

Hvordan opnås den rette biotilgængelighed af mikronæringsstoffer i en grønnere kost

Temamøde – Ernæring og Sundhed 2023
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KØBENHAVNS UNIVERSITET





3 % lever vegetarisk
18-34 årige: 7,4%

20% spiser overvejende eller helt vegetarisk
18-34 årige: 36%

35% har mindst en kødfri dag/uge
18-34 årige: 52%

66% vil gerne spise mindre kød
18-34 årige: 76%



www.vegetarisk.dk
Hentet 19/10-2023

Gennemsnitligt spiser hver dansker 142 g kød om dagen (DTU Food, hentet 19/11-2023)

Er det et problem at spise grønt?



The EPIC-Oxford study (65000 M&F) (1980s)
Oxford vegetarian Study (11000 M&F) (1990s)
UK biobank (500000 M&F) (2006-10)

Vegetarians and vegans vs omnivorous

Diseases

22% lower IHD risk

35% lower diabetes

10-18% lower all cancer risk

62% lower stomach cancer

11% **higher** fracture risk
and 50% **higher** risk in vegans

17% **higher** stroke risk
48% **higher**
haemorrhagic stroke risk

90% **higher** cervix cancer

Indtag af mikronæringsstoffer hos personer med forskellige kostvaner

Nutrient	Study*	vegans	Lacto-ovo	Fish eaters	semiveg	Meat eaters
Vit B12	EPIC-oxford	0,78	3,09	6,36		7,88
	AHS-2	6,3	8,0	8,5	8,3	7,1
Vit D	EPIC-oxford	1,8	2,0	3,7		3,8
	AHS-2	2,4	4,6	5,8	5,5	6,1
Ca	EPIC-oxford	848	1117	1131		1083
	AHS-2	933	1145	1125	1195	1072
Zinc	EPIC-oxford	8,7	10,3	10,2		10,5
	AHS-2	11,3	11,5	11,5	11,6	11,9
Iron	EPIC-oxford	18,3	16,7	16,7		16,3
	AHS-2	22,2	22,1	22,4	21,7	20,0

Epic-Oxford målte kun næringsstofindtag fra kosten. AHS-2 inkluderede også indtag fra kosttilskud

EPIC-Oxford (UK): 65429 personer, (50823 kvinder), 20-97 år.

AHS-2 (7-dags adventister i USA): 96194 personer (62500 kvinder), 30-112 år

Table 2. Overview of nutrients at risk of inadequacy and nutrients of favorably high intake across dietary patterns.

Dietary Pattern	Nutrients at Risk of Inadequacy	Nutrients of Favorably High Intake
Vegans	EPA, DHA, vitamins B12, D, calcium, iodine, iron (in women), zinc	fiber, PUFA, ALA, vitamins B1, B6, C, E, folate, magnesium
Vegetarians	fiber, EPA, DHA, vitamins B12, D, E, calcium, iodine, iron (in women), zinc	PUFA, ALA, vitamin C, folate, magnesium
Meat-eaters	fiber, PUFA, ALA (in men), vitamins D, E, folate, calcium, magnesium	protein, niacin, vitamin B12, zinc



Systematic Review

Nutrient Intake and Status in Adults Consuming Plant-Based Diets Compared to Meat-Eaters: A Systematic Review

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Calcium indtag var ens, men status var dårligere hos veg (målt på PTH og knoglemarkører)

Jern indtag højere, men status var dårligere hos veg. I 4 studier fandt man jernmangel hos X= 7% i kødspisere; 11% vegetarer og 15% veganere. Anæmi forekomsten var 5% hos kødspisere; 11% hos vegetarer og 17% veganere

Zink indtag var ens, men status var dårligere hos veg.

Zink mangel var 13% i kødspisere, 14% i vegetarer og 30% i veganere

Jod indtag og status lavere hos veganere og vegetarer

Totalt 141 studier

Neufingerl N, Eilander A. Nutrient Intake and Status in Adults Consuming Plant-Based Diets Compared to Meat-Eaters: A Systematic Review. *Nutrients*. 2021 Dec 23;14(1):29. doi: 10.3390/nu14010029. PMID: 35010904; PMCID: PMC8746448.

The NuEva study – a non-randomised intervention study

N=172 (72% kvinder), alder 18-69 år

40 meat-eaters

47 flexitarians (meat 1-2 d/w)

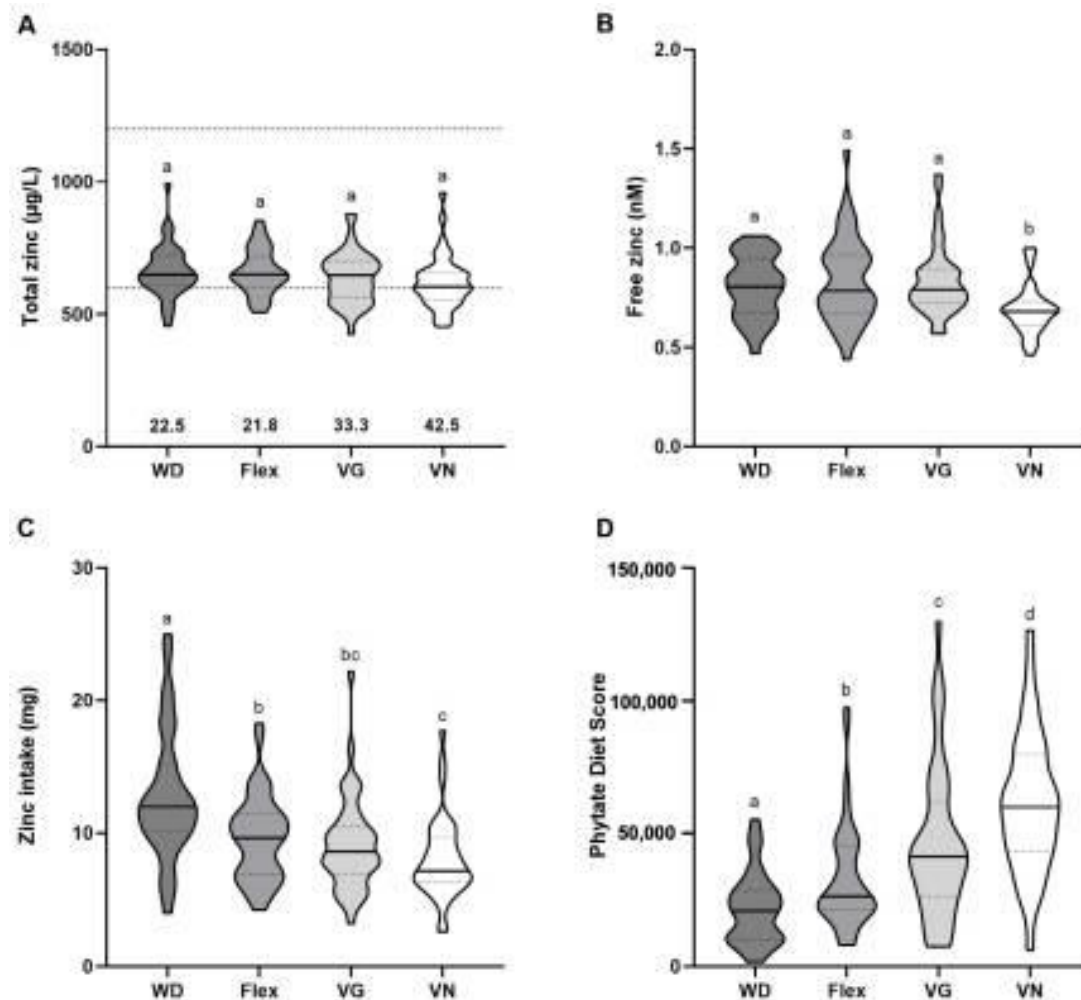
45 vegetarians

40 vegans

Followed an individual, but nutrient-optimised diet for 1 year

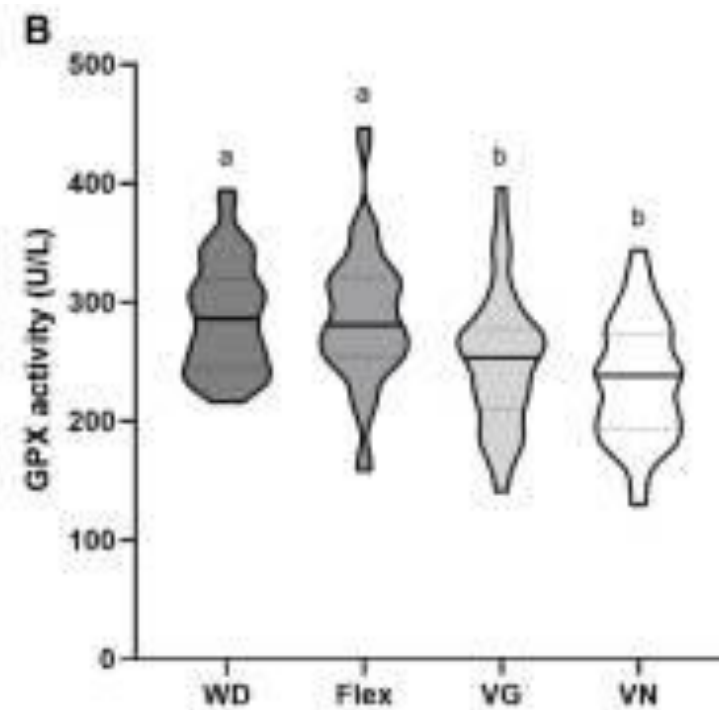
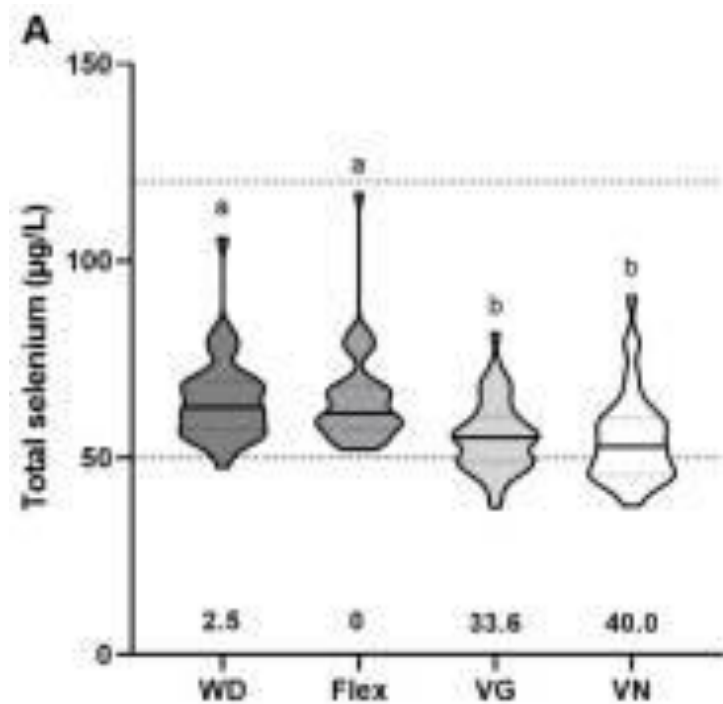
1. Adequate amounts of energy derived from carbohydrates, protein, and fat
2. Defined intake of fatty acids
3. Encouraged consumption of vegetables, fruits, and cereals;
4. Intake of >40 g dietary fiber per day
5. Maximum of 6 g salt per day and maximum of 50 g sugar per day
6. Reduced intake of highly processed, calorie-rich, low-nutrient foods (fast foods, convenience products);
7. Optimized intake of vitamins, minerals, and trace elements by commercially available foods, considering the seasonal availability of vegetables and fruits.

Zink indtag og status (NuEva study)



Klein L, Dawczynski C, Schwarz M, Mares M, Kipp K, Haase H, Kipp AP. Selenium, Zinc, and Copper Status of Vegetarians and Vegans in Comparison to Omnivores in the Nutritional Evaluation (NuEva) Study. *Nutrients*. 2023 Aug 11;15(16):3538. doi: 10.3390/nu15163538. PMID: 37630729; PMCID: PMC10459941.

Selen status (NuEva study)



NuEva resultat

- Zink status og selen status var dårligere hos veganere
- Kobber status ens

Faktorer der påvirker biotilgængelighed af mikronæringsstoffer

Kostfaktorer:

Indtaget mængde

Kemisk form

Hæmmere og fremmere i kosten (andre næringsstoffer, anti-næringsstoffer)

Forarbejdning/tilberedning

Medicin

Værtsfaktorer:

Ernæringsstatus

Fysiologisk status (vækst, graviditet etc.)

Sygdomme

Livsstil

Plant-based protein = protein-rich plant seeds

Plant seeds are packed with 'anti-nutrients':

Plant seeds defence mechanisms

– do not eat me!



Alkaloids

Amylase inhibitor

$M_w < 60$ kDa

Cyanogenic glycosides/galactosides

$M_w \approx 0.5$ kDa

Haemagglutinins/Lectins

$M_w \approx 120$ kDa

Oxalates

$M_w \approx 0.09$ kDa

Phytic acid/Phytates

$M_w \approx 0.6$ kDa

Protease inhibitor

$M_w < 50$ kDa

Saponins

$M_w \approx 0.9$ kDa

Tannins

$M_w > 0.5$ kDa

Seeds are planted to germinate,

not to be eaten

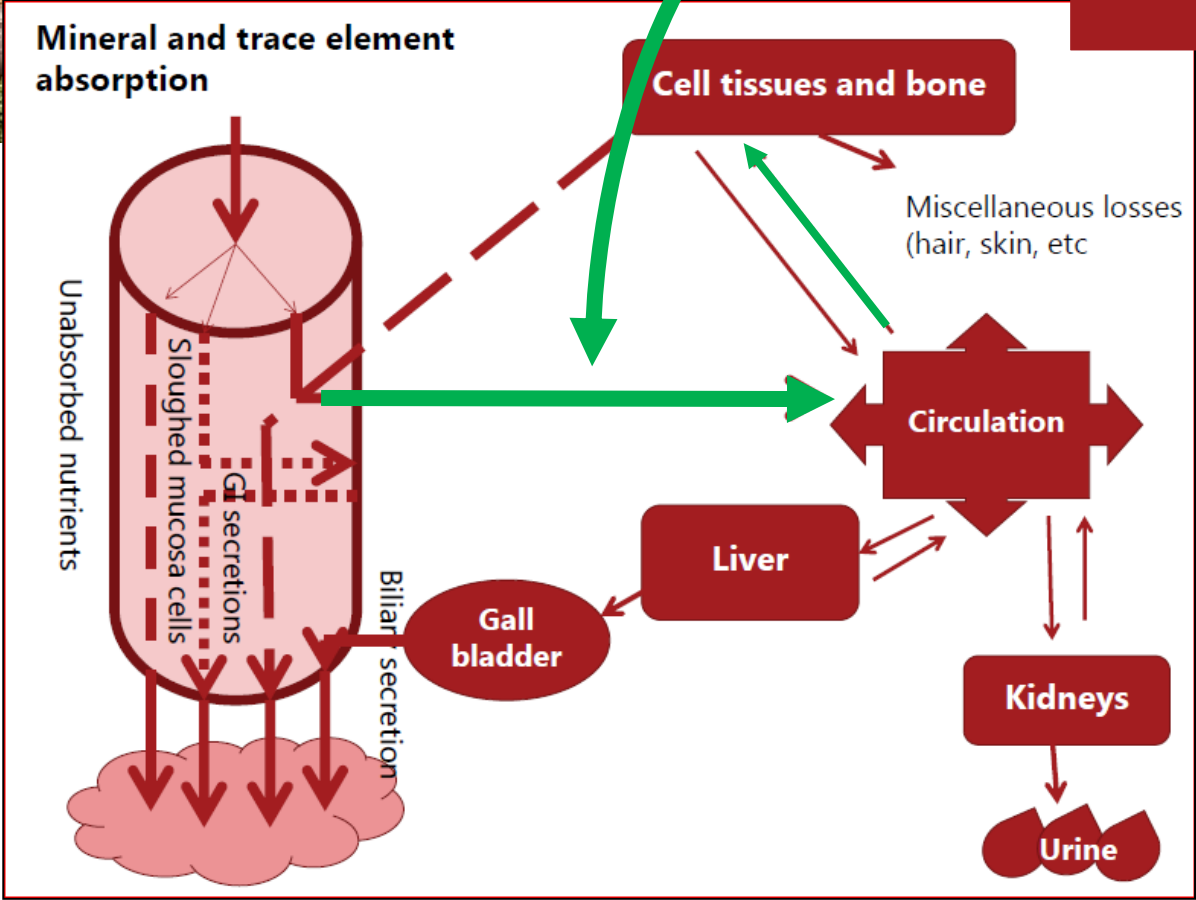


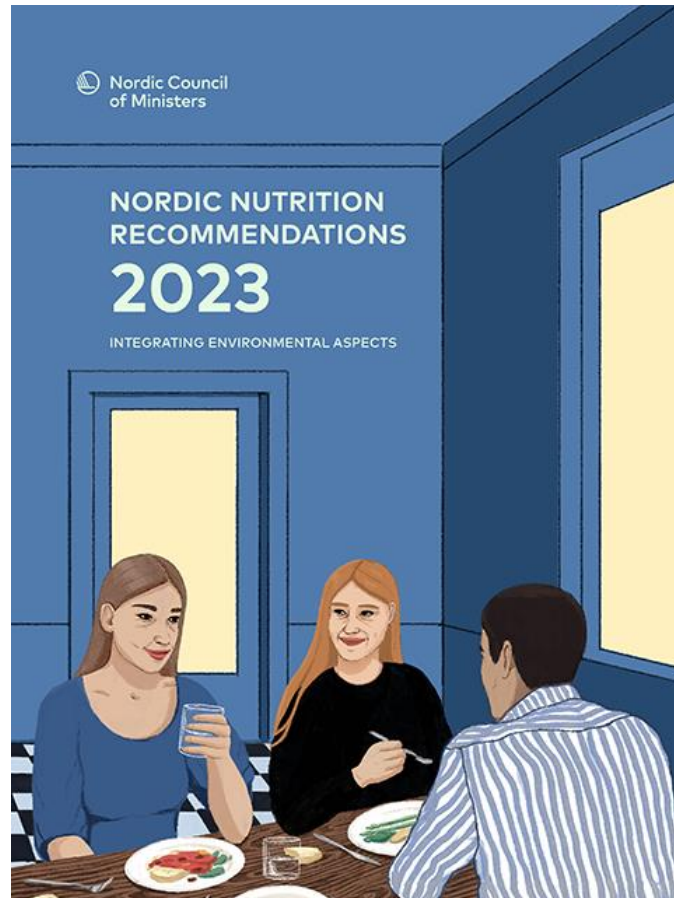
Amin et al (2022) ACS Food
Sci. Technol. 2022, 2, 604–612

Biotilgængelighed af næringsstoffer



Biotilgængelighed
Calcium 20-40%
Jern 14-18% fra mix diet
Jern 5-12% fra veg diet
Zink 20-40%





Behov: 7-9 for mænd og kvinder
Anbefalet indtag 9 og 15 mg/d for mænd og kvinder

Baseret på en blandet kost

Main data gaps... How to minimize the risk of iron deficiency in populations shifting to vegetarian diet"

"

Table 40

The recommended nutrient intakes for iron based on varying dietary iron bio-availabilities

Group	Age (years)	Mean Body weight (kg)	Recommended Nutrient Intake ^a (mg/day)			
			% Dietary Iron Bio-availability			
			15	12	10	5
Children	0.5–1	9	[6.2] ^b	[7.7] ^b	[9.3] ^b	[18.6] ^b
	1–3	13.3	3.9	4.8	5.8	11.6
	4–6	19.2	4.2	5.3	6.3	12.6
	7–10	28.1	5.9	7.4	8.9	17.8
Males	11–14	45	9.7	12.2	14.6	29.2
	15–17	64.4	12.5	15.7	18.8	37.6
	18+	75	9.1	11.4	13.7	27.4
Females	11–14 ^c	46.1	9.3	11.7	14	28
	11–14	46.1	21.8	27.7	32.7	65.4
	15–17	56.4	20.7	25.8	31	62
	18+	62	19.6	24.5	29.4	58.8
Post-menopausal		62	7.5	9.4	11.3	22.6
Lactating		62	10	12.5	15	30

^aBased in part on a 1988 report from the FAO/WHO (8) and in part on new calculations of the distribution of iron requirements in menstruating women. Because of the very skewed distribution of iron requirements in these women, dietary iron requirements are calculated for four levels of dietary iron bio-availability.

^bBio-availability of dietary iron during this period varies greatly.

^cNon-menstruating.

Human Vitamin and Mineral Requirements

Report of a joint FAO/WHO expert consultation Bangkok, Thailand



Food and Agriculture Organization of the United Nations



World Health Organization

Food and Nutrition Division
FAO Rome

2001

Kan vi selv gøre noget for at øge biotilgængeligheden?

Hæmmer optagelse

- Fytinsyre
- Kostfibre
- Oxalat
- Te/kaffe



Øger optagelse

- Askorbinsyre
- Kødprotein
- "kødfaktoren"
- Hævning af brød
- Bageenzymer
- Surdejgsbaging