Ingezonden commentaren op het openbare concept van het achtergronddocument Granen en graanproducten

De volgende personen/organisaties hebben commentaar ingestuurd:

- Federatie Nederlandse Levensmiddelen Industrie
- Rijksinstituut voor Volksgezondheid en Milieu
- Drs. B. Spoorenberg, Maastricht
- Unilever
- De Vries Nutrition Solutions / Healthgrain Forum & TNO Food and Nutrition

Van: Christine Grit
Verzonden: dinsdag 10 februari 2015 16:36
Aan: GR_RGV2O15
Onderwerp: Respons op eerste serie achtergronddocumenten Gezondheidsraad RGV

Geachte heer/mevrouw,

Bijgaand doe ik u toekomen een reactie namens de Federatie Nederlandse Levensmiddelen Industrie (FNLI) op de eerste 8 achtergronddocumenten waarvoor een publieke consultatieronde was ingesteld in het licht van de nieuwe Richtlijnen Goede Voeding van de Gezondheidsraad. De opmerkingen over alle documenten zijn gebundeld in één document dat bij deze e-mail is gevoegd.

Uiteraard kunt u bij eventuele vragen, bij mij terecht.

Met vriendelijke groet,

Christine Grit
Manager Voeding & Gezondheid

FNLI

EGV 15 004 A
Notitie

Consultatierespons op 8 achtergronddocumenten

Onderwerp Achtergronddocumenten Aardappelen, Granen en Graanproducten, Koffie, Thee, Vetten en Oliën, Vitamine- en Mineralensupplementen, Voedingsvezel, Water.

Datum | 10 februari 2015

Inleiding
Als eerste willen we de Commissie bedanken voor het kunnen inzien van de Werkwijze en de achtergronddocumenten voor de Richtlijnen Goede Voeding (RGV) 2015. Als tweede willen we ook graag de Commissie complimenteren met het vele werk dat hiertoe moet zijn uitgevoerd. Er is sprake van stuk voor stuk zeer grondig uitgewerkte documenten en dat is wat ons betreft zeker een compliment waard. Voor de goede orde willen we daarbij ook vermelden dat juist de grondigheid het voor de lezers en belanghebbenden relatief eenvoudig heeft gemaakt om er op- en aanmerkingen bij te plaatsen. Een zeer transparante werkwijze die ons bijzonder aanspreekt.

Vervolgens willen we uiteraard wel graag van de gelegenheid gebruik maken om te reageren op de verschillende achtergronddocumenten die bij deze eerste ronde zijn verspreid voor consultatie. Alle 8 achtergrond documenten zijn in onze achterban doorgenomen waarbij uiteraard de door de Commissie gestelde vragen zoveel mogelijk centraal hebben gestaan. De reacties op de verschillende documenten volgen vanaf pagina 4 van deze consultatierespons. De documenten worden in alfabetische volgorde behandeld, te beginnen bij 'aardappelen' en eindigend bij 'water'.

We willen wel graag een algemeen punt naar voren brengen naar aanleiding van de gekozen thema's voor de achtergronddocumenten. De gedachte dat er zowel naar voedingsmiddelen en dranken als naar voedingsstoffen en voedingspatronen zal worden gekeken, onderschrijven wij uiteraard van harte. Het is de laatste jaren duidelijk geworden dat het uitsluitend evalueren van voedingsstoffen tekort schiet in het duiden van alle mogelijke relaties tussen voeding en gezondheid. Uit de Werkwijze komt naar voren dat er achtergrond documenten zijn opgesteld over verschillende basisvoedingsmiddelen en dat één categorie uit de zogenaamde "extra" categorie of niet-basisvoedingsmiddelen zal worden uitgelicht. De motivering achter de keuze voor de groepen voedingsmiddelen die zijn uitgekozen, is ons onduidelijk gebleven. De meeste basisvoedingsmiddelen lijken te zijn meegenomen maar er lijkt niet gekeken te zijn naar samengestelde voedingsmiddelen en de meeste niet-basisvoedingsmiddelen (die wel een

bijdrage aan de totaal voeding leveren) zijn evenmin opgenomen. De drankenkeuze roept eveneens enkele vragen op. Zo vragen wij ons af of er niet naast dranken met toegevoegd suiker er niet nog anderen zijn om te bespreken.

Werkwijze
De Werkwijze is niet ter consultatie aangeboden, doch ter inzage verstrekt. Hier hebben wij uiteraard begrip voor. Voorop zij gesteld dat het ons verheugt dat er sprake is van een systematische en uitgebreide werkwijze die bovendien heel inzichtelijk is gemaakt. Desalniettemin roept dit document wel enige vragen en opmerkingen op. Deze vragen en opmerkingen willen wij u hieronder graag voorleggen. We zijn ons ervan bewust dat u deze niet mee behoeft te nemen in uw algemene reactie op de verschillende consultatierondes. We hopen echter wel dat u er kennis van wilt nemen, en indien mogelijk, er rekening mee wilt houden.

Werkwijze
1. Het baart ons enige zorgen dat er nauwelijks recht wordt gedaan aan de complexe functie en werking van voedsel en voeding maar uitsluitend naar de relatie tussen voedselinname, voeding en chronische ziekten wordt gekeken. Bovendien via een tamelijk klinische benadering die naar onze mening slechts beperkt recht doet aan de volledige betekenis van voeding en voedsel in de mens en de samenleving (indirecte effecten die eveneens van betekenis zijn voor een goede gezondheid komen niet aan bod). Hiermee wordt enerzijds mogelijkerwijs een negatieve associatie opgeroepen tussen voedsel en voeding en anderzijds worden meer indirecte aspecten van voedsel, zoals met plezier eten en sociaal eetgedrag buiten beschouwing gelaten. Onzes inziens zijn de navolgende factoren eveneens van belang voor de gezondheid en deze zouden eigenlijk ook moeten worden meegenomen.

- Timing van consumptie en de hoeveelheden ervan. In de Richtlijnen Goede Voeding 1986 en 2006 was er ook aandacht voor frequentie van consumptie van bepaalde producten/voedingsstoffen. Wordt dit aspect ook meegenomen in de algehele uiteindelijke analyse
- Chronische effecten van voedsel of voeding kunnen niet gekoppeld worden aan de eenmalige consumptie van één product maar ook niet aan kortdurende voedselpatronen. Wordt de tijdsduur van het gebruikte voedingspatroon ook meegenomen?
- Wij zijn heel benieuwd naar de afweging tussen voedingsmiddelen en voedingsstoffen en ook wellicht de interacties tussen voedingsmiddelen en voedingsstoffen en de effecten daarvan op de gezondheid.

2. Deze kanttekening vloeit eigenlijk voort uit de eerste. Naar ons idee zijn de achtergronddocumenten wel erg op zichzelfstaand en is het lastig om inzicht te krijgen in de context. Als bijvoorbeeld een effect wordt gevonden van een bepaald voedingsmiddel op het voorkomen van een bepaalde aandoening, is het erg onduidelijk hoe dat dan beoordeeld moet worden in het licht van de rest van de voeding, om welke hoeveelheden het gaat in die bepaalde context, wordt er gekeken naar de wenselijke consumptie in een voedingspatroon of de gebruikelijke consumptie, en zo verder. Wij hopen dat er nog wel

enig inzicht zal worden geboden in deze materie voordat de nieuwe Richtlijnen Goede Voeding verschijnen. Het is wat ons betreft ook onduidelijk wanneer er precies sprake is van een voedingspatroon en hoe deze wordt gedefinieerd.

3. Het buiten het bestek vallen van dit document van supplementen met andere bioactieve stoffen lijkt eveneens een aandachtspunt. We concluderen hieruit dat noch supplementen, noch levensmiddelen verrijkt met deze stoffen aan bod zullen komen in de nieuwe RGV terwijl ze wel een onderdeel uit kunnen maken van de geconsumeerde voeding. Hierdoor zou een vertekend beeld kunnen ontstaan. Wij hopen dat u op een of andere wijze tóch aan deze stoffen recht wilt doen.

4. Bij ons wordt ook de vraag opgeroepen wat de consequentie is van het niet opnemen van de verhoudingen tussen de verschillende cholesterolfracties in het bloed maar uitsluitend naar LDL-cholesterol te kijken (alleen deze is als intermediair eindpunt opgenomen). Dat dit voor de conclusies van het achtergronddocument over oliën en vetten weinig uitmaakt, wil nog niet zeggen dat het voor andere documenten die de relatie met hart- en vaatziekten in kaart brengen, ook het geval zal zijn. Wij hopen dat u hier nog naar wilt kijken en – indien enigszins mogelijk – antwoord wilt/kunt geven.

5. De keuze om alleen PubMed publicaties over de relatie tussen voedsel en/of voeding en chronische ziekten te onderzoeken, levert een incompleet beeld op. Uiteraard begrijpen we dat er op een of andere manier een afbakening moet plaatsvinden omdat er anders wel een hele grote reeks publicaties meegenomen moet worden, zelfs met het in acht nemen van de gestelde criteria aan het onderzoeksdesign. Desalniettemin zouden er belangrijke publicaties kunnen ontbreken. Daarom willen we u vriendelijk verzoeken dit punt te heroverwegen.

Granen en Graanproducten

Opmerkingen vooraf
Het valt ons op dat het recentelijk verschenen ontwerp rapport van de Britse SACN met een uitgebreide systematische review met betrekking tot koolhydraten – inclusief granen en graanproducten – niet is meegenomen bij de beoordeling. De onderliggende methodologie is een andere dan die welke is gebruikt door de commissie, terwijl ook andere intermediaire eindpunten zijn meegenomen. Wij vermoeden dat het SACN rapport (ook al is het op dit moment nog een ontwerpversie) zeer complementair kan zijn voor dit specifieke achtergronddocument.

Referentie:
The Scientific Advisory Committee on Nutrition (SACN), Draft Carbohydrates and Health report, scientific consultation: 26 june to 1 september 2014. Note: This is a draft report and does not necessarily represent the final views of the Scientific Advisory Committee on Nutrition, or the advice/policy of Public Health England and Health Departments.

Regels 53 - 77
Heeft de Commissie bij alle beschikbare onderzoek kunnen nagaan dat de 25% minimum hoeveelheid volkorenmeel ook daadwerkelijk gehanteerd werd?

Verder is naar onze mening onderzoek gebruikt waarin zowel volkoren producten (min 25% volkoren), hoog vezel ontbijtgranen en zemelen worden meegenomen onder de noemer 'volkoren'. Wetenschappelijk gezien lijkt het erop dat deze verschillende groepen dezelfde gezondheidseffecten bewerkstelligen en daarom zeker bij elkaar in de analyse gebruikt kunnen worden. In de publicatie van De Moura et al (2009) – bijgevoegd – wordt duidelijk dat bij gebruik van publicaties met de huidige volkoren definitie er te weinig onderzoek is om relaties vast te stellen, terwijl als de bredere definitie van volkoren wordt gebruikt, deze wel kunnen worden vastgesteld. Zij concluderen dan ook: When considering only whole grain studies that met the FDA definition, we found insufficient scientific evidence to support a claim that whole grain intake reduces the risk of CVD. However, a whole grain and reduced risk of CVD health claim is supported when using a broader concept of whole grain to include studies that considered intake of fiber-rich bran and germ als well as whole grain.

Het is in onze ogen zeer belangrijk om bij de conclusies steeds 'volkoren, hoog vezel producten en zemelen' te schrijven en niet te volstaan met 'volkoren' (een andere optie is om de type voedingsmiddelen die in de studies zijn gebruikt in relatie tot de uitkomst maat te gebruiken). Officieel zijn zemelen en hoog vezel producten niet 'volkoren' en dan kan er al gauw verwarring ontstaan. Dat laatste is niet in het belang van de consument.

Bovenstaand punt geldt voor veel meer plaatsen in het document. De GR vermeldt dit op verschillende plaatsen ook maar in de conclusies wordt vervolgens volstaan met uitsluitend het woord volkoren. Wij zouden willen voorstellen dit aan te passen.

Wij denken dat het ook belangrijk is om een definitie of omschrijving van 'geraffineerde' granen' te hebben. Zijn dat graanproducten waarvan het aandeel volkoren minder dan 25% is? En hoe zit het dan met hoog vezel producten en zemelen?

Graanzemelen worden op zichzelf niet als volkoren aangemerkt omdat zij een onderdeel vormen van de graankorrel. Wij zouden daarom willen suggereren dat het wellicht zinvol is om ook nader in te gaan op de mogelijke bijdrage aan de gezondheid van graanzemelen en bioactieve stoffen die in graanzemelen en volkoren producten aanwezig zijn.

Het lijkt ons zinvol als de navolgende publicaties eveneens in de analyse worden betrokken.

Referenties:

Consumption of cereal fiber, mixtures of whole grains and bran, and whole grains and risk reduction in type 2 diabetes, obesity, and cardiovascular deseases, American Journal of Clinical Nutrition 2013, Aug. 98 (2): pp. 594-619.

Additionele studie volkoren versus geraffineerde tarweproducten en systolische bloeddruk:
Bodinham CL, Hitchen KL, Youngman PJ, Frost GS, Robertson MD. Short-term effects of whole-grain wheat on appetite and food intake in healthy adults: a pilot study. Br J Nutr. 2011 Aug; 106(3):327-30.

Additionele studie volkoren versus geraffineerde tarweproducten en LDL cholesterol:
Tighe P, Duthie G, Vaughan N, Brittenden J, Simpson WG, Duthie S e.a. Effect of increased consumption of whole-grain foods on blood pressure and other cardiovascular risk markers in healthy middle-aged persons: a randomized controlled trial. Am J Clin Nutr 2010; 92(4): 733-740.

Additionele systematische review volkorenproducten en diabetes mellitus type 2:
Priebe MG, van Binsbergen JJ, de Vos R, Vonk RJ, Whole grain foods for the prevention of type 2 diabetes mellitus. Cochrane Database of Systematic Reviews 2008, Issue 1. Art. No.: CD006061. DOI: 10.1002/14651858.CD006061.

De Moura F.F., Lewis K.D., and Falk M.C., Applying the FDA definition of Whole Grains to the Evidence for Cardiovascular Disease Health claims, The Journal of Nutrition, Supplement, doi 10.3945/jn.109112383. (bijgevoegd)

Ferruzzi M.G., et al, Developing a Standard definition of Whole-Grain foods for dietary Recommendations: Summary Report of a Multidisciplinary Expert Roundtable discussion, Adv. Nutr. 5: pp. 164-176, 2014. (bijgevoegd).

Tot slot vragen wij ons bij deze sectie af of producten als koek en banket ook tot de groep graanproducten worden gerekend. Het zijn wel producten waarvan het belangrijkste ingrediënt veelal de granen is.

Regels 78 - 85
Ontbijtgranen worden wel als voorbeeld meegenomen in regels 76-77 maar zijn niet in de tabel opgenomen. Volgens onze gegevens is de gemiddelde per capita inname in Nederland van ontbijtgranen ongeveer 7 gram per dag. Dat is vergelijkbaar met witte rijst, maar veel meer dan roggebrood, haver en gerst. Het lijkt zinvol om ook de groep ontbijtgranen toe te voegen.

Regel 201
Volgens ons is de literatuurverwijzing incorrect, dit zou 9 moeten zijn.

Regels 869 - 877
In de tabel worden de volkoreneffecten beschreven als 'volkoren versus geraffineerde graanproducten'. Klopt dit wel? Het was behalve bij haver nergens uit de tekst te halen. In regels 611/612 lijkt naar een vergelijking te worden verwezen. Maar bij de overige publicaties lijkt er uitsluitend naar de effecten van volkoren te zijn gekeken, niet in vergelijking met geraffineerde graan(producten).

Regels 931-933
Is de publicatie van Kyro over de biomarker alkylresorcinols wel gebruikt in het document?

Referenties:
Hauner H, et al. Evidence-Based Guideline of the German Nutrition Society: Carbohydrate Intake and Prevention of Nutrition-Related Diseases. Ann Nutr Metab 2012;60(suppl 1):1-58.

Cho et al. Consumption of cereal fiber, mixtures of whole grains and bran, and whole grains and risk reduction in type 2 diabetes, obesity, and cardiovascular disease. Am J Clin Nutr. 2013 Aug;98(2):594-619.

En de zeer recente, Wu H, et al. Association Between Dietary Whole Grain Intake and Risk of Mortality. JAMA 2015, E1-E13.

Regels 982-983
In de tabel ontbreekt de eenheid van de Follow-up duur: 6-40

The Journal of Nutrition. First published ahead of print September 23, 2009 as doi: 10.3945/jn.109.112383.

The Journal of Nutrition
Supplement

Applying the FDA Definition of Whole Grains to the Evidence for Cardiovascular Disease Health Claims[1,2]

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Abstract

The U.S. FDA defines whole grains as consisting of the intact, ground, cracked, or flaked fruit of the grains whose principal components, the starchy endosperm, germ, and bran, are present in the same relative proportions as they exist in the intact grain. We evaluated the effect of applying the FDA definition of whole grains to the strength of scientific evidence in support of claims for risk reduction of cardiovascular disease (CVD). We concluded that using the FDA definition for whole grains as a selection criterion is limiting, because the majority of existing studies often use a broader meaning to define whole grains. When considering only whole grain studies that met the FDA definition, we found insufficient scientific evidence to support a claim that whole grain intake reduces the risk of CVD. However, a whole grain and reduced risk of CVD health claim is supported when using a broader concept of whole grain to include studies that considered intake of fiber-rich bran and germ as well as whole grain. This type of analysis is complicated by diversity in nutrients and bioactive components among different types of whole grains. J. Nutr. doi: 10.3945/jn.109.112383.

Introduction

In the US, food laws and regulations are generally supported by sound scientific evidence and aim to promote health and well-being by providing the public with the basis to make informed nutritional choices. At times, food laws and regulations become asynchronous. Either new evidence is discovered that contradicts the previous scientific consensus or new policies are introduced that may have the unintended consequence of misdirecting the public from good nutritional choices. Thus, it is necessary to periodically review the scientific evidence and update public policy to provide optimal nutritional guidance.

U.S. whole grain health claim regulations

One means to disseminate nutritional information is through label claims, in particular health claims, for foods and dietary supplements. These claims are regulated by the U.S. FDA under the Federal Food, Drug and Cosmetic Act. Health claims for food labels are authorized in the US by 2 amendments to the Federal Food, Drug and Cosmetic Act: the Nutrition Labeling and Education Act (NLEA)[3] of 1990 and the Food and Drug Administration Modernization Act (FDAMA) of 1997. Under the NLEA, a health claim is a food label statement that characterizes a relationship between a food ingredient or specific food and a disease. Health claims must be authorized and published as regulations by the FDA to be used in food labels (1). To be approved as an NLEA health claim, the FDA must evaluate the supporting evidence to ascertain it meets the standard of significant scientific agreement, a level that has been described as well after the state of emerging science but before unanimous agreement. Such claims are also known as unqualified health claims. In response to a series of court rulings, the FDA has exercised enforcement discretion to also allow claims based on a lesser standard of evidence if they contain language qualifying the strength of the claim. These are known as qualified health claims. FDAMA health claims are based on an

[1] This review summarizes the findings of a recent Life Sciences Research Office (LSRO) report, "Whole Grain Intake and Cardiovascular Disease and Whole Grain Intake and Diabetes—A Review" (Bethesda, MD: Life Sciences Research Office, 2008). The supplement coordinator for this supplement is Michael C. Falk, LSRO. Publication costs for this supplement were defrayed in part by the payment of page charges. This publication must therefore be hereby marked "advertisement" in accordance with 18 USC section 1734 solely to indicate this fact. The LSRO report was developed under a contract between the Kellogg Company and LSRO. An independent Expert Panel appointed by LSRO on the basis of their qualifications and freedom from conflict of interest provided scientific oversight and direction for the study. The Kellogg Company provided a limited review of the report to assure contractual conformance. Supplement Coordinator disclosure: Michael C. Falk: no conflicts to disclose. Catherine Ross handled the manuscript review process, and had no conflict of interest. The opinions expressed in this publication are those of the authors and are not attributable to the sponsors or the publisher, Editor, or Editorial Board of *The Journal of Nutrition*.

[2] Author disclosures: F. F. De Moura, K. D. Lewis, and M. C. Falk, no conflicts of interest.

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[3] Abbreviations used: AACC, American Association for Cereal Chemists; CHD, coronary heart disease; CVD, cardiovascular disease; DBP, diastolic blood pressure; FDAMA, Food and Drug Administration Modernization Act; LDL-C, LDL cholesterol; LSRO, Life Sciences Research Office; MI, myocardial infarction; ND, not detected; NLEA, Nutrition Labeling and Education Act; SBP, systolic blood pressure; TC, total cholesterol.

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authoritative statement from an appropriate federal agency or the National Academy of Sciences (2). Distributors or manufacturers may submit to FDA a notification of a FDAMA health claim and if FDA does not prohibit or modify it within 120 d of receipt of the notification, the claim may be used. Therefore, the health claim provisions in FDAMA were intended to expedite the process by which the use of food label health claims are authorized (3).

Composition and definition of whole grains

A whole cereal grain is the fruit (also known as the seed, caryopsis, or kernel) of plants belonging to the *Poaceae* (or *Gramineae*) family also known as grasses. Some examples of cereal grains are wheat, rice, barley, corn, rye, oats, millet, sorghum, teff, triticale, canary seed, Job's tears, fonio, and wild rice. The seed is composed of 3 parts: the endosperm; the bran, which is the outer layer of the whole grain; and the germ or embryo, which is located at the base of the grain. There is great variability among the various whole grains in their content of macronutrients, micronutrients, and bioactive components, including components thought to have a role in disease prevention such as fiber, folate, phenolic compounds, lignan, and sterols (**Tables 1** and **2**).

Although working definitions of whole grains were in common use, it was not until 1999 that a standardized definition of whole grains was recommended on the basis of a consensus among an ad hoc committee of experts from the American Association for Cereal Chemists (AACC). In 2006, the AACC whole grains definition was adopted by the FDA in the document "Whole Grain Label Statements" (4) to provide guidance to the industry about what the agency considers to be whole grain and to assist manufacturers in labeling their products. The FDA defines whole grains as consisting of the "intact, ground, cracked or flaked fruit of the grains whose principal components—the starchy endosperm, germ and bran—are present in the same relative proportions as they exist in the intact grain." For purposes of this review, we will refer to the whole grains definition as the FDA definition of whole grains.

TABLE 1 Nutrient concentrations of a variety of grains[1]

Nutrient[2]	Barley (hulled)[3]	Brown rice	Bulgur	Corn (yellow)	Oats	Rye	Sorghum	Wheat	Wild rice
					unit/100 g				
Proximates									
Energy, *kJ*	1481	1548	1431	1527	1628	1402	1418	1389	1494
Protein, *g*	12.48	7.50	12.29	9.42	16.89	14.76	11.30	12.61	14.73
Total lipid, *g*	2.30	2.68	1.33	4.74	6.90	2.50	3.30	1.54	1.08
Carbohydrate,[4] *g*	73.48	76.17	75.87	74.26	66.27	69.76	74.63	71.18	74.90
Fiber, total dietary, *g*	17.3	3.4	18.3	7.3	10.6	14.6	6.3	12.2	6.2
Minerals									
Calcium, *mg*	33	33	35	7	54	33	28	29	21
Iron, *mg*	3.60	1.80	2.46	2.71	4.72	2.67	4.40	3.19	1.96
Magnesium, *mg*	133	143	164	127	177	121	—	126	177
Phosphorus, *mg*	264	264	300	210	523	374	287	288	433
Potassium, *mg*	452	268	410	287	429	264	350	363	427
Sodium, *mg*	12	4	17	35	2	6	6	2	7
Zinc, *mg*	2.77	2.02	1.93	2.21	3.97	3.73	—	2.65	5.96
Copper, *mg*	0.498	0.277	0.335	0.314	0.626	0.450	—	0.434	0.524
Manganese, *mg*	1.943	3.743	3.048	0.485	4.916	2.680	—	3.985	1.329
Selenium, *μg*	37.7	—[5]	2.3	15.5	—	35.3	—	70.7	2.8
Vitamins[6]									
Thiamin, *mg*	0.646	0.413	0.232	0.385	0.763	0.316	0.237	0.383	0.115
Riboflavin, *mg*	0.285	0.043	0.115	0.201	0.139	0.251	0.142	0.115	0.262
Niacin, *mg*	4.604	4.308	5.114	3.627	0.961	4.270	2.927	5.464	6.733
Pantothenic acid, *mg*	0.282	1.493	1.045	0.424	1.349	1.456	—	0.954	1.074
Vitamin B-6, *mg*	0.318	0.509	0.342	0.622	0.119	0.294	—	0.300	0.391
Folate, *μg*	19	20	27	19	56	60	—	38	95
Choline, total, *mg*	—	—	28.1	—	—	30.4	—	31.2	35.0
Vitamin A, *μg_RAE*	1	0	0	11	0	1	0	0	1
Vitamin E[7] *mg*	0.57	—	0.06	0.49	—	1.28	—	1.01	0.82
Vitamin K, *μg*	2.2	—	1.9	0.3	—	5.9	—	1.9	1.9
Other									
β-Carotene, *μg*	13	—	5	97	—	7	—	5	11
Lutein + zeaxanthin, *μg*	160	—	220	1355	—	210	—	220	220

[1] Adapted from (11), with permission.
[2] Nutrient values and weights are for edible portion.
[3] Scientific names and specifications of grains (top row, from left to right): barley, hulled (*Hordeum vulgare L.*); rice (*Oryza sativa L.*), brown and medium-grain raw; bulgur (*Triticum*) dry; corn, yellow (*Zea mays L.*); oats (*Avena sativa L.*); rye (*Secale cereale L.*); sorghum (*Sorghum spp.*); wheat (*Triticum aestivum L.*), hard red winter; wild rice, raw (*Zizani spp.*).
[4] The sum of available and nonavailable carbohydrate.
[5] Dash represents the nutrients not listed in the USDA database for the respective grains.
[6] The values for vitamin C and vitamin B-12 for all the grains listed above were 0.0 mg/100 g.
[7] Vitamin E values are for α-tocopherol.

TABLE 2 Phytochemical content of cereal grains and brans[1]

Phytochemicals	Reference	Whole cereal grain				Bran			
		Barley	Oat	Rye	Wheat	Barley	Oat	Rye	Wheat
Lignan, *μg/100 g dry weight*	(12,13)								
Total		58	13.7	112	35.5	63	179	299	110
Matairesinol		0	0.3	65	2.6	0	155	167	0
Secoisolariciresinol		58	13.4	47	32.9	63	24	132	110
Isoflavonoids, *μg/100 g dry weight*	(12)								
Total		21.7	0	0	0	22.7	0	0	10.4
Daidzein		14	0	0	0	6.4	0	0	3.5
Genistein		7.7	0	0	0	16.3	0	0	6.9
Phenolic acids, *μg/g dry weight*	(14–18)								
Total		478	9.4	1210	640	—[3]	360	3360	5655
Ferulic		478	2.1	1035[2]	640	—	360	2780	5410
Sinapic		—	—	120[2]	—	—	—	390	75
p-coumaric		—	7.3	55[2]	—	—	—	190[2]	170
Phenolic lipids, *μg/g dry weight*	(19,20)								
Akylresorcinols		45	—	734	583	—	ND	2758	2211
Sterols, *mg/100 g wet weight*	(21)								
Total sterols		67.8	33.5	88.7	66.4	—	—	—	—
Campesterol		17	4	17	12	—	—	—	—
Campestanol		0.8	Trace	8.3	6.5	—	—	—	—
Stigmasterol		3	1.6	3.4	1.9	—	—	—	—
Sitosterol		46	27	48	36	—	—	—	—
Sitostanol		1	0.9	12	10	—	—	—	—

[1] This is an illustrative table comparing the dietary fiber and phytochemical content of 4 cereal grains and their respective bran. It is not meant to be representative.
[2] Mean values of different cultivars.
[3] Dash represents data not found; it does not necessarily mean that data are unavailable.

The FDA has approved health claims relating to the effect of diet and reduction of risk of cardiovascular disease (CVD) (5). Three NLEA health claims have been approved for grain products (not whole grains), 1 related to cancer (6) and 2 related to coronary heart disease (CHD) (7,8). All health claims for grain products refer to a specific substance, 1 to total dietary fiber, the others to soluble dietary fiber, and a disease component. The FDAMA health claim addressing whole grains is based on the following authoritative statement: "diets high in plant foods—i.e., fruits, vegetables, legumes, and whole grain cereals—are associated with lower occurrence of CHD and cancers of the lung, colon, esophagus, and stomach" extracted from the NRC report (9). The scientific research upon which these claims were based was largely conducted prior to the 2006 release of the FDA guidance document on the definition of whole grains. In this context, we conducted an independent review of the scientific literature to evaluate the effect of applying the FDA definition of whole grains on the strength of scientific evidence in support of whole-grain health claims for risk reduction of CVD and diabetes (10). Here, we restrict the results and conclusions of that review regarding the outcomes for CVD only and expand beyond the report to elaborate public health implications. It is important to note that the FDA has not conducted such a review, because the only health claim petitions related to whole grains were submitted under FDAMA and based on the conclusions of the NRC rather than an independent FDA review of the literature.

Methodology

Literature search

We conducted a comprehensive search of the scientific literature by searching MEDLINE for articles published through February 2008. The following search strategy was used to identify relevant articles: (whole grain OR whole grains) AND (cardiovascular disease OR heart OR coronary heart disease OR stroke OR blood pressure OR myocardial infarction OR health OR diabetes). The MEDLINE searches returned 634 potentially relevant articles. Additional articles were identified from a Web of Science database search using the same keywords used for the MEDLINE search. Other studies were identified by bibliographic searches of relevant reviews and articles.

The Life Sciences Research Office (LSRO) report was guided by an independent expert panel composed of Julie Mares, Ph.D., Judith Marlett, Ph.D., Harry Sapirstein, Ph.D., and James Hoadley, Ph.D., whose fields of expertise are in epidemiology, nutrition, cereal chemistry, and federal food regulations, respectively. Two scientists independently reviewed each article for inclusion and to ensure the information was accurately abstracted from the article. Further details about methodology may be found in the LSRO report.

Inclusion criteria

The inclusion criteria were derived from the specifications of the FDA guidelines for studies eligible to establish a health claim under the NLEA (22). Therefore, reviews, editorials, and meta-analysis studies (n = 200) were excluded, as were studies not written in English (n = 28). Although the FDA may use animal and in vitro studies as background information, only human intervention and observational studies were considered for the purpose of this study. According to the FDA, only these studies can provide evidence from which scientific conclusions can be drawn about substance and disease relationships in humans. Consequently, animal and in vitro studies were also excluded (n = 79). A total of 327 articles remained. After reading titles and abstracts, 204 articles were evaluated further. Studies were considered if they measured a validated endpoint [i.e. CHD,

myocardial infarction (MI), ischemic heart disease, and stroke] or surrogate endpoints [i.e. blood pressure, total cholesterol concentration (TC), and serum LDL cholesterol (LDL-C) concentration] for CVD in a healthy U.S population and populations representative of the US. Two scientists independently reviewed each article for inclusion and to ensure the information was accurately abstracted from the article.

LSRO first analyzed only studies that explicitly described or defined whole grains according to the FDA definition of whole grains to evaluate the effect of applying the FDA definition of whole grains on the strength of the scientific evidence. Later, LSRO expanded the analysis to include studies with a broader definition of whole grains, including studies that added bran and/or germ along with whole grains or studies that did not explicitly use the term whole grains but were in fact conducted with individual whole grains (e.g. oats or barley). Other sources of dietary fiber not derived from whole grains or typically found in whole grain foods (e.g. psyllium seed husk, inulin) were not included.

Results

Restricted analysis (FDA definition only)

Only 4 studies conformed to the FDA definition of whole grains. Two were observational studies, including a prospective cohort study (23) and a cross-sectional study (24). Jensen et al. (23) observed a reduced relative risk of CHD comparing the highest to the lowest quintile of whole grain intake (P-trend = 0.01). Jensen et al. (24) observed a decrease in total cholesterol of 0.16 mmol/L comparing the highest to the lowest quintile of whole grain intake (P-trend = 0.02). Two were randomized, crossover design intervention studies (25,26). Notably, both of these were published after the FDA definition of whole grains was publicly released. Neither study evaluated health outcomes per se but both evaluated surrogate endpoints such as TC, LDL-C, systolic blood pressure (SBP), and diastolic blood pressure (DBP). Neither study observed any significant differences from control. Although the 2 observational studies observed a significant reduction of CVD-related surrogate endpoints, the absence of support from intervention studies leads to the conclusion that the evidence does not support a health claim for the reduced risk of CVD.

Expanded analysis

The expanded approach included additional human studies for a total of 29 (15 intervention and 14 observational) studies for the association between whole grain consumption and CVD.

Most of the observational studies in the expanded definition analysis (Table 3) were excluded from the FDA definition because they considered the intake of bran, germ, or fiber along with whole grain foods. Twelve additional observational studies were included in the evaluation when considering an expanded definition of whole grains. Of these 12 studies, 10 defined whole grains as described by Jacobs Jr. et al. (27), who included individual bran and germ as whole grain: Esmaillzadeh et al. (28), Jacobs Jr. et al. (27), Jacobs Jr. et al. (29), Liu et al. (30), Liu et al. (31), Liu et al. (32), McKeown et al. (33), Newby et al. (34), Steffen et al. (35), and Wang et al. (36); 1 study assessed intake of whole grain bread (37,38); and 1 study evaluated the effect of oats (39). Results of all 14 observational studies included in the expanded definition, regardless of their whole grain source, suggested a protective association between whole grain intake and risk of CVD (Table 3).

Most of the intervention studies in the expanded definition analysis (Table 4) were excluded from the FDA definition analysis because the authors had not explicitly stated that the endosperm, bran, and germ are present in the same proportion as required by the FDA definition. Although the intervention study by Andersson et al. (25) that met the FDA definition reported no effect on CVD outcomes, other intervention studies in the expanded definition generally reported a beneficial effect. A beneficial effect of oats was reported in 6 studies (40–45), whereas only 1 study showed no effect (46). Studies of oats that reported a positive effect were conducted for 6–8 wk compared

TABLE 3 Observational studies on the association of whole grain intake and incidence of CVD

Author, publication year, and reference	Population	Study design	Whole grain intake	Sex	n	Length, y	(Surrogate) endpoint	Outcome
Restricted analysis								
Jensen et al., 2004 (23)	US	Cohort	3.5 vs. 42.4 servings/d	M	40,850	2	CHD	RR = 0.82, P-trend = 0.01
Jensen et al., 2006 (24)	US	Cross-sectional	8.2 vs. 43.8 g/d	F/M	938	NA	TC and LDL-C	Lowered TC, P-trend = 0.02
Expanded analysis								
Fraser et al., 1992 (37);	US	Cohort	Bread: whole	F/M	26,473	6–8	Fatal MI	Whole RR = 0.45, $P < 0.01$
Fraser et al., 1999 (38)			wheat vs. white				Nonfatal MI	Nonsignificant
Jacobs et al., 1998 (27)	US	Cohort	0.2 vs. 3.2 servings/d	F	31,284	9	Ischemic heart disease	RR = 0.70, P-trend = 0.02
Jacobs et al., 1999 (29)	US	Cohort	0.2 vs. 3.2 servings/d	F	31,284	9	CHD	RR = 0.82, P-trend = 0.03
Liu et al., 1999 (30)	US	Cohort	0.13 vs. 2.7 servings/d	F	75,521	10	CHD	RR = 0.67, P-trend < 0.01
Liu et al., 2000 (32)	US	Cohort	0.13 vs. 2.7 servings/d	F	75,521	10	Ischemic stroke	RR = 0.64, P-trend = 0.04
Steffen et al., 2003 (35)	US	Cohort	0.1 vs. 3.0 servings/d	F/M	15,792	11	Incident coronary artery disease	RR = 0.52, P-trend = 0.001
Liu et al., 2003 (31)	US	Cohort	rare vs. 1.0 servings/d	M	75,521	6.6	CVD mortality	RR = 0.80, P-trend = 0.08
Wang et al., 2007 (36)	US	Cohort	<0.5 vs. >4 servings/d	F	28,926	10	Hypertension	RR = 0.77, P-trend = 0.007
He et al., 1995 (39)	China	Cross-sectional	0 vs. 90 g oats/d	F/M	850	NA	TC, LDL-C, SBP, and DBP	Decreased all ($P < 0.05$)
McKeown et al., 2002 (33)	US	Cross-sectional	0.1 vs. 2.91 servings/d	F/M	2941	NA	TC, LDL-C, SBP, and DBP	Decreased TC (P-trend = 0.02) and LDL-C (P-trend = 0.006)
Esmaillzadeh et al., 2005 (28)	Iran	Cross-sectional	6 vs. 229 g/d	F/M	827	NA	TC, LDL-C, SBP, and DBP	RR = 0.84, P-trend = 0.03
Newby et al., 2007 (34)	US	Cross-sectional	0.63 vs. 45.6 g/d	F/M	1516	NA	TC, LDL-C, SBP, and DBP	Decreased TC (P for trend = 0.02) and LDL-C (P for trend = 0.04)

TABLE 4 Intervention studies on the association of whole grain intake and incidence of CVD

Author, publication, year, and reference	Population	Study design	Cereal grain	Quantity	Sex	*n*	Length, *wk*	Outcome
Restricted analysis								
Andersson et al., 2007 (25)	Sweden	Randomized crossover	Whole grain	112 g/d	F/M	22/8	6	No significant changes in TC, LDL-C, SBP, and DBP
Rave et al., 2007 (26)	Germany	Randomized crossover	Whole wheat[1]	200 g/d	F/M	18/13	4	No significant changes in TC, LDL-C, SBP, and DBP
Expanded analysis								
Judd et al., 1981 (46)	England	Randomized crossover	Rolled oats	125 g/d	F/M	4/6	3	No significant change in TC
Van Horn et al., 1986 (45)	US	Randomized parallel	Oat bran and oatmeal	60 g/d	F/M	99/109	6	Decreased TC with oatmeal only ($P < 0.05$)
Van Horn et al., 1988 (43)	US	Randomized parallel	Oatmeal	60 g/d	F/M	150/86	8	No significant change in TC
Van Horn et al., 1991 (44)	US	Randomized parallel	Oatmeal	56 g/d	F/M	40/40	8	No significant changes in TC, LDL-C, SBP, and DBP
Davidson et al., 1991 (40)	US	Randomized parallel	Oat bran and oatmeal	28, 56, or 84 g/d	F/M	60/80	6	Decreased TC and LDL-C ($P < 0.05$) with oat bran (56 and 84 g/d) and oatmeal (84 g/d)
Saltzman et al., 2001 (42)	US	Randomized parallel	Oats	45 g/d	F/M	23/20	8	Decreased TC, LDL-C, and SBP ($P < 0.05$)
Keenan et al., 2002 (41)	US	Randomized parallel	Oat cereal	5.52 g/d β-glucan	F/M	9/9	6	Oats decreased TC, LDL-C, SBP, and DBP ($P < 0.05$)
Davy et al., 2002 (51)	US	Randomized parallel	Oat cereal	Oatmeal: 60 g/d and oat bran: 76 g/d	F/M	18/18	12	No significant changes in SBP and DBP
Hallfrisch et al., 2003 (52)	US	Latin square	Barley, brown rice, and wheat	0, 3, or 6 g/d β-glucan	M	16	5	Decreased SBP ($P = 0.0004$) and DBP ($P = 0.015$)
Behall et al., 2004 (48)	US	Latin square	Barley, brown rice, and wheat	0, 3, or 6 g/d β-glucan	M	16	5	Decreased TC and LDL-C ($P < 0.0001$)
Behall et al., 2004 (47)	US	Latin square	Barley, brown rice, and wheat	0, 3, or 6 g/d β-glucan	F/M	18/7	5	Decreased TC and LDL-C ($P < 0.0001$) only when barley was included
Behall et al., 2006 (49)	US	Latin square	Barley, brown rice, and wheat	0, 3, or 6 g/d β-glucan	F/M	18/7	5	Decreased DBP ($P < 0.0003$) with all grains, and SBP ($P < 0.003$) with all grains except with 100% barley
Li et al., 2003 (50)	Japan	Randomized crossover	Barley	1.8 g/kg body weight	F	10	4	Decreased TC and LDL-C ($P < 0.05$)

[1] Starch-reduced whole grain derived from double-fermented wheat.

with fewer than 3 wk for those studies that reported no beneficial effect. Four intervention studies with barley showed a reduction in plasma TC and LDL-C levels. Three of these barley studies were published by the same research group in the US (47–49) and the other was conducted by a research group in Japan (50). Two of these studies had a similar study design, sample size, and study duration. One studied a diverse population of American men with hypercholesterolemia (48) and the other studied healthy Japanese women (50), but they reported similar reductions in TC (20–15%) and LDL-C (21%) levels. The positive effect of barley reported across population, gender, and health status adds strength to the evidence for a beneficial health effect of barley on plasma TC and LDL-C levels.

A consistent definition of whole grains has not been applied in existing research that investigates the health benefits of consuming whole grains. As such, drawing specific conclusions about health benefits of whole grains in general from the body of scientific literature is confounded, typically with bran/dietary fiber. Using the FDA definition for whole grains as a selection criterion is limiting, because the vast majority of studies often have used a broader meaning to categorize a grain product as whole grain. Restricting the analysis of the literature about health benefits of whole grains to studies explicitly using the FDA definition of whole grains results in the exclusion of the majority of observational studies, because they include the intake of bran and germ to evaluate the health effect of whole grains, and a great number of intervention studies that use individual grains, because they do not explicitly state that the endosperm, bran, and germ are present in the same proportion.

The scientific evidence on the relationship between whole grain consumption and CVD can be evaluated 2 ways (**Table 5**). First, there is no consistent scientific evidence to support a whole grain and CVD risk health claim if only whole grain studies that explicitly conform to the FDA whole grain definition (using the "native" proportion of endosperm, bran, and germ) are considered. To date, only 4 studies conform to the FDA definition. In contrast, a whole grain and CVD health claim is supported using a broader concept of whole grain typically used in the scientific literature that includes whole grain foods containing principal components such as bran. A health claim for the relationship between soluble fiber from oats and barley and risk of CHD has been approved by the FDA (53).

The results also suggest that the health benefits observed from consumption of 1 whole grain do not necessarily reflect the same benefit or the same magnitude of benefit from other whole grains. For example, intake of oat and barley products for 5–6 wk had a beneficial effect on reducing TC and LDL-C plasma levels, whereas intake of whole wheat products elicited no significant change in those variables when consumed for the same length of time (Table 4). This may be due to the diversity

TABLE 5 Comparing the FDA definition with the expanded definition

Outcome	Design	FDA definition only	Expanded definition	Expanded analysis
CVD	Intervention	2	15	Beneficial effect
	Observational	2	14	Consistent protective effect

among whole grains in terms of macronutrient, micronutrient, fiber, and bioactive components. For example, the total fiber content of bulgur and barley is ~5-fold higher than that of brown rice (Table 1). Rye contains the highest amount of lignan and sterols (other than phenolic acids and phenolic lipids) compared with wheat, oats, and barley (Table 2). Furthermore, some nutrients are absent in some grains but present in high amounts in other grains as in the case of vitamin A, β-carotene, lutein, and zeaxanthin that are present in high levels in corn but absent in brown rice, oats, and sorghum (Table 1). Therefore, the variation in constituents among types of whole grains should be considered when associating whole grains with a health benefit. Among the intervention studies included in the expanded definition, only the studies conducted with oats and barley (44,48) reported reduced cholesterol levels. Milled wheat did not lower serum cholesterol levels (25). Therefore, studying the association of individual grains, rather than an entire category of whole grains, with a particular health benefit would provide additional evidence about the possible beneficial components of whole grains.

Beyond the LSRO report: implications for public health

Because the majority of scientific evidence supporting the CVD health benefits of whole grains is confounded, typically with bran, germ, or fiber, it is difficult to dissociate the effect of whole grains from that of their major components. Restricting the scientific evidence to only that which expressly and clearly addresses whole grains is an artificial construct and obscures the potential benefits of whole grain components. The scientific evidence supporting the CVD health benefits of fiber are well documented in approved health claims. Public health policy and dietary recommendations on carbohydrate intake should clearly communicate the value of whole grains, grain foods, and cereal fiber by broadening recommendations to any grain that is a good source of fiber. Moreover, because the FDA definition does not include an assessment of fiber, the label "whole grains" can be mistakenly understood as a good or excellent source of fiber, although that is not necessarily the case. This may have the negative effect of limiting fiber intake rather than increasing it. Broadening recommendations to include bran and including an assessment for fiber may be warranted to significantly increase Americans' fiber intake.

Although whole grains share enough similarities to be thought of as a class, there are significant differences among the individual grains not only in the fiber content (Table 1) or bran but also in the content of putative bioactive compounds (Table 2), such that products of the various grains may have substantially different health benefits. The majority of the intervention studies on whole grain and CVD were conducted with oats and barley (Table 3). Potentially, claims of whole grain health benefits could be restricted to only those grains for which adequate scientific support can be demonstrated to avoid generalizing conclusions based on evidence developed on a specific grain. Additional research is required to identify the health benefits of whole grains other than oats and barley, and on the relative contribution to health benefit of the individual grain components such as bran, germ, fiber, and phytochemicals.

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REVIEW

Developing a Standard Definition of Whole-Grain Foods for Dietary Recommendations: Summary Report of a Multidisciplinary Expert Roundtable Discussion[1,2]

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ABSTRACT

Although the term "whole grain" is well defined, there has been no universal standard of what constitutes a "whole grain food," creating challenges for researchers, the food industry, regulatory authorities, and consumers around the world. As part of the 2010 Dietary Guidelines for Americans, the U.S. Dietary Guidelines Technical Advisory Committee issued a call to action to develop definitions for whole-grain foods that could be universally accepted and applied to dietary recommendations and planning. The Committee's call to action, and the lack of a global whole-grain food definition, was the impetus for the Whole Grain Roundtable held 3–5 December 2012 in Chicago, Illinois. The objective was to develop a whole-grain food definition that is consistent with the quartet of needs of science, food product formulation, consumer behavior, and label education. The roundtable's expert panel represented a broad range of expertise from the United States and Europe, including epidemiology and dietary intervention researchers, consumer educators, government policy makers, and food and nutrition scientists from academia and the grain food industry. Taking into account the totality, quality, and consistency of available scientific evidence, the expert panel recommended that 8 g of whole grain/30 g serving (27 g/100 g), without a fiber requirement, be considered a minimum content of whole grains that is nutritionally meaningful and that a food providing at least 8 g of whole grains/30-g serving be defined as a whole-grain food. Having an established whole-grain food definition will encourage manufacturers to produce foods with meaningful amounts of whole grain, allow consistent product labeling and messaging, and empower consumers to readily identify whole-grain foods and achieve whole-grain dietary recommendations. *Adv. Nutr. 5: 164–176, 2014.*

Introduction

Definition of a whole-grain food is lacking

Although a working definition exists for what constitutes a whole grain (1), no standard definition for what constitutes a whole-grain food was in place at the time of the roundtable, creating challenges for researchers, industry, regulatory authorities, and consumers alike. Developing a definition for a whole-grain food will be a critical first step to help consumers meet their whole-grain dietary intake recommendations and ultimately contribute to the improvement of their health.

The need for a standard definition for whole-grain foods is evidenced by the fact that:

- whole-grain foods are not consistently defined,
- whole-grain qualification standards, where they exist, vary among countries, government and regulatory agencies, and private bodies,
- whole-grain foods and package labeling lack standardization,

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- due to myriad labeling inconsistencies, consumers are often confused when shopping for whole-grain foods, and,
- whole-grain and fiber contents of foods are often incorrectly used interchangeably.

The roundtable experts agreed to assess 4 criteria for the establishment of a whole-grain food definition: scientific basis (rationale), food formulation (feasibility), consumer acceptance, and ease of label education (application). Standardizing a definition for whole-grain foods would encourage manufacturers and governmental and regulatory authorities to develop and label foods with meaningful amounts of whole grain, provide researchers with a consistent approach to quantify whole-grain intake, and help advance science related to the effects of whole grain on health outcomes.

The current lack of a clear definition for whole-grain foods may be contributing to the widespread failure of consumers to meet current whole-grain dietary recommendations.

A call to action to develop a definition for whole-grain foods that could be universally accepted and applied to dietary recommendations and planning was issued by the U.S. Dietary Guidelines Technical Advisory Committee (DGTAC)[16] as part of the 2010 Dietary Guidelines for Americans (DGA). The committee stated, "Without clear definitions, it is difficult to compare studies examining the effectiveness of various whole grains on biomarkers of interest in disease. Clear definitions would also help consumers identify foods that can help them meet the Dietary Guidelines recommendation (2)."

The ongoing lack of a globally accepted whole-grain food definition, along with the DGTAC call to action, was the impetus to organize the "Whole Grain Roundtable" held 3–5 December 2012, in Chicago, Illinois. The purpose of the meeting was to discuss and agree upon a definition for a whole-grain food that could be used both in the United States and internationally. The roundtable, jointly sponsored by the General Mills Bell Institute of Health and Nutrition (United States) and Cereal Partners Worldwide (Switzerland), hosted experts from the United States and Europe in multiple disciplines, including epidemiology, public health nutrition, dietetics, clinical medicine, consumer education, policy and law, food science, and technology, including grain food processing. The panel of experts recognized that establishing a whole-grain food definition is critical to move the field forward, not only to improve dietary guidance but to provide a standard for the food industry to translate dietary recommendations for consumers. The primary objectives of the Whole Grain Roundtable were to: *1*) present and discuss relevant scientific evidence to confirm that the benefits of whole grain are attributable to many of its components; and *2*) review relevant evidence and develop a standard definition for whole-grain foods.

[16] Abbreviations used: AACCI, American Association of Cereal Chemists International; CVD, cardiovascular disease, DGA, Dietary Guidelines for Americans; DGTAC, U.S. Dietary Guidelines Technical Advisory Committee; T2DM, type 2 diabetes.

Health benefits of whole grains: A brief summary of the evidence

Although this is not a comprehensive review of the whole-grain science literature, the expert panel at the roundtable engaged in a review of the evidence relevant to the objectives. The evidence linking whole-grain intake to reduced risk of cardiovascular disease (CVD), diabetes, and excess weight is briefly summarized in **Table 1**. Consumption of whole grains also has been associated with greater nutrient intakes and enhanced diet quality (3–6).

Findings from large, population-based, prospective, observational studies have consistently observed a dose-response relation between whole-grain intake and disease risk, with health benefits proportional to the amount of whole grain consumed (7–17). Consumption of 2–3 servings/d (~48 g) of whole grains, an amount that is readily achievable, may reduce risk of CVD, type 2 diabetes mellitus (T2DM), and overweight and obesity. Generally, the current evidence shows that consuming between 3 and 5 servings of whole grains per day reduce not only the risk of ischemic heart disease and CVD events but also risk factors associated with CVD (15, 18–20). Evidence also suggests that those who consume an average of 3–5 daily servings of whole grains have a 21–30% reduction in risk of T2DM compared with those who rarely or never consume whole grains (14,16,17,21,22). Potential mechanisms for whole grain health benefits include aiding in the maintenance of glucose and insulin homeostasis, lowering of serum cholesterol and LDL-cholesterol concentrations, and reducing inflammation and oxidative stress (7).

These observational data have been supported to some extent by small-scale intervention studies of at-risk populations, i.e., participants with T2DM, hypertension, and/or high cholesterol, but findings have not always been consistent (23–27).

In addition, there may be as-yet–unidentified genetic and other lifestyle influences that interact with the inclusion of whole grains in the diet as well as inherent metabolic differences among populations and between men and women that affect study outcomes. Proving a cause and effect relation with one aspect of the diet, even in intervention trials, can be challenging because of the inherent complexity of the food/dietary matrix and the general lack of large changes in targeted biomarkers in apparently healthy populations as a result of short-term dietary interventions.

Another factor contributing to inconsistent findings is that the diets of free-living populations typically contain a variety of grains, with different phytonutrients (e.g., phenolic acids, polyphenols, inositol, alkylresorcinol, phytosterols), fibers (e.g., β-glucans in oats and barley, arabinoxylans in wheat and rye), micronutrients, and macronutrients that may play important roles in whole-grain health benefits. Interactions among these whole grain co-passengers may contribute to the observed differences in health benefits, but because they exist together as part of the whole-grain package, delineating which compound(s) is (are) responsible for observed health benefits or whether specific synergies exist remains a challenge not yet addressed (28–30).

TABLE 1 Summary of the potential whole-grain health benefits evidence[1,2]

Outcome	Benefits	USDA evidence analysis conclusion (6)
CVD	Associated with ~21% lower risk of CVD	A moderate body of evidence from large prospective cohort studies shows that whole-grain intake, which includes cereal fiber, protects against CVD.
T2DM	Associated with ~26% lower risk of T2DM	Limited evidence shows that consumption of whole grains is associated with a reduced incidence of T2DM in large prospective cohort studies.
Weight management	Associated with lower BMI, less weight gain during 8–13 y (1.27 kg), and lower central adiposity	Moderate evidence shows that intake of whole grains and grain fiber is associated with lower body weight.

[1] Conclusions are drawn from a series of meta-analyses and critical systematic reviews of whole grains in relation to health outcomes. Compared with never/rare consumers of whole grains, those consuming 2–3 servings/d of whole grains have lower risk of CVD, T2DM, and weight gain. CVD, cardiovascular disease; T2DM, type 2 diabetes.

[2] The most up-to-date systematic review and meta-analysis assessing the role of whole-grain intake in developing health outcomes of interest indicate that compared with never/rare consumers of whole grains, those consuming ≥48 g/d of whole grains have a lower risk of CVD, T2DM, and body weight gain.

Although the understanding of the mechanisms behind whole-grain health benefits is limited, relying on randomized controlled trials that focus on intermediate outcomes alone may not be the best approach for setting dietary recommendations. In evaluating studies for the 2010 Dietary Guidelines, the DGTAC gave more weight to experimental studies than to observational studies, more weight to meta-analysis of randomized controlled trials than to individual randomized controlled trials, and more weight to cohort studies than to case-control studies (6). Overall, the panel supported the view that the totality of the evidence for health benefits of whole-grain consumption is convincing and serves as the basis of dietary recommendations globally to include and/or choose whole grains more frequently in the diet (31–48) (Table 2).

Recommendations to increase consumption of whole grains are global

Worldwide, dietary recommendations for consuming whole grains range from the generic, e.g., eat more fruits, vegetables, and whole-grain products (49), and intermediate, e.g., eat at least 30 g of dietary fiber daily, especially from whole-grain products (50), to the more specific, e.g. consume at least one-half of all grains as whole grains and increase whole-grain intake by replacing refined grains with whole grains (2).

Several countries recommend consumption of whole grains, including Australia, Canada, Chile, China, Colombia, Denmark, France, Germany, Greece, Iceland, India, Latvia, Mexico, Oman, Singapore, Switzerland, the United Kingdom, and the United States. Table 2 provides a summary of some existing global dietary whole-grain guidelines. However, the specific quantities of whole grains recommended to be consumed per day vary considerably. The first specific advice in the United States to include whole-grain servings was a part of the 2005 DGA (51). This change from a more general grain recommendation to a specific whole-grain recommendation was developed from and supported by a body of epidemiological (52) and mechanistic experimental (53) studies linking whole-grain intake to an array of beneficial outcomes. The 2010 DGA recommends 6–11 servings/d of grains based on an individual's energy needs, with at least one-half of those servings (at least 3 servings) as whole grains. In these guidelines, foods with at least 51% of the total weight as whole-grain ingredients or at least 8 g of whole grains/ounce-equivalent (~30 g) were identified as foods that provided a substantial amount of whole grains (47).

Whole-grain recommendations in some countries have recently become more specific. In Mexico, e.g., the recommendation from the Official Mexican Norm of Nutrition/Food Education was recently altered from "Wholegrains should be recommended…" to "Include wholegrain cereals in each meal…." (41). Many recommendations stress the importance of the co-passengers in whole grain, including fiber and phytochemicals, but without specifying quantities or defining what constitutes a whole-grain food.

Historically, increasing whole-grain intake was recommended primarily because it increased fiber intake, as whole-grain foods make an important contribution to dietary fiber intake. Choosing whole grains that are higher in fiber has additional health benefits; however, high fiber does not always equate with whole grain, just as whole grain does not always equate with high fiber (2,54) (Table 3). Dietary recommendations in some countries have slowly shifted over time from being nutrient based to being food based (55–59). Importantly, although countries may vary in their food vs. nutrient approaches to dietary guidelines, many include a recommendation to increase consumption of whole grains (60,61).

Whole grains are defined but whole-grain foods are not

In 1999, a whole-grain ingredient definition was developed by the Whole Grains Working Group of the American Association of Cereal Chemists International (AACCI) (1). The AACCI established this working group as a source of accurate scientific information on whole grains and charged the group with discussing and establishing criteria to define a whole grain. The AACCI definition states that whole grains are "intact, ground, cracked or flaked fruit of the grain whose principal components, the starchy endosperm, germ and bran, are present in the same relative proportions as they exist in the intact grain" (1). This definition was adopted and issued by the U.S. FDA in its Draft Whole Grain Label Guidance in 2006 (62,63). Some countries use an adapted AACCI/FDA whole-grain definition and/or DGA whole-grain dietary recommendation (1). The European HEALTHGRAIN Forum, a European Union consortium of scientists, industry representatives, and policy makers advocating for whole grains and grain-based foods also agreed and published a whole-grain

TABLE 2 Global dietary whole-grain guidelines[1]

Country/organization	Specific recommendation	Reference
Australia	The Australian Dietary Guidelines and Guide to Healthy Eating recommend 3–8 1/2 servings (dependent upon age, sex, or caloric requirements) of grain (cereal) foods, mostly whole grain, such as breads cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa, and barley.	31
Austria	The Austrian Food Pyramid (Die österreichische Ernährungspyramide) recommends consuming 4 servings/d of cereals, bread, pasta, rice, or potatoes (5 servings for active adults and children), preferably whole grain.	32
Canada	The Canadian Food Guide recommends 3–8 servings/d (age and sex dependent) of grain products and advises making at least one-half of the grain product choices whole grain each day. Further recommendations state to eat a variety of whole grains such as barley, brown rice, oats, quinoa, and wild rice.	33
Chile	Group of pediatricians in Chile from Chilean Pediatric Society recommends that one-half of grains should be whole grain to reach recommended amount of fiber.	34
China	The Chinese Dietary Guidelines and the Diet Pagoda recommend adults consume 300–500 g/d (dependent upon energy requirements) of total grains, cereals, and legumes, among them, at least 50 g/d of coarse grains, including whole grains.	35
Denmark	Denmark's Food Administration uses the Diet Compass (Kostkompasset) and the Dietary 8 (8 kostråd) to recommend consuming 75 g/d whole grains (for energy requirements of 10 MJ/d). Bread, grains, rice, and pasta should be an essential part of the diet and for older children and adults, 500 g/d is recommended.	36
France	France's Guide of the National Health and Nutrition Program (Guides alimentaires du program national nutrition-santé) recommends consumption of breads, cereals, and starchy foods at each meal, especially whole-grain foods that provide considerable amounts of fiber.	37
Greece	The Dietary Guidelines for adults in Greece suggest consuming 8 servings of nonrefined cereals and products, preferably whole-grain varieties (whole-grain bread, whole-grain pasta, brown rice, etc.).	38
India	The Dietary Guidelines for Indians recommends increasing consumption of whole grains, legumes, and nuts to maintain body weight and body composition.	39
Latvia	The Latvian Health Ministry recommends consumption of 4–6 servings/d of cereals, especially whole grains such as fiber-rich whole-grain products (bread, pasta, oatmeal porridge) to reduce the risk of diseases.	40
Mexico	Mexico's Department of Nutrition and Health Promotion recommends consumption of cereals should be recommended, preferably whole grains without added sugar. Their fiber and nutrients should be highlighted. Whole grains should be eaten with every meal, with legume seeds.	41
Norway	The Health Directorate of Norway's Key Advice for a Healthy Diet (Nøkkelråd for et sunt kosthold) suggests increasing intake of whole-grain products and cereals each day. The whole-grain products should together provide 70–90 g/d of whole-meal flour or whole grain.	42
Oman	The Omani Guide to Healthy Eating recommends choosing whole grains and cereals and consuming potatoes, with their skin. For an average diet of 2000 kcal, 2–3 servings/d of whole grains is advised.	43
Singapore	The Dietary Guidelines for Adult Singaporeans and Healthy Diet Pyramid recommend eating sufficient amounts of grains especially whole grains. Out of the 5–7 servings of rice and alternatives, adults should consume 2–3 servings/d of whole-grain food.	44
Switzerland	The Swiss Society for Nutrition recommends that each main meal should be served with 1 starch-rich side dish [i.e., 3 portions/d, 1 portion = 75–125 g of bread or 60–100 g of pulses (raw weight)]; for instance, lentils/chick peas or 180–300 g of potatoes or 45–75 g of pasta/rice/flakes/corn/other grains (raw weight), including at least 2 portions of whole-grain products.	45
United Kingdom	The National Health Service's Eatwell Plate recommends eating plenty of bread, rice, potatoes, pasta, and other starchy foods (shown as one-third of a plate) and choosing whole-grain varieties whenever possible.	46
United States	The 2010 DGA suggests consuming 3 or more ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products (at the 2000 kcal intake level). Consume at least one-half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.	47
WHO	The WHO and the FAO of the United Nations recommend increasing consumption of whole grains as a strategy to prevent diet-related chronic diseases. The WHO/FAO rate the strength of evidence for whole-grain consumption and decreased risk of CVD and diabetes as probable.	48

[1] CVD, cardiovascular disease; DGA, Dietary Guidelines for Americans.

TABLE 3 Fiber content of a variety of grains[1]

Grain	Fiber content	
	g/8 g grain	*g/100 g grain*
Brown rice	0.3	3.5
Wild rice	0.5	6.2
Corn, yellow	0.6	7.3
Oats	0.9	10.6
Wheat	1.0	12.2
Amaranth	1.2	15.0
Rye	1.2	15.1
Barley	1.4	17.3

[1] Data from reference 54.

definition. This defines whole grains as "consisting of the intact, ground, cracked or flaked kernel after the removal of inedible parts such as the hull and husk. The principle anatomical components—the endosperm, germ and bran—are to be present in the same relative proportions as they exist in the intact kernel. Small losses of components, i.e., <2% of the germ or <10% of the bran, which may occur through processing methods consistent with safety and quality, are allowed" (64). The definition differs from that of the AACCI in that it allows for small losses during initial processing/cleaning of the grain. It has been suggested that the effects of further processing (baking, malting, and fermentation) should be determined before a whole-grain food definition is developed (65). However, available research suggests that the frequency of consumption and amount of whole grain eaten, rather than the type of processing, are the most important considerations when selecting a healthful diet (66). As new scientific evidence emerges, dietary recommendations and guidelines should be reexamined and further consideration of defining whole-grain foods may be warranted.

Although definitions exist for whole grains and relevant whole-grain ingredients, a consistent definition for what constitutes a whole-grain food has not been developed and adopted for use by the FDA, the USDA, or the European Commission. Researchers have defined criteria for quantifying whole-grain foods based on the available information and marketplace of whole-grain products, but in the absence of an accepted definition of a whole-grain food, an array of packaged food products provides diverse amounts of whole grain per serving. Given the different regulatory standards and requirements across the globe, for the purpose of this roundtable meeting and discussions, the United States was considered as the starting point for defining whole-grain foods. In the United States, a standard grain food serving size is estimated to be 1 ounce-equivalent by the USDA (39) or ~30 g by the FDA (67), a definition for whole-grain foods that incorporates a specific amount of whole grains per 30-g serving is needed.

Multiple whole grain policies and regulations

Though no universally accepted definition has existed for whole-grain foods, several government agencies in the United States and elsewhere have established whole-grain food definitions for a wide range of purposes (31,35,41,47,48,62,63, 65, 68–72), which has added to the confusion (Table 4). Some have argued for quantifying whole-grain content of foods based on fiber content, e.g., as a compliance marker for the FDA whole-grain health claim. However, fiber content of whole grains varies widely (Table 3), considerably limiting its reliability as a whole-grain indicator for all whole-grain foods. Furthermore, the content and type of fiber in a whole-grain food depends not only on the grain but also on the density of the product, moisture content, amount of bran, and other ingredients. For example, a grain food made with 100% whole-grain corn will naturally contain ~1 g fiber/30-g serving but still provide all of the beneficial compounds found in that whole grain. An internationally accepted definition for whole-grain foods could help in the development of clear regulatory standards and food package labeling, differentiate between whole grains and fiber, promote easier identification of whole-grain foods by consumers, and contribute to improved quantification of whole-grain intake.

The 2010 DGA recommends that consumers make one-half of their grains whole, which approximates to a minimum of 48 g/d whole grains (47). If whole-grain foods are defined as providing 8 g whole grains/30 g (27 g/100 g), then consumers could meet the whole-grain recommendation of 48 g/d with six 30-g servings of such foods, the current minimum amount of grain foods the DGA recommend to include in the diet each day (2). For foods with 100% whole-grain content, the target could be met with 3 servings (each of 16 g whole grains).

Whole-grain food definition would support whole-grain research efforts

Whole-grain information in nutrient databases varies. Whole-grain research, both observational and intervention trials, largely relies upon the completeness and accuracy of nutrient databases to capture whole-grain intakes of study participants. A substantial increase in the availability of whole-grain products during the past decade has made accurate assessment of whole-grain intake increasingly challenging. Dietary intakes in most observational studies reflect intakes before the introduction of a wider variety of whole-grain foods, with whole-grain intakes being represented mainly by whole-grain breads and whole-grain ready-to-eat breakfast cereals. Existing whole-grain food composition data are limited, as are the number of whole-grain food items listed on some FFQs. Up-to-date nutrient databases are needed to better assess whole-grain intake and capture the changing whole-grain food supply.

Lack of a whole-grain food definition slows research progress. The significant heterogeneity among studies is in part the result of differing whole-grain classifications (73) used such as: *1*) foods that list a whole grain as the first ingredient on the food label (13); *2*) fiber-rich, whole-grain cereals providing specific amounts of total, insoluble, and soluble fiber per serving (74); *3*) whole-grain items with added bran, germ, and fiber (9); *4*) products with 25% or more of whole-grain or bran weight (9); *5*) whole grain

TABLE 4 Multiple whole-grain dietary guidance, policies, and regulations in the United States and internationally[1]

Agency/organization (reference)	Definition/classification
United States	
2010 DGA (47)	Make one-half of your grains whole grains. Eat at least 3-oz equivalents of whole grains daily (1 ounce equivalent is about 1 slice bread; 1 oz ready-to-eat cereal; or 1/2 cup cooked rice, pasta, or cereal; 1 ounce equivalent ~30 g). 51% whole grain is a significant amount. Foods with at least 8 g whole grains per ounce-equivalent. Whole grains provide benefits beyond fiber.
FDA Whole Grain Health Claim (1999, 2003, 2008) (62)	Foods must be ≥51% whole grain by weight per RACC. Dietary fiber used as marker for compliance. Exceptions include single ingredient whole-grain food, i.e., first grain ingredient and no fiber marker.
FDA Draft Guidance on Whole Grain Label Statement (2006) (63)	Allows factual statements about whole-grain content of products, e.g., 100% whole grains, 10 g of whole grains, 1/2 oz whole grains. Restates the FDA whole-grain health claim as a permitted statement: product must meet the requirements outlined in the health claim. Does not characterize a significant amount of whole grain (no minimal standard). No final guidance.
USDA School Meals Regulations (2012) (68)	Whole grain rich defined as ≥50% whole grain by weight or first ingredient is whole grain or ≥8 g whole grain/serving.
USDA WIC Food Package Regulations (2013) (69)	Bread: Standard of identity for whole-grain bread and contain a minimum of 51% whole grain by weight (using dietary fiber as the indicator) and first ingredient whole grain and meet FDA labeling requirement for making a whole-grain health claim and meet regulatory definitions for "low saturated fat" and "low cholesterol" and bear quantitative *trans* fat labeling and contain ≤6.5 g total fat/RACC and ≤0.5 g *trans* fat/RACC. Cereal: Same requirements as whole-grain bread plus no more than 21 g sugars/100 g.
USDA Food Safety and Inspection Service Statement of Interim Policy Guidance (2005) (70)	Only applicable to products containing meat or poultry. Foods can be considered whole grain that meet 51% of the grain as whole grain or 51% of the product by weight or contain at least 1/2-oz equivalent or 8 g dry whole-grain ingredient. Products that meet FDA standards of identity or that contain at least 1/2-oz equivalent or 8 g whole grain can be described as "made with whole grains."
Whole Grain Council Stamp (71)	100% Stamp: all grain ingredients are whole grains. Minimum requirement of 16 g of whole grain per labeled serving. Basic Stamp: contains at least 8 g of whole grain. Even if a product contains large amounts of whole grain (23 g, 37 g, 41 g, etc.), it will use the Basic Stamp if it also contains extra bran, germ, or refined flour.
Other countries/organizations	
Australia (31)	Whole-grain food must provide a minimum of 8 g/serving.
China (35)	The Chinese Dietary Guidelines and the Diet Pagoda recommend adults consume 300–500 g/d (dependent upon energy requirements) of total grains, cereal, and legumes, among them, at least 50 g/d of coarse grains, including whole grains.
Germany (72)	Whole-grain bread must be 90% whole grain.
Mexico (41)	Mexico's Department of Nutrition and Health Promotion recommends consumption of cereals, preferably whole grains without added sugar. Their fiber and nutrients should be highlighted. Whole grains should be eaten with every meal, with legume seeds.
Sweden Code of Practice (65)	Conditions for the use of the whole-grain claim according to the Code are that flours, grains, and flakes must be 100% whole grain and other products, including breakfast cereals and bread, must have at least 50% whole grain based on the dry matter. Dietary fiber content must be at least 4.5 g/1000 kJ and conditions regarding fat, sugar, and salt content for the keyhole must be fulfilled.
WHO (48)	The WHO and FAO of the United Nation recommend increasing consumption of whole grains as a strategy to prevent diet-related chronic diseases.

[1] This is not a comprehensive list of all relevant guidance, regulations, or policies. DGA, Dietary Guidelines for Americans; RACC, Reference Amount Customarily Consumed.

from "dark" breads (9); and 6) products with ≥51% of whole grain by weight (9–11). Products made with whole grains that fail to meet a study's unique criteria for what constitutes a whole-grain food may still contribute to an individual's whole-grain intake. Failure to account for these foods may lead to substantial misclassification of whole-grain intake and have an impact on study outcomes.

Previous epidemiological studies have categorized whole-grain intakes into discrete groups (>50%, 25–50%, or < 25% whole grain by weight) or "servings," in order to rank intakes and compare them with health outcomes of interest. However, such a ranking strategy cannot completely quantify the content of whole grains within foods, making the comparison of findings across studies difficult, particularly among diverse populations.

Comparisons of study findings are also hampered by the diversity and characteristics within whole grains (oats vs. rye vs. wheat). For example, according to the USDA database, which bases the serving size recommendations on the DGA and FDA guidelines (54) and many FFQs, 1/2 cup (97 g) of cooked brown rice and 1/2 cup (117 g) cooked oatmeal are both considered a single serving of a whole-grain food, yet the actual amount of whole grain they provide differs significantly; brown rice provides 26 g of whole grain per serving, whereas oatmeal provides 17 g, because of the different dry matter content of each food. They also differ substantially in the amounts and spectrum of the bioactive components (such as dietary fiber, micronutrients, and phytochemicals) each serving provides due to differences in composition of the 2 cereal grains. The lack of a standard measurement for a whole-grain food could also affect the observed association between biomarkers and health outcomes. Unless a whole-grain food definition is developed that allows researchers to capture the whole-grain contribution of lower fiber whole grains as well as products with different whole-grain content, determining health effects will continue to be challenging, particularly if whole grains are consumed in combination with refined grains.

Whole-grains research needs for the future. There is a clear need for large, controlled, dietary intervention studies in diverse ethnic populations that examine the potential health effects of specific and well-characterized whole grains alone and in combination, as a prerequisite to demonstrating sustained health effects over time. Overall, observational research suggests that health benefits are dose dependent, i.e., the more whole grains that are consumed, the greater the likelihood of a protective effect (14,75–81). However, intervention studies are needed to better identify the amount of whole grains likely to confer the most health benefits.

In tandem, standardized methods for identifying and classifying whole grains and their biomarkers are needed to help distinguish whole-grain intake from fiber intake and intact grains from processed flours, and to accurately identify and precisely quantify whole-grain foods. Gaining consensus on a definition of what constitutes a whole-grain food can help overcome current challenges in determining whole-grain intakes in populations and ultimately in evaluating the strength of the evidence for issuing population-specific dietary guidance internationally.

Educating consumers on how to incorporate whole grains into their diets

A clear definition for whole-grain foods would help health professionals and consumers to accurately identify foods that provide a meaningful amount of whole grains. For example, although continued public education efforts in the United States encourage the consumption of one-half of the recommended 6 servings of grain-based foods per day as whole grains (48 g/d), the median intake of U.S. adults based on current classifications is about one-half serving or 8 g/d (2). Less than 1% of the U.S. population consumes the recommended intake and 20% of individuals report consuming no whole-grain products (3). A USDA analysis found that Americans choose refined grains over whole grains by a ratio of 5:1 (80). In the UK, the average daily whole grain intake is 14–16 g, with one-third of the adult population never eating whole grains (81). The average whole-grain consumption in France is only 7.3 g/d. In contrast, adult populations in Sweden and Denmark consume much higher amounts, a mean of 42 g/d whole grains in Sweden and 36 g/d in Denmark (82–84).

Motivators and barriers to increasing consumption of whole-grain foods are sometimes similar, depending on consumer perceptions of taste; familiarity with whole-grain foods, especially for children; cost; identification skills; and knowledge of the associated health benefits (85,86). The following are strategies found to be effective in increasing whole-grain consumption (87,88):

- Direct substitution (i.e., brown rice for white rice)
- Replacement of refined-grain foods with whole-grain foods, where the 2 foods differ (i.e., whole-grain pretzels instead of refined-grain crackers)
- Adding new whole-grain foods in the diet (i.e., whole-grain cereals or whole wheat pasta that were not previously consumed)
- Structural changes in meal patterns (i.e., eating breakfast that contains whole grains when breakfast was not previously consumed)
- Stealth approach (i.e., whole-grain ingredients are gradually substituted for refined grains)

Inconsistencies in labeling and wide variations in the amounts of whole grain found in foods labeled as whole grain make it difficult for educators to provide advice to consumers on what to look for in a whole-grain food product. Because whole grain is an ingredient, and not a nutrient, it does not appear on the Nutrition Facts Panel, the very place where consumers are instructed to look for important nutrition information. Consumers often equate fiber, which is available on the Nutrition Facts Panels of food products, with whole grain (89), mistakenly believing that a food must be high in fiber to provide whole grains. In the United States, many health professionals, in fact, instruct their clients to look for fiber as a proxy for whole grains and recommendations exist to choose whole-grain foods that provide

at least 3 g fiber/serving (90). However, most nutrient-rich whole grains provide fewer than 3 g fiber/16 g whole grain, including amaranth, barley, brown rice, oats, wheat, wild rice, and quinoa (91) (Table 3).

Barriers to increasing the consumption of whole grains should be addressed in part by focusing on identification skills (86,90,91). Unlike fruits and vegetables, which are available in distinct, recognizable units, making it easy for consumers to know if they are meeting recommendations, whole grains are often consumed as an ingredient in a packaged food and are not easily identified. A standard whole-grain food definition would identify whole-grain foods for consumers. Multicomponent educational strategies in schools, including classroom curricula, family newsletters, and supermarket and bakery tours coupled with daily exposure in school cafeterias, have increased the knowledge and whole-grain product identification skills of children, parents, and school food service personnel and increased intake among children (85,92).

Guidance for choosing whole-grain foods should be in the context of the overall healthful diet and include specific information on how to identify and limit whole-grain foods that are high in calories, sugar, sodium, saturated fats, or *trans* fats. In the United States, this would be in accordance with the FDA's definitions for acceptable levels of negative nutrients (93). The ongoing obesity and diabetes epidemics call for the grain community to provide leadership by making more nutrient-dense, lower energy, whole-grain options available. Additionally, to ensure nutrient adequacy, especially for folate, individuals, especially women of child-bearing age, who consume all of their grains as whole grains should include some enriched grains that have been fortified with folic acid (2). There must also be whole-grain educational efforts within the food industry itself. Currently, little effort focuses on industry-wide recommendations for food product formulation that would increase availability of more healthful whole-grain foods in the marketplace (94).

An environment in which supermarkets, restaurants, homes, and other venues support current dietary guidance on whole grains will require small and gradual modifications to grain food staples, combined with aggressive consumer education and awareness building. A universally accepted definition for whole-grain foods outlining a meaningful minimum amount of whole grains would ease the transition for the food industry as its members develop new whole-grain food products and for consumers as they learn to more easily identify and incorporate whole-grain foods into their daily dietary intake. Although such a whole-grain definition is important, the message to consumers should continue to be that "more is better," within the scope of calories and negative nutrients, and they should be encouraged to consume whole-grain–dense foods and make more healthful whole-grain food choices.

Challenges, considerations, and future opportunities for formulating whole-grain foods

To increase consumption in populations, whole-grain foods must be formulated to be practical, affordable, and desirable for consumers. Consumer taste preferences often present the greatest challenge in the development of whole-grain food products. The variety of the grain, the cultivar, and the processing technique employed all affect flavor, appearance, texture, shelf life, and the final cost of a product. A variety of other factors affect the formulation and processing of whole-grain foods, including serving size; stability of the food matrix; moisture content; presence of other ingredients such as yeast, spices, sugar, fats, and oils; and total grain content. For example, a food with a larger portion size can accommodate more whole grains in its formulation without introducing considerable changes in taste, appearance, or texture, i.e., the amount of whole grains that can be incorporated into a food with a 15-g serving size without substantially affecting sensory characteristics would be less than the amount that can be incorporated into a food with a 30-g serving size. Eight grams of whole grain per 30-g serving (27 g/100 g) assures an achievable and meaningful minimum amount of whole grain relative to serving size and simplifies for consumers the identification of whole-grain foods. This would encourage manufacturers to promote whole-grain foods with smaller serving sizes and potentially increase whole-grain intake while gaining wider consumer acceptance.

Although new processing opportunities exist for the future, the industry is faced with processing challenges now. Most manufacturing facilities are designed to accommodate large volumes of refined grains, not whole grains. New cost-effective manufacturing lines and processes that can work with large volumes of whole grains would be able to accommodate any resulting increase in demand for whole-grain foods. A coordinated effort to implement comprehensive change across the entire food industry is needed, yet food companies may be hesitant to initiate such widespread formulation and processing changes without clear consumer demand and preferences for whole-grain foods. A consistent definition for whole-grains foods would not only enable clearer identification of whole-grain foods but can also increase their availability and consumer acceptance of whole-grain foods. In the United States, grains and grain-based foods constitute a considerable portion of the packaged foods consumed (66). New products can serve as the primary vehicles to carry beneficial whole grains while reducing fat, sugar, sodium, calories, and portion size, in keeping with dietary guidance. Packaged foods represent a unique opportunity to increase whole-grain consumption.

The limitations and gaps that currently exist in whole-grain research provide future research opportunities, including the identification of biomarkers for individual whole grains, the role that each of the components of whole grains plays in health and disease prevention, and the unique contributions of each whole grain to health.

Coordinated approach to increasing whole-grain intake

A clear whole-grain food definition, coupled with the cooperation of various sectors and disciplines, could provide an

organized process for gradually shifting the amount of whole grain incorporated into the food supply and increasing the availability of desirable, affordable, and healthful whole-grain foods for consumers. Partnerships of industry, government, academia, and food and nutrition organizations to develop a supply chain infrastructure and help support the gradual introduction of more whole-grain foods into the diet are needed. Such an effort has been underway in the United States with the recent stealth introduction of whole-grain foods into school meals. These interventions have been effective in increasing whole-grain intake among children in school cafeterias and afterschool programs, including substituting whole-grain foods for refined-grain menu items (95,96), reformulating products to gradually increase whole-grain content (88), and distributing novel whole-grain commodity food products (97). In a study of fifth and sixth grade students in a large suburban school district, whole-grain consumption was increased by nearly a full serving when white whole wheat flour was partially substituted for refined wheat flour in pizza crust (98). Findings were similar for 10 schools in Minnesota and 7 schools in Texas in which refined-grain pancakes and tortillas were replaced with whole-grain versions (99). Current supply chain technologies, processes, and infrastructure developed through the delivery of whole grains into school cafeterias can be effectively applied to restaurant and other food service settings as well.

Dietary modeling exercises of U.S. children ages 9–18 y indicate the feasibility of increasing intake via substitution of whole-grain ingredients in commonly consumed foods (99). Substituting whole-grain products for refined-grain products, particularly yeast breads, pizza, and grain-based desserts, which together account for almost one-half of the refined grains in the American diet (100), could be one effective strategy to increase whole-grain consumption.

To increase the availability of whole-grain foods in foodservice as well as retail and home environments, dietary guidance should be aligned with food formulation and new product development.

Expert Panel Recommendation for Adopting a Standard Definition of a Whole-Grain Food

Benefits of whole-grain components. An accumulating body of evidence now shows that diets rich in whole grains impart health benefits (8–15). Dietary fiber greatly contributes to these benefits but does not explain them all. For example, some, but not all, studies suggest that consuming brown rice, which is a whole grain that is relatively low in fiber (3.5% by weight), can impart health benefits (101–103). In contrast, a recent meta-analysis by Hu et al. (104) indicated that higher consumption of white rice is associated with a significantly increased risk of 2TDM, especially in Asian (Chinese and Japanese) populations. Although fiber is the most extensively studied, it is only one of a complex array of beneficial bioactive components, including vitamins, minerals, dietary fiber, lignans, β-glucan, inulin, and phenolic and polyphenolic constituents, phytosterols, and sphingolipids that are found in much greater amounts in whole grains than in their refined-grain counterparts (30). All of these components are present in different proportions in the bran, germ, and endosperm fractions of the whole grain and vary in concentration based on the type of whole grain. Whole grains contribute to a phytochemical-rich dietary pattern. However, research has been unable to identify how much of the reduced risk associated with consumption of whole grains is due to fiber alone or to the combination of the compounds found in whole grains. Whole-grain phytochemicals and macro- and micronutrients may work synergistically to contribute to the observed whole-grain health benefits (30). More research is needed to better understand the effects of these individual components on health outcomes.

Participants in the roundtable discussed whether the definition of a whole-grain food should include products with partially refined grain, or products which contain other grain components, like "added bran" and "added germ." The AACCI and HEALTHGRAIN definitions of whole grain clearly state that a whole-grain flour must contain all the constituent parts of the grain and in the same proportions as the original grain. The 2010 U.S. DGA also specifically states that bran is not a whole grain (2). Thus, a food made from refined flour with bran or germ as an additional ingredient alone does not qualify as a whole-grain food and should not be described as such. Both observational and intervention studies that have examined the effects of the consumption of specific whole grains and whole-grain foods on biomarkers, surrogate endpoints, and incidence of disease have found that when intakes of added bran and germ were controlled for, the beneficial association with whole grain remained (14,15,105). Although the majority of phytochemicals in whole grains are indeed found in the bran and germ, in some cases, a substantial proportion can be found elsewhere: in whole wheat, the starchy endosperm contributes >50% of the β-crypotxanthin, almost 50% of the lutein, 21% of the flavonoid content, and 17% of the total phenolic content (106). Furthermore, evidence for beneficial metabolic effects is stronger for consuming a variety of whole grains than for a single moiety in isolation (14).

In practice, recombining or reconstitution of whole-grain components is the most common way in which whole-grain flours are produced. The roller mill process involves dividing the germ, bran, and endosperm during processing of the grain and then recombining or reconstituting them back to their original proportions during processing. The majority of products found on retail store shelves would be considered recombined or reconstituted whole-grain products. Not only do recombined or reconstituted whole grains comprise most of the whole grains in the food supply, but most studies showing health benefits of whole grains have used recombined or reconstituted whole grains (107).

Whole-grain food definition. Dietary guidance from several countries currently recommends increased consumption of whole grains (Table 2). The observational research data published to date clearly demonstrate an association

between intake of whole grains and a reduced risk of disease. From a practical standpoint, many food products already on the market provide at least 8 g of whole grains per serving and can contribute to achieving the dietary recommendation of 48 g/d (1). Therefore, it is recommended that 8 g of whole grain per 30 g (27 g/100 g), without a fiber requirement, be considered a minimum content that is substantial and meaningful to aid consumers toward achieving their whole-grain dietary recommendation and that a food providing at least 8 g of whole grains per 30 g (27 g/100 g) be recognized as a whole-grain food. This aligns with both the 2010 DGA and the newly approved AACCI whole-grain characterization, which states that a whole-grain food product must contain at least 8 g whole grain/30 g of product. On 21 May 2013, the AACCI Board of Directors independently approved the Whole Grains Working Group's characterization (108) (the roundtable was held ~6 mo prior to AACCI's announcement of a characterization of what constitutes a whole-grain food). Provided that this requirement is fulfilled, the product can contain additional amounts of bran or germ and be deemed a "wholegrain food with added bran," for example.

When making whole-grain dietary recommendations, it should also be recognized that different whole-grain varieties provide different types and amounts of fiber as well as phytonutrients, micronutrients, and macronutrients. Based on the existing evidence, consensus was also achieved by the expert panel that fiber contributes to the health benefits of whole grains but does not explain them all. Therefore, to help consumers fill the current whole-grain consumption gap, a balanced diet should include a variety of whole grains and whole-grain foods that provide a minimum of 8 g whole grains/30-g serving (27 g/100 g) but do not contain excessive amounts of fat, sugar, sodium, or calories. This definition would apply to all foods, not just grain-based foods.

Although regulations will understandably vary across the globe to accommodate existing dietary intake patterns, dietary recommendations, and regulations within countries, the definition proposed here is the first phase in a process to engage an international community in the development of a universal definition for whole-grain foods within the context of cultural food intake patterns.

Developing a wider array of whole-grain foods in keeping with the proposed definition of 8 g whole grains/30-g serving (27 g/100 g) and with the ultimate goal of increasing whole-grain consumption of populations will require the involvement and the coordinated efforts of food science and nutrition science, as well as the food service and grain and food industries.

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Van: Caroline van Rossum
Verzonden: maandag 9 februari 2015 22:35
Aan: Javanmardi, M. (Mitra)
CC: Spaaij, C.J.K. (Caroline); Weggemans, R.M. (Rianne)
Onderwerp: Re: Commentaarronde Richtlijnen goede voeding 2015

Beste collega's van de GR,

Hierbij stuur ik jullie de reacties vanuit het RIVM op de documenten in de eerste commentaarronde ..

Succes met de wijzigingen.

Groetjes Caroline

Caroline van Rossum, PhD
Centre for Nutrition, Prevention and Health Services
National Institute for Public Health and the Environment
PO Box 1
3720 BA Bilthoven
The Netherlands
See http://www.voedselconsumptiepeiling.nl for information on the Dutch food consumption surveys
See http://www.rivm.nl/nevo for information on the Dutch food composition database

Reactie RIVM op concept-achtergrondrapporten RGV

dd 2 februari 2015

Granen

- Regel 426; Er worden veel aannames gemaakt in de kwantificering van de sterkte van het effect;
  Dit is een algemene opmerking als er kwantitatieve relaties worden beschreven op basis van cohortonderzoek dat met voedselfrequentievragenlijsten gebeurt. Deze vragenlijsten zijn niet goed in staat om het absolute niveau van inname goed te schatten.

Commentaar ontvangen per email 9 februari 2015

Goedenmiddag,

Graag wilde ik uw aandacht vragen voor de publicatie:

Fasano et al

Zonulin and Its Regulation of Intestinal Barrier Function: The Biological Door to Inflammation, Autoimmunity, and Cancer

http://physrev.physiology.org/content/91/1/151

welke naar mijn mening aannemelijk maakt dat graanproducten (in elk geval in de huidige densiteit) voor gezonde volwassenen bedreigend is voor hun gezondheid. Ook in de populaire media is er afgelopen jaar erg veel aandacht geweest voor de voor- en nadelen van het eten van granen en naar mijn mening is het eerlijker om te vermelden dat we niet weten of het consumeren van granen op harde eindpunten significante verschillen laat zien met voedingspatronen zonder graan, maar dat dat zeer wel aannemelijk is.

Ik ben werkzaam als docent op een instituut waar huisartsen worden opgeleid en zie zelf hoeveel gezondheidsproblemen deze artsen aan hun eigen lijf ervaren. En hoe ze het vertrouwen in de oa het voedingscentrum (en daarmee de GR) verliezen.

Granen, suikers, omega 6:omega 3 en toevoegingen zijn m.i. hoofdverdachten.

Ik ben erg benieuwd naar uw reactie op bovenstaand artikel en zou het ten zeerste waarderen om te vernemen in hoeverre deze informatie wordt meegenomen in het ontwikkelen van de nieuwe voedingsrichtlijnen.

Met betrekking tot de adviezen omtrent vetconsumptie zou ik u willen verzoeken het volgende artikel te lezen:

Are some diets “mass murder”?

BMJ 2014; 349 doi: http://dx.doi.org/10.1136/bmj.g7654 (Published 15 December 2014)

Cite this as: BMJ 2014;349:g7654

Tevens interessant, m.n. met het oog op de metabool-syndroom-golf die de wereld meer en meer overspoelt:

http://youtu.be/D0GSSSE4l8U

Professor Tim Noakes on the topic: "The Great Diet Controversy: UCT taught me to Challenge Beliefs."

Wat denkt u?

Hartelijke groet,

drs Birgit Spoorenberg

huisarts

tevens werkzaam als docent bij de huisartsopleiding Maastricht

Van: Elk, Kathelijn-van
Verzonden: maandag 9 februari 2015 18:28
Aan: GR_Webmaster; Javanmardi, M. (Mitra)
Onderwerp: Commentaar Unilever achtergronddocumenten Richtlijnen goede voeding 2015

Beste commissie van de Gezondheidsraad, beste Mitra,

Wij danken de commissie voor de inzage in de werkwijze en achtergronddocumenten voor de Richtlijnen Goede Voeding 2015. Bij dezen maken wij graag gebruik van de gelegenheid tot het geven van commentaar op verschillende achtergronddocumenten.

In de bijlage vindt u het Unilever commentaar op de volgende achtergronddocumenten:

- 'Granen en graanproducten', gecombineerd met 'Voedingsvezel'
- 'Thee'
- 'Vetten en oliën'

Daarnaast hebben we nog een vraag gerelateerd aan het achtergronddocument over supplementen.
Regel 80-81:
Supplementen met andere bioactieve stoffen zoals flavonoïden, fytosterolen, terpenen en probiotica, vallen buiten het bestek van dit document.
Graag zouden we van de commissie vernemen in welk achtergrond document supplementen of voedingsmiddelen verrijkt met deze genoemde bioactieve stoffen, wel zullen worden behandeld.

Wij wensen de commissie veel succes met de komende fases van dit belangrijke werk, en kijken met belangstelling uit naar de volgende achtergronddocumenten.
Mocht u van de genoemde referenties de abstract of de volledige publicatie ontvangen, dan verneem ik dat graag, ook indien er overige vragen zijn.

Met vriendelijke groet,

Kathelijn van Elk

Unilever

Kathelijn van Elk Nutrition and Health Manager

February 9, 2015

[COMMENTAAR ACHTERGRONDDOCUMENTEN GRANEN EN GRAANPRODUCTEN EN VOEDINGSVEZEL]

INTRODUCTIE:

Wij danken de commissie voor de inzage in de werkwijze en achtergronddocumenten voor de Richtlijnen Goede Voeding 2015. Bij dezen maken wij graag gebruik van de gelegenheid tot het geven van commentaar op het achtergronddocument Granen en graanproducten en het achtergronddocument Voedingsvezel.

We complimenteren de commissie met de systematische en uitgebreide werkwijze voor de nieuwe richtlijnen. Wij verwelkomen de afstemming van de conclusies met internationale richtlijnen. Het is in onze ogen erg belangrijk dat voedingsadviezen breed worden gedragen. Internationale eenduidigheid in adviezen voor de bevolking verschaft ook de voedingsmiddelenindustrie duidelijke richtingen voor het verbeteren van producten.

Wij waarderen ook de grondige evaluatie en weging van verschenen literatuur tot juli 2014. Toch zouden we graag meegeven dat de Britse SACN onlangs een draft rapport heeft gepubliceerd met een uitgebreide systematische review met betrekking tot koolhydraten inclusief graanproducten en voedingsvezel voor een brede reeks aan uitkomsten. Zij komen op meerdere punten tot andere conclusies (bv. effect van vezels op bloeddruk, LDL-cholesterol en lichaamsgewicht) dan de commissie. Dit door het gebruik van een andere onderliggende methodologie, waardoor het SACN rapport ook andere intermediaire uitkomstmaten includeert.

Dit rapport willen we graag onder de aandacht brengen, zodat de commissie zich bewust is van het bestaan van deze publicatie en de nieuwe Nederlandse voedingsrichtlijnen gebaseerd zullen zijn op de meest recente wetenschappelijke inzichten.

GEDETAILEERD COMMENTAAR:

- Achtergrond document Granen en graanproducten: regel 54 - 77
  Er staan momenteel definities in voor Volkoren, Graansoorten en Graanproducten. Wij stellen voor ook een definitie toe te voegen omtrent 'geraffineerde granen'.

  Referentie:

  1. The Scientific Advisory Committee on Nutrition (SACN), Draft Carbohydrates and Health report, scientific consultation: 26 june to 1 september 2014. Note: This is a draft report and does not necessarily represent the final views of the Scientific Advisory Committee on Nutrition, or the advice/policy of Public Health England and Health Departments.

Verzonden: ma 9-2-2015 11:38

Geachte heer/mevrouw,

De concept-achtergronddocumenten Richtlijnen goede voeding 2015 **Granen en graanproducten** en **Voedingsvezel** geven een gedegen overzicht van de stand van zaken op deze terreinen. Desondanks willen wij voor het opstellen van de definitieve documenten hierbij nog enkele zaken ter overweging geven voor aanpassingen en completering.

Onze opmerkingen treft u aan in de bijlage.

Met vriendelijke groet,

Jan de Vries,

(www.healthgrain.org)

Jan Willem van der Kamp
Board member van Healthgrain Forum

Jan Willem van der Kamp
Senior Officer International Projects
TNO Food and Nutrition

Geachte heer/mevrouw,

De concept-achtergronddocumenten Richtlijnen goede voeding 2015 **Granen en graanproducten** en **Voedingsvezel** geven een gedegen overzicht van de stand van zaken op deze terreinen. Desondanks willen wij voor het opstellen van de definitieve documenten hierbij nog enkele zaken ter overweging geven voor aanpassingen en completering.

Concept document granen en graanproducten

In navolging van onderzoek uit de Verenigde Staten gebruikt de commissie in dit document de term volkorenproducten voor graanproducten die voor ten minste 25 procent uit volkorenmeel bestaan, en voor graanzemelen. Daarom is het wenselijk om nader in te gaan op de mogelijke bijdrage van graanzemelen en bioactieve stoffen aanwezig in graanzemelen en volkorenproducten op gezondheid.

Het is wellicht zinvol om de publicatie Cho et al. met een Scientific Statement van de American Society for Nutrition bij uw analyse te betrekken. *Consumption of cereal fiber, mixtures of whole grains and bran, and whole grains and risk reduction in type 2 diabetes, obesity, and cardiovascular disease* van Am J Clin Nutr. 2013 Aug;98(2):594-619. doi: 10.3945/ajcn.113.067629. Epub 2013 Jun 26. Dit statement sluit aan bij de voedingsaanbeveling van de USDA (2010): "Choosing whole grains that are higher in dietary fiber has additional health benefits".

Concept document Voedingsvezel

Constipatie

In de Richtlijnen Goede Voeding van 2006 en in de Richtlijn voor de vezelconsumptie 2006 wordt aangegeven dat voedingsvezel de snelheid waarmee voedsel het maagdarmkanaal passeert verhoogt (Richtlijnen Goede Voeding 2006, pg 66; Richtlijn voor de vezelconsumptie 2006, pg 12 en hoofdstuk 2 Obstipatie). In beide richtlijnen wordt dit gekoppeld aan een risico vermindering op obstipatie. In de Richtlijn voor de vezelconsumptie wordt dit zelfs getalsmatig uitgewerkt: *Voor volwassenen ligt de optimale vezelconsumptie in verband met de darmpassagesnelheid bij een gemengde voeding rond de 32 tot 45 gram per dag. Daarbij is essentieel dat men voldoende vocht gebruikt en voldoende lichaamsbeweging heeft.*

Daarnaast heeft EFSA een positief oordeel uitgesproken over de dossiers van een aantal voedingsvezels waarin de claim "increase in fecal bulk" is ingediend. In de literatuur variëren prevalentie cijfers voor constipatie (conform de meest recente Rome Criteria[1]) tussen de 2% en 27%[2] welke in de VS een geschat laxantia gebruik van ca $800 miljoen dollar met zich mee brengt[2]. Het mag algemeen bekend worden geacht dat obstipatie, of constipatie, een veel voorkomend ongemak is dat in veel gevallen door middel van een hogere inneming van bepaalde voedingsvezels kan worden verholpen, een goedkopere oplossing dan het gebruik van laxatieve geneesmiddelen.. Daarom geven we u in overweging om, in navolging van de adviezen uitgegeven in 2006, dit onderwerp in uw advisering te betrekken.

[1] Drossman DA, Dumitrascu DL, Rome III: New standard for functional gastrointestinal disorders. *J Gastrointestin Liver Dis* 2006; 15: 237-41

[2] MI Pinto Sanchez, P Bercik. Epidemiology and burden of chronic constipation. *Can J Gastroenterol* 2011;25(Suppl B):11B-15B.

Definitie van voedingsvezel

Het huidige sub-hoofdstuk 1.1 stelt dat er geen internationale consensus is. Echter, een publicatie (*CODEX-aligned dietary fiber definitions help to bridge the 'fiber gap', Julie Miller Jones, Nutrition Journal 2014, **13**:34 doi:10.1186/1475-2891-13-34*) laat zien dat de CODEX definitie, met inclusie van niet-verteerbare koolhydraten vanaf polymerisatiegraad 3 wereldwijd breed wordt overgenomen. Zie ook hieronder voor het overzicht in Table 3 van deze publicatie. Ook het in ontwikkeling zijnde voorstel van de FDA gaat deze kant op, zoals blijkt in diverse mededelingen en presentaties van deze organisatie. Zie bijvoorbeeld

FDA: Proposed Dietary Fiber Definition (in presentatie: Nutrition & Supplement Facts Label Proposed Rule Paula R. Trumbo, PhD www.fda.gov/downloads/Food/.../UCM403514.pdf)

http://www.nutritionj.com/content/13/1/34

http://www.nutritionj.com/content/13/1/34/table/T3

Table 3

Countries adopting the CODEX with DP >3 dietary fiber definition

Authorities/Countries accepting the definitions with DP3	Countries not accepting the definition with DP3	Countries awaiting a decision
EFSA/European Union	South Africa	US FDA
Food Standards Australia and New Zealand (FSANZ)		
Brazil		
Health Canada		
Chile – for labeling	Chile - not for health claims	
China		
Indonesia		
Korea		
Malaysia		
Mexico		
Thailand		

Reactie van de commissie Richtlijnen goede voeding 2015 op het achtergronddocument Granen en graanproducten

De commissie heeft op het achtergronddocument over granen en graanproducten reacties ontvangen van de Federatie Nederlandse Levensmiddelen Industrie (FNLI), Unilever, De Vries Nutrition Solutions / Health grain forum & TNO Food and Nutrition, drs. B. Spoorenberg en het Rijksinstituut voor Volksgezondheid en Milieu (RIVM). De commissie heeft de inhoudelijke reacties betrokken bij het opstellen van het definitieve achtergronddocument en over het algemeen de tekstuele suggesties overgenomen.

Geen van de commentaren heeft geresulteerd in wijzigingen van conclusies.

Op de volgende pagina's beschrijft de commissie in een tabel alle inhoudelijke commentaren en wat zij daarmee heeft gedaan.

Tabel Overzicht ontvangen **inhoudelijke** commentaren op achtergronddocument over granen en graanproducten en reactie van de commissie.

Commentatoren	Commentaar	Reactie commissie
FNLI en Unilever	Het valt ons op dat het recentelijk verschenen ontwerp rapport[1] van de Britse SACN met een uitgebreide systematische review met betrekking tot koolhydraten - inclusief granen en graanproducten - niet is meegenomen bij de beoordeling. Zij komen op meerdere punten tot andere conclusies dan de commissie (bv. effect van vezels op bloeddruk, LDL-cholesterol en lichaamsgewicht). Dit door het gebruik van een andere onderliggende methodologie, waardoor het SACN ook andere intermediaire eindpunten includeert.	Niet verwerkt Het rapport van het Scientific Advisory Committee on Nutrition (SANC) [1] was ten tijde van het opstellen van de achtergronddocumenten alleen beschikbaar als concept. In het concept was vermeld dat het niet noodzakelijkerwijs een weergave was van het uiteindelijke standpunt van SANC. Daarom is het niet aangehaald in het achtergronddocument. De commissie baseert zich op peer-reviewed publicaties die binnen haar werkwijze passen.[2]
FNLI	Heeft de Commissie bij alle beschikbare onderzoek kunnen nagaan dat de 25% minimum hoeveelheid volkorenmeel ook daadwerkelijk gehanteerd werd?	Niet verwerkt De commissie heeft niet bij ieder onderzoek kunnen nagaan hoe de term volkoren gedefinieerd was.
FNLI	Verder is naar onze mening onderzoek gebruikt waarin zowel volkoren producten (min 25% volkoren), hoog vezel ontbijtgranen en zemelen worden meegenomen onder de noemer 'volkoren'. Wetenschappelijk gezien lijkt het erop dat deze verschillende groepen dezelfde gezondheidseffecten bewerkstelligen en daarom zeker bij elkaar in de analyse gebruikt kunnen worden. In de publicatie van De Moura et al (2009) - bijgevoegd - wordt duidelijk dat bij gebruik van publicaties met de huidige volkoren definitie er te weinig onderzoek is om relaties vast te stellen, terwijl als de bredere definitie van volkoren wordt gebruikt, deze wel kunnen worden vastgesteld. Zij concluderen dan ook: *"When considering only whole grain studies that met the FDA definition, we found insufficient scientific evidence to support a claim that whole grain intake reduces the risk of CVD. However, a whole grain and reduced risk of CVD health claim is supported when using a broader concept of*	Niet verwerkt De commissie geeft aan dat de term volkoren niet goed is gedefinieerd en dat zij de term volkorenproducten hanteert voor graanproducten die voor ten minste 25 procent uit volkorenmeel bestaan en voor graanzemelen (paragraaf 1.1), hetgeen aansluit aan bij het beschikbare cohortonderzoek (paragraaf 3.1). De definitie is herhaald in hoofdstuk 4 (conclusies relevant voor de richtlijnen). Verwerkt Om verwarring te voorkomen is de definitie ook toegevoegd in paragraaf 3.7 (alle conclusies uit het cohortonderzoek).

Commentatoren	Commentaar	Reactie commissie
	whole grain to include studies that considered intake of fiber-rich bran and germ as well as whole grain." Het is in onze ogen zeer belangrijk om bij de conclusies steeds 'volkoren, hoog vezel producten en zemelen' te schrijven en niet te volstaan met 'volkoren' (een andere optie is om de type voedingsmiddelen die in de studies zijn gebruikt in relatie tot de uitkomstmaat te gebruiken). Officieel zijn zemelen en hoog vezel producten niet 'volkoren' en dan kan er al gauw verwarring ontstaan. Dat laatste is niet in het belang van de consument. En hoe zit het dan met hoog vezel producten en zemelen? Graanzemelen worden op zichzelf niet als volkoren aangemerkt omdat zij een onderdeel vormen van de graankorrel. Wij zouden daarom willen suggereren dat het wellicht zinvol is om ook nader in te gaan op de mogelijke bijdrage aan de gezondheid van graanzemelen en bioactieve stoffen die in graanzemelen en volkoren producten aanwezig zijn. Bovenstaand punt geldt voor veel meer plaatsen in het document. De GR vermeldt dit op verschillende plaatsen ook maar in de conclusies wordt vervolgens volstaan met uitsluitend het woord volkoren. Wij zouden willen voorstellen dit aan te passen.	Niet verwerkt De commissie vindt het niet wenselijk om hoog-vezelproducten en graanzemelen in de formulering van conclusies op te nemen. De formulering 'hoog-vezelproducten' is niet specifiek voor graanvezel en graanproducten. De stand van wetenschap die door de commissie is beschreven gaat niet specifiek over graanzemelen, maar over producten die voor ten minste 25 procent uit volkorenmeel bestaan en graanzemelen samengenomen. Niet verwerkt Het beschrijven van onderzoek naar bioactieve stoffen die in de graanzemel voorkomen past niet in de werkwijze van de commissie.[2]
FNLI en Unilever	Wij denken dat het ook belangrijk is om een definitie of omschrijving van 'geraffineerde' granen te hebben. Zijn dat graanproducten waarvan het aandeel volkoren minder dan 25% is?[1]	Niet verwerkt Het geven van een definitie van geraffineerde graanproducten zou binnen de werkwijze van de commissie[2] passen, als die definitie was beschreven en toegepast in de publicaties over het cohortonderzoek. Dat is niet het geval. NB: De innamegegevens van geraffineerde graanproducten in Tabel 1 hebben uitsluitend betrekking op producten waarin geen volkorenmeel is verwerkt, zoals witbrood, witte pasta en bloem.

Commentatoren	Commentaar	Reactie commissie
FNLI	Het lijkt ons zinvol als de navolgende publicaties eveneens in de analyse worden betrokken: • Cho e.a. (Am J Clin Nutr 2013)[3] • De Moura e.a. (J Nutr Supplement 2008)[4] • Ferruzzi e.a. (Adv Nutr 2014)[5]	Verwerkt • Een verwijzing naar Cho e.a.[3] is toegevoegd in paragraaf 1.1 (definities) en in de inleidende alinea van de paragraaf 3.5.1 (cohortonderzoek naar het verband tussen volkorenproducten en het risico op diabetes). Deze systematische review bevat ten opzichte van de meta-analyse van Aune e.a.[6] geen aanvullende publicaties en beschrijft een deel van de cohortonderzoeken op basis oudere publicaties met een kortere follow-up duur. Daarom blijft de publicatie verder buiten beschouwing. De literatuurlijst levert geen aanvullende onderzoeken op. Niet verwerkt • De Moura e.a.[4] is niet toegevoegd, omdat het geïncludeerde observationele onderzoek deels cross-sectioneel onderzoek betreft dat niet aansluit bij de werkwijze van de commissie.[2] • Ferruzzi e.a.[5] is niet toegevoegd, omdat het geen systematische review betreft en daarom niet aansluit bij de werkwijze van de commissie.[2]
FNLI	Additionele studie volkoren versus geraffineerde tarweproducten en systolische bloeddruk: • Bodinham (Br J Nutr 2011)[7]	Verwerkt • De referentie is toegevoegd. Dit leidt niet tot aanpassing van de conclusie.
FNLI	Additionele studie volkoren versus geraffineerde tarweproducten en LDL cholesterol: • Tighe (Am J Clin Nutr 2010)[8]	Niet verwerkt • Deze referentie was al aangehaald in Tabel 8. De publicaties van Tighe e.a. uit 2010[8] en 2013[9] hebben betrekking op dezelfde RCT.

Commentatoren	Commentaar	Reactie commissie
FNLI	Additionele systematische review volkorenproducten en diabetes mellitus type 2: • Priebe e.a. (Cochrane Database of Systematic Reviews 2008)[10]	Niet verwerkt • Een verwijzing naar Priebe e.a.[10] is toegevoegd in de inleidende alinea van de paragraaf 3.5.1 (cohortonderzoek naar het verband tussen volkorenproducten en het risico op diabetes). De systematische review van Priebe e.a.[10] is gedateerd ten opzichte van de beide meta-analyses (2008 versus 2012 en 2013). In de publicatie is niet gespecificeerd welke referenties in de specifieke meta-analyses zijn opgenomen. De literatuurlijst van deze publicatie levert geen aanvullende onderzoeken op.
FNLI	Tabel 1: Tot slot vragen wij ons bij deze sectie af of producten als koek en banket ook tot de groep graanproducten worden gerekend. Het zijn wel producten waarvan het belangrijkste ingrediënt veelal de granen is.	Niet verwerkt In de Nederlandse consumptiegegevens die in Tabel 1 gepresenteerd worden, zijn koek en banket niet meegerekend.
FNLI	Tabel 1: Ontbijtgranen worden wel als voorbeeld meegenomen in de tekst maar zijn niet in de tabel opgenomen. Volgens onze gegevens is de gemiddelde per capita inname in Nederland van ontbijtgranen ongeveer 7 gram per dag. Dat is vergelijkbaar met witte rijst, maar veel meer dan roggebrood, haver en gerst. Het lijkt zinvol om ook de groep ontbijtgranen toe te voegen.	Niet verwerkt In Tabel 1 zijn ontbijtgranen geïncludeerd in de gegevens over de consumptie van granen en graanproducten (totaal, geraffineerd en ongeraffineerd). De consumptie van ontbijtgranen is niet apart berekend, omdat geen van de conclusies in het achtergronddocument specifiek betrekking hebben op ontbijtgranen.
FNLI	In de tabel van hoofdstuk 4 (Conclusies relevant voor de richtlijnen) worden de volkoreneffecten beschreven als ‘volkoren versus geraffineerde graanproducten’. Klopt dit wel?	Verwerkt De kop ‘Volkoren[a] versus geraffineerde graan(producten)’ is vervangen door ‘Volkorenproducten[a]’. Deze kolom betreft bevindingen uit cohortonderzoek waarbij het gaat om de vergelijking van verschillende consumptieniveaus van volkorenproducten.

Commentatoren	Commentaar	Reactie commissie
FNLI	Is de publicatie van Kyro over de biomarker alkylresorcinols gebruikt in het document?	Niet verwerkt De publicatie van Kyro e.a.[11] is niet gebruikt, omdat de commissie zich in het achtergronddocument richt op onderzoek waarin de inname direct is geschat.
FNLI	Additionele referenties: • Hauner e.a. (Ann Nutr Metab 2012)[12] • Cho e.a. (Am J Clin Nutr 2013)[3] • Wu e.a. (JAMA 2015)[13]	Verwerkt: • Een verwijzing naar Cho e.a.[3] is toegevoegd in paragraaf 1.1 (definities) en in de inleidende alinea van de paragraaf 3.5.1 (cohortonderzoek naar het verband tussen volkorenproducten en het risico op diabetes). Deze systematische review bevat ten opzichte van de meta-analyse van Aune e.a.[6] geen aanvullende publicaties en beschrijft een deel van de cohortonderzoeken op basis oudere publicaties met een kortere follow-up duur. Daarom blijft de publicatie verder buiten beschouwing. De literatuurlijst levert geen aanvullende onderzoeken op. Niet verwerkt: • Hauner e.a.[12] is niet toegevoegd. In deze systematische review zijn de oorspronkelijke cohortonderzoeken beschreven, maar niet samengevat in meta-analyses. • Wu e.a.[13] is gepubliceerd na juli 2014, terwijl het literatuuronderzoek voor de achtergronddocumenten de periode tot juli 2014 betreft, en de bevindingen zijn in lijn met de conclusies van de commissie. De publicatie is niet toegevoegd.

Commentatoren	Commentaar	Reactie commissie
De Vries Nutrition Solutions / Health grain forum & TNO Food and Nutrition	In navolging van onderzoek uit de Verenigde Staten gebruikt de commissie in dit document de term volkorenproducten voor graanproducten die voor ten minste 25 procent uit volkorenmeel bestaan, en voor graanzemelen. Daarom is het wenselijk om nader in te gaan op de mogelijke bijdrage van graanzemelen en bioactieve stoffen aanwezig in graanzemelen en volkorenproducten op gezondheid.	Niet verwerkt Dit past niet in de werkwijze van de commissie.[2]
De Vries Nutrition Solutions / Health grain forum & TNO Food and Nutrition	Het is wellicht zinvol om de publicatie *Consumption of cereal fiber, mixtures of whole grains and bran, and whole grains and risk reduction in type 2 diabetes, obesity, and cardiovascular disease* van Cho et al.[3] met een Scientific Statement van de American Society for Nutrition bij uw analyse te betrekken. Dit statement sluit aan bij de voedingsaanbeveling van de USDA (2010): *"Choosing whole grains that are higher in dietary fiber has additional health benefits"*.	Verwerkt • Een verwijzing naar Cho e.a.[3] is toegevoegd in paragraaf 1.1 (definities) en in de inleidende alinea van de paragraaf 3.5.1 (cohortonderzoek naar het verband tussen volkorenproducten en het risico op diabetes). Deze systematische review bevat ten opzichte van de meta-analyse van Aune e.a.[6] geen aanvullende publicaties en beschrijft een deel van de cohortonderzoeken op basis oudere publicaties met een kortere follow-up duur. Daarom blijft de publicatie verder buiten beschouwing. De literatuurlijst levert geen aanvullende onderzoeken op.
Drs. B. Spoorenberg	Graag wilde ik uw aandacht vragen voor de publicatie van Fasano et al uit 2011[14] welke naar mijn mening aannemelijk maakt dat graanproducten (in elk geval in de huidige densiteit) voor gezonde volwassenen bedreigend is voor hun gezondheid. Ook in de populaire media is er afgelopen jaar erg veel aandacht geweest voor de voor- en nadelen van het eten van granen en naar mijn mening is het eerlijker om te vermelden dat we niet weten of het consumeren van granen op harde eindpunten significante verschillen laat zien met voedingspatronen zonder graan, maar dat dat zeer wel aannemelijk is.	Niet verwerkt Dit past niet in de werkwijze van de commissie.[2]

Commentatoren	Commentaar	Reactie commissie
RIVM	Er worden veel aannames gemaakt in de kwantificering van de sterkte van het effect. Dit is een algemene opmerking als er kwantitatieve relaties worden beschreven op basis van cohortonderzoek dat met voedselfrequentievragenlijsten gebeurt. Deze vragenlijsten zijn niet goed in staat om het absolute niveau van inname goed te schatten.	Niet verwerkt De commissie beschrijft in paragraaf 3.1 de methodologische kanttekeningen bij cohortonderzoek; daarin is aangegeven dat sprake kan zijn van schattingsfouten. Het achtergronddocument beschrijft de kwantificeringen zoals gerapporteerd in het gepubliceerde onderzoek.

Literatuur

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14 Fasano A. Zonulin and its regulation of intestinal barrier function: the biological door to inflammation, autoimmunity, and cancer. Physiol Rev 2011; 91(1): 151-175.