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Veldbonen als eiwitbron: waar zit de gezondheidsuitdaging?

Dr. Peter J Voshol

p.voshol@louisbolk.nl

Louis Bolk Instituut

Kort CV:

Radboud University Nijmegen

umcg

LUMC
Leids Universitair Medisch Centrum

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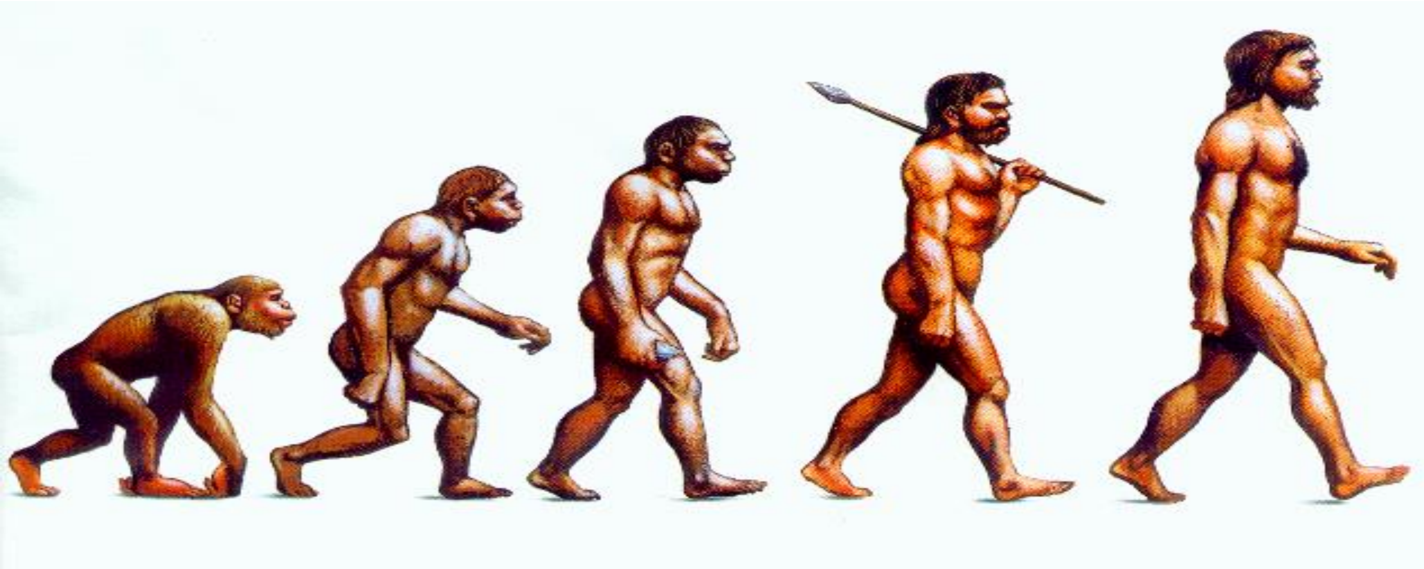
Onderwerpen:

1) Waarom is voeding cq plantaardige voeding een hot topic?
2) Bonen/Peulvruchten en Gezondheid?
3) De nutrienten?
4) De ‘anti-nutrienten’?
5) Verder in ons modern westers maatschappelijk probleem:
    1) Verzadiging en eetgedrag?
    2) Eiwitten?
6) Metabole effecten en consequenties?
7) Ons darm-microbioom?
8) Het klimaatdilemma?
9) Conclusies

Wat hebben wij gedaan......????



Only 50 years

Millions of years

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Voeding en Leefstijl dragen tot 90% bij aan het ontstaan van diverse chronische ziekten:

Source: Willett WC, Science 2002

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Algemeen: Het eten van Bonen en peulvruchten heeft gezondheidsvoordelen:

TABLE 2.3 Pulses and their main potential positive and beneficial effects.

Source	Involved metabolism	Beneficial effect	Reference
Legumes (including some pulses)	Cardiovascular	22% lower risk of coronary heart disease and an 11% lower risk of cardiovascular disease	Bazzano et al. (2001)
	Cardiovascular and diabetes	Modulation of glucose, insulin, and homocysteine concentrations and lipid peroxidation in coronary artery disease patients	Jang et al. (2001)
Adzuki bean juice	Hypertriglyceridemia	Decreased triglyceride concentrations by inhibited pancreatic lipase activity	Maruyama et al. (2008)
Legumes	Type 2 diabetes mellitus	Risk reduction to develop type 2 diabetes in the order of 20–30%	Venn and Mann (2004)
Mung bean	Glucose and lipid metabolism	Modify glucose and lipid metabolism favorably in rats	Lerer-Metzger et al. (1996)
Legumes	Endometrial cancer	Low risk of endometrial cancer	Tao et al. (2005)
	Breast cancer	Low breast cancer risk	Velie et al. (2005)
	Colon cancer	Low risk of colorectal adenoma	Agurs-Collins et al. (2006)
Legumes and cereals	Obesity	Low average body mass index (BMI) and low risk of obesity	Greenwood et al. (2000)
Pulses	Obesity	Low waist-to-hip ratio	Williams et al. (2000)
Whole grains, beans, and legumes	Obesity	Low BMI and waist circumference	Haveman-Nies et al. (2001)
Whole-grain bread and beans	Glycemia and obesity	Glycemic control and weight loss	Jimenes-Cruz et al. (2003)

TABLE 2.3 Pulses and their main potential positive and beneficial effects.—cont'd

Source	Involved metabolism	Beneficial effect	Reference
Chickpeas	Skin and ear inflammation	Low risk of skin diseases and inflammation of the ear	Agharkar (1991); Warrier et al. (1995)
	—	Tonic, appetizer, stimulant, and aphrodisiac, anthelmintic properties	Sastry and Kavathekar (1990)
	Hypertriglyceridemia	Reductions in serum total and low-density lipoprotein cholesterols	Pittaway et al. (2006)
Vegetables (including some seeds of pulses)	Lymphoblastic leukemia	Low risk of lymphoblastic leukemia	Petridou et al. (2005)
Common bean	Colon cancer	Inhibition of aberrant foci crypt development in rat colon	Feregrino-Perez et al. (2008)

Source: Capos-Vega et al. (2010).

En wat zit er dan allemaal in bonen/peulvruchten:

TABLE 2.1 Nutritional composition of pulses.

Nutritional composition ($g\ 100\ g^{-1}$)	Peas (boiled)	Chickpeas (soaked and boiled)	Lentils (dried and boiled)	Soya beans (dried and boiled)	Ter vergelijk: Gem vlees (varken/rund)
Energy (kcal)	69	121	105	141	270
Carbohydrate (g)	9.7	18.2	16.9	5.1	0,5-2
Protein (g)	6.0	8.4	8.8	14.0	25-30
Fat (g)	0.9	2.1	0.7	7.3	15-20
Dietary fiber (NSP) (g)	5.1	4.3	3.8	6.1	0-2
Saturated fat (g)	0.2	0.2	0.1	0.9	5-6
Monounsaturated fat (g)	0.1	0.4	0.1	1.4	7
Polyunsaturated fat (g)	0.5	1.0	0.3	3.5	3
Sodium (mg)	Tr	5.0	3.0	1.0	430
Potassium (mg)	230	270	310	510	450
Calcium (mg)	19	46	22	83	19

CONTENT AND DISTRIBUTION OF TRYPSIN INHIBITORS AND HEMAGGLUTININS IN SOME LEGUME SEEDS

P. VALDEBOUZE, E. BERGERON, T. GABORIT, and J. DELORT-LAVAL.

Chapter 2

The nutritional value of whole pulses and pulse fractions

Emma Derbyshire, Joanne Delange

Nutritional Insight, Surrey, United Kingdom

Non-Nutritive Compounds in Fabaceae Family Seeds and the Improvement of Their Nutritional Quality by Traditional Processing – a Review

Food Research International

Nutritional and antinutritional composition of fava bean (Vicia faba L., var. minor) cultivars

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Variatie per genotype Veldboon

Food Research International 140 (2021) 110038

Table 1
Protein, phytate, ash and mineral content of the 15 fava bean cultivars.

Flower type	Cultivar	Protein	Phytate	Fe	Zn	Ash
Colored	Alexia	$22.7^{\pm0.10}$ *	$1281^{\pm15}$ *	$3.8^{\pm0.02}$ *	$3.8^{\pm0.06}$ *	3.41
Colored	Birgit	$24.0^{\pm0.07}$ *	$773^{\pm13}$	$3.2^{\pm0.07}$ *	$1.3^{\pm0.05}$	3.23
Colored	Boxer	$25.8^{\pm0.03}$ *	$880^{\pm18}$	$5.5^{\pm0.00}$ *	$1.6^{\pm0.01}$	2.96
Colored	Daisy	$24.8^{\pm0.04}$ *	$720^{\pm13}$ *	$4.7^{\pm0.04}$ *	$1.2^{\pm0.03}$ *	2.83
Colored	Emilia	$25.5^{\pm0.04}$ *	$742^{\pm5}$ *	$4.8^{\pm0.04}$ *	$1.5^{\pm0.05}$	2.72
Colored	FanFare	$24.9^{\pm0.06}$ *	$612^{\pm10}$ *	$4.0^{\pm0.13}$	$1.22^{\pm0.05}$	3.10
Colored	Fuego	$24.5^{\pm0.03}$ *	$724^{\pm1.9}$ *	$4.3^{\pm0.15}$	$1.4^{\pm0.01}$	3.17
Colored	Lynx	$23.4^{\pm0.01}$ *	$313^{\pm6}$ *	$7.0^{\pm0.18}$ *	$1.4^{\pm0.02}$	3.15
Colored	Stella	$22.8^{\pm0.24}$ *	$735^{\pm29}$	$3.9^{\pm0.05}$ *	$1.2^{\pm0.01}$ *	3.19
Colored	Tiffany	$23.3^{\pm0.24}$ *	$748^{\pm18}$	$3.9^{\pm0.02}$ *	$0.9^{\pm0.00}$ *	3.19
White	Banquise	$24.3^{\pm0.04}$ *	$946^{\pm1}$ *	$1.8^{\pm0.02}$ *	$3.6^{\pm0.10}$ *	3.13
White	Fernando	$27.1^{\pm0.03}$ *	$810^{\pm26}$	$4.4^{\pm0.27}$	$1.3^{\pm0.01}$	3.02
White	Gloria	$28.3^{\pm0.03}$ *	$820^{\pm6}$	$5.1^{\pm0.02}$	$1.5^{\pm0.02}$	3.24
White	Sunrise	$24.6^{\pm0.03}$ *	$112^{\pm4.2}$ *	$21.3^{\pm0.29}$ *	$5.2^{\pm0.06}$ *	3.36
White	Taifun	$25.0^{\pm0.03}$ *	$823^{\pm21}$	$3.9^{\pm0.22}$	$1.3^{\pm0.02}$ *	3.27

Data presented as means of duplicates ± standard deviation.
Phytate and mineral content are presented as mg/100 g DW.
Ash and protein are presented as percentage on a DW basis.
*Indicate a significant difference compared to the reference cultivar Gloria.

I.-C. Mayer Labba et al.

Table 3
Dietary fiber contents of the different fava bean cultivars, presented as percentages on a dry-weight (DW) basis.

	Soluble	Insoluble	Total
Alexia	0.60	15.29	15.89
Birgit	0.56	13.62	14.19
Boxer	0.66	12.13	12.79
Daisy	0.67	10.70	11.37
Emilia	0.69	13.71	14.40
FanFare	1.06	13.05	14.11
Fuego	0.79	14.84	15.64
Lynx	0.66	14.84	15.50
Stella	0.62	15.96	16.59
Tiffany	0.55	13.23	13.78
Banquise	0.55	11.64	12.19
Fernando	0.80	14.26	15.06
Gloria	0.71	12.95	13.66
Sunrise	0.76	14.29	15.05
Taifun	0.65	12.18	12.82

Table 2
Amino acid compositions of the 15 cultivars of fava bean, expressed as mg of amino acid per g of protein. Calculations on daily requirements and recommendations are based on data from WHO/FAO/UNU (FAO/WHO/UNU, 2007).

	Amino acid content (mg/g protein)																
Amino acids	Alexia	Banquise	Birgit	Boxer	Daisy	Emilia	FanFare	Fernando	Fuego	Gloria	Lynx	Stella	Sunrise	Taifun	Tiffany	mg/kg BW per day[A]	mg/g protein[B]
Essential																	
Histidine	$28.2^{+0.5}$	$30.8^{+0.5}$	$35.9^{+1.2}$	$33.6^{+0.2}$	$31.6^{+1.8}$	$27.5^{+2.8}$	$27.3^{+0.5}$	$30.8^{+1.5}$	$29.1^{+0.1}$	$31.0^{+0.9}$	$13.3^{+1.0}$	$29.3^{+1.5}$	$28.5^{+0.0}$	$30.3^{+0.2}$	$31.3^{+0.0}$	10	15
Isoleucine	$23.4^{+1.0}$	$25.9^{+0.6}$	$20.7^{+0.4}$	$33.1^{+2.3}$	$26.7^{+1.8}$	$24.4^{+3.5}$	$20.9^{+0.7}$	$24.6^{+1.1}$	$21.4^{+0.0}$	$25.8^{+0.3}$	$23.7^{+0.5}$	$27.1^{+1.5}$	$22.3^{+0.7}$	$24.0^{+0.9}$	$23.9^{+1.0}$	20	30
Leucine	$55.0^{+0.4}$	$59.8^{+0.8}$	$52.8^{+0.4}$	$72.1^{+1.3}$	$61.6^{+4.7}$	$56.9^{+5.4}$	$50.8^{+1.4}$	$58.9^{+2.7}$	$51.5^{+0.1}$	$58.0^{+4.9}$	$55.7^{+1.6}$	$63.3^{+2.8}$	$54.8^{+1.0}$	$57.4^{+0.9}$	$58.4^{+0.8}$	39	59
Lysine	$49.7^{+0.4}$	$51.6^{+0.3}$	$74.8^{+0.3}$	$65.4^{+5.2}$	$51.4^{+3.3}$	$47.2^{+4.7}$	$44.8^{+0.7}$	$48.9^{+2.5}$	$46.3^{+0.1}$	$52.4^{+1.1}$	$48.9^{+1.3}$	$54.4^{+3.0}$	$47.7^{+0.7}$	$51.7^{+0.9}$	$51.6^{+0.7}$	30	45
Phenylalanine	$30.5^{+0.9}$	$31.3^{+0.8}$	$32.1^{+0.4}$	$36.6^{+1.2}$	$32.4^{+2.7}$	$29.9^{+3.3}$	$27.4^{+0.4}$	$31.1^{+1.6}$	$27.5^{+0.0}$	$33.3^{+0.2}$	$23.0^{+0.1}$	$33.6^{+1.6}$	$29.0^{+0.5}$	$30.6^{+0.1}$	$31.7^{+0.4}$	25^{C}	38^{C}
Threonine	$28.6^{+0.1}$	$32.1^{+0.1}$	$38.0^{+0.3}$	$37.7^{+1.0}$	$33.8^{+3.3}$	$29.3^{+2.8}$	$26.6^{+0.2}$	$31.0^{+1.4}$	$27.4^{+0.5}$	$32.1^{+0.4}$	$29.6^{+1.2}$	$32.9^{+1.3}$	$29.0^{+0.3}$	$30.8^{+0.4}$	$31.2^{+0.2}$	15	23
Valine	$36.0^{+0.7}$	$38.7^{+0.5}$	$33.2^{+0.5}$	$42.3^{+0.5}$	$39.8^{+2.4}$	$37.2^{+2.5}$	$32.9^{+0.7}$	$37.4^{+2.2}$	$35.7^{+0.6}$	$38.4^{+0.8}$	$36.6^{+1.3}$	$39.5^{+1.5}$	$34.6^{+0.0}$	$37.5^{+1.0}$	$37.2^{+0.7}$	26	10
Non essential																	
Alanine	$49.1^{+0.1}$	$57.9^{+0.1}$	$52.8^{+0.1}$	$53.8^{+1.2}$	$57.3^{+3.6}$	$45.6^{+3.1}$	$48.4^{+0.3}$	$54.4^{+4.5}$	$47.6^{+0.2}$	$55.7^{+0.2}$	$53.7^{+1.9}$	$48.9^{+2.6}$	$52.4^{+0.4}$	$54.9^{+0.6}$	$56.5^{+1.5}$	–	–
Arginine	$75.1^{+0.6}$	$98.7^{+0.8}$	$121.0^{+2.5}$	$107.3^{+2.4}$	$94.4^{+6.1}$	$85.1^{+6.0}$	$85.3^{+0.2}$	$99.5^{+5.9}$	$88.5^{+0.3}$	$114.7^{+1.2}$	$52.1^{+2.4}$	$86.4^{+6.0}$	$90.0^{+1.7}$	$95.6^{+1.9}$	$103.9^{+1.7}$	–	–
Asparginine	$89.3^{+0.9}$	$101.7^{+0.6}$	$117.8^{+2.1}$	$111.4^{+4.6}$	$99.4^{+9.0}$	$111.5^{+6.2}$	$84.1^{+3.1}$	$99.5^{+7.7}$	$86.5^{+0.9}$	$120.5^{+6.8}$	$91.5^{+0.2}$	$97.0^{+15.5}$	$94.5^{+2.6}$	$100.8^{+12.5}$	$104.9^{+4.9}$	–	–
Aspartic acid	$95.0^{+0.0}$	$107.1^{+1.1}$	$106.7^{+0.2}$	$107.1^{+0.1}$	$102.5^{+7.1}$	$89.1^{+7.1}$	$88.0^{+0.4}$	$101.0^{+7.1}$	$86.4^{+1.0}$	$109.5^{+0.5}$	$96.8^{+1.3}$	$96.7^{+6.1}$	$94.8^{+0.8}$	$101.4^{+0.3}$	$102.0^{+1.3}$	–	–
Cysteine	$10.0^{+0.0}$	$10.2^{+0.4}$	$11.3^{+0.1}$	$9.9^{+0.6}$	$10.7^{+0.6}$	$8.5^{+1.0}$	$9.4^{+0.4}$	$10.2^{+0.4}$	$10.3^{+0.0}$	$10.0^{+0.4}$	$9.9^{+0.5}$	$10.0^{+0.4}$	$9.8^{+0.3}$	$10.5^{+0.2}$	$10.4^{+0.1}$	–	–
Glutamic acid	$133.2^{+2.8}$	$151.5^{+2.6}$	$187.9^{+0.1}$	$154.5^{+0.7}$	$150.2^{+8.7}$	$130.1^{+9.4}$	$125.6^{+0.9}$	$148.1^{+8.7}$	$125.0^{+1.6}$	$154.2^{+2.4}$	$136.6^{+1.3}$	$141.0^{+8.2}$	$137.2^{+2.4}$	$145.3^{+0.6}$	$149.8^{+0.2}$	–	–
Glycine	$32.7^{+0.2}$	$37.8^{+0.6}$	$39.5^{+0.8}$	$30.2^{+1.9}$	$36.0^{+2.0}$	$27.2^{+1.5}$	$31.9^{+0.0}$	$34.6^{+2.4}$	$32.1^{+0.0}$	$35.8^{+0.2}$	$35.0^{+1.1}$	$28.8^{+2.2}$	$35.8^{+1.2}$	$35.8^{+1.0}$	$37.5^{+1.0}$	–	–
Proline	$32.9^{+0.2}$	$37.8^{+0.1}$	$45.6^{+0.2}$	$48.2^{+2.3}$	$38.1^{+2.1}$	$35.0^{+3.4}$	$32.9^{+0.2}$	$36.9^{+2.7}$	$33.5^{+0.3}$	$37.8^{+0.1}$	$36.0^{+1.2}$	$41.1^{+2.9}$	$35.7^{+0.1}$	$36.8^{+0.4}$	$37.6^{+0.1}$	–	–
Serine	$41.3^{+1.1}$	$45.6^{+0.2}$	$52.1^{+0.0}$	$48.9^{+3.0}$	$46.0^{+2.4}$	$40.2^{+3.5}$	$39.5^{+0.3}$	$44.7^{+2.6}$	$40.7^{+0.3}$	$45.5^{+1.4}$	$43.1^{+1.2}$	$44.2^{+2.9}$	$42.6^{+0.5}$	$44.4^{+1.1}$	$46.1^{+0.4}$	–	–
Taurine	$30.3^{+0.7}$	$32.0^{+2.1}$	$41.5^{+0.6}$	$34.1^{+1.2}$	$30.1^{+2.1}$	$18.6^{+0.2}$	$26.4^{+0.7}$	$28.5^{+2.7}$	$24.9^{+1.0}$	$33.8^{+1.9}$	$30.6^{+2.8}$	$22.5^{+0.2}$	$30.8^{+2.2}$	$26.8^{+0.6}$	$32.2^{+0.9}$	–	–

Results are expressed on a dry weight basis. Values are means (n = 2) ± standard deviation.
A Amino acid recommendations calculated as mg/kg body weight per day for adults, based on a total protein requirement of 0.66 g/kg BW per day according to WHO/FAO/UNU 2007[34].
B Amino acid recommentations expressed as mg/g protein consumed for adults according to WHO/FAO/UNU 2007[34].
C Phenylalanine and Tyrosine combined.

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4. Conclusions

This study provides an analysis of the nutritional and antinutritional composition of fifteen different varieties of fava bean cultivated in the same region and during the same growth season. The results indicate substantial differences between cultivars in relation to their contents of nutrients and antinutrients, leading to variations in bioavailability of nutrients such as iron and zinc between the cultivars. The nutritional gain from consuming fava beans is affected by the cultivar chosen as the food source. Of the analyzed cultivars, only one (Sunrise) showed a high bioavailability of iron and zinc. This is a major dietary concern when facing a large shift in dietary preferences into a more plant based food pattern, especially for groups at risk of developing iron and zinc deficiency. However, the Sunrise cultivar did not have the highest protein content, illustrating the need to look beyond protein when considering a dietary shift. From a large-scale societal perspective, it is important to

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De kwaliteit van de eiwitbron is belangrijk voor de groei:

14 *J. Agric. Food Chem.*, Vol. 44, No. 1, 1996

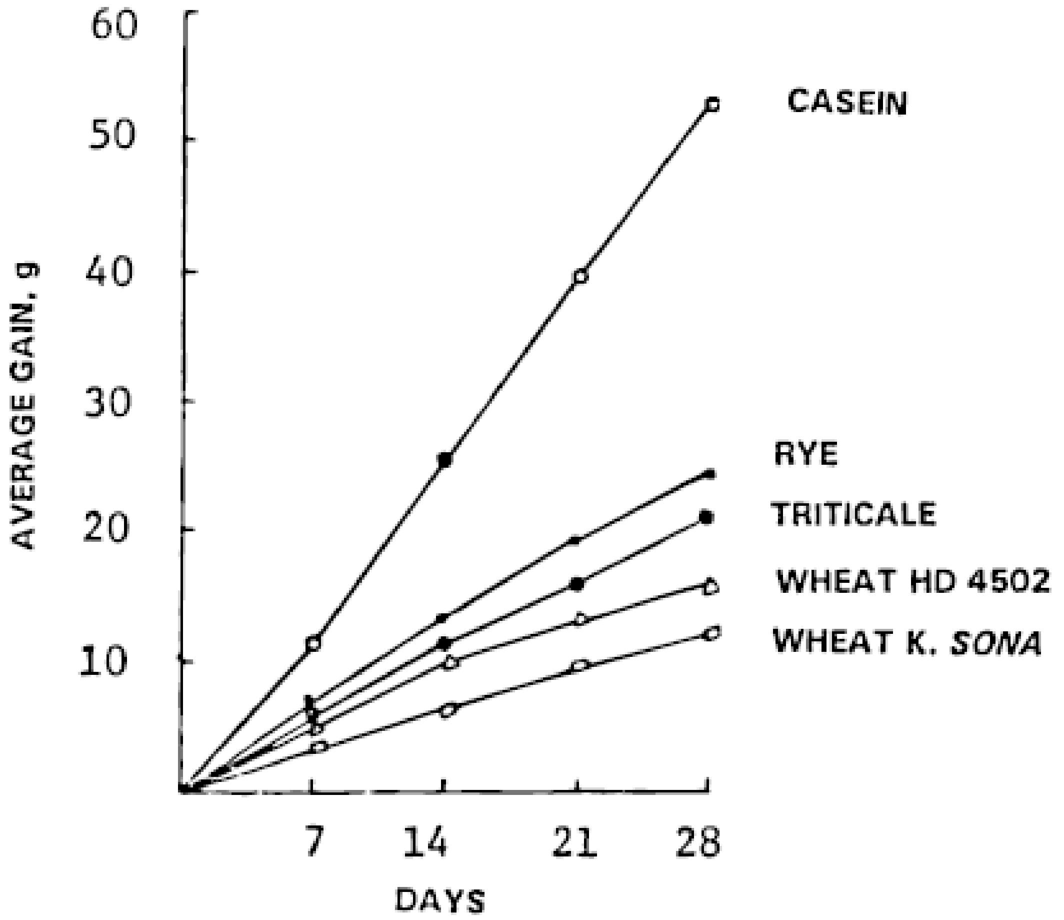

Figure 1. Weight gain of rats fed wheats, triticale, rye, and casein (Sikka et al., 1978).

Hierbij zijn zogenaamde ‘anti-nutrienten’ belangrijk.

ABLE 1. The content of antinutritional factors in different legume species.

Plant species		Trypsin inhibitor TIA (TIUmg^{-1})	Lectin HG (HU×10^{-3}/mg)	Phytic acid PA (mg/g)	Raffinose family oligosacharides RFOs (mg/g)	Tannins (mg/g)	Quinolizidine alkaloids QA (% in dm)	Saponin (mg/g)	Vicine & convicine (mg/g)
Cicer arietinum	**Chickpea**	15–19[1*] 10.3–12.7[7]	-	5.4–12.3[12]	2.0–7.6[17,18]	-	-	2.3[17,18]	
Glycine max	**Soybean**	43–84[1]	1600-3200 units/mg	6.2–20.5[11] 32.4–41.3[12]	8.2[19]	0.45[21]	-	6.5[17] 5.8[22]	
Lens culinaris	**Lentil**	3–8[1] 1.9–2.8[2]	-	6.2–8.8[2]	1.8–7.5[18]	3.4–6.1[2]	-	1. 11[7,18]	
Lupinus albus	Lupine (white flower)	0.9[1]	-	-	8.5–9.3[19]	-	0.03–2.0[20]	-	
L.angustifolius	Lupine (blue flower)	0.8[1]	-	-	7.79–8.6[19]	-	0.01–1.3[20]	0.27–0.48[23]	
L. luteus	Lupine (yellow flower)	0.5[1]	-	-	11.4–16.0[19]	-	0.01–0.8[20]	0.06–0.07[23]	
Phaseolus vulgaris	**Common bean**	21–25[1]	2.15[9]	16.50[9] 2.9–17.8[13]	2.6[9] 0.4–8[17,18]	14.99[9] 0–38.5[14]	-	2.3–3.5[17,18] 2.9–3.2[22]	
Pisum sativum	**Pea**	6–15[1] 1–14.6[3] 1.9–6.8[4]	100-400 units/mg	1.3–10.2[3]	2.3–9.6[17] 3.6–10[3]	0.04–7.4[3]	-	1.11[7,18] 0.3–1[3]	
Vicia faba	**Faba bean**	5–10[1] 0.3–5.3[5] 0.8–3.6[6]	25-100 units/mg	3.8–13.4[5]	1.4–6.2[5] 1.0–4.5[17,18] 1.0[19]	0.1–10.4[5] 2.1–3.2[15] 20[21]	-	0.11[7,18]	1480–2680
Vigna anguiculata *Vigna radiata*		12–16.6[8] -	-	- 10.2–14.8[17]	- -	0.3–6.9[16] -	-	-	
Cajanus cajan	**Pigeon pea**	-	-	9.9–16.4[10] 6.8–14.9[12]	-	-	-	-	
Lathyrus spp.	**Sweet pea**	19–30[1]	-	-	-	-	-	-	
Medicago sativa	**Alfafa**	-	-	-	3.5[19]	-	-	-	
Triforium repens	**White clover**	-	-	-	6.7[19]	-	-	-	
Ornithopus sativus	**Bird’s foot**	-	-	-	3.6[19]	-	-	-	

TIA – trypsin inhibitors activity; HG - hemagglutinins; PA - phytic acid; RFOs - raffinose family oligosaccharides QA - quinolizidine alkaloids;
*References: [1]Guillamon *et al.* [2008]; [2]Wang *et al.* [2009]; [3]Bastianelli *et al.* [1998]; [4]Gabriel *et al.* [2008]; [5]Duc *et al.* [1999]; [6]Filippetti *et al.* [1999] [7]Singh & Jambunatham [1981]; [8]Vasconcelos *et al.* [2010]; [9]Barampama *et al.* [1993]; [10]Singh [1999]; [11]Saghai Maroof *et al.* [2009]; [12]Chitra *et al* [1995]; [13]Blair *et al.* [2009]; [14]Caldas & Blair [2009]; [15]Avola *et al.* [2009]; [16]Plahar *et al.* [1997]; [17]Kadlec *et al.* [2001]; [18]Kozlowska *et al.* [2001] [19]Muzquiz *et al.* [1999]; [20] Gulewicz [1988]; [21]Reddy *et al.* [1985]; [22]Gurfinkel & Rao [2002]; [23]Muzquiz *et al.* [1993].

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Wat doe deze ‘anti-nutrienten’?

- **Trypsin inhibitor**
  - a protein that reduces the biological activity of trypsin and other enzymes by controlling the activation and catalytic reactions of proteins.
- **Lectin (Hemagglutinins)**
  - specific sugar-binding proteins exhibiting reversible carbohydrate-binding activities. Lectins are similar to antibodies in their ability to agglutinate red blood cells. Bind to intestinal cell lining.
- **Phytic acid**
  - strong binding affinity to the dietary minerals, calcium, iron, and zinc, inhibiting their absorption.
- **Raffinose family oligosaccharides/alpha-galactosides**
  - the oligosaccharides of the raffinose family that induce flatulance in monogastries due to lack of a-galactosidase in lower intestinal tract.
- **Tannins**
  - a class of astringent, polyphenolic biomolecules that bind to and precipitate proteins and various other organic compounds including amino acids and alkaloids.
- **Quinolizidine alkaloids**
  - a group of secondary compounds that can be found in legume plants, especially lupins. They can be toxic to human and they also have a bitter taste.
- **Saponin**
  - plant glycosides with a steroid or triterpenoid structure as part of the molecule, bitter and inhibit enzymes
- **Vicine/convicine**
  - alkaloid glycoside found mainly in faba beans (Vicia faba). Vicine is toxic in individuals who have a hereditary loss of the enzyme glucose-6-phosphate dehydrogenase. It causes haemolytic anaemia, called favism.

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Wat kunnen we met deze ‘anti-nutrienten’?

Trypsin inhibitor sta

Table 4. Composit
from faba bea

Crude protein (%)
Ether extract
(fat) (%)
Crude fiber (%)
Ash (%)
Calcium (%)
Phosphorous (%)
Trypsin inhibitor
(units/g)
Hemagglutinin
(units/g × 10^3)

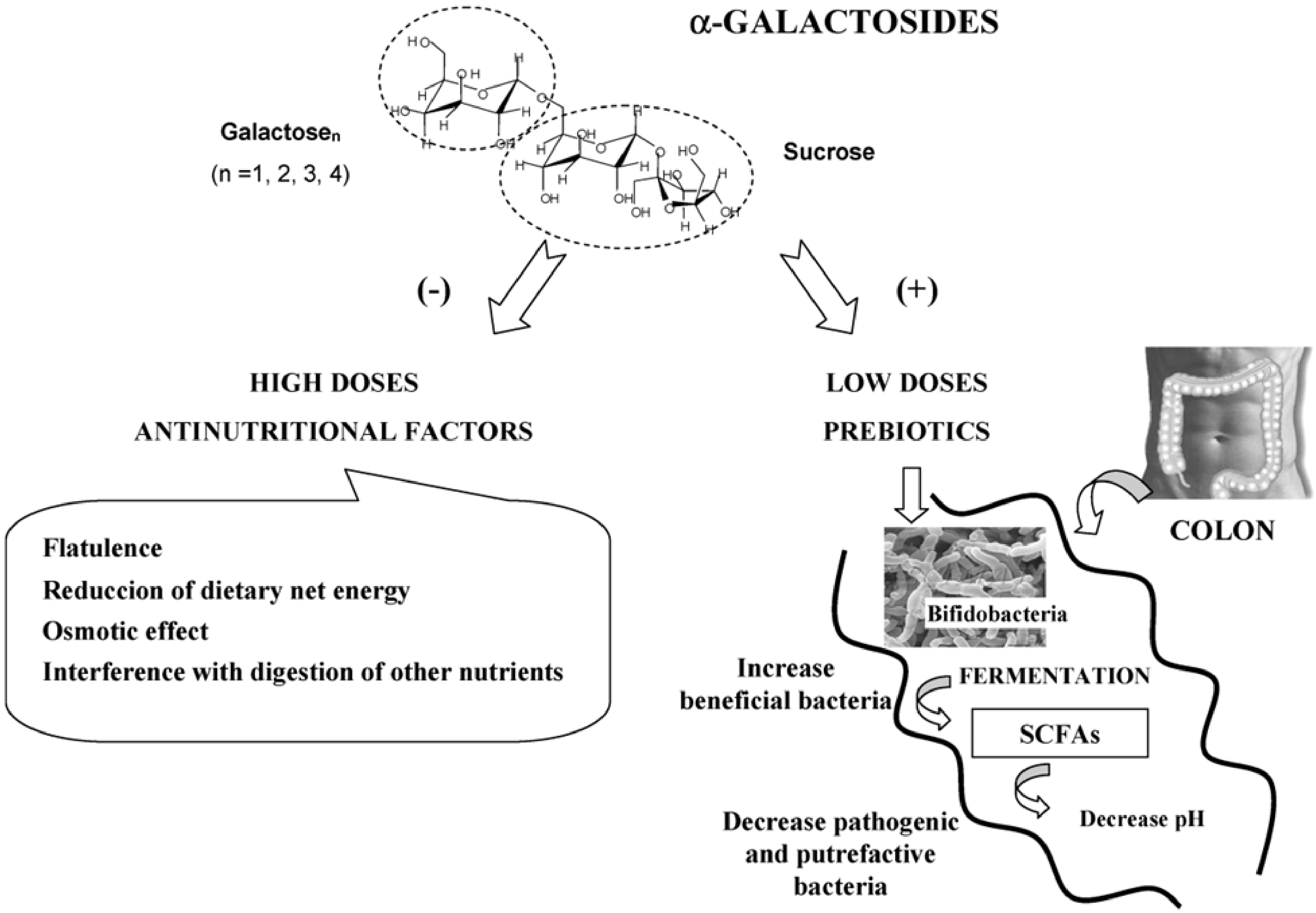

Figure 3 Physiological effects of α-galactosides.

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Ook de aanwezigheid van toxische zaden/sporen etc: Doornappel/duivelskruid

Reviews J. *Agric. Food Chem.*, Vol. 44, No. 1, 1996 **17**

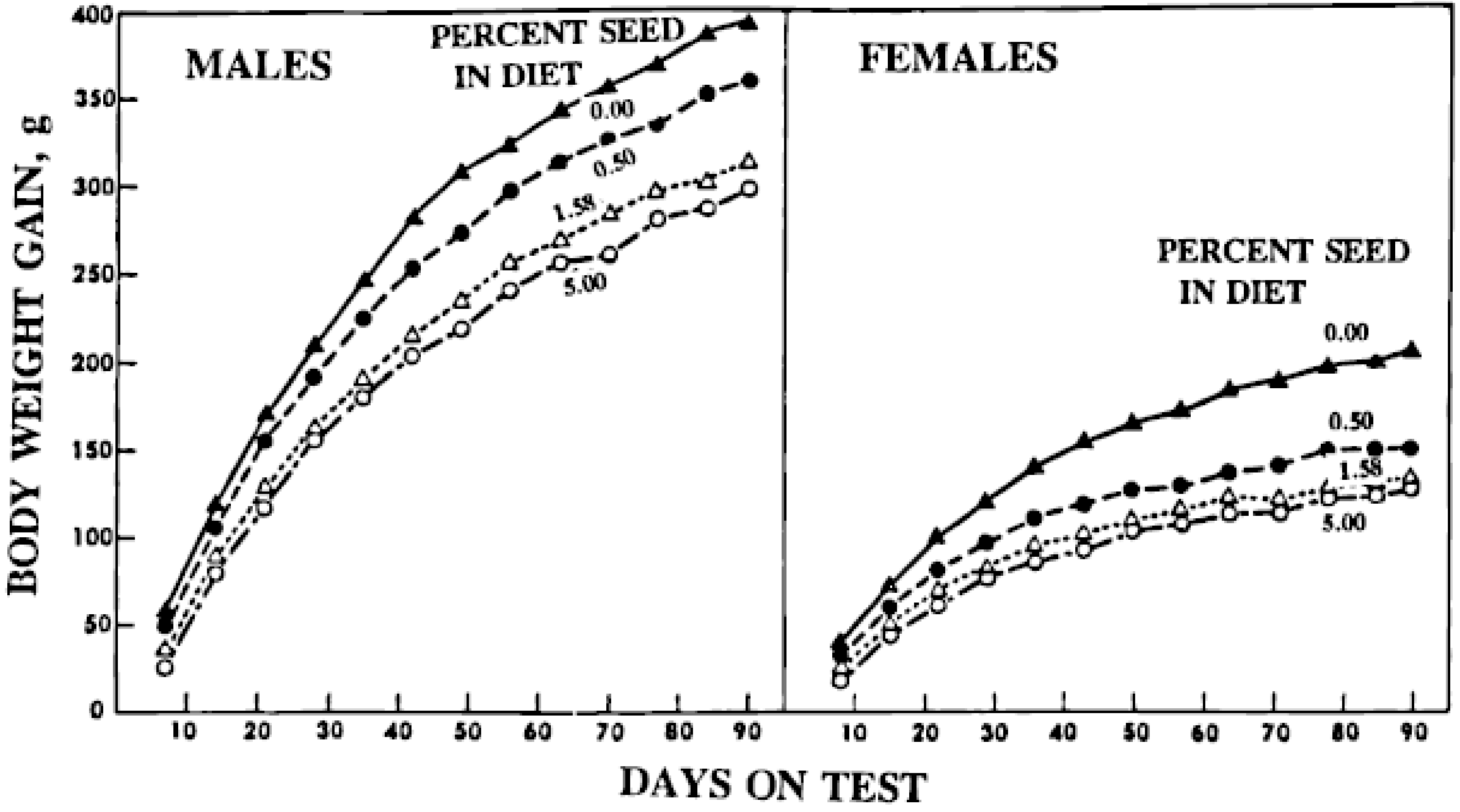

Figure 3. Body weight gain in rats fed jimson weed for 90 days (Dugan et al., 1989).

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Het bredere perspectief van ons Westers probleem.

Te dik, maar toch ondervoed. Hoogleraar Gerjan Navis en diëtist Iris van Vliet van het UMC Groningen stuiten op bijzonder fenomeen

2 oktober 2021, 18:30 · Groningen

Deel dit artikel

„Een behoorlijk schokkende ontdekking'', noemt hoogleraar nefrologie Navis de uitkomsten. Uit het onderzoek onder de patiënten bleek ook dat de ondervoeding hun herstel belemmert. „Het echte probleem was dat ze weinig eiwit binnenkregen, daardoor slap en moe bleven, niet goed herstelden, en daardoor ook spiermassa verloren'', zegt Navis.

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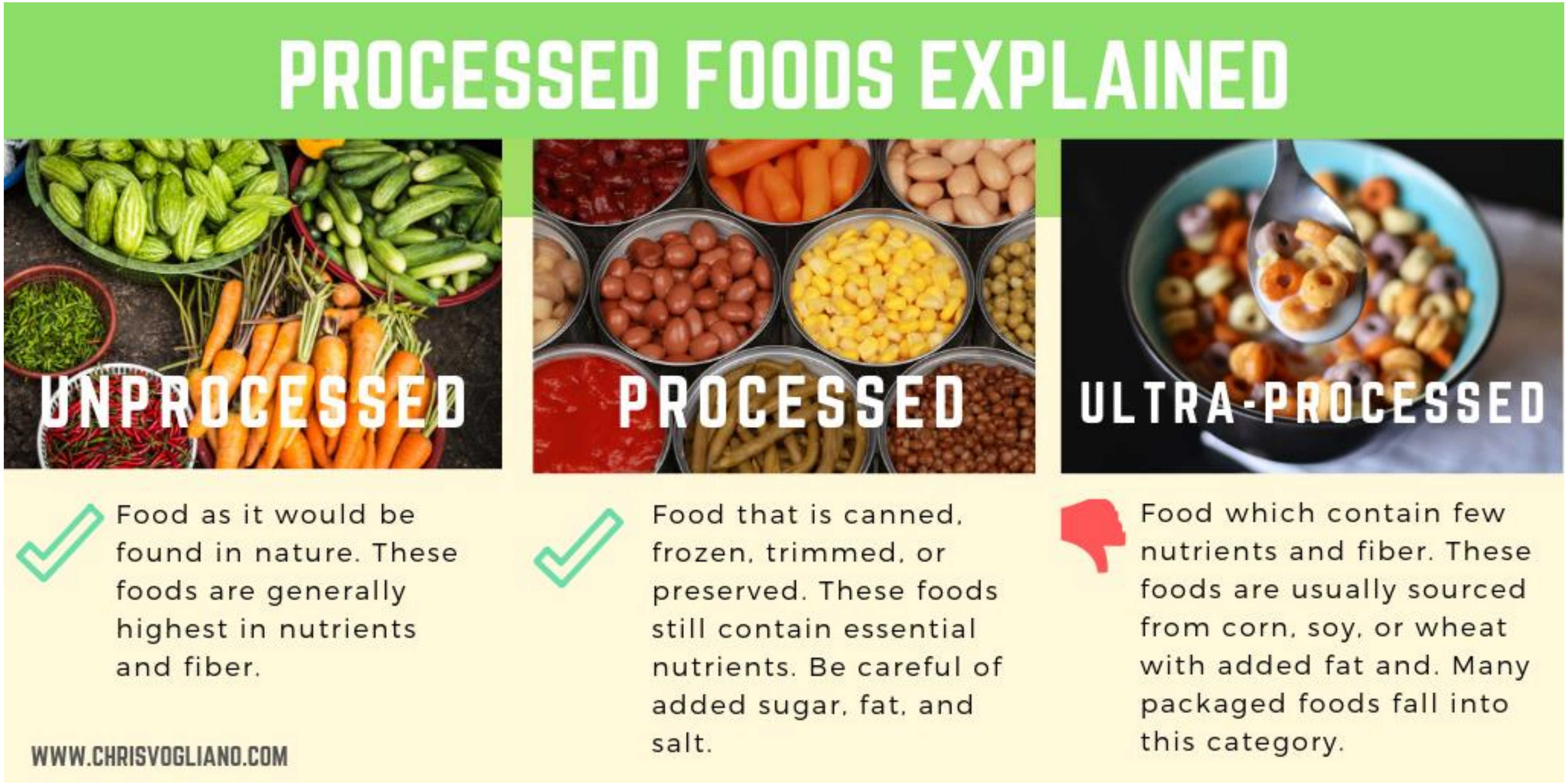

De NOVA classificatie:

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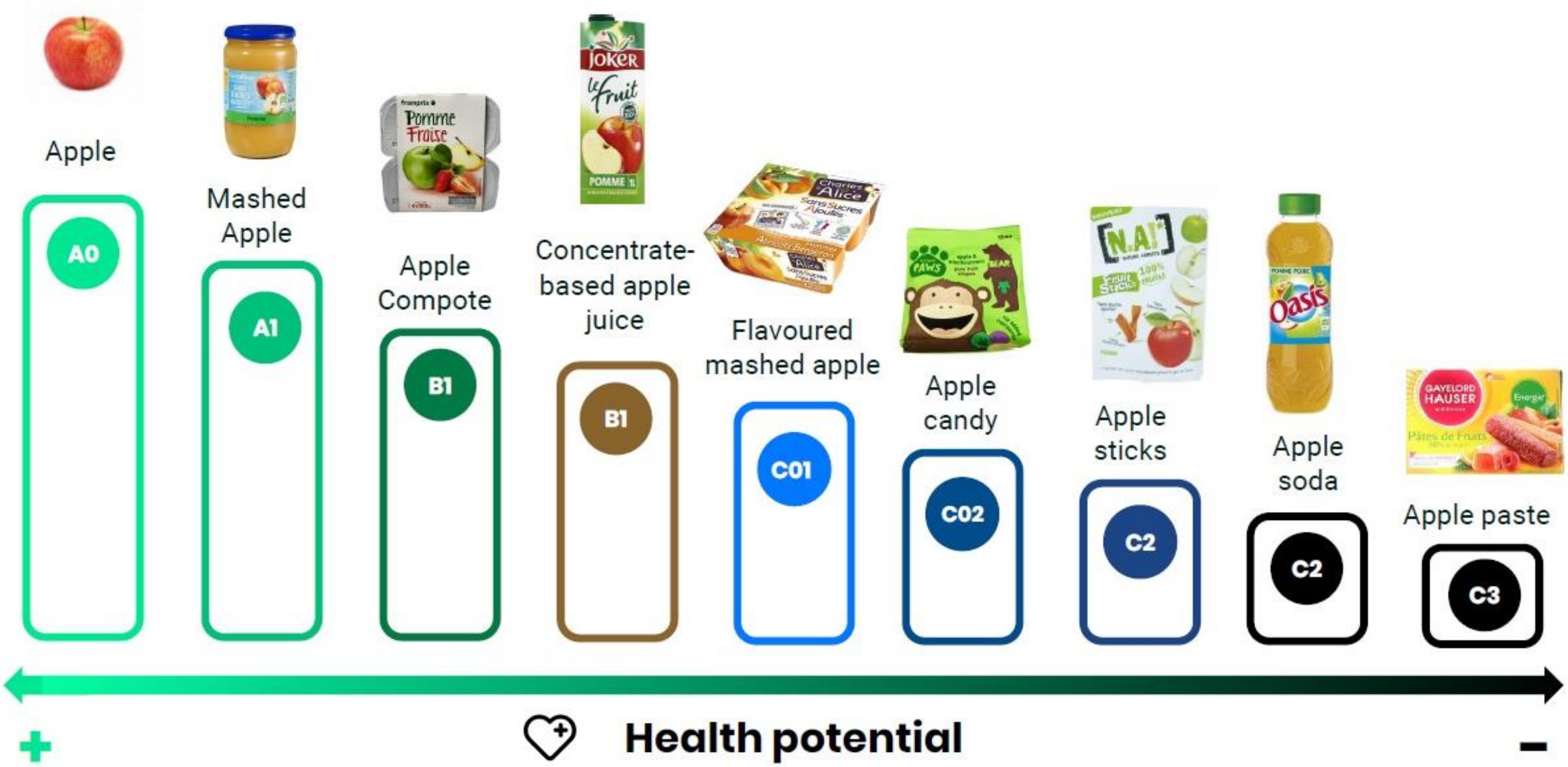
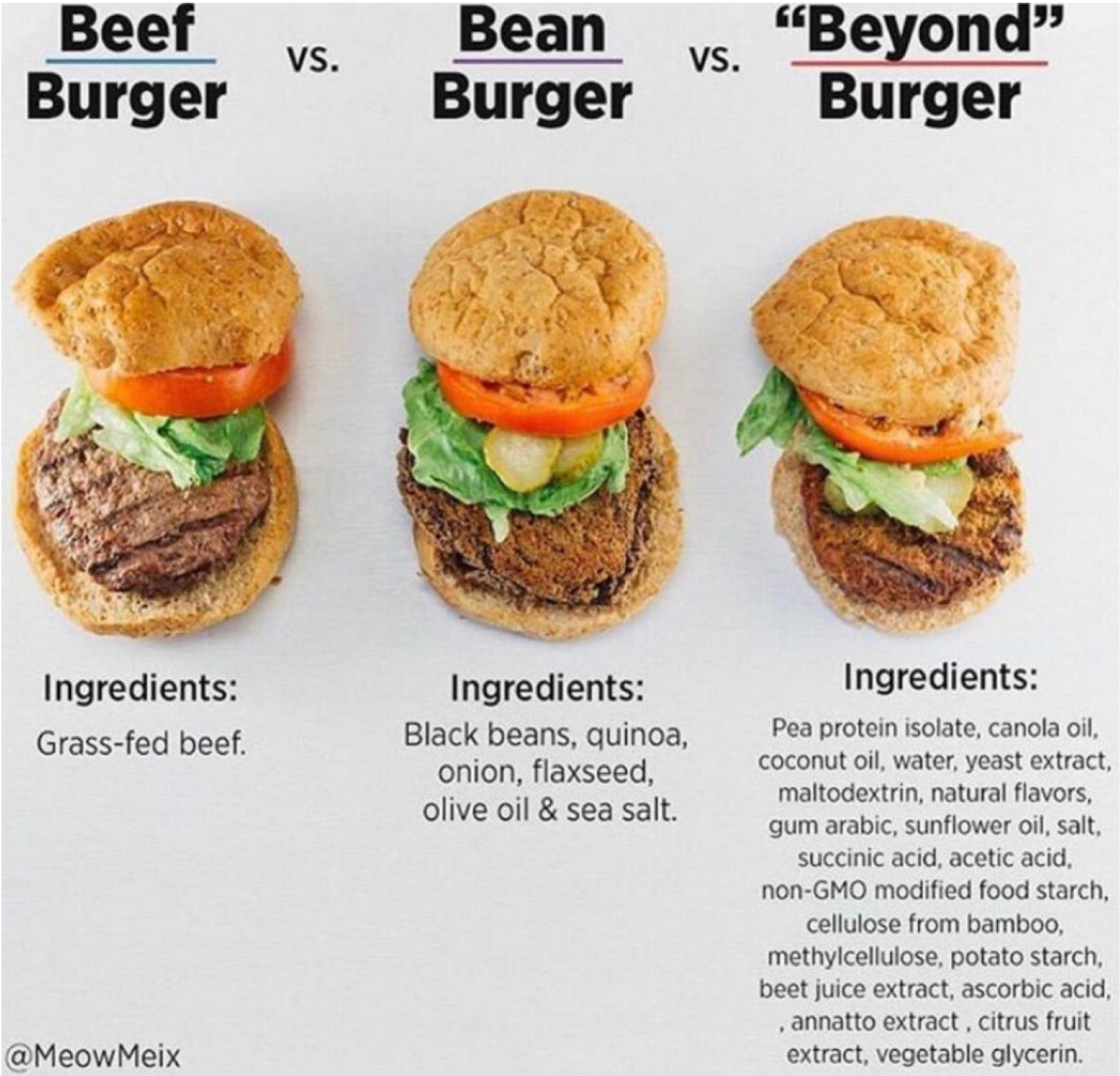
Het Franse systeem:



De uitdaging zit hem ook in de eiwittransitie:



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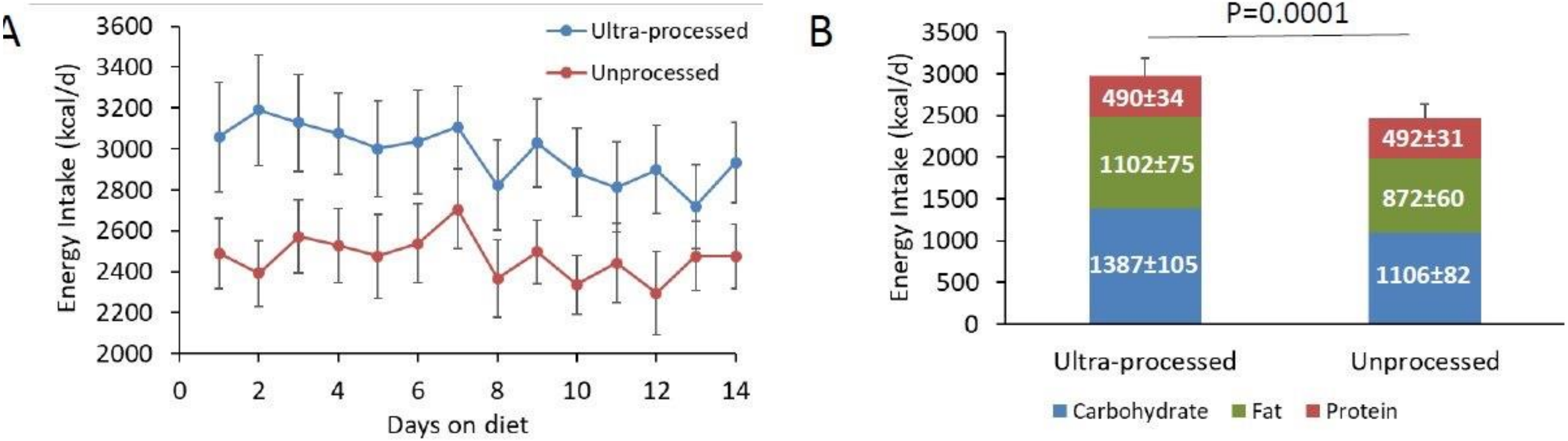
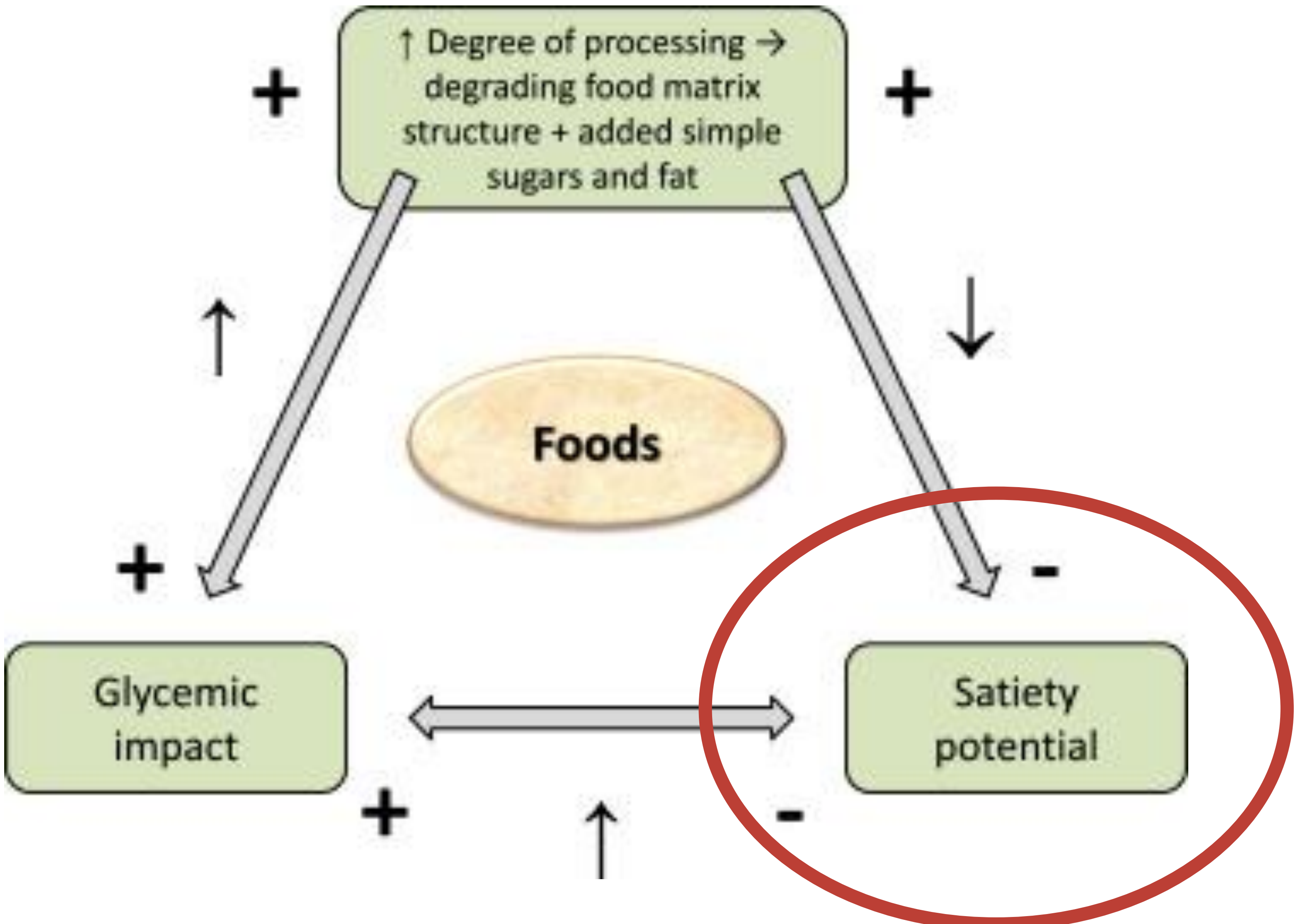
Processed foods induce overeating:

Kevin Hall, Feb 2019, @NutriXiv



Welke fysiologische processen geven dit nadelige effect?



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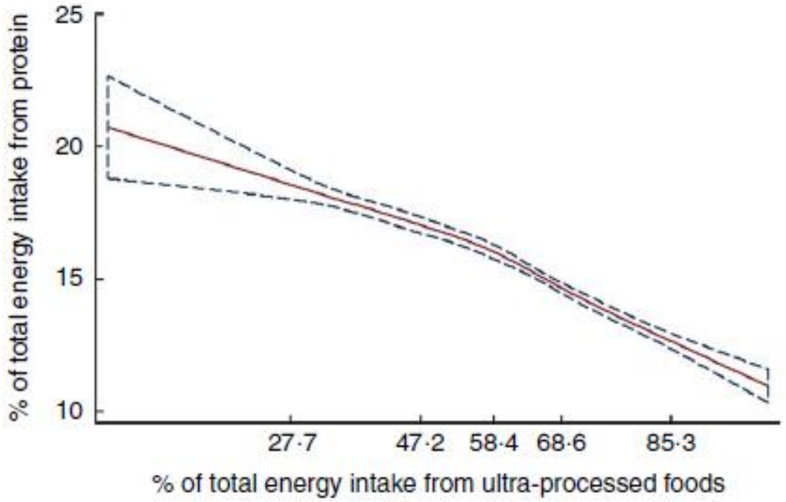
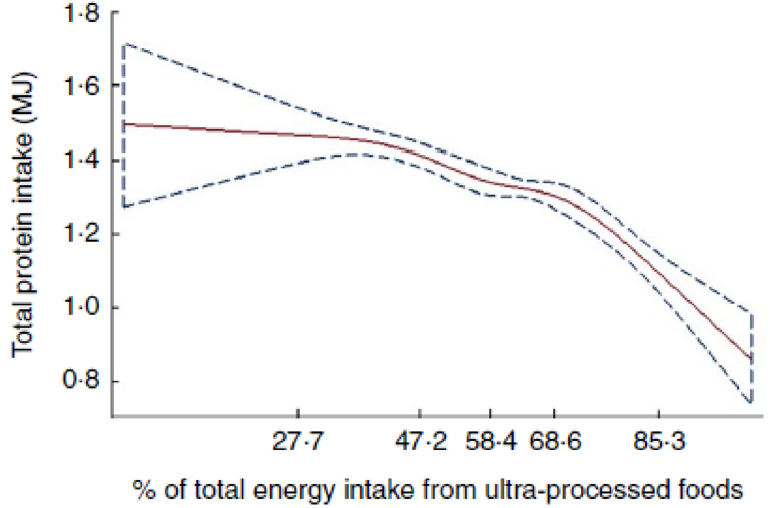
Het mechanisme achter verminderde verzadiging en malnutrition: EIWIT te kort!

Food group	Mean energy intake		Mean protein intake		Mean protein content (% of energy from protein)
	Absolute (MJ/d)	Relative (% of total energy intake)	Absolute (MJ/d)	Relative (% of total energy intake from protein)	
Unprocessed or minimally processed foods	2·5	30·1	0·7	48·7	27·6
Meat (includes poultry)	0·7	8·4	0·4	23·7	52·5
Fruit and freshly squeezed fruit juices	0·4	5·2	0·0	1·7	4·9
Milk and plain yoghurt	0·4	4·9	0·1	8·6	28·4
Grains	0·2	2·9	0·0	1·9	10·5
Roots and tubers	0·1	1·6	0·0	1·0	10·8
Eggs	0·1	1·5	0·0	3·2	36·6
Pasta	0·1	1·4	0·0	1·4	14·2
Legumes	0·1	0·9	0·0	1·4	25·6
Fish and seafood	0·1	0·8	0·0	2·9	68·3
Vegetables	0·1	0·8	0·0	1·2	24·9
Other unprocessed or minimally processed foods*	0·2	1·7	0·0	1·7	30·6
Ultra-processed foods	5·0	57·6	0·5	38·3	9·5
Breads	0·8	9·7	0·1	8·6	13·6
Soft and fruit drinks¶	0·6	6·8	0·0	0·7	5·4
Cakes, cookies and pies	0·5	5·5	0·0	2·5	5·8
Salty snacks	0·4	4·4	0·0	2·3	7·2
Frozen and shelf-stable plate meals	0·3	3·9	0·1	5·2	18·4
Pizza (ready-to-eat/heat)	0·3	3·3	0·1	3·9	16·6
Breakfast cereals	0·2	3·0	0·0	1·7	8·6
Sauces, dressings and gravies	0·2	2·6	0·0	0·5	8·5
Reconstituted meat or fish products	0·2	2·3	0·1	3·9	31·7
Ice cream and ice pops	0·2	2·3	0·0	1·2	6·9
Sweet-snacks	0·2	2·3	0·0	0·9	4·6
Milk-based drinks	0·1	1·9	0·0	2·1	18·2
Desserts**	0·1	1·8	0·0	0·3	2·7
French fries and other potato products	0·2	1·7	0·0	0·7	5·1
Sandwiches and hamburgers on bun (ready-to-eat/heat)	0·1	1·4	0·0	1·9	19·2
Instant and canned soups	0·1	0·9	0·0	1·1	32·3
Other ultra-processed foods††	0·3	3·7	0·0	0·6	2·9



(b)



Public Health Nutrition: 21(1), 114–124 doi:10.1017/S1368980017001574

Ultra-processed foods, protein leverage and energy intake in the USA

Euridice Martínez Steele[1,2], David Raubenheimer[3], Stephen J Simpson[3], Larissa Galastri Baraldi[1,2] and Carlos A Monteiro[1,2,*]
[1]Department of Nutrition, School of Public Health, University of São Paulo, Av. Dr Arnaldo 715, São Paulo, SP 01246-907, Brazil: [2]Center for Epidemiological Studies in Health and Nutrition, University of São Paulo, São Paulo, Brazil: [3]Charles Perkins Centre and School of Life and Environmental Sciences, The University of Sydney, Sydney, Australia

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Hoe zit het dan met de eiwitten in bonen/peulvruchten?

Table 3. Ranking of Diets by Five Different Protein Quality Indices (Mean Values from Six Laboratories) [Adapted from Sarwar et al. (1984)]

diet	PER	NPR	NU	RPER	RNPR
ANRC casein + 0.1% Met	4.04	5.30	5.68	100	100
egg white solids	3.71	5.08	5.43	91	95
minced beef	3.36	4.83	5.16	83	91
rapeseed protein concentrate (RPC)	3.29	4.59	4.90	81	87
ANRC casein	3.13	4.55	4.83	78	86
pea flour + 0.1% Met	2.91	4.33	4.59	72	81
whole wheat flour + ANRC casein[a]	3.01	4.20	4.47	74	79
whole wheat flour + minced beef[a]	2.97	4.16	4.41	73	79
whole wheat flour + egg white solids[a]	2.90	4.09	4.36	72	77
soy protein + 0.1% Met	2.55	3.72	3.87	64	70
whole wheat flour + pea flour[a]	2.18	3.50	3.60	54	66
whole wheat flour + soy prote					
whole wheat flour + RPC[a]					
whole wheat flour + 0.16% Ly					
pea flour					
soy protein					
whole wheat flour					

[a] 50/50 mixture based on protei

Table 5. Chemical Score (CS), Digestibility (D), Biological Value (BV), and Net Protein Utilization (NPU) of Selected Legumes (Burr, 1975)

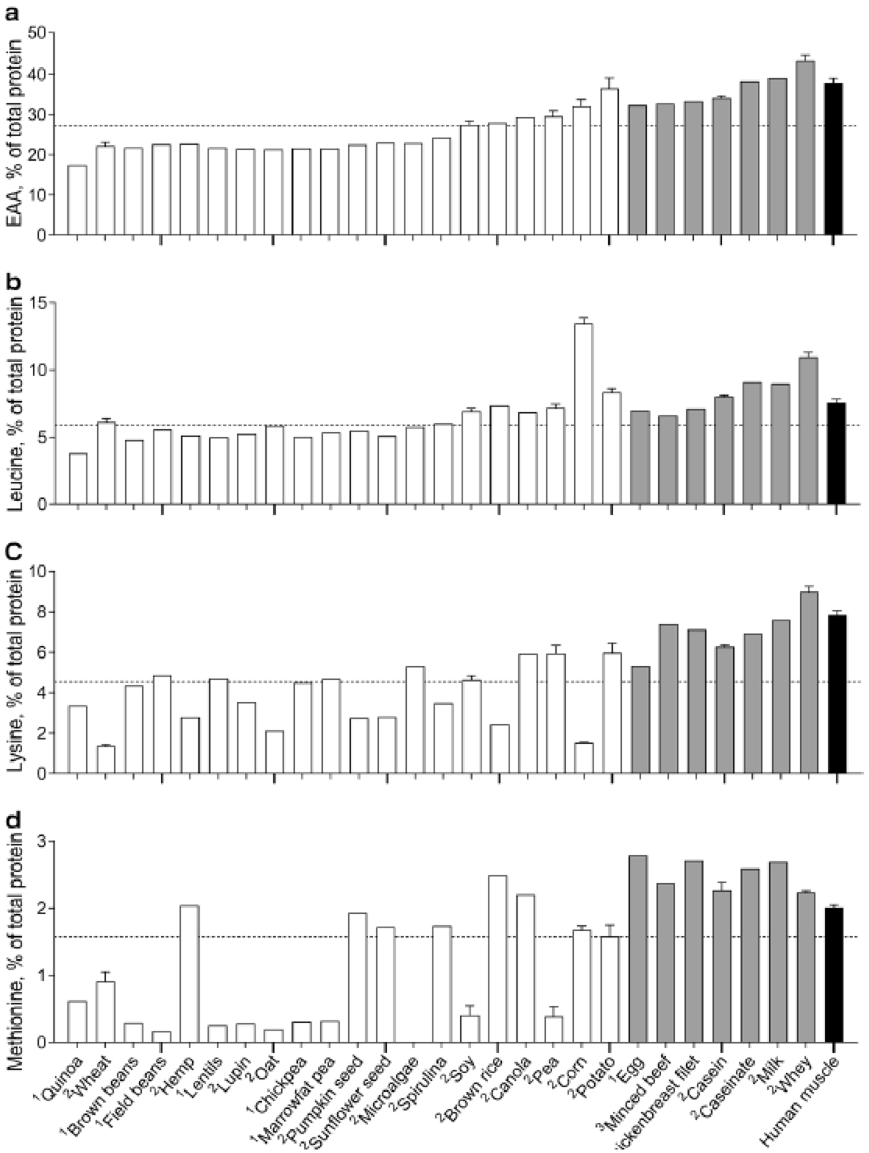
food source	CS	D	BV	NPU
bean	54	73	58	42
broad bean	44	87	55	48
chickpea	63	86	68	58
cowpea	64	79	57	45
lentil	49	85	45	38
lima bean	64	78	66	51
pea	58	88	64	56
pigeon pea	42	78	57	44
peanut	65	87	54	47
soybean	74	90	73	66

1983). The tree contains the unusual amino acid canavanine, which is not extracted by cooking methods.

Fava Beans (Vicia fava). Fava beans, also known as faba beans, are a widely used protein source (Pastuszewska et al., 1993; Rubio et al., 1991). Some people with an inborn deficiency of glucose-6-phosphate dehydrogenase (G6PD) suffer from a hemolytic crisis known as favism when they consume fava beans. Studies of the pathogenesis of this disease suggest that isouramil (2,4,6-trihydroxy-6-aminopyrimidine) and divicine (2,6-diamino-4,5-dihydroxypyrimidine), the aglycons of the β-glycosides convicine and vicine, respectively, appear to be responsible for the hemolysis (Liener, 1975).

De chemische samenstelling, cq de aminozuren:

Fig. 1 Essential amino acid (EAA, Panel **a**), leucine (Panel **b**), lysine (Panel **c**), and methionine (Panel **d**) contents (expressed as % of total protein) of various dietary protein sources and human skeletal muscle protein. White bars represent plant-based protein sources, grey bars represent animal-derived protein sources, and the black bar represents human skeletal muscle protein. Dashed line represents the amino acid requirements for adults (WHO/FAO/UNU Expert Consultation 2007 [58]). Note: EAA is the sum of histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, and valine, as tryptophan was not measured. Values obtained from multiple products are expressed as mean (± SEM). This figure represents an extension from data previously presented by Gorissen et al. 2018 [39], assessed using the same method. [1] Flour, [2] Protein concentrate/isolate, [3] Freeze-dried raw product



Sports Medicine
https://doi.org/10.1007/s40279-021-01540-8

REVIEW ARTICLE

The Anabolic Response to Plant-Based Protein Ingestion

Philippe J. M. Pinckaers[1] · Jorn Trommelen[1] · Tim Snijders[1] · Luc J. C. van Loon[1]

Mixen van bonen/peulvruchten/granen/zaden:

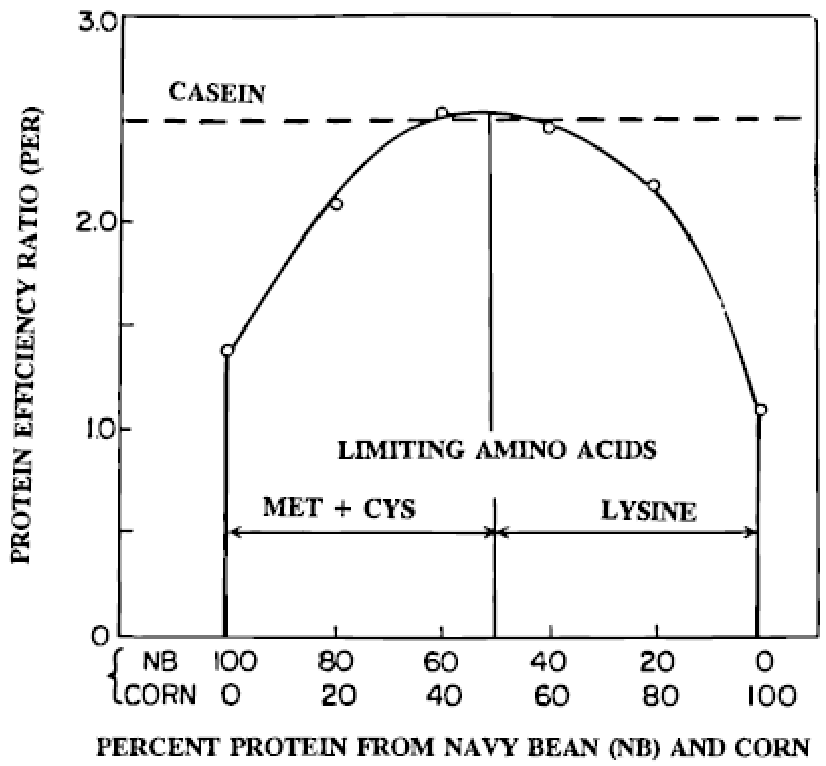


Figure 4. Complementary nutritional effects produced by mixtures of navy beans (NB) and corn at a protein level of 8.3% [adapted from Yadav and Liener (1978)].

mother likes to admit that her child is malnourished. This strategy merits general adoption for the development and marketing of new foods.

Extensive field studies on possible nutritional benefits on feeding children lysine-fortified corn, rice, and wheat gave inconclusive results (Betschart, 1978, 1982; Latham, 1988). Since the dynamics of absorption, transport, and utilization of free amino acids such as lysine differ from those of protein-bound lysine, which has to be first liberated by digestion (Rerat, 1995; Scharrer, 1989), lysine peptides might be better candidates for fortifying low-lysine foods than free lysine (Friedman and Finot, 1990; Sarwar and Paquet, 1989). Since peptides may also undergo less browning than free amino acids, possible benefits of peptide-fortified foods merit extensive study.

In addition to the usual growth and biochemical parameters, future studies should also address the improvement in health, general intelligence, and longevity of malnourished children consuming fortified foods and costs associated with the introduction of new foods (Caswell, 1991).

Genetic Approaches. Lysine, threonine, and tryptophan are nutritionally limiting in cereals as are methionine and cystine in legumes. Improved nutri-

De beschikbaarheid voor ons metabole systeem:

	Protein content	DIAAS (Digestible Indispensable Amino Acid Score)
Soybean	16-43%	1.1
Caesin	/	0.93
Lupinus albus	38%	0.87
Lupinus angustifolius	35%	1.00
Lupinus mutabilis	44%	0.95
Vicia faba	27%	0.59

En wat moeten we dan eten als we puur naar de eiwitbehoefte kijken van de mens:

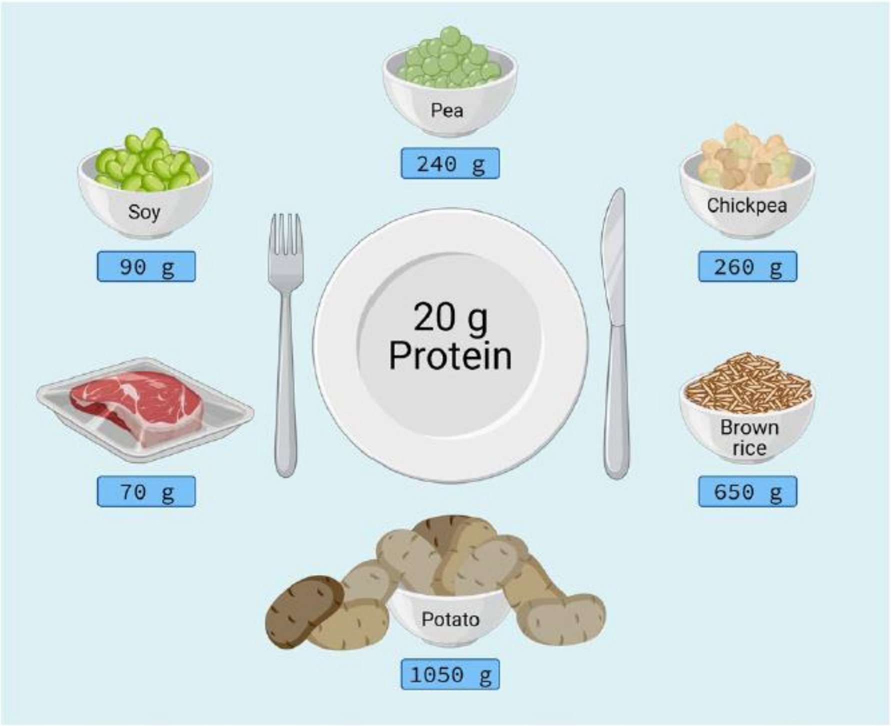


Fig. 4 Amount of the selected whole-food protein sources to be consumed to allow ingestion of 20 g protein. Illustrated are meat, soy, pea, chickpea, brown rice and potato in order of protein content (from high to low)

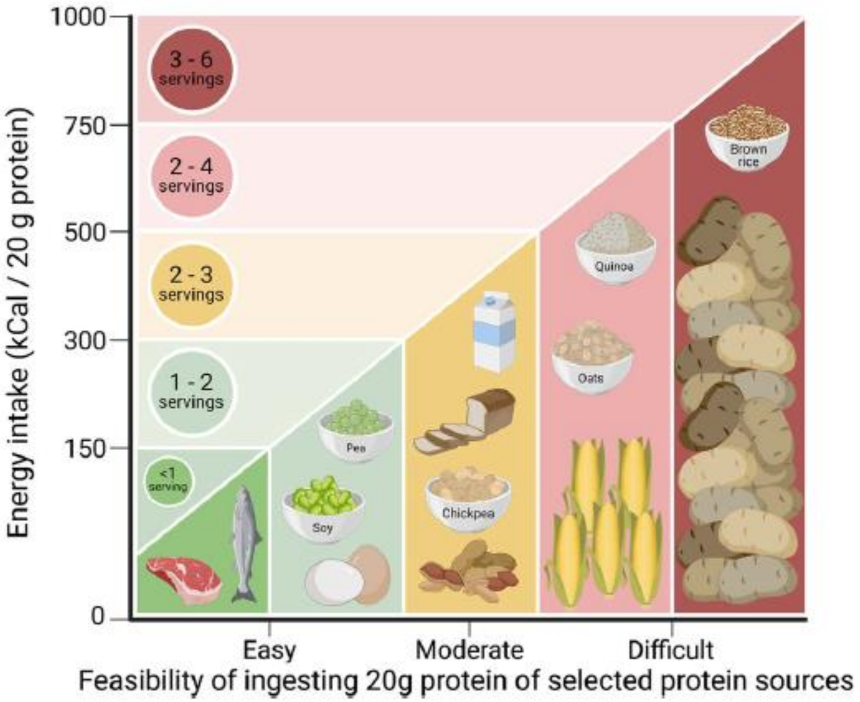


Fig. 2 Categorical representation of the feasibility of consuming 20 g protein provided by ingesting the whole food source (*x*-axis), with the amount of food that needs to be consumed expressed as servings with the concomitant energy intake equivalent (*y*-axis). Serving sizes: meat/salmon: ~ 100 g, egg: ~ 120 g (2 eggs), soy: ~ 100 g, pea: ~ 150 g, chickpea: ~ 150 g, peanut: ~ 50 g, bread (wheat): ~ 70 g (2 slices), milk: ~ 200 mL, corn: ~ 150 g, oats ~ 40 g (raw), quinoa: ~ 75 g (raw), brown rice: ~ 75 g (raw), potato: 175 g

Sports Medicine
https://doi.org/10.1007/s40279-021-01540-8
REVIEW ARTICLE

The Anabolic Response to Plant-Based Protein Ingestion

Philippe J. M. Pinckaers[1] · Jorn Trommelen[1] · Tim Snijders[1] · Luc J. C. van Loon[1]

En wat nou met de bewerkingen van eiwitten:

Reviews — *J. Agric. Food Chem.*, Vol. 44, No. 1, 1996 **11**

Table 4. Total and Reactive (Available) Lysine Content (LYS) and Nitrogen Recovered from the Amino Acid Analyzer for Untreated and Heat-Treated Casein and Casein–Carbohydrate Mixtures (Smith and Friedman, 1984)

material	treatment	total LYS (g/16 g of N) (from amino acid analysis)	reactive LYS (g/16 g of N)		N recovered (%)
			FDNB	dye binding	
casein	none	9.68	8.03	7.98	91.9
casein	37 °C, 10 days	9.70	7.45	7.73	92.5
casein + starch	37 °C, 10 days	9.71	7.91	7.62	91.6
casein + sucrose	37 °C, 10 days	9.24	7.39	7.17	89.7
casein + glucose	37 °C, 10 days	7.43	4.87	4.54	65.5
casein	121 °C, 1 h	9.40	7.83	7.38	88.8
casein + starch	121 °C, 1 h	9.50	7.83	7.42	85.8
casein + sucrose	121 °C, 1 h	2.73	1.05	0.81	88.4
casein + glucose	121 °C, 1 h	3.15	1.54	1.95	58.8
casein	200 °C, 1 h	8.03	2.24	2.47	90.2
casein + starch	200 °C, 1 h	8.52	2.33	3.01	89.1
casein + sucrose	200 °C, 1 h	7.94	3.15	3.61	86.5
casein + glucose	200 °C, 1 h	6.92	3.72	3.41	85.2
casein	300 °C, 1 h	7.28	1.28	1.25	47.8
casein + starch	300 °C, 1 h	4.43	0.00	0.19	4.3
casein + sucrose	300 °C, 1 h	3.75	0.21	0.03	6.3
casein + glucose	300 °C, 1 h	4.22	0.00	0.17	3.3

Ook dit zie je terug in voedingsexperimenten bij muizen:

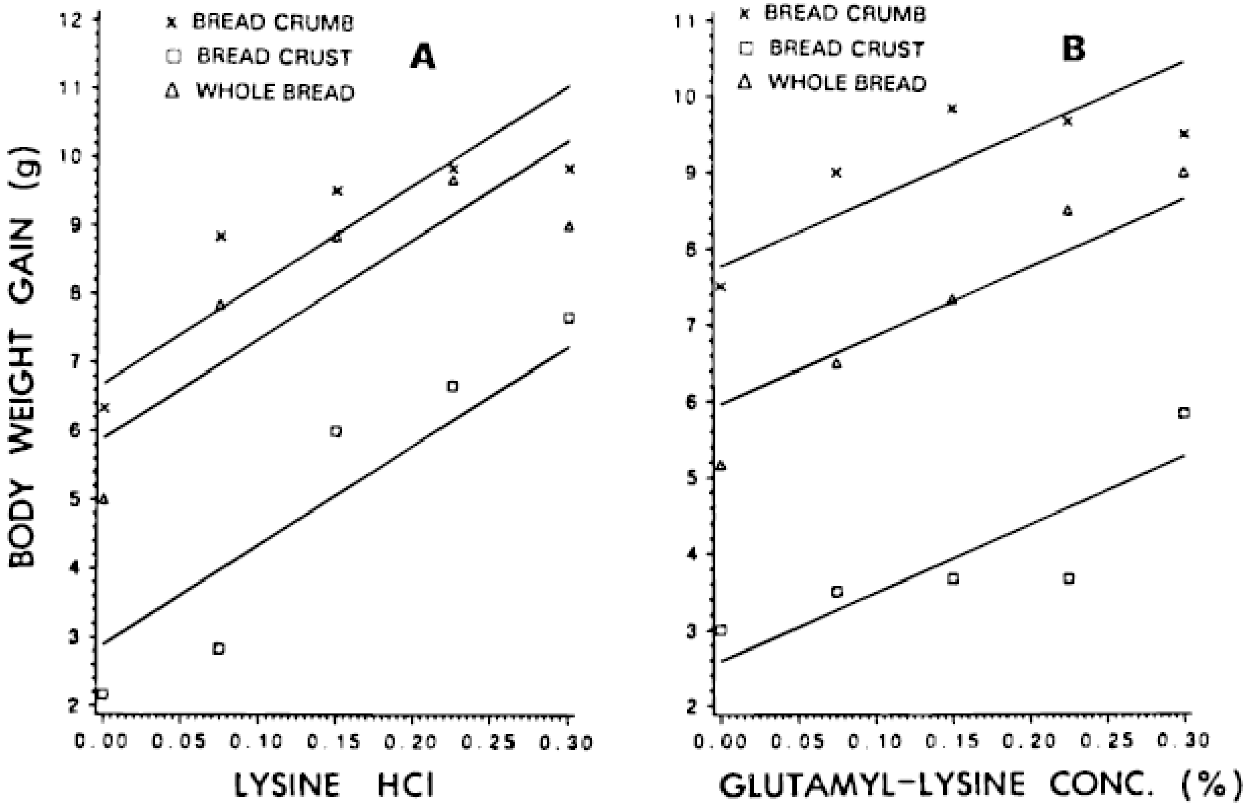


Figure 2. Weight gain in mice after 14 days of being fed whole bread, bread crumb, and bread crust cobaked with lysine (A) and glutamyllysine (B) (Friedman and Finot, 1990).

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De impact op glucoseregulatie in ons lichaam: second meal effect!!!

OVERNIGHT SECOND MEAL EFFECT 1043

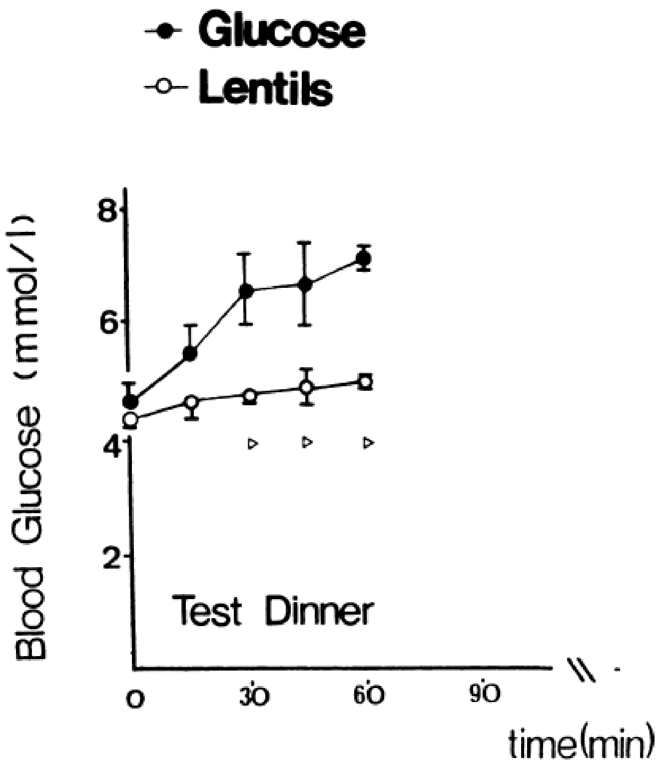
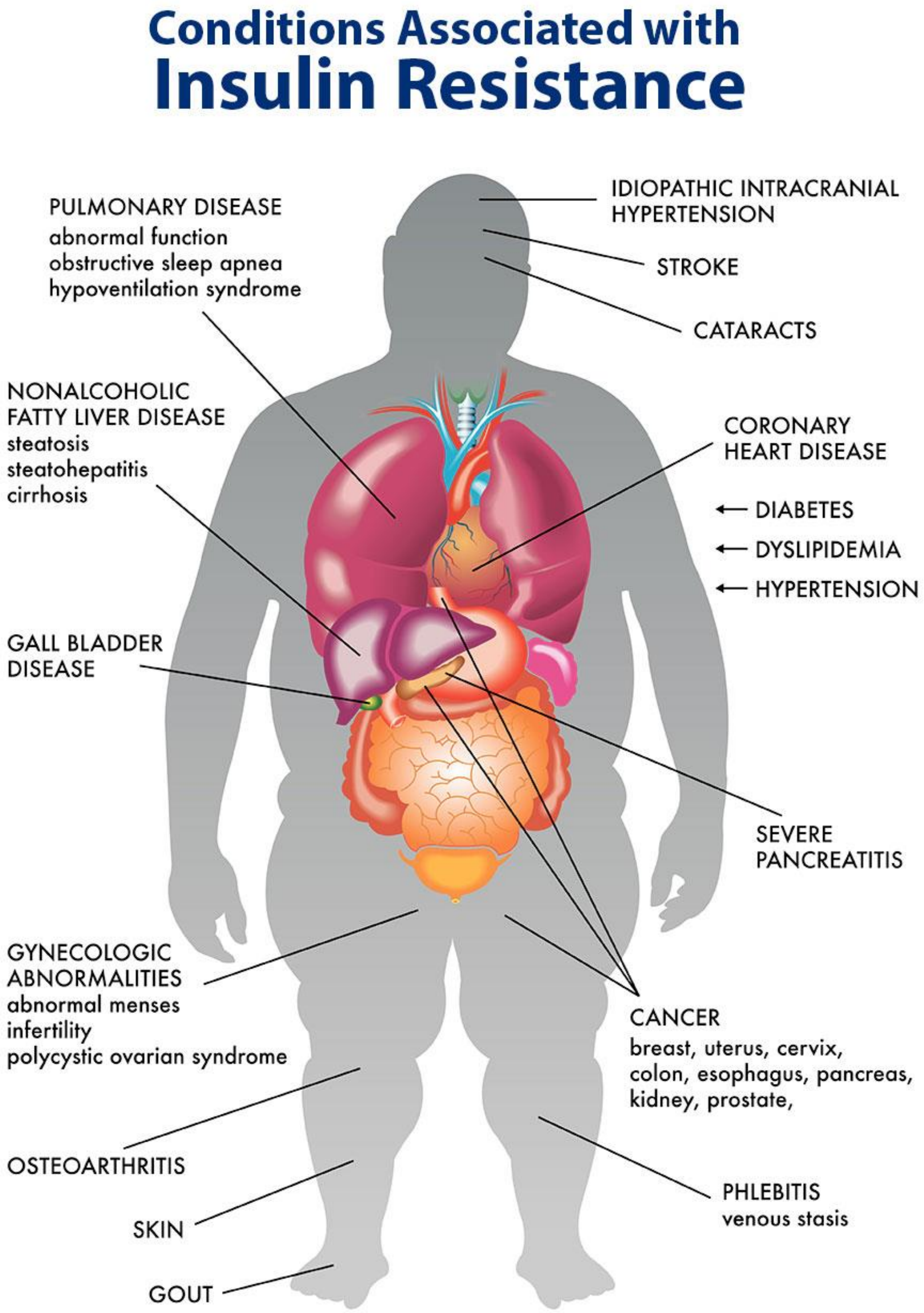


FIG 1. Blood glucose responses ($\bar{x} \pm$ SEM) of normal subjects to dinners containing either lentils or glucose (left; $n = 4$) and to 50 g oral glucose taken on the next morning (right; $n = 5$).

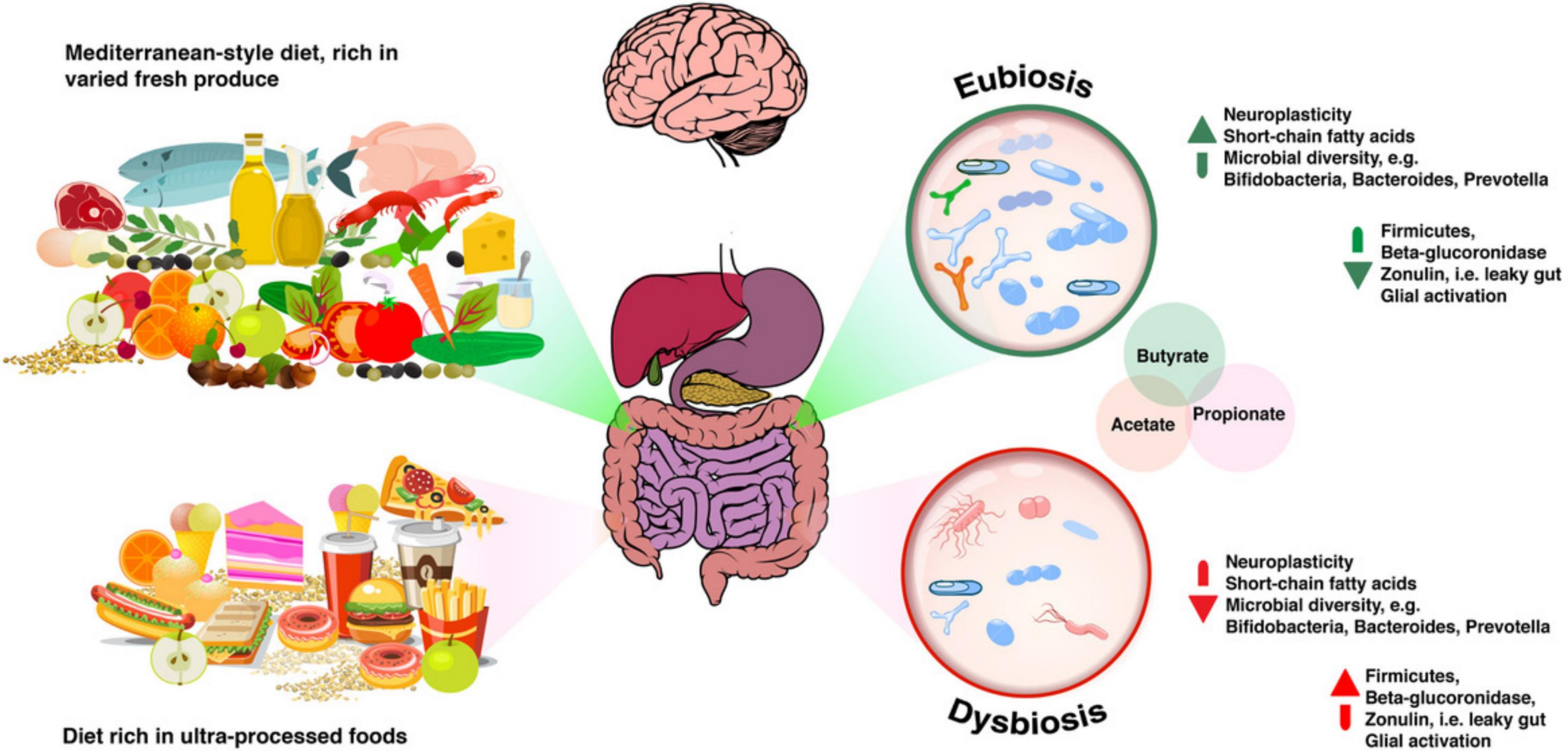
Second-meal effect: low-glycemic-index foods eaten at dinner improve subsequent breakfast glycemic response[1–3]

Thomas MS Wolever, BM, PhD; David JA Jenkins, DM, PhD; Anthony M Ocana, BSc; Venketeshwer A Rao, PhD; and Gregory R Collier, PhD

De continue verstoring van ons metabolisme (glucose/insuline huishouding) en verzadiging leidt tot:



En dan is er nog Voeding en ons darmbioom:



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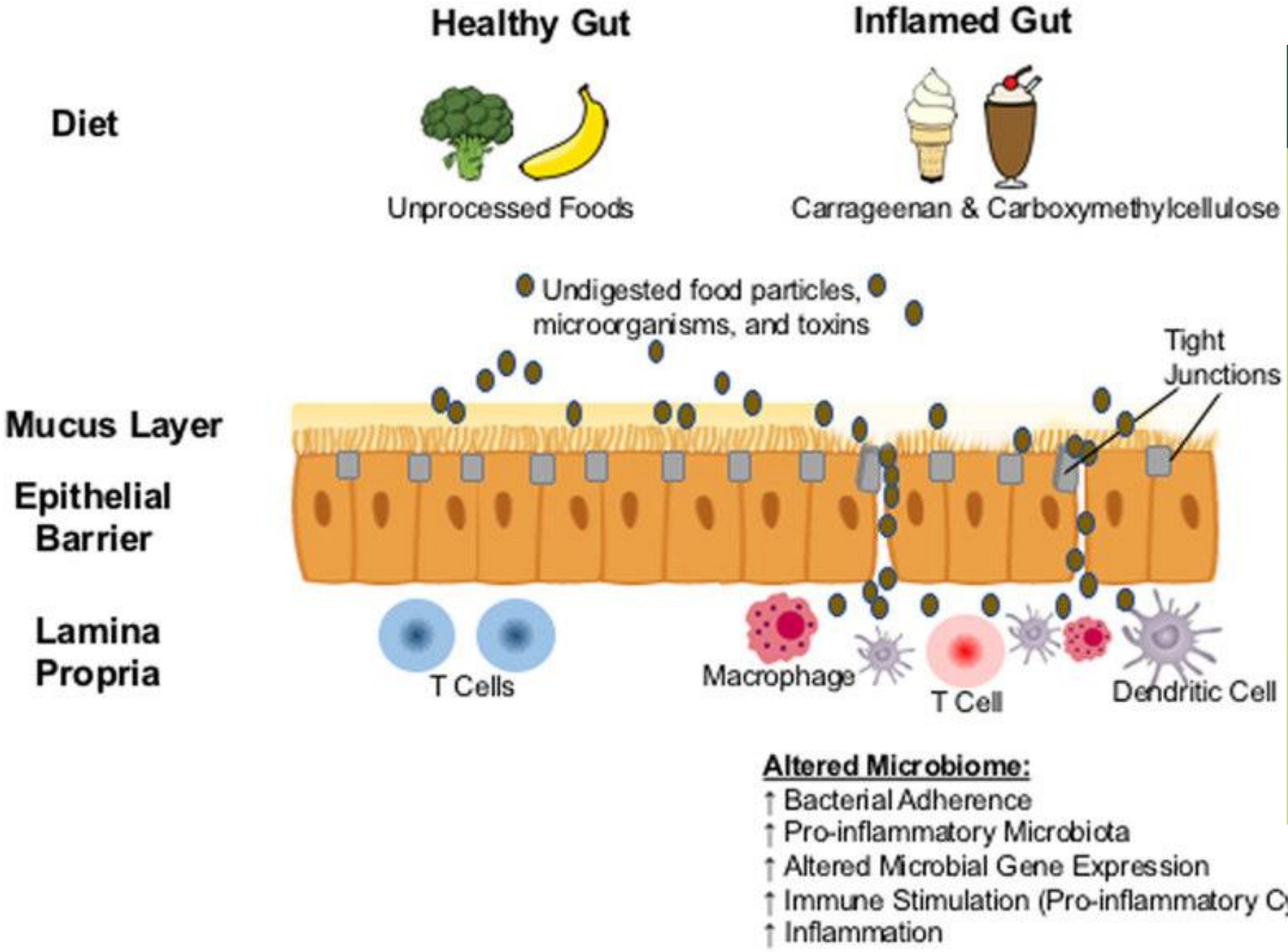
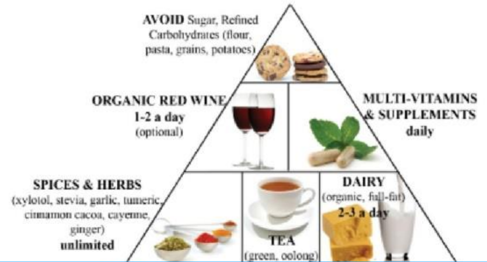
En dat gaat verder dan alleen de koolhydraten en vezels:



The Role of Carrageenan and Carboxymethylcellulose in the Development of Intestinal Inflammation

John Vincent Martino[1], Johan Van Limbergen[1,2] and Leah E. Cahill[2,3]*

[1] Pediatric Gastroenterology, Hepatology and Nutrition, IWK Health Centre, Halifax, NS, Canada, [2] Medicine, Dalhousie University, Halifax, NS, Canada, [3] Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA, USA



__Basis principes in vele leefstijlinterventies:__

Vers, onbewerkt en verzadigend;

Veel groente;

Natuurlijke vetten en eiwitten;

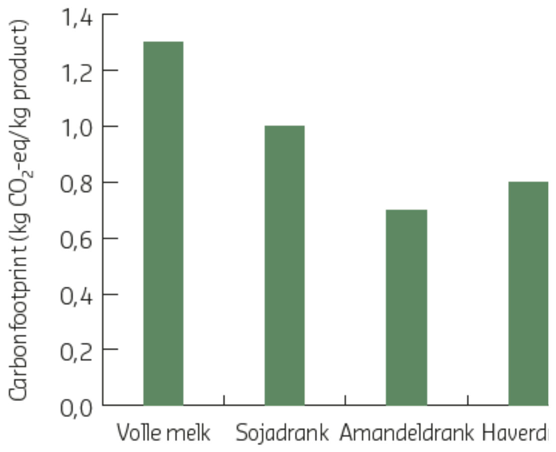
Geen bewerkte/geraffineerde suikers en zetmelen;

Beperkt in alcohol;

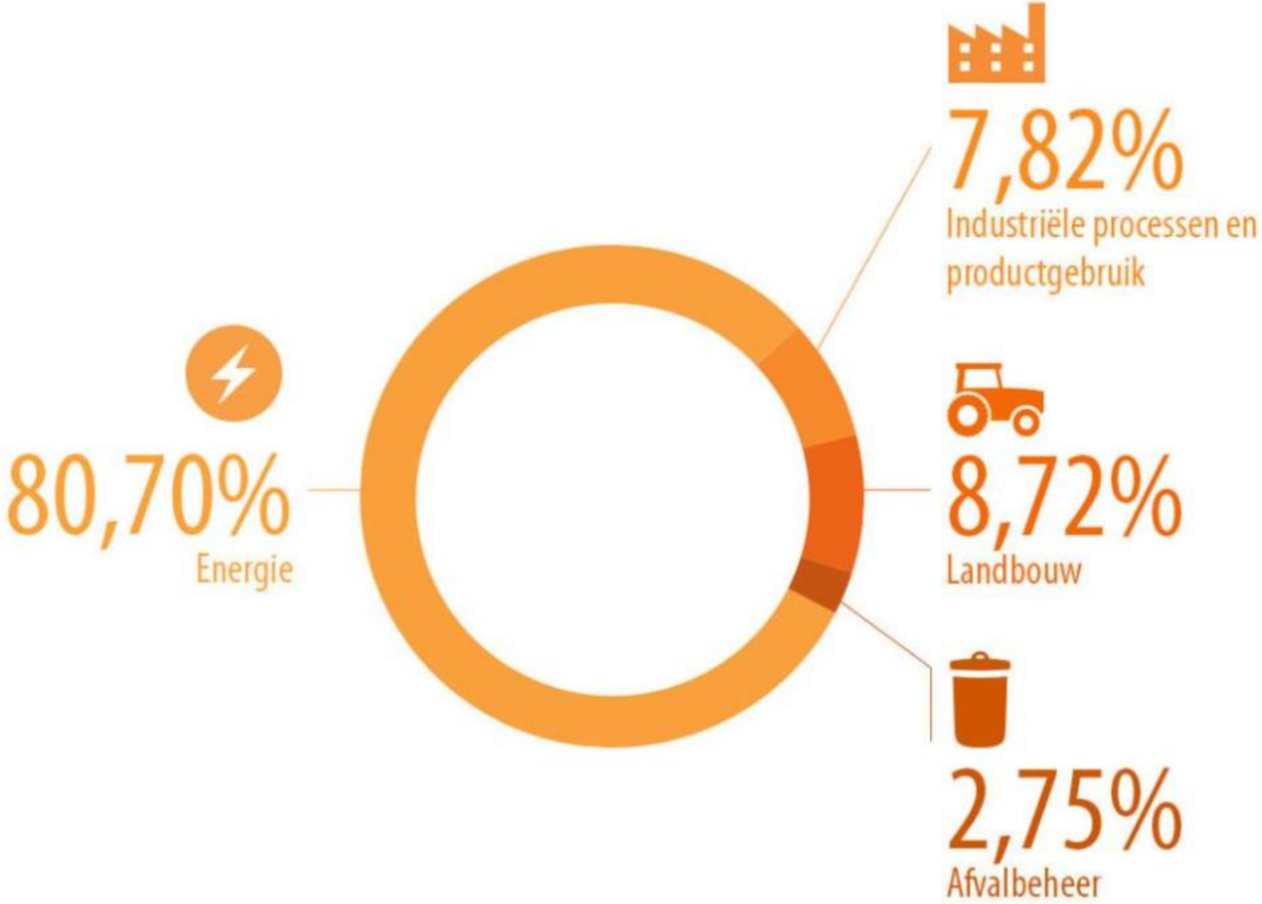
__Kwaliteit boven kwantiteit__

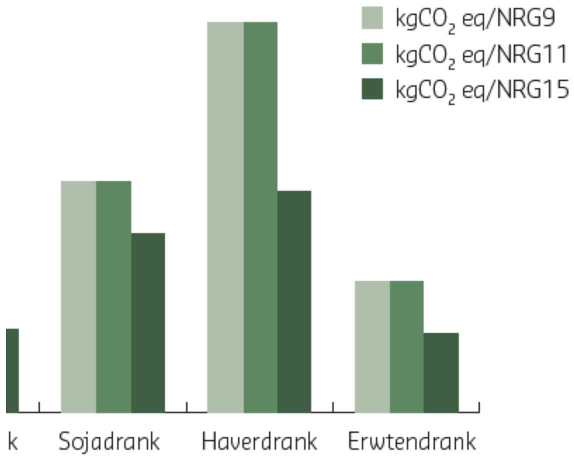
Het 'Klimaatdilemma'....???

Interview **dr. Peter de J**



Figuur 1. De CO_2-voetafdruk per kg product van verschi levensmiddelen





stoot van levensmiddelen in relatie tot de ndex scores

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Bonen en Pe

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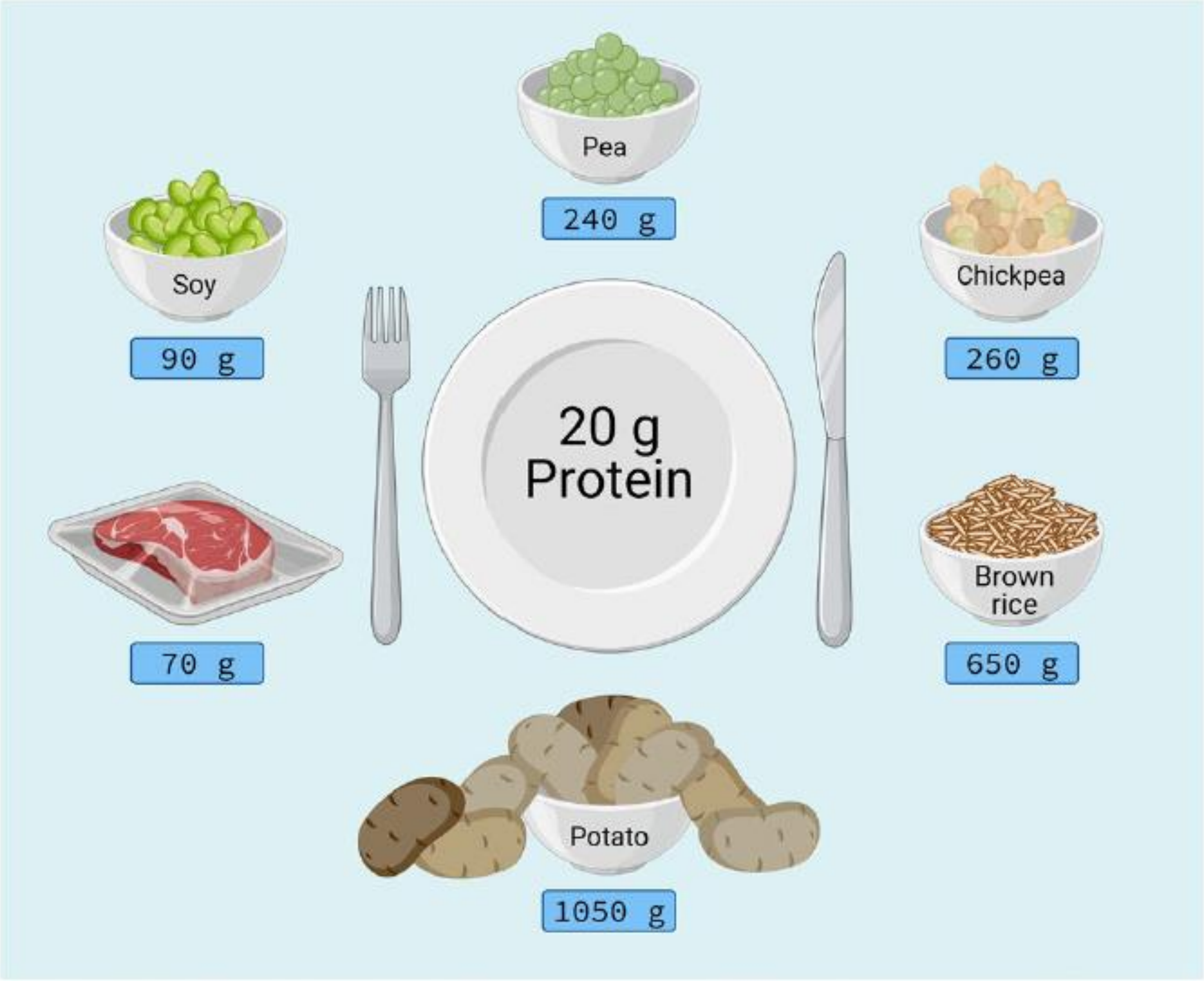
2) Eet voldoe
3) Eet vers er
4) Bekijk de c



V deze de

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Dank jullie wel.