Switching towards more sustainable eating patterns

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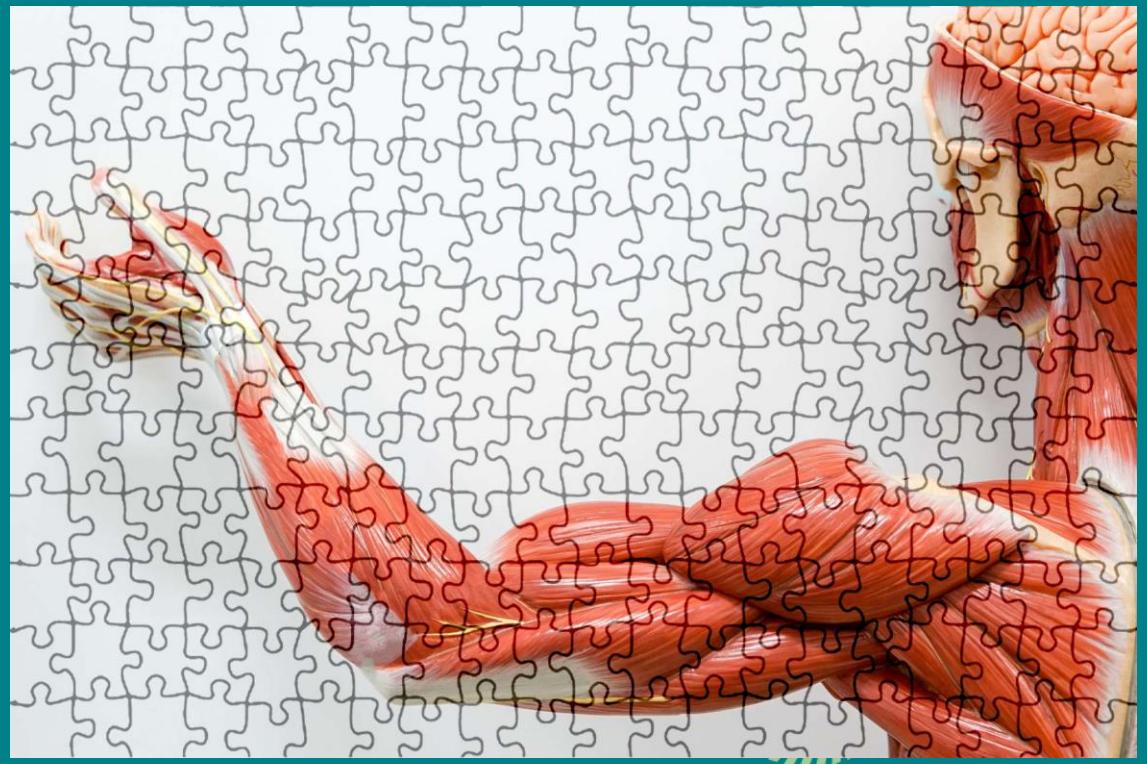


Functions protein in body

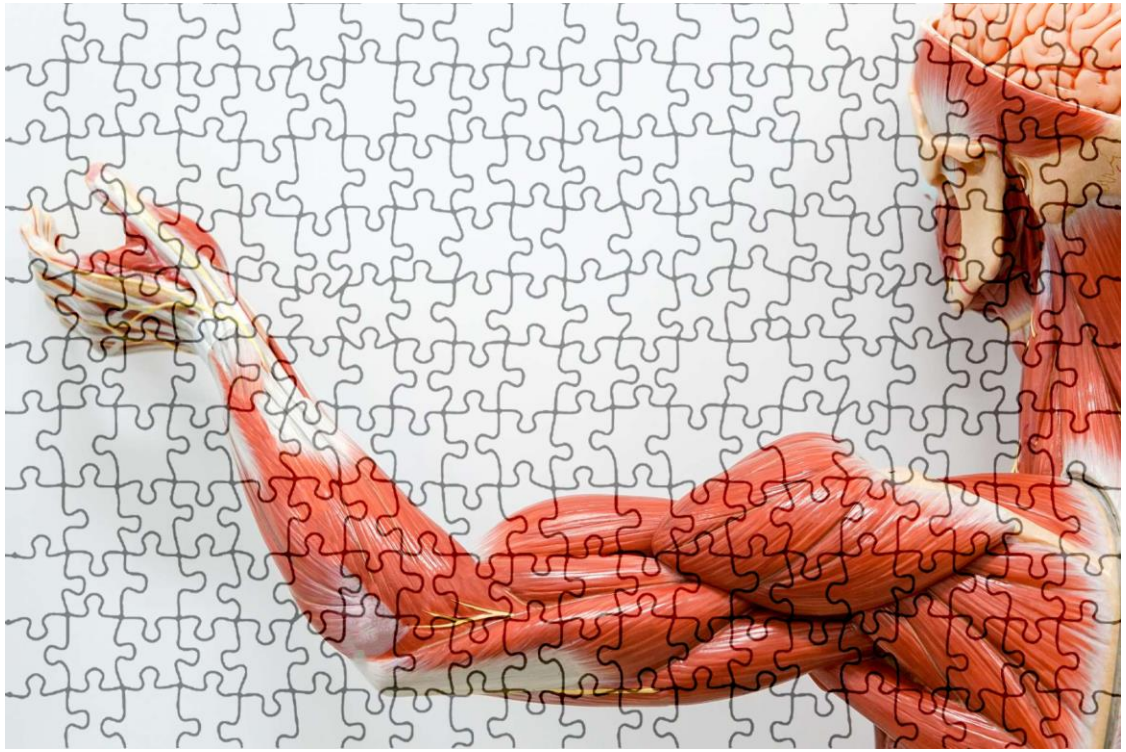
Muscle

Immune system

Blood

Enzymes

Recommendation 0.83 g/kg bw/day



Protein vs. amino acids

Amino acids are building blocks of protein

20 different types of amino acids

9 essential amino acids

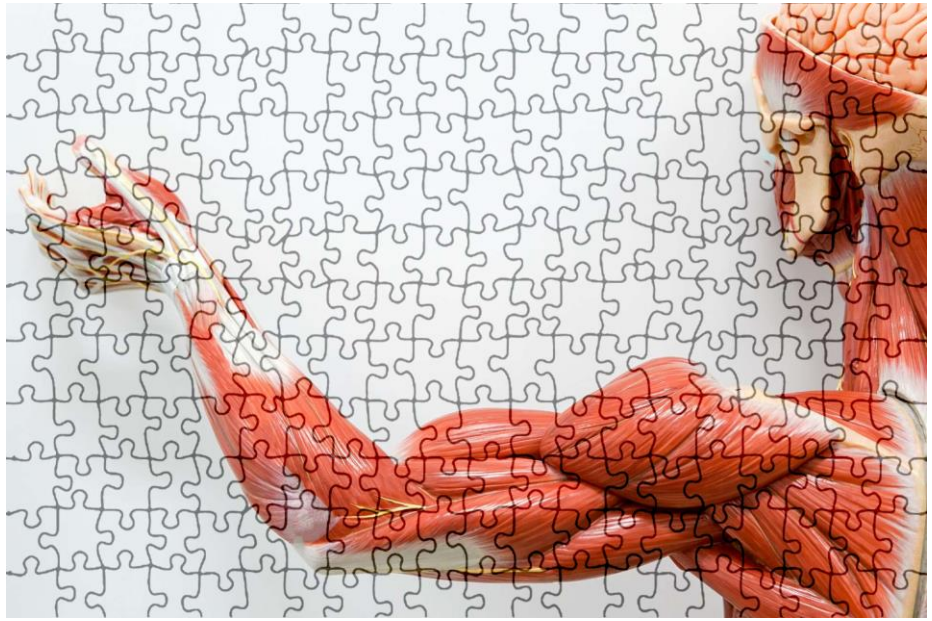
Right composition is needed

Limiting amino acid

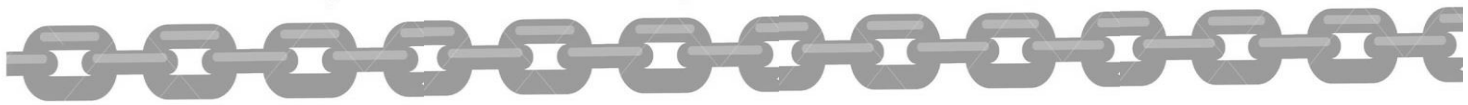
Maximum quality is 100%

Reference protein

Aminozuren	Mg per gram eiwit
Histidine	16
Iso leucine	30
leucine	59
Lysine	45
Methionine + cysteine	22
Phenylalanine + tyrosine	38
Threonine	23
Tryptophan	6
Valine	39

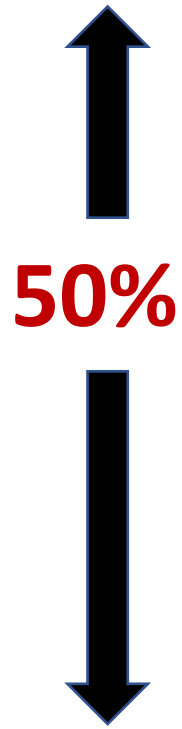


De zwakste schakel



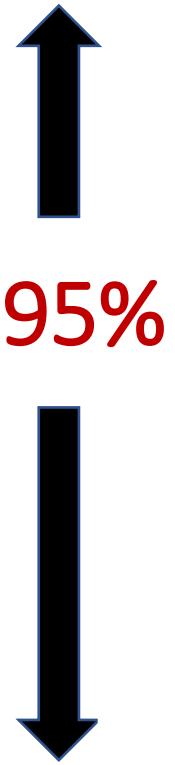
Reference protein

Aminozuren	Referentie	Granen
Histidine	16	21
Iso leucine	30	34
Leucine	59	69
Lysine	45	**23**
Methionine + cysteine	22	36
Phenylalanine + tyrosine	38	77
Threonine	23	28
Tryptophan	6	10
Valine	39	36



Reference protein

Aminozuren	Referentie	Granen	Kidneybonen
Histidine	16	21	27
Iso leucine	30	34	45
Leucine	59	69	77
Lysine	45	**23**	68
Methionine + cysteine	22	36	**21**
Phenylalanine + tyrosine	38	77	62
Threonine	23	28	39
Tryptophan	6	10	11
Valine	39	36	48



95%

Protein quality in food

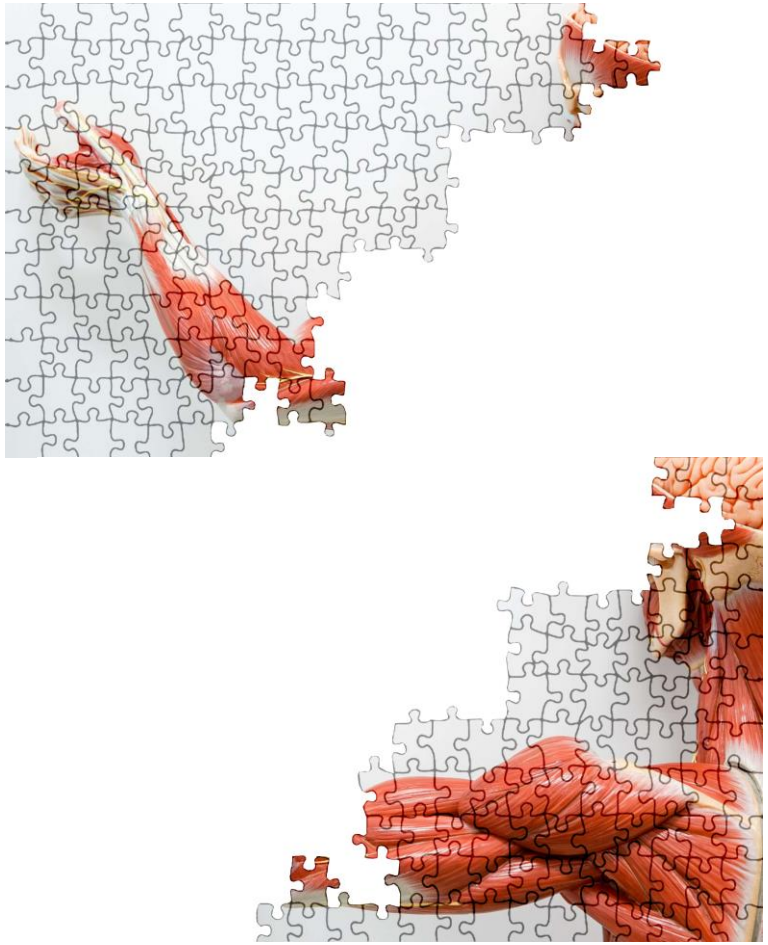
Animal-based protein

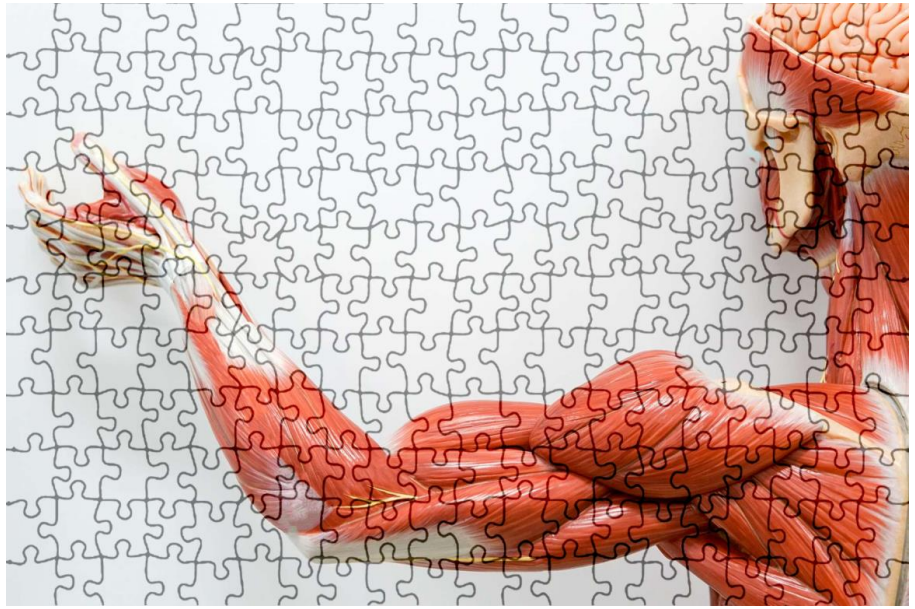
- High quality
- Surplus of most essential amino acids
- Good digestibility (>90%)

Plant-based protein

- Most low quality (exception soy)
- Main source in Western eating pattern is cereals
- Cereals: low in lysine, high in methionine. Relatively high digestibility (~80-90%)
- Legumes: low in methionine, high in lysine. Poor digestibility (~65-80%)

Protein puzzle: combinations within meals





Replacing animal-based protein: Loss in both quantity AND quality

Original breakfast

- 4 slices whole wheat bread: 15.4 gram P
- 4 slices chicken filet: 9.4 gram P
- Total protein: 24.8 P
- Utilizable protein: **24.8** gram

Replacement by jam

- 4 slices whole wheat bread : 15.4 gram P
- 4 Portions jam: 0 gram P
- Total protein: 15.4 gram
- Utilizable protein: : **7.3** grar

Replacing animal-based protein: Loss in both quantity AND quality

Original breakfast

- 4 slices whole wheat bread: 15.4 gram P
- 4 slices chicken filet: 9.4 gram P
- Total protein: 24.8 P
- Utilizable protein: **24.8** gram

Replacement by jam and milk

- 4 slices whole wheat bread : 15.4 gram P
- 4 Portions jam: 0 gram P
- 1 Glas milk: 7.1 gram P
- Total protein : 22.5 gram
- Utilizable protein: **20.0** gram

Replacing animal-based protein: Loss in both quantity AND quality

Original breakfast

- 4 slices whole wheat bread: 15.4 gram P
- 4 slices chicken filet: 9.4 gram P
- Total protein: 24.8 P
- Utilizable protein: **24.8** gram

Replacement by hummus

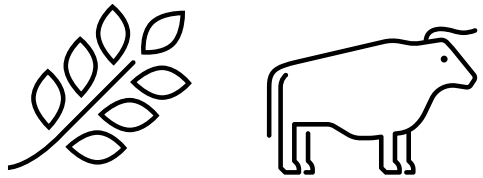
- 4 slices whole wheat bread : 15.4 gram P
- 4 Portions hummus: 4.6 gram P
- Totaal protein: 20.0 gram
- Utilizable protein : **12.3** gram

Replacing animal-based protein: Loss in both quantity AND quality

	Chicken filet	Jam	Milk	Hummus
Total protein gram	24.8	15.4	22.5	20.0
Utilizable protein gram	24.8	7.3	20.0	12.3
Protein quality	100%	47.4%	88.9%	61.5%

Is this feasible in older adults?

Wat eet Nederland: ouderen 65+



- 40% van het vlees vervangen (40 / 60)
- 80% van het vlees vervangen (50 / 50)
- Geen vlees, wel vis (50 / 50)
- Vegetarisch (60 / 40)
- Veganistisch (99 / 1)

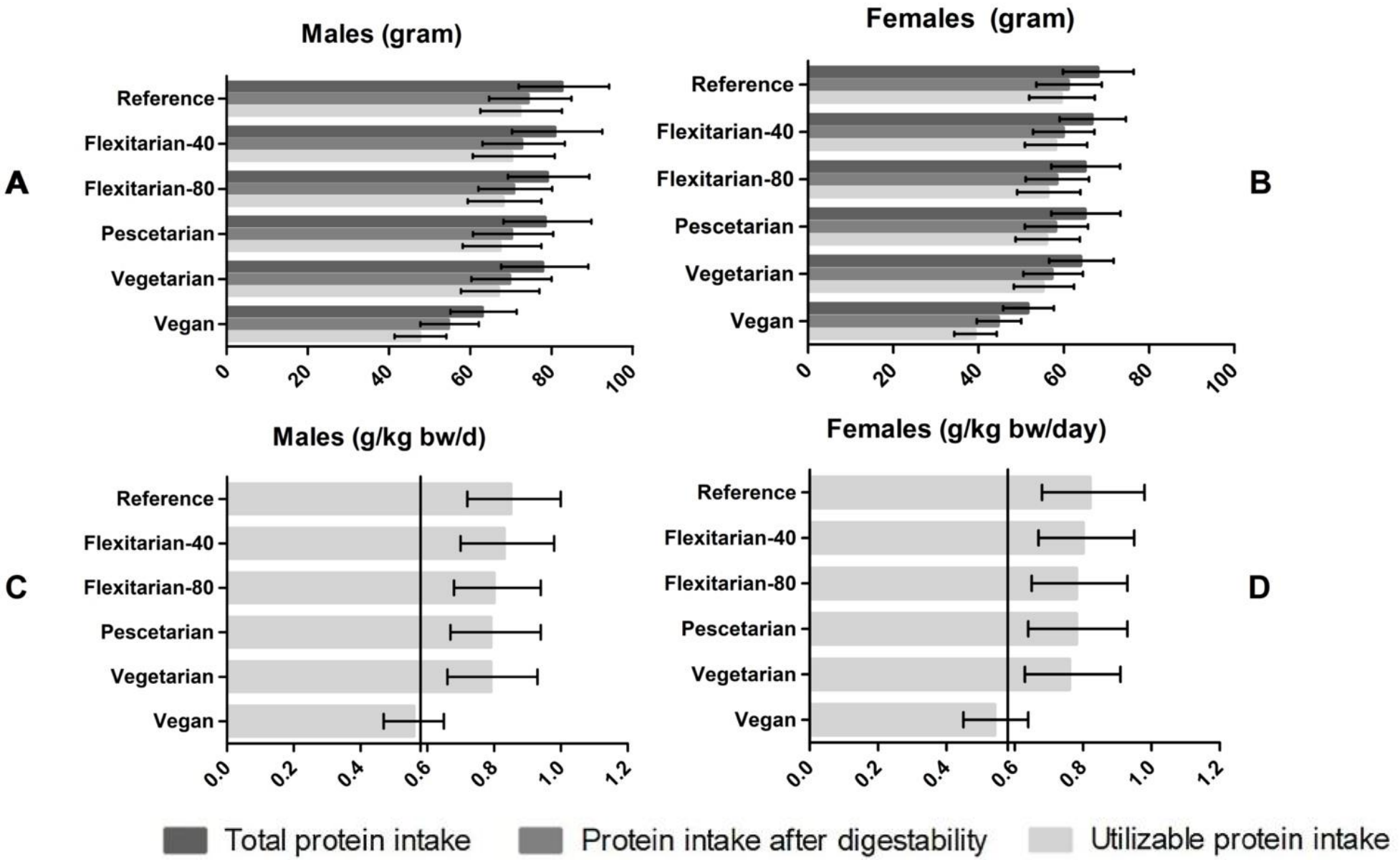
Simulation study on DNFCS: >65 years

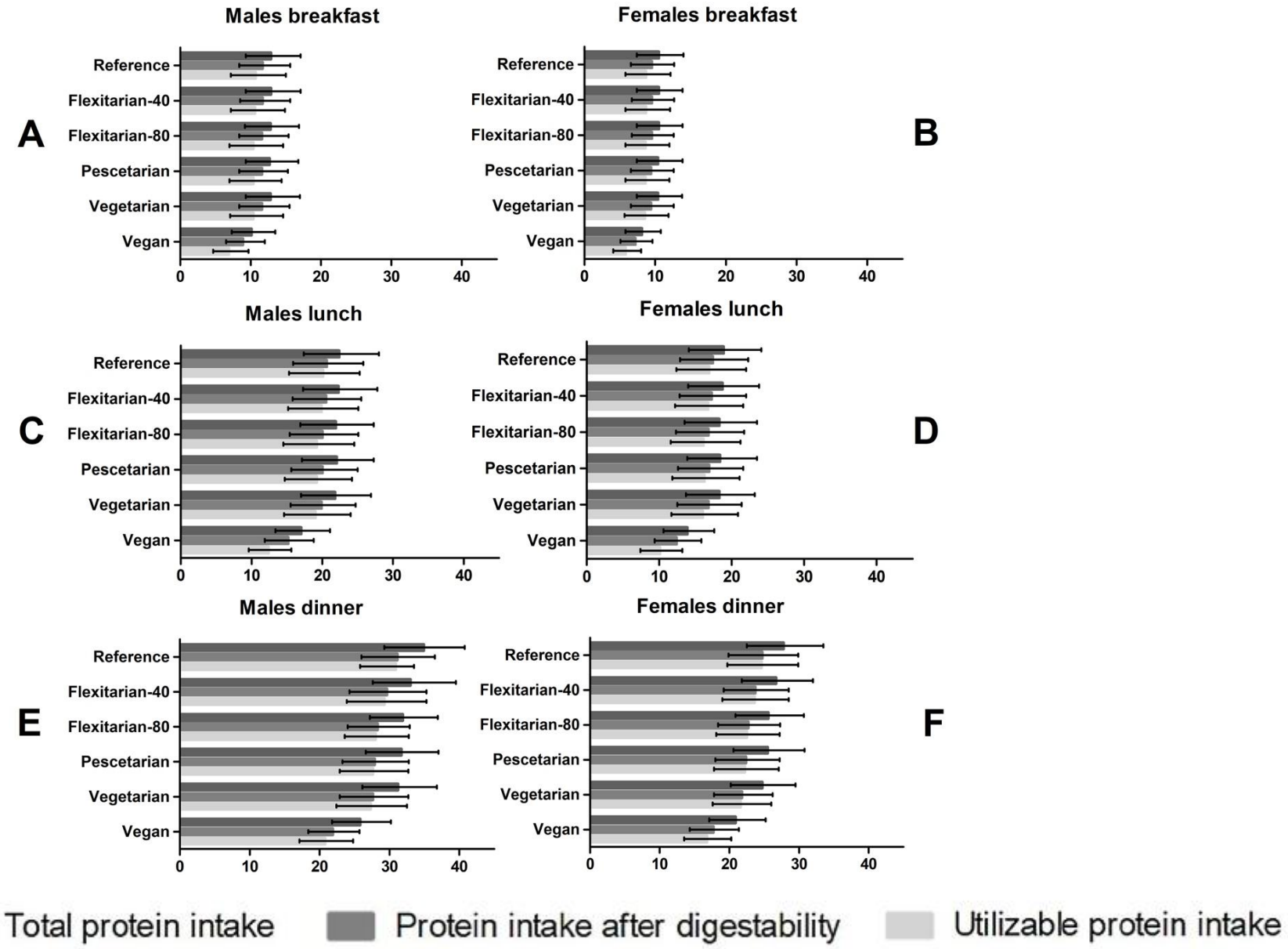
- ~ 600 participants
- ~50% men
- Community-dwelling
- 2-day food dairy

- Replacement of products (gram for gram)
- Flexitarian, Pescetarian, Vegetarian and Vegan scenarios
- Calculation based on **amino acid score** and **digestibility**

Examples of replacements (up to 12 per category)

	Vegetarisch	**Vegan**
Cheese		Vegan sandwich spread Hummus Vegan sausage
Meat (on bread)	Peanut butter Egg salad Cheese	Peanut butter Vegetarisch meat replacement Hummus
Meat/fish (dinner)	Valess schnitzel (melk basis) Vegetarian minced meat/burger/ schnitzel	Vegetarian minced meat/burger/ schnitzel Soy beans
Milk		Soja custard/yoghurt/drink Cocos milk
Snacks	Falaffal vegetarian (bitter)bal Cheese souffle	Falaffal Vegetarian (bitter)bals


A
Males (gram)
Reference
Flexitarian-40
Flexitarian-80
Pescetarian
Vegetarian
Vegan
0
20
40
60
80
100
B
Females (gram)
Reference
Flexitarian-40
Flexitarian-80
Pescetarian
Vegetarian
Vegan
0
20
40
60
80
100
C
Males (g/kg bw/d)
Reference
Flexitarian-40
Flexitarian-80
Pescetarian
Vegetarian
Vegan
0.0
0.2
0.4
0.6
0.8
1.0
1.2
D
Females (g/kg bw/day)
Reference
Flexitarian-40
Flexitarian-80
Pescetarian
Vegetarian
Vegan
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Total protein intake
Protein intake after digestability
Utilizable protein intake


Males breakfast
Females breakfast
A
B
Males lunch
Females lunch
C
D
Males dinner
Females dinner
E
F
Reference
Flexitarian-40
Flexitarian-80
Pescetarian
Vegetarian
Vegan
0
10
20
30
40
Total protein intake
Protein intake after digestability
Utilizable protein intake

Key-points protein

- Less animal-based protein is feasible in older adults
- Shifting towards 60% plant based (vegetarian scenario) is safe in terms of protein quantity and quality
- Stronger shifts might be a risk as a vegan pattern is unsufficient

Full paper on protein

Contents lists available at ScienceDirect

The Journal of Nutrition, Health and Aging

journal homepage: www.elsevier.com/locate/jnha

Original Article

A vegan dietary pattern is associated with high prevalence of inadequate protein intake in older adults; a simulation study

Jos W. Borkent [a,b,*], Pol Grootswagers [b], Joost Linschooten [c], Annet J.C. Roodenburg [c], Marga Ocké [b,d], Marian A.E. de van der Schueren [a,b]

Micronutrients?

Health Council of the Netherlands: *“Since the current Dutch diet already provides more than enough protein, a decrease in total protein intake would not result in a deficiency for most Dutch people. The Committee advises to keep monitoring the intake of vitamins A, B2 and B12, calcium, iron (in girls and women of childbearing age) and iodine to ensure adequacy.”*

Dia’s met resultaten nog niet beschikbaar voor algemeen gebruik.

Key-points

- Only a small shift is feasible in terms of micronutrient adequacy
- Risks are mainly seen for vitamin A, B-vitamins and zinc
- Iron increases but this is mostly non-haem which has less bio-availability
- Simulations are based on processed foods, different type of vegetarian/vegan eating patterns with more legumes/nuts/vegetables might be more micronutrient adequate

Met dank aan

- Jos Borkent
- Gloria Liliana Mendoza Valbuena
- Pol Grootswagers