently healthy people that is assumed to be adequate.
- *Reference Intake ranges for macronutrients (RI)*: the intake range for macronutrients, expressed as % of the energy intake. These apply to ranges of intakes that are adequate for maintaining health and associated with a low risk of selected chronic diseases.

Saturated fatty acids

- SFA are synthesised by the body and are not required in the diet. Therefore, no Population Reference Intake (PRI), Average Requirement (AR), Lower Threshold Intake (LTI), or Adequate Intake (AI) is set.
- There is a positive, dose-dependent relationship between the intake of a mixture of saturated fatty acids and blood low density lipoprotein (LDL) cholesterol concentrations, when compared to carbohydrates. There is also evidence from dietary intervention studies that decreasing the intakes of products rich in saturated fatty acids by replacement with products rich in n-6 polyunsaturated fatty acids (without changing total fat intake) decreased the number of cardiovascular events. As the relationship between saturated fatty acids intake and the increase in LDL cholesterol concentrations is continuous, no threshold of saturated fatty acids intake can be defined below which there is no adverse effect. Thus, also no Tolerable Upper Intake Level can be set.
- The Panel concludes that saturated fatty acids intake should be as low as is possible within the context of a nutritionally adequate diet. Limiting the intake of saturated fatty acids should be considered when establishing nutrient goals and recommendations.

Cis-monounsaturated fatty acids (cis-MUFA)

- Cis-monounsaturated fatty acids are synthesised by the body, have no known specific role in preventing or promoting diet-related diseases, and are therefore not indispensable constituents of the diet. The Panel proposes not to set any Dietary Reference Value for cis- monounsaturated fatty acids.

Cis-polyunsaturated fatty acids (cis-PUFA)

- In view of the different metabolic effects of the various dietary cis-polyunsaturated fatty acids, the Panel proposes not to formulate a Dietary Reference Value for the intake of total cis- polyunsaturated fatty acids. Also, the Panel proposes not to set specific values for the n-3/n-6 ratio as there are insufficient data on clinical and biochemical endpoints in humans to recommend a ratio independent of absolute levels of intake.

n-6 polyunsaturated fatty acids (n-6 PUFA)

- Linoleic acid (LA) cannot be synthesised by the body, is required to maintain “metabolic integrity”, and is therefore an EFA. However, there are not sufficient scientific data to derive an Average Requirement, a Lower Threshold Intake or a Population Reference Intake.
- There is a negative (beneficial), dose-dependent relationship between the intake of linoleic acid and blood LDL cholesterol concentrations, while this relationship is positive for HDL cholesterol concentrations. In addition, linoleic acid (LA) lowers fasting blood triacylglycerol concentrations when compared to carbohydrates. There is also evidence that replacement of saturated fatty acids by n-6 polyunsaturated fatty acids (without changing total fat intake) decreases the number of cardiovascular events in the population. As the relationship between linoleic acid intake and the blood lipid profile is continuous, no threshold value of linoleic acid intake can be identified below which the risk for cardiovascular events increases.
- The Panel proposes to set an Adequate Intake for linoleic acid of 4 E%, based on the lowest estimatedmean intakes of the various population groups from a number of European countries, where overt LA deficiency symptoms are not present.
- Arachidonic acid (ARA) is synthesised by the body from linoleic acid and is therefore not an essential fatty acid despite its important role in maintaining “metabolic integrity”. The Panel proposes not to set any Dietary Reference Value for arachidonic acid.
- Finally, there is at present no consistent evidence that the intake of any of the n-6 polyunsaturated fatty acids has detrimental effects on health (e.g. in promoting diet-related diseases). The Panel proposes not to set a Tolerable Upper Intake Level UL for total or any of the n-6 polyunsaturated fatty acids.

n-3 polyunsaturated fatty acids (n-3 PUFA) (1)

- Alpha-linolenic acid (ALA) cannot be synthesised by the body, is required to maintain “metabolic integrity”, and is therefore considered to be an EFA. However, there are not sufficient scientific data to derive an Average Requirement, a Lower Threshold Intake or a Population Reference Intake.. The Panel proposes to set an Adequate Intake for alpha-linolenic acid of 0.5 E%, based on the lowest estimated mean intakes of the various population groups from a number of European countries, where overt alpha-linolenic acid deficiency symptoms are not present. There is no convincing evidence that the intake of alpha-linolenic acid has detrimental effects on health (e.g. in promoting diet-related diseases). The Panel, therefore, proposes not to set a Tolerable Upper Intake Level for alpha-linolenic acid.
- The human body can synthesise eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) from alpha-linolenic acid. Intervention studies have demonstrated beneficial effects of preformed n-3 longchain polyunsaturated fatty acids on recognised cardiovascular risk factors, such as a reduction of plasma triacylglycerol concentrations, platelet aggregation, and blood pressure. These effects were observed at intakes 1g per day, well above levels that were associated with lower cardiovascular disease (CVD) risk in epidemiological studies. With respect to cardiovascular diseases, prospective epidemiological and dietary intervention studies indicate that oily fish consumption or dietary n-3 long-chain polyunsaturated fatty acids supplements (equivalent to a range of 250 to 500 mg of eicosapentaenoic acid plus docosahexaenoic acid daily) decrease the risk of mortality from coronary heart disease (CHD) and sudden cardiac death. An intake of 250 mg per day of eicosapentaenoic acid plus docosahexaenoic acid appears to be sufficient for primary prevention in healthy subjects.).

n-3 polyunsaturated fatty acids (n-3 PUFA) (2)

- Therefore, and taking into account that available data are insufficient to derive an Average Requirement, the Panel proposes to set an Adequate Intake of 250 mg for eicosapentaenoic acid plus docosahexaenoic acid for adults based on cardiovascular considerations.
- **To this intake 100 to 200 mg of preformed docosahexaenoic acid should be added during pregnancy and lactation to compensate for oxidative losses of maternal dietary docosahexaenoic acid and accumulation of docosahexaenoic acid in body fat of the foetus/infant.**
- In older infants, docosahexaenoic acid intakes at levels of 50 to 100 mg per day have been found effective for visual function in the complementary feeding period and are considered to be adequate for that period.
- The Panel proposes an Adequate Intake of 100 mg docosahexaenoic acid for older infants (>6 months of age) and young children below the age of 24 months.
- The currently available evidence does not permit to define an age specific quantitative estimate of an adequate dietary intake for eicosapentaenoic acid and docosahexaenoic acid for children aged 2 to 18 years. However, dietary advice for children should be consistent with advice for the adult population (i.e., 1 to 2 fatty fish meals per week or ~250 mg of eicosapentaenoic acid plus docosahexaenoic acid per day).

Trans fatty acids (TFA)

- Trans fatty acids are not synthesised by the human body and are not required in the diet. Therefore, no Population Reference Intake, Average Requirement, or Adequate Intake is set.Consumption of diets containing trans-monounsaturated fatty acids, like diets containing mixtures of saturated fatty acids, increases blood total and LDL cholesterol concentrations in a dose-dependent manner, compared with consumption of diets containing cis-monounsaturated fatty acids or cispolyunsaturated fatty acids. Consumption of diets containing trans-monounsaturated fatty acids also results in reduced blood HDL cholesterol concentrations and increases the total cholesterol to HDL cholesterol ratio. The available evidence indicates that trans fatty acids from ruminant sources have adverse effects on blood lipids and lipoproteins similar to those from industrial sources when consumed in equal amounts. Prospective cohort studies show a consistent relationship between higher intakes of trans fatty acids and increased risk of coronary heart disease. The available evidence is insufficient to establish whether there is a difference between ruminant and industrial trans fatty acids consumed in equivalent amounts on the risk of coronary heart disease.
- Dietary trans fatty acids are provided by several fats and oils that are also important sources of essential fatty acids and other nutrients. Thus, there is a limit to which the intake of trans fatty acids can be lowered without compromising adequacy of intake of essential nutrients. Therefore, the Panel concludes that trans fatty acids intake should be as low as is possible within the context of a nutritionally adequate diet. Limiting the intake of trans fatty acids should be considered when establishing nutrient goals and recommendations.

EFSA e gravidanza

- 5.1.1.2. Pregnancy
- Pregnancy leads to an additional energy requirement of 375, 1200, 1950 kJ per day during the first, second and third trimesters, respectively (Prentice and Goldberg, 2000; Butte and King, 2005). There are no data which would suggest that the fat intake as percentage of the total energy should differ from that of the diet in non-pregnant women.
- 5.1.1.3. Lactation
- Lactating women have an increase in energy expenditure consistent with the energy cost of milk synthesis. Part of this energy can be mobilised from subcutaneous fat particularly but the major part has to be provided by the diet. An additional energy requirement of 1380 to 1900 kJ per day has been estimated (Butte and King, 2005; IoM, 2005). There are no data which would suggest that the fat intake as percentage of the total energy should differ from that of the diet in non-lactating women.

EFSA e gravidanza

- Estimates of the DHA amount a woman needs to accumulate to accommodate the needs of her infant for deposition of DHA in the brain and retina during the last trimester of pregnancy (about 10 g) and during six months of lactation (12 to 14 g) add up to an additional requirement of 22 to 25 g equivalent to 90 to 100 mg per day over her basic DHA requirement (SACN, 2004) satisfied by limited endogenous synthesis from ALA and her habitual dietary DHA intake which may be low in many women in Europe who do not regularly consume fatty fish (or fish oil). Oxidative losses of maternal dietary DHA and accumulation of DHA in body fat of the foetus/infant should be taken into account when estimating adequate dietary DHA intakes for pregnant women (SACN, 2004). A recent consensus among several research projects and scientific societies recommends a dietary intake of at least 200 mg of DHA per day for both pregnant and lactating women (Koletzko et al., 2007 and 2008).

SUMMARY OF DRV FOR FATS

	Adults	Children [1]	Pregnancy and lactation [1]
Total fat	RI = 20-35E%	>6-12 months, AI[2] = 40 E% 1-3 years, RI = 35-40 E% > 4 years, RI = 20-35 E%	RI = 20-35E%
SFA	As low as possible	As low as possible	As low as possible
Cis-MUFA	No DRV	No DRV	No DRV
Cis-PUFA	No DRV	No DRV	No DRV
.n-3/n-6 ratio	No recommendation	No recommendation	No recommendation
.n-6 PUFA	No DRV	No DRV	No DRV
..LA	AI[3] = 4 E%,	AI[3] = 4 E%,	AI[3] = 4 E%,
..ARA	No DRV	No DRV	No DRV
.n-3 PUFA	No DRV	No DRV	No DRV
..ALA	AI[3] = 0.5 E%	AI[3] = 0.5 E%	AI[3] = 0.5 E%
..EPA+DHA	AI = 250mg per day	AI 7-24 mths, DHA = 100 mg per day	RI: DHA+EPA = 250mg per day plus 100-200mg per day DHA
TFA	As low as possible	As low as possible	As low as possible
CLA	No DRV	No DRV	No DRV
Cholesterol	No reference value besides the limitation on the intake of SFA	No reference value besides the limitation on the intake of SFA	No reference value besides the limitation on the intake of SFA

1 Dietary Reference Values are as for adults unless otherwise noted.

2 Based upon experimentally derived estimates of adquate nutrient intake/ consensus reports (Aggett et al., 1994, Agostoni et al., 2008)

3 Based on lowest estimated mean intakes in EU where overt deficiency symptoms are not present

venerdì 27 febbraio 2015

Alimentazione della donna durante l'allattamento: quali raccomandazioni secondo la IV revisione dei Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione italiana (LARN)

Elvira Verduci

- Per quanto riguarda l'apporto di grassi, oltre la quantità (20-35% dell'apporto energetico giornaliero) è importante la qualità. In particolare, l'acido docosaesaenoico (DHA) è necessario per un corretto sviluppo delle strutture cerebrali e retiniche. Si raccomanda in allattamento, cosi come in gravidanza, l'assunzione di 100-200 mg/die di DHA in più rispetto a quanto indicato per la donna adulta. Numerosi studi hanno infatti dimostrato l'esistenza di un'associazione tra l'assunzione materna di DHA in allattamento e lo sviluppo visivo e cognitivo del bambino.
- Il pesce, vista l'importanza di un'aumentata assunzione di DHA, ha un ruolo di rilievo nell'alimentazione della donna che allatta. Per coprire questa quota di DHA sono necessarie almeno 2 porzioni di pesce (grasso o semigrasso) alla settimana, fino a 3-4 porzioni alla settimana. La scelta del pesce deve saper combinare però, allo stesso tempo, pesce relativamente grasso e ricco di EPA e DHA e pesce a basso rischio di contenere i contaminanti ambientali quali il metil-mercurio. È bene quindi preferire pesce azzurro di taglia piccola (sarde, alici, sgombro) piuttosto che pesci di grossa taglia come tonno e pesce spada, accumulatori di contaminanti (EFSA 2015).

SFA is not evil….

Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies

Russell J de Souza,[1,2,3,4] Andrew Mente,[1,2,5] Adriana Maroleanu,[2] Adrian I Cozma,[3,4] Vanessa Ha,[1,3,4] Teruko Kishibe,[6] Elizabeth Uleryk,[7] Patrick Budylowski,[4] Holger Schünemann,[1,8] Joseph Beyene,[1,2] Sonia S Anand[1,2,5,8]

[1]Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, ON, Canada

[2]Chanchlani Research Centre, McMaster University, Hamilton, ON, Canada

[3]Department of Nutritional Sciences, University of Toronto, Toronto, ON, Canada

[4]Clinical Nutrition and Risk Factor Modification Center, St Michael's Hospital, Toronto, ON, Canada

[5]Population Health Research Institute, Hamilton Health Sciences, Hamilton, ON, Canada

[6]Scotiabank Health Sciences Library, St Michael's Hospital, Toronto, ON, Canada

[7]Hospital Library and Archives, Hospital for Sick Children, Toronto, ON, Canada

[8]Department of Medicine, McMaster University, Hamilton, ON, Canada

Correspondence to: S Anand, McMaster University, 1280 Main St W, MDCL-3204, Hamilton, ON L8N 3Z5, Canada anands@mcmaster.ca

Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bmj.h3978)

Cite this as: *BMJ* 2015;351:h3978
doi: 10.1136/bmj.h3978

Accepted: 15 July 2015

ABSTRACT

OBJECTIVE
To systematically review associations between intake of saturated fat and trans unsaturated fat and all cause mortality, cardiovascular disease (CVD) and associated mortality, coronary heart disease (CHD) and associated mortality, ischemic stroke, and type 2 diabetes.

DESIGN
Systematic review and meta-analysis.

DATA SOURCES
Medline, Embase, Cochrane Central Registry of Controlled Trials, Evidence-Based Medicine Reviews, and CINAHL from inception to 1 May 2015, supplemented by bibliographies of retrieved articles and previous reviews.

ELIGIBILITY CRITERIA FOR SELECTING STUDIES
Observational studies reporting associations of saturated fat and/or trans unsaturated fat (total, industrially manufactured, or from ruminant animals) with all cause mortality, CHD/CVD mortality, total CHD, ischemic stroke, or type 2 diabetes.

DATA EXTRACTION AND SYNTHESIS
Two reviewers independently extracted data and assessed study risks of bias. Multivariable relative risks were pooled. Heterogeneity was assessed and quantified. Potential publication bias was assessed and subgroup analyses were undertaken. The GRADE approach was used to evaluate quality of evidence and certainty of conclusions.

RESULTS
For saturated fat, three to 12 prospective cohort studies for each association were pooled (five to 17 comparisons with 90 501-339 090 participants). Saturated fat intake was not associated with all cause mortality (relative risk 0.99, 95% confidence interval 0.91 to 1.09), CVD mortality (0.97, 0.84 to 1.12), total CHD (1.06, 0.95 to 1.17), ischemic stroke (1.02, 0.90 to 1.15), or type 2 diabetes (0.95, 0.88 to 1.03). There was no convincing lack of association between saturated fat and CHD mortality (1.15, 0.97 to 1.36; P=0.10). For trans fats, one to six prospective cohort studies for each association were pooled (two to seven comparisons with 12 942-230 135 participants). Total trans fat intake was associated with all cause mortality (1.34, 1.16 to 1.56), CHD mortality (1.28, 1.09 to 1.50), and total CHD (1.21, 1.10 to 1.33) but not ischemic stroke (1.07, 0.88 to 1.28) or type 2 diabetes (1.10, 0.95 to 1.27). Industrial, but not ruminant, trans fats were associated with CHD mortality (1.18 (1.04 to 1.33) *v* 1.01 (0.71 to 1.43)) and CHD (1.42 (1.05 to 1.92) *v* 0.93 (0.73 to 1.18)). Ruminant *trans*-palmitoleic acid was inversely associated with type 2 diabetes (0.58, 0.46 to 0.74). The certainty of associations between saturated fat and all outcomes was "very low." The certainty of associations of trans fat with CHD outcomes was "moderate" and "very low" to "low" for other associations.

CONCLUSIONS
Saturated fats are not associated with all cause mortality, CVD, CHD, ischemic stroke, or type 2 diabetes, but the evidence is heterogeneous with

WHAT IS ALREADY KNOWN ON THIS TOPIC

Contrary to prevailing dietary advice, authors of a recent systematic review and meta-analyses claim that there is no excess cardiovascular risk associated with intake of saturated fat, and the US has recently taken policy action to remove partially hydrogenated vegetable oils from its food supply

Population health guidelines require a careful review and assessment of the evidence of harms of these nutrients, with a focus on replacement nutrients

WHAT THIS STUDY ADDS

This study reviewed prospective observational studies and assessed the certainty of the associations with GRADE methods

There was no association between saturated fats and health outcomes in studies where saturated fat generally replaced refined carbohydrates, but there was a positive association between total trans fatty acids and health outcomes

Dietary guidelines for saturated and trans fatty acids must carefully consider the effect of replacement nutrients

Cochrane corner: what are the effects of reducing saturated fat intake on cardiovascular disease and mortality?

Lee Hooper,[1] Nicole Martin,[2] Asmaa Abdelhamid[1]

BACKGROUND

What should we be telling our patients about saturated fat and cardiovascular risk? There have been highly publicised systematic reviews of observational data suggesting no relationship between saturated fat and all-cause mortality or coronary heart disease (CHD).[1 2] This is sensational, but is it correct? cardiovascular mortality, CHD mortality, CHD events, non-fatal myocardial infarction (MI) or stroke, but there was a 17% reduction in people experiencing cardiovascular disease (CVD) events and a marginal effect (suggesting a 10% reduction) on those experiencing MI (fatal or non-fatal). In this context we defined CVD events as including MI, angina, stroke, heart failure, peripheral vascular events, atrial fibrillation the effects of replacing saturated fats with other macronutrients. Subgrouping of studies that replaced saturated fat with polyunsaturated fats showed 27% reduction in people experiencing CVD events (relative risk (RR) 0.73, 95% CI 0.58 to 0.92, see figure 1), whereas studies replacing saturated fats with protein or carbohydrates did not protect against CVD. There were insufficient studies to assess replacement with monounsaturated fats. In an earlier Cochrane review we tried to clarify the different effects of replacement by polyunsaturated and monounsaturated fats.[4] We searched for trials that randomised participants to reducing saturated fat and replacing it with polyunsaturated fats compared with reducing saturated fat and replacing it with monounsaturated fats —but unfortunately there were insufficient

CLINICAL IMPACT

The review findings are suggestive of a small yet potentially important reduction in cardiovascular risk stemming from reduction of saturated fat intake, though without any clear effects on all-cause mortality or CVD mortality (at least over the duration of the included trials, a mean duration of over 4 years). Replacing the

INDICE GLICEMICO

Cosa succede al sistema glucosio-insulina in risposta al pasto?

British Journal of Nutrition

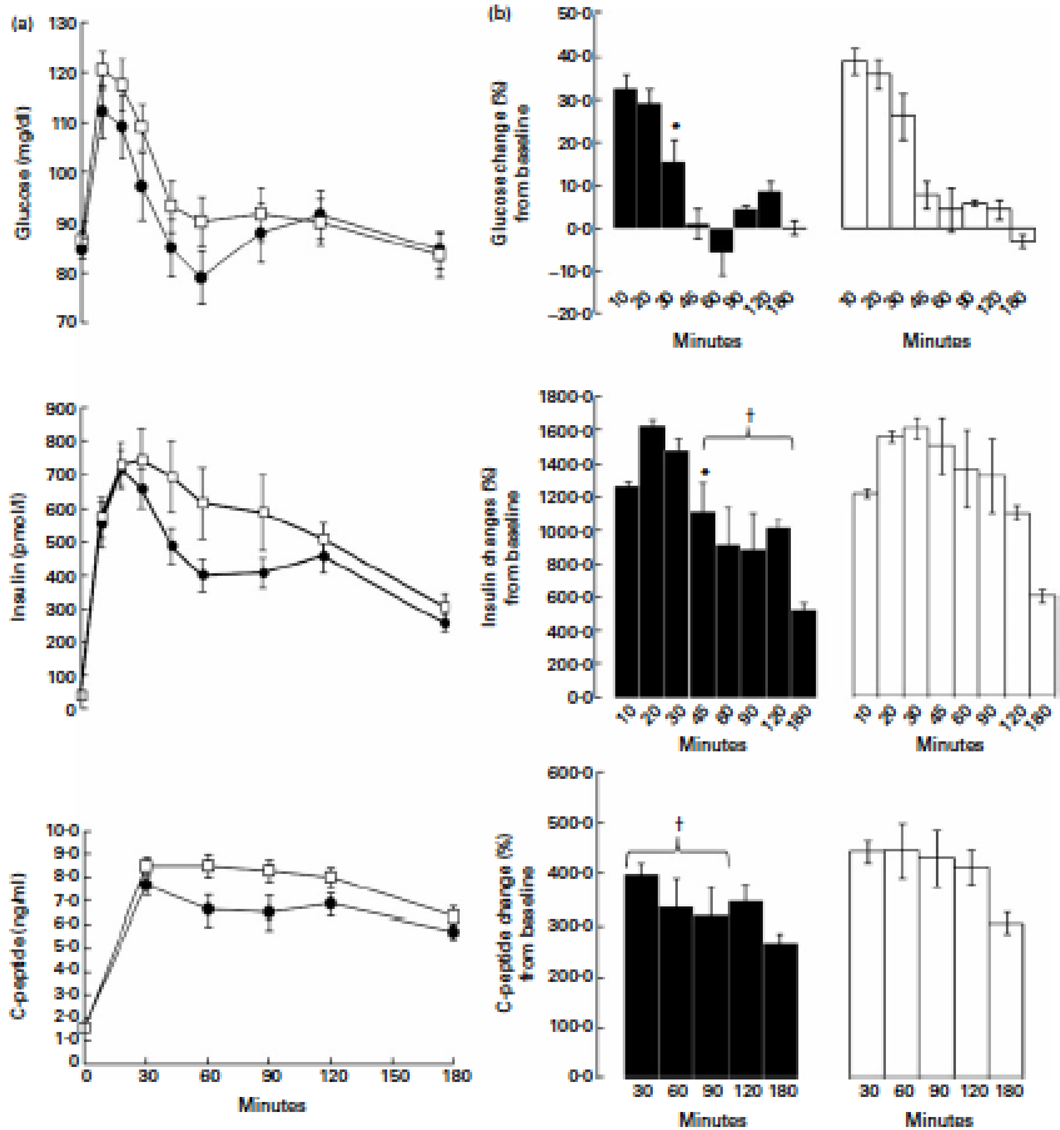
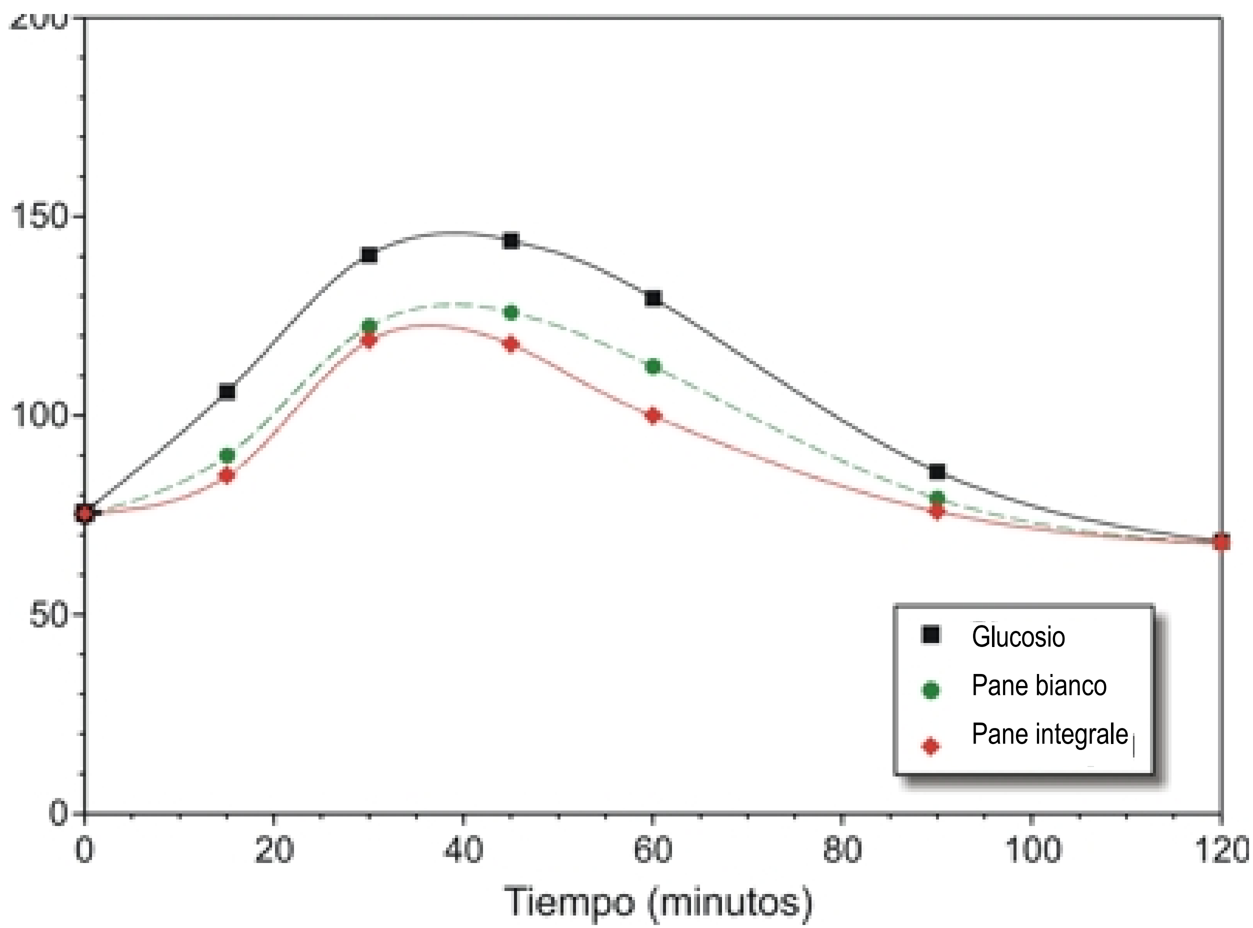


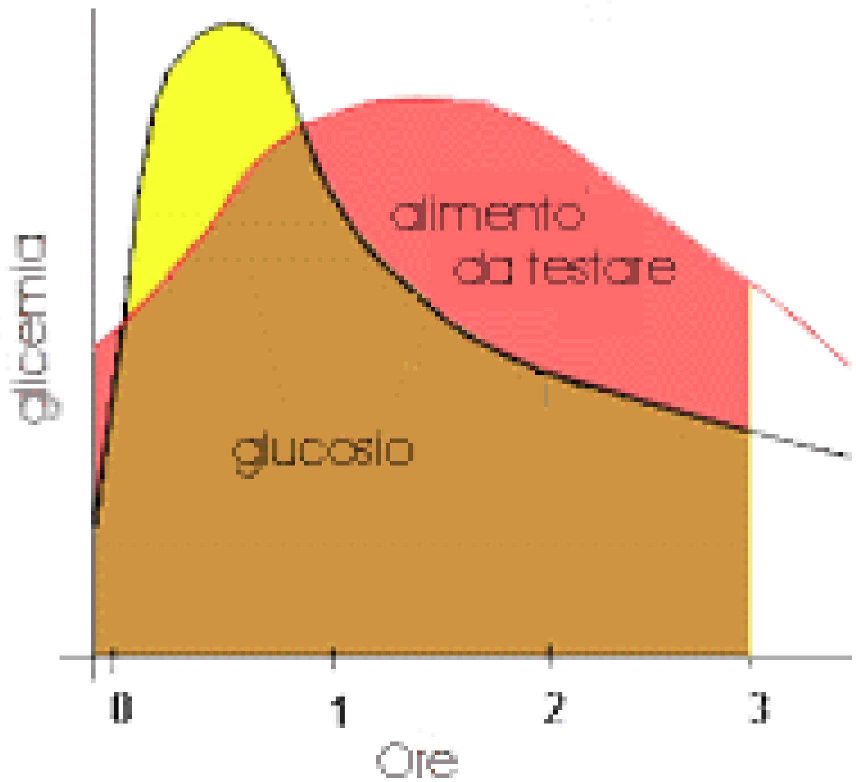
Fig. 2. (a) Fasting and postprandial glucose, insulin and C-peptide responses to the mixed standardised meal (MixStMeal) associated with *Phaseolus vulgaris* extract (PVE) (●) and placebo (□). Values are means, with their standard errors represented by vertical bars. There was a significant time effect ($P < 0.05$; repeated-measures ANOVA) for glucose, insulin and C-peptide. (b) Glucose, insulin and C-peptide changes (%) with respect to baseline after the MixStMeal associated with PVE (■) and placebo (□). * Mean value was significantly different from that of placebo, as percentage increment from basal ($P < 0.05$). † Mean value was significantly different from that of placebo, as percentage mean increment from basal during 45–120 min ($P < 0.05$).

INDICE GLICEMICO (GI)

Area incrementale della risposta glicemica a 50 grammi di carboidrati disponibili di un alimento test, espressa come percentuale della risposta alla stessa quantità di carboidrati contenuta in un alimento di riferimento consumato dallo stesso soggetto (glucosio o pane bianco).



200
150
100
50
0
0
20
40
60
80
100
120
Tiempo (minutos)
Glucosio
Pane bianco
Pane integrale

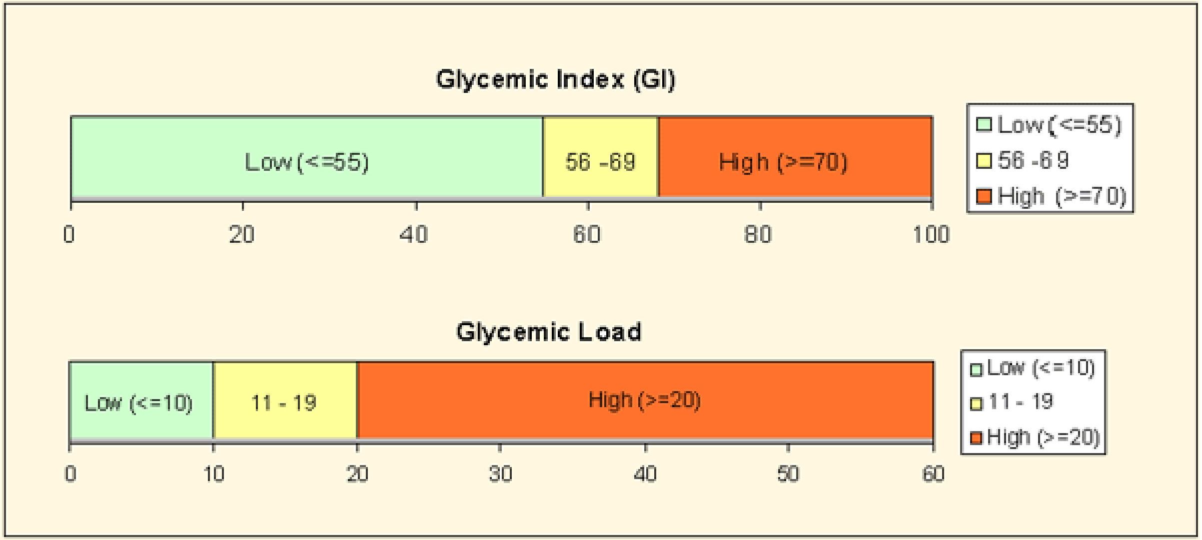


alimento
da testare
glucosio
glicemia
0
1
2
3
Ore

INDICE GLICEMICO

Alimenti ad elevato indice glicemico: >70

Alimenti a basso indice glicemico: <= 55



indice glicemico basso

ALIMENTO	IG
Yogurt a basso tenore di grassi dolcificato con aspartame	20
Fagioli di soia in scatola	20
Noccioline	21
Fagioli di soia	25
Crusca di riso	27
Fagioli rossi	27
Ciliege	32
Fruttosio	32
Piselli secchi	32
Cioccolato al latte dolcificato con aspartame	34
Fagioli marroni	34
Pompelmo	36
Lenticchie rosse	36
Spaghetti arricchiti di proteine	38
Latte + 30g di crusca	38
Latte intero	39
Fagioli secchi comuni	40
Salsicce	40
Lenticchie comuni	41
Fagioli	42
Lenticchie verdi	42

ALIMENTO	IG
Fagioli Neri	43
Latte di Soya	43
Albicocca	44
Piselli bolliti	45
Latte scremato	46
Fettuccine	46
Nutella (Ferrero)	46
Yogurt a basso contenuto di grassi, dolcificato con zucchero della frutta	47
Segale	48
Orzo	49
Cioccolato al latte senza zucchero	49
Vermicelli	50
Yogurt standard	51
Pere fresche	52
Succo di mela	53
Spaghetti	53
Mela	54
Pastina Star	54
Polpa di pomodoro	54
Pane d'orzo	55

indice glicemico intermedio

ALIMENTO	IG
Ravioli	56
Spaghetti cotti per 5 min.	58
All-Brain	60
Pesca fresca	60
Aranicia	63
Pere in scatola	63
Zuppa di lenticchie in scatola	63
Cappellini	64
Maccheroni	64
Linguine	65

ALIMENTO	IG
Riso rapido bollito per 1 min.	65
Lattosio	65
Pan di Spagna	66
Uva	66
Succo d'ananas	66
Pesche in scatola	67
Riso parboiled	68
Piselli verdi	68
Riso parboiled, alti amidi	69
Succo di pompelmo	69

indice glicemico alto

ALIMENTO	IG
Cioccolato	70
Pane di segale	71
Gelato a basso contenuto di grassi	71
Tortellini al formaggio	71
Crusca con uva sultanina	74
Succo d'arancia	74
Lenticchie verdi in scatola	74
Kiwi	75
Torta comune	77
Patate dolci	77
Special K Kellog's	77
Banana	77
Grano saraceno	78
Cereali dolci	78
Spaghetti	78
Riso integrale (brown)	79
Farina d'avena galletta	79
Biscotti da té	79
Succo di frutta mista	79
Popcorn	79
Muesli	80
Uva sultanina	80
Patate comuni bianche bollite	80
Riso integrale	81
Patate novelle	81
Riso bianco	83
Pizza al formaggio	86
Zuppa di piselli	86
Hamburger bun	87
Farinata di fiocchi di avena	87
Gelato	87
Barrette di muesli	87
McDonald's Muffins	88
Sciroppo di mais ad alto tenore di fruttosio	89
Biscotto di pasta frolla	91
Uva passa	91
Pane di segale	92
Saccarosio/zucchero di canna	92
Timballo	93
Cous-cous	93
Pane di segale, alte fibre	93

ALIMENTO	IG
Cocomero	93
Patate al vapore	93
Cordiale all'arancia	94
Ananas	94
Semolino	94
Gnocchi	95
Cornetti (croissant)	96
Nocciole	96
Fanta	97
Mars barrette	97
Pane di frumento, alte fibre	97
Frittella	98
Biscotti di frumento	100
Purea di patate	100
Carote	101
Pane bianco di frumento	101
Crackers	102
Melone	103
Panino	104
Miele	104
Patate bollite schiacciate	104
Corn chips	105
Panino ripieno	106
Patate fritte	107
Zucca	107
Wafers alla vaniglia	110
Dolcetti di riso	110
Galletta tipo colazione	113
Patate al microonde	117
Cornflakes	119
Patate al forno	121
Patatine fritte croccanti	124
Riso, parboiled, basso amido	124
Riso bianco, basso amido	126
Riso soffiato	128
Riso istantaneo bollito per 6 min	128
Pane di frumento senza glutine	129
Glucosio	137
Maltodestrine	137
Tavolette di glucosio	146
Maltosio	150

indice glicemico alto

ALIMENTO	IG
Cioccolato	70
Pane di segale	71
Gelato a basso contenuto di grassi	71
Tortellini al formaggio	71
Crusca con uva sultanina	74
Succo d'arancia	74
Lenticchie verdi in scatola	74
Kiwi	75
Torta comune	77
Patate dolci	77
Special K Kellog's	77
Banana	77
Grano saraceno	78
Cereali dolci	78
Spaghetti	78
Riso integrale (brown)	79
Farina d'avena galletta	79
Biscotti da té	79
Succo di frutta mista	79
Popcorn	79
Muesli	80
Uva sultanina	80
Patate comuni bianche bollite	80
Riso integrale	81
Patate novelle	81
Riso bianco	83
Pizza al formaggio	86
Zuppa di piselli	86
Hamburger bun	87
Farinata di fiocchi di avena	87
Gelato	87
Barrette di muesli	87
McDonald's Muffins	88
Sciroppo di mais ad alto tenore di fruttosio	89
Biscotto di pasta frolla	91
Uva passa	91
Pane di segale	92
Saccarosio/zucchero di canna	92
Timballo	93
Cous-cous	93
Pane di segale, alte fibre	93

ALIMENTO	IG
Cocomero	93
Patate al vapore	93
Cordiale all'arancia	94
Ananas	94
Semolino	94
Gnocchi	95
Cornetti (croissant)	96
Nocciole	96
Fanta	97
Mars barrette	97
Pane di frumento, alte fibre	97
Frittella	98
Biscotti di frumento	100
Purea di patate	100
Carote	101
Pane bianco di frumento	101
Crackers	102
Melone	103
Panino	104
Miele	104
Patate bollite schiacciate	104
Corn chips	105
Panino ripieno	106
Patate fritte	107
Zucca	107
Wafers alla vaniglia	110
Dolcetti di riso	110
Galletta tipo colazione	113
Patate al microonde	117
Cornflakes	119
Patate al forno	121
Patatine fritte croccanti	124
Riso, parboiled, basso amido	124
Riso bianco, basso amido	126
Riso soffiato	128
Riso istantaneo bollito per 6 min	128
Pane di frumento senza glutine	129
Glucosio	137
Maltodestrine	137
Tavolette di glucosio	146
Maltosio	150

ALIMENTO	IG
Riso rapido bollito per 1 min.	65
Riso parboiled	68
Riso integrale (brown)	79
Riso bianco	83
Riso, parboiled, basso amido	124
Riso bianco, basso amido	126
Riso soffiato	128
Riso istantaneo bollito per 6 min	128

ALIMENTO	IG
Patate dolci	77
Patate comuni bianche bollite	80
Patate novelle	81
Patate al vapore	93
Purea di patate	100
Patate bollite schiacciate	104
Patate fritte	107
Patate al microonde	117
Patate al forno	121
Patatine fritte croccanti	124

CARICO GLICEMICO (GL)

Concetto introdotto per standardizzare i valori di indice glicemico rispetto al contenuto in carboidrati di una porzione di quell' alimento o di un pasto.

GL = (GI × carbohydrate content per serving) / 100.

Ad esempio: GI del mais = 60

1 porzione = 150 g

carboidrati disp. = 30 g

→ *GL approx 20*

International Tables of Glycemic Index and Glycemic Load Values: 2008

Fiona S. Atkinson, RD
Kaye Foster-Powell, RD
Jennie C. Brand-Miller, PHD

OBJECTIVE — To systematically tabulate published and unpublished sources of reliable glycemic index (GI) values.

RESEARCH DESIGN AND METHODS — A literature search identified 205 articles published between 1981 and 2007. Unpublished data were also included where the data quality could be verified. The data were separated into two lists: the first representing more precise data derived from testing healthy subjects and the second primarily from individuals with impaired glucose metabolism.

RESULTS — The tables, which are available in the online-only appendix, list the GI of over 2,480 individual food items. Dairy products, legumes, and fruits were found to have a low GI. Breads, breakfast cereals, and rice, including whole grain, were available in both high and low GI versions. The correlation coefficient for 20 staple foods tested in both healthy and diabetic subjects was $r = 0.94$ ($P < 0.001$).

CONCLUSIONS — These tables improve the quality and quantity of GI data available for research and clinical practice.

Diabetes Care 31:2281–2283, 2008

first list. Two columns of GI values were created because both glucose and white bread continue to be used as reference foods. The conversion factor 100/70 or 70/100 was used to convert from one scale to the other. In instances where other reference foods (e.g., rice) were used, this was accepted provided the conversion factor to the glucose scale had been established. To avoid confusion, the glucose scale is recommended for final reporting. GL values were calculated as the product of the amount of available carbohydrate in a specified serving size and the GI value (using glucose as the reference food), divided by 100. Carbohydrate content was obtained from the reference paper or food composition tables (8). The relationship between GI values determined in normal subjects versus diabetic subjects was tested by linear regression. Common foods ($n = 20$), including white bread, cornflakes, rice, oranges, corn, ap-

Food Number and Item		GI[2] (Glucose = 100)	GI[2] (Bread = 100)	Subjects (type & number)	Reference food & time period	Ref.	Serve Size	Avail. carbo-hydrate	GL[3] per serve
							g	g/serve	
311	Wholemeal high-fiber barley flour porridge (50% barley flour: 50% high-fiber barley flour) (Sweden)	55	78±8	Normal, 8	Bread, 2h	15	50 (dry)	15	8
312	Bran cereal, high fiber (UK)	43±10	61	Normal, 10	Glucose, 2h	23	30	12	5
	Bran Flakes								
313	Branflakes (Healthy Living, UK)	50±7	72	Normal, 10	Glucose, 2h	23	30	20	10
314	Bran Flakes, President's Choice® Blue Menu™ (Loblaw Brands Limited, Canada)	65±8	93	Normal, 10	Bread, 2h	UO[5]	30	19	12
315	Bran Flakes™ (Kellogg's, Australia)	74	106	Normal, 12	Bread, 2h	UO[4]	30	18	13
	mean of three studies	63	90				30	19	12
	Chocapic™ (Nestlé, France)								
316	Chocapic™, wheat-based flaked cereal (2003)	70±10	100	Normal, 11	Glucose, 2h	UO[4]	30	25	17
317	Chocapic™, wheat-based flaked cereal (2003)	74±9	106	Normal, 12	Glucose, 2h	UO[4]	30	26	19
318	Chocapic™, wheat-based flaked cereal (2003)	84±9	120	Normal, 11-14	Glucose, 2h	59	30	26	22
	mean of three studies	76	109				30	26	20
	Coco Pops™ (cocoa flavored puffed rice)								
319	Coco Pops™ (Kellogg's, Australia)	77±8	110	Normal, 8	Bread, 2h	1	30	26	20
320	Coco Pops™ (Kellogg's, Australia)	77±3	110	Normal, 10	Glucose, 2h	UO[4]	30	26	20
	Cornflakes™								
321	Cornflakes (China)	74±3	106	Normal, 9	Glucose, 2h	3	30	25	19
322	Cornflakes™ (Kellogg's, Australia)	77	110	Normal, 6	Glucose, 2h	60	30	25	19
323	Cornflakes (China)	79±4	112	Normal, 9	Glucose, 2h	3	30	25	20
324	Cornflakes™ (Kellogg's Inc., Canada)	80±6	114	Normal, 6	Glucose, 2h	33	30	26	21
325	Cornflakes (Kellogg's, UK)	93±14	133	Normal, 10	Glucose, 2h	14	30	25	23
	mean of five studies	81±3	115±5				30	25	20
326	Cornflakes, Crunchy Nut™ (Kellogg's, Australia)	72±4	103	Normal, 10	Glucose, 2h	UO[4]	30	24	17
327	Corn Pops™ (Kellogg's, Australia)	80±4	114	Normal, 10	Glucose, 2h	UO[4]	30	26	21
328	Energy Mix™, wheat-based flaked cereal (Quaker, France)	80±7	114	Normal, 11-14	Glucose, 2h	59	30	25	20
329	Fibre First Multi-Bran Cereal, President's Choice® Blue Menu™ (Loblaw Brands Limited, Canada)	56±10	79	Normal, 10	Bread, 2h	UO[5]	30	10	6
330	Froot Loops™ (Kellogg's, Australia)	69±9	98±13	Normal, 10	Bread, 2h	UO[4]	30	26	18
331	Frosties™, sugar-coated cornflakes (Kellogg's, Australia)	55	79	Normal, 12	Bread, 2h	UO[4]	30	26	14

Use of the Glycemic Index for Weight Loss and Glycemic Control: A Review of Recent Evidence

Sonia Vega-López, PhD, and Sandra N. Mayol-Kreiser, PhD, RD

Corresponding author
Sonia Vega-López, PhD
Healthy Lifestyles Research Center, Nutrition Program, College of Nursing and Health Innovation, Arizona State University, 6950 East Williams Field Road, Mesa, AZ 85212, USA.
E-mail: sonia.vega.lopez@asu.edu

Current Diabetes Reports 2009, **9**:379–388
Current Medicine Group LLC ISSN 1534-4827

of carbohydrate from a standard food taken by the same subject" over a 2-hour period [2], with glucose or white bread as reference food. High-GI foods are those with a GI value of 70 or higher; low-GI foods are those with a GI value equal to or lower than 55. The term glycemic load (GL) was first introduced to adapt the concept of GI to food frequency questionnaire data and is used to standardize GI values to a food's or meal's carbohydrate content and portion size [3–5]. The GL value of a food is

This article summarizes current findings regarding the use of low–glycemic index (GI) diets for weight loss and type 2 diabetes control. Results from cross-sectional studies evaluating the association between dietary GI and body mass index had equivocal results, especially when dietary fiber was included in the model. Of five prospective cohort studies, two reported increased risk of type 2 diabetes diagnosis with higher dietary GI or glycemic load (GL). Risk of type 2 diabetes appeared to have a stronger association with carbohydrate intake or GL than with GI. Evidence from intervention studies using a low-GI approach for weight loss produced inconsistent results, especially for longer-term studies. In intervention studies with type 2 diabetes patients, consumption of a low-GI diet resulted in lower hemoglobin A_{1c} concentrations in participants of shorter-term studies. Recent evidence adds to the controversy regarding the effectiveness of consuming low-GI diets for glycemic control and weight reduction.

Curr Diab Rep (2016) 16:22
DOI 10.1007/s11892-016-0717-7

Role of Medical Nutrition Therapy in the Management of Gestational Diabetes Mellitus

Cristina Moreno-Castilla[1] · Didac Mauricio[2] · Marta Hernandez[1]

The first randomized trial (n = 63) assessing the effect of a low GI for women with GDM found that treatment failure (defined as the need to commence insulin) was reduced by 50 % in women with a low-GI diet compared with women who ate a high-fiber/low-sugar diet with high-to-moderate-GI foods (low-GI group 29 % vs. the high-GI group 59 %; $p < 0.05$). Moreover, 9 out of 19 women in the higher-GI group were able to avoid needing insulin by moving toward a low-GI diet. There were no significant differences in any other reported pregnancy outcomes [Moses RG, Barker M, Winter M, Petocz P, Brand-Miller JC. Can a low-glycemic index diet reduce the need for insulin in gestational diabetes mellitus? Diabetes Care. 2009;32:996–1000].

In a latter RCT with a larger sample (n = 99), authors compared a low-GI diet and a high-fiber/ moderate-GI diet [Louie JCY, Markovic TP, Perera N, Foote D, Petocz P, Ross GP, et al. Investigating the effects of a low-glycemic index diet on preg- nancy outcomes in gestational diabetes mellitus. Diabetes Care. 2011;34:2341–6.].

The authors did not find significant differences between groups in terms of the number of women requiring insulin or the rates of cesarean sections, macrosomia, or LGA. However, there were no statistical differences in the GI content of the diets, and the trial was stopped prematurely because it was unable to detect a difference in its main outcome (infant birth weight).

Grant SM, Wolever TMS, O'Connor DL, Nisenbaum R, Josse RG. Effect of a low glycaemic index diet on blood glucose in women with gestational hyperglycaemia. Diabetes Res Clin Pr. 2011;91(1): 15–22.

Perichart-Perera O, Balas-Nakash M, Rodríguez-Cano A, Legorreta-Legorreta J, Parra-Covarrubias A, Vadillo-Ortega F. Low glycemic index carbohydrates versus all types of carbohy- drates for treating diabetes in pregnancy: a randomized clinical trial to evaluate the effect of glycemic control. Int J Endocrinol. 2012; doi:10.1155/2012/296017.

By including these two RCTs and two others [37, 38], the most recent SR and meta-analysis noted that a low-GI diet was associated with beneficial outcomes in GDM, mainly a lower percentage of women requiring insulin and a lower birth weight without an increase in the number of small for gestational age or macrosomia cases [Viana LV, Gross JL, Azevedo MJ. Dietary intervention in patients with gestational diabetes mellitus: a systematic review and meta- analysis of randomized clinical trials on maternal and newborn out-comes. Diabetes Care. 2014;37:3345–55.]

This is the only meta- analysis of RCTs about MNT in GDM and it suggests that a low-GI diet is the most indicated option.

Regarding fiber on GDM, one small RCT (n=31) compared two groups with a low-GL diet by adding a supplement of fiber to one of the diets [Afaghi A, Ghanei L, Ziaee A. Effect of low glycemic load diet with and without wheat bran on glucose control in gestational diabetes mellitus: a randomized trial. Indian J Endocrinol Metab. 2013;17(4):689–92.]. These authors found that this intervention resulted in fewer women requiring insulin. This study did not report dietary compliance.

There have been no RCTs in GDM patients in which the GL of diets was measured.

International Center for the Assessment of Nutritional Status

University of Milan

Department of Food, Environment, Nutrition Sciences