

Ernæring til den ældre patient - synergieffekt af fysisk aktivitet



**Bispebjerg
Hospital**



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Ernæring og fysisk aktivitet for ældre

Kulhydrat

45-65%

ca. 30 kcal/kg/dag



Fedt

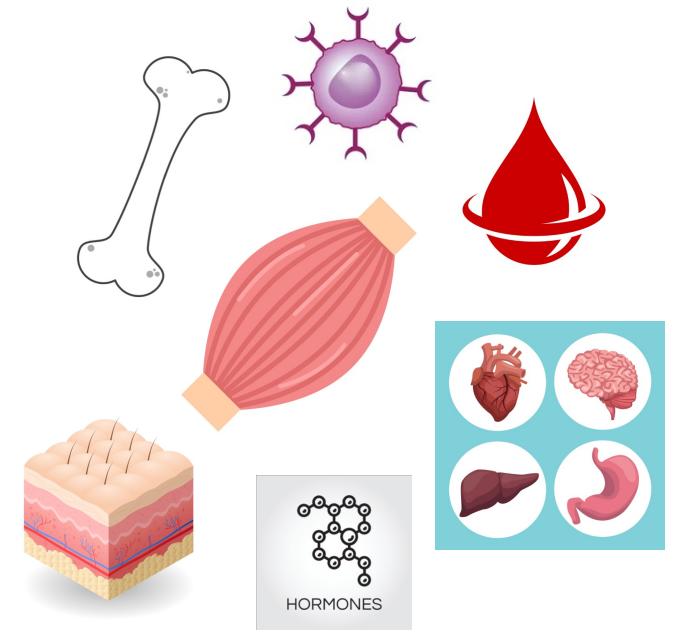
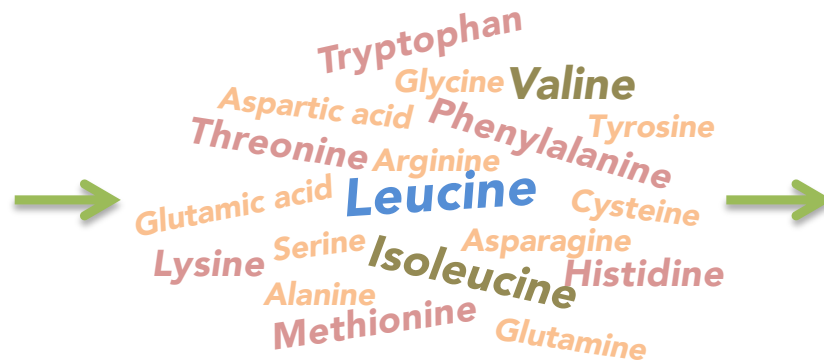
20-35%

Protein

15-20%

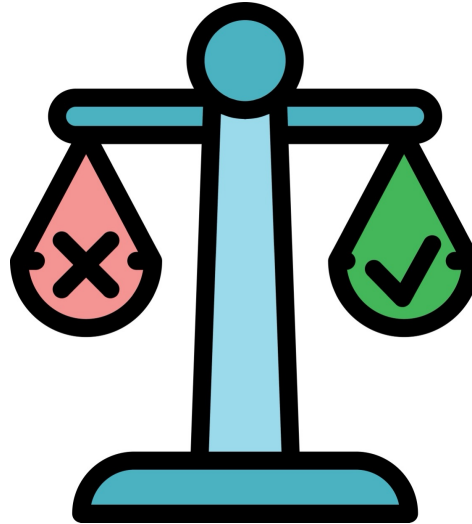
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Hvorfor protein?



Muskel protein nedbrydning

- Sygdom
- Inaktivitet
- Inflammation
- Stress hormoner
-



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Muskel protein syntese

- Fysisk aktivitet og træning
- Protein indtag
- Hormoner
-

Vi vil **MEGET** gerne bibeholde muskelmassen

- Opretholdelse af homeostase
 - Bevægeapparatet – stabilitet og balance
 - Energiomsætning og metabolisme
 - Kropstemperatur
- **Lav muskelmasse, muskelstyrke og funktion er stærkt relateret til øget morbiditet og mortalitet**

Mere og mere vigtigt jo ældre vi bliver

KLINISK RELEVANT!!

Guidelines for dagligt protein indtag

1) WHO: RDA = 0.83 g protein/kg kropsvægt

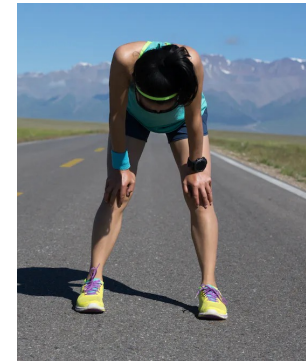
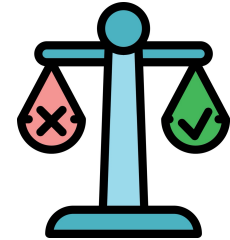
- For at sikre protein-balance

2) ACSM: Atleter: 1.6 (1.2-2.0) g protein/kg kropsvægt

- Metabolisk tilpasninger
- Vævs-reparation og remodelering
- Proteinopbygning

3) NNR: >65 år: 1.2 g protein/kg kropsvægt

- Immunfunktion
- Restitution efter sygdom
- Vævsheling
- Bibeholde muskelmasse



Hvor meget protein spiser vi?

I Danmark er det gennemsnitlige proteinindtag 1.0-1.2 g/kg kropsvægt/dag

Pedersen et al 2015, DTU Fødevareinstituttet – Danskernes kostvaner 2011-2013



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Protein indhold



100 g ærter = 9 g protein



100 g hakkebøf = 18 g protein



100 g kogte linser = 9 g protein



1 æg = 7 g protein



1 glas (2 dl) mælk = 7 g protein



2 dl skyr = 22 g protein
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100 g havregryn = 13 g protein

Så er alt godt eller hvad?

Politik

**Flere ældre dør af fejl- og underernæring:
- De kunne lige så godt have åbnet en
dåse hundemad**

Aktindsigter viser, at pårørende blandt andet
"udkogte og vandede" kartofler, for få grønt
aldrig bliver leveret.

Indland

**Underernærede ældre
kan koste sundheds-
væsnen dyrt**

**Underernæring - et overset
sundhedsproblem**

Underernæring er et problem, som desværre bliver overset på
hospitalet og i ældreplejen. Det er et paradoks. For vi ved, hvad
der virker effektivt.

NYHEDER

**Ny rapport: 77.000 i ældreplejen
lider af underernæring**

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Geriatrisk ældre

Indlagte geriatriske patienter

>70 år, n=143



	During the hospital admission†			
	Protein		Placebo	
	Median	Q1, Q3	Median	Q1, Q3
From the diet‡ (n)		70		74
Protein (g/d)	42	36, 52	42	30, 52
Protein (g/kg§ per d)	0.6	0.5, 0.8	0.6	0.5, 0.8

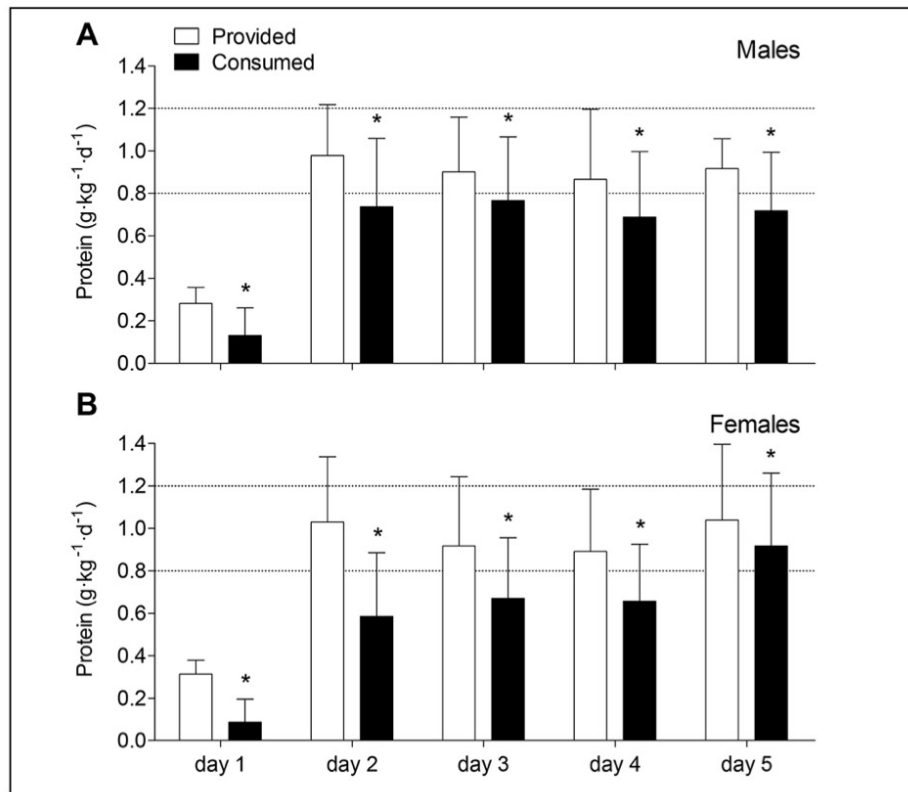
0.6 g protein/kg
kropsvægt!

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Gade et al 2019 – Br J Nutr

Rehabilitering efter operation

Hofte eller knæalloplastik operation



* Indicates a significant difference when compared with provided food, $P < 0.001$

Weijzen et al 2019 - J Nutr Health Aging

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Rehabilitering efter knæalloplastik EAA (20 g) or placebo twice daily

	Placebo Group [*] (N = 20)		EAA Group [*] (N = 19)		
Variable	Baseline	6 Weeks Postop.	Baseline	6 Weeks Postop.	P Value [†]
Quadriceps					
Involved leg	44.81 ± 3.09	38.31 ± 2.39	48.66 ± 3.45	43.87 ± 2.93	0.03 (0.04)
Contralateral leg	49.98 ± 3.05	46.44 ± 2.94	55.49 ± 3.87	54.41 ± 3.65	0.01 (0.02)
Hamstrings					
Involved leg	63.86 ± 3.33	55.93 ± 2.91	69.32 ± 4.05	63.76 ± 3.41	0.04 (0.04)
Contralateral leg	63.64 ± 3.33	58.75 ± 3.05	69.37 ± 4.19	67.50 ± 3.75	0.01 (0.02)

Atrofi af quadriceps- og hamstringmusklerne var signifikant større i placebogruppen end i EAA-gruppen

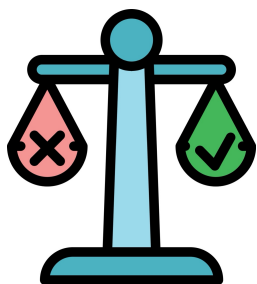
Dreyer et al 2018 - JBJS

”Mere protein til fru. Hansen...”

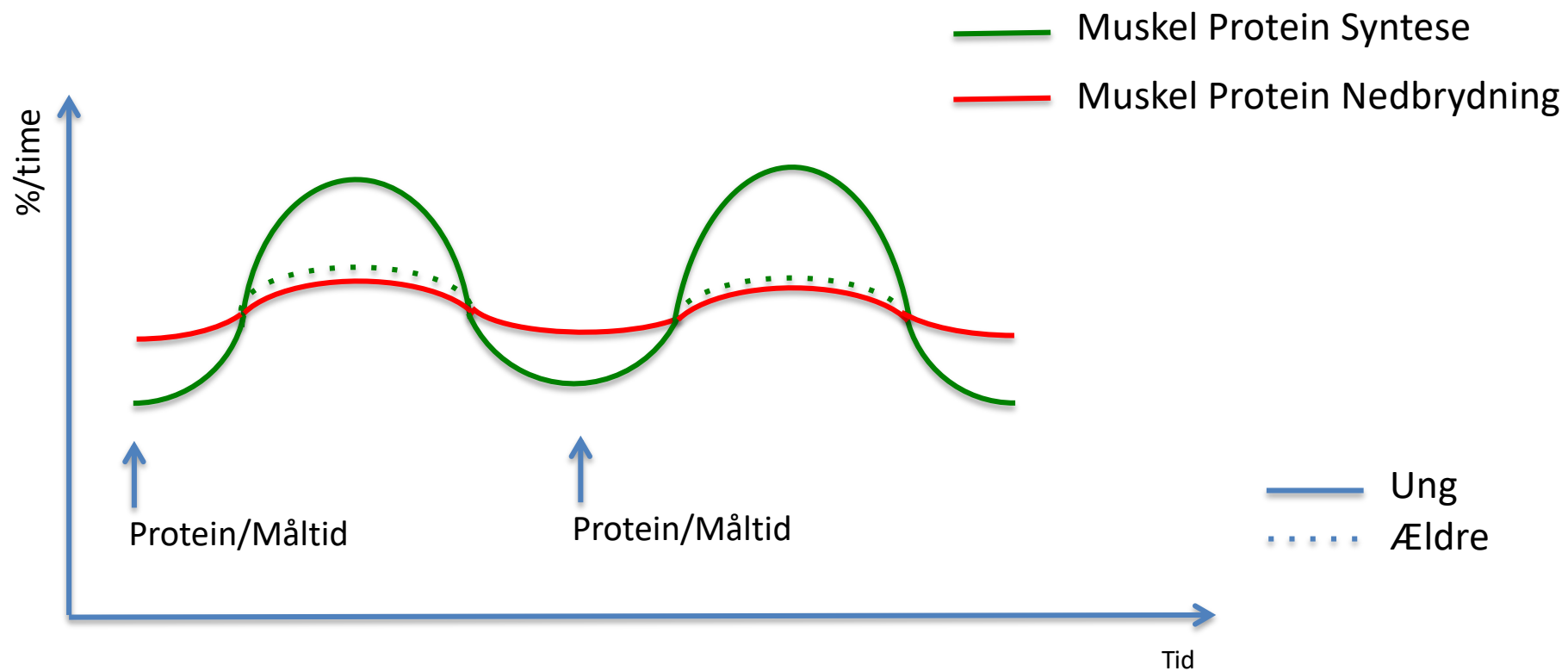


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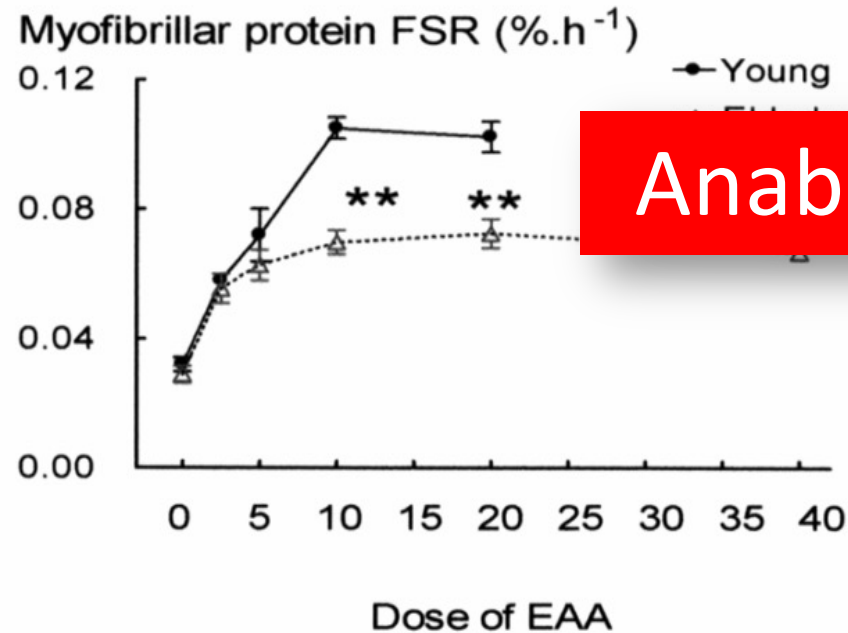




Respons til protein indtag

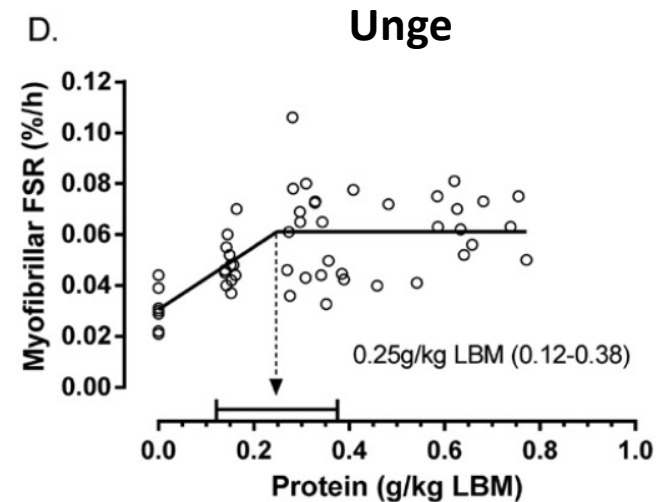
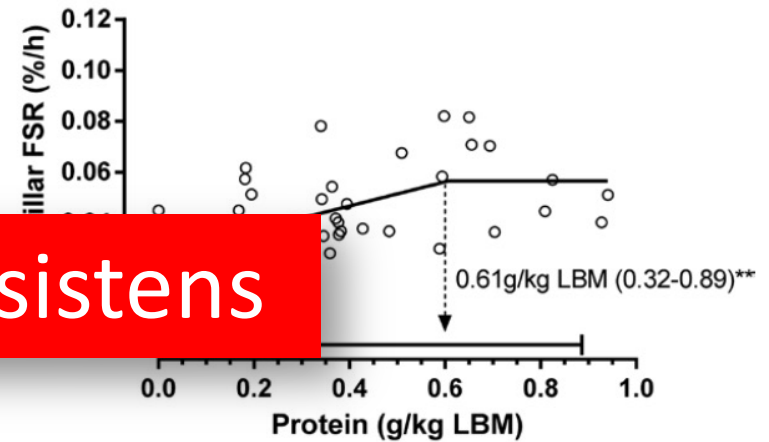


Respons til protein indtag



Cuthbertson et al 2005 FASEB

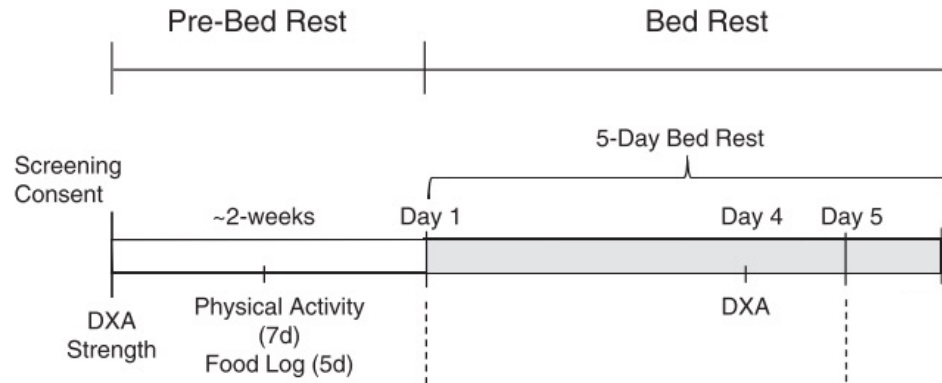
Anabolsk resistens



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Mitchell et al 2014 J Gerontol A Biol Sci Med Sci

Betydningen af inaktivitet

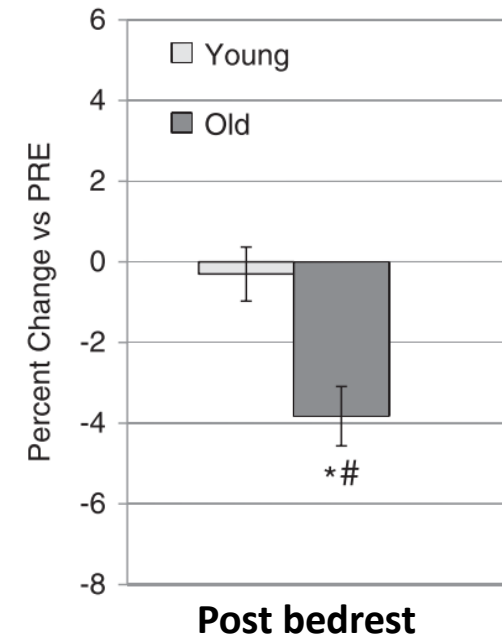


Unge (n=14), 22 ± 1 år

Ældre (n=9), 66 ± 1 år

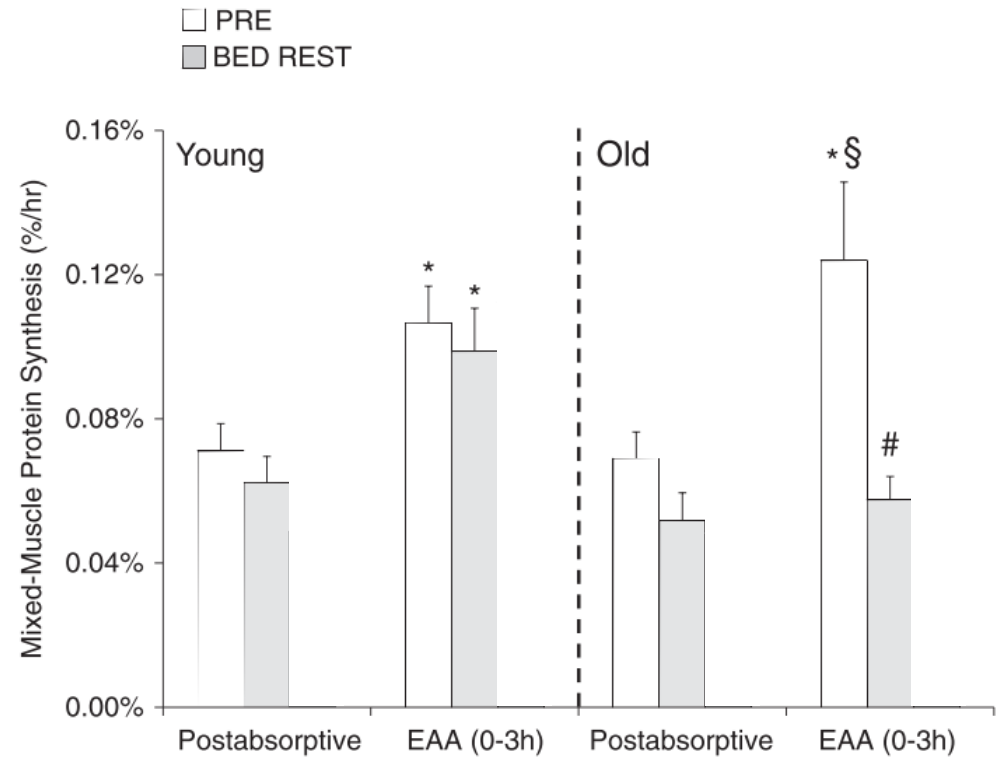
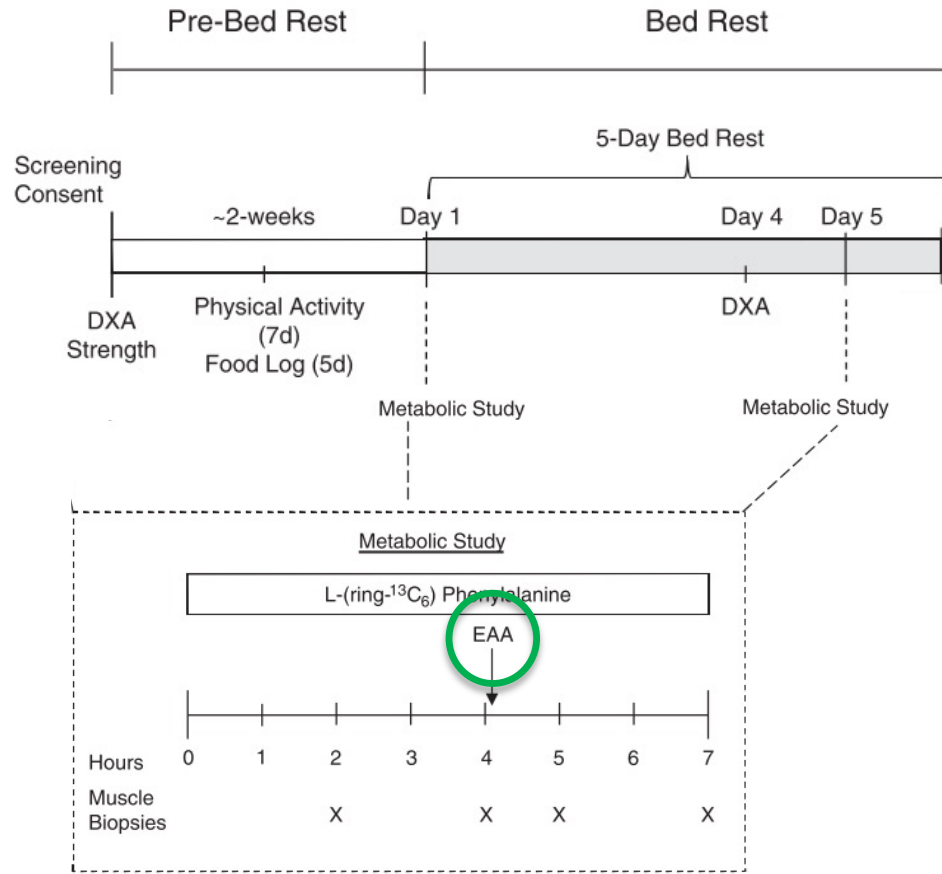


A Fedtfri masse i benene



* forskellig fra før bed rest
forskellig fra unge

Betydningen af inaktivitet



* forskellig fra postabsorptive

§ forskellig fra BED REST

forskellig fra Young ved BED REST

Mere protein til fru. Hansen?

RCT studier med protein/aminosyre intervention under bed rest eller unilateral immobilisering

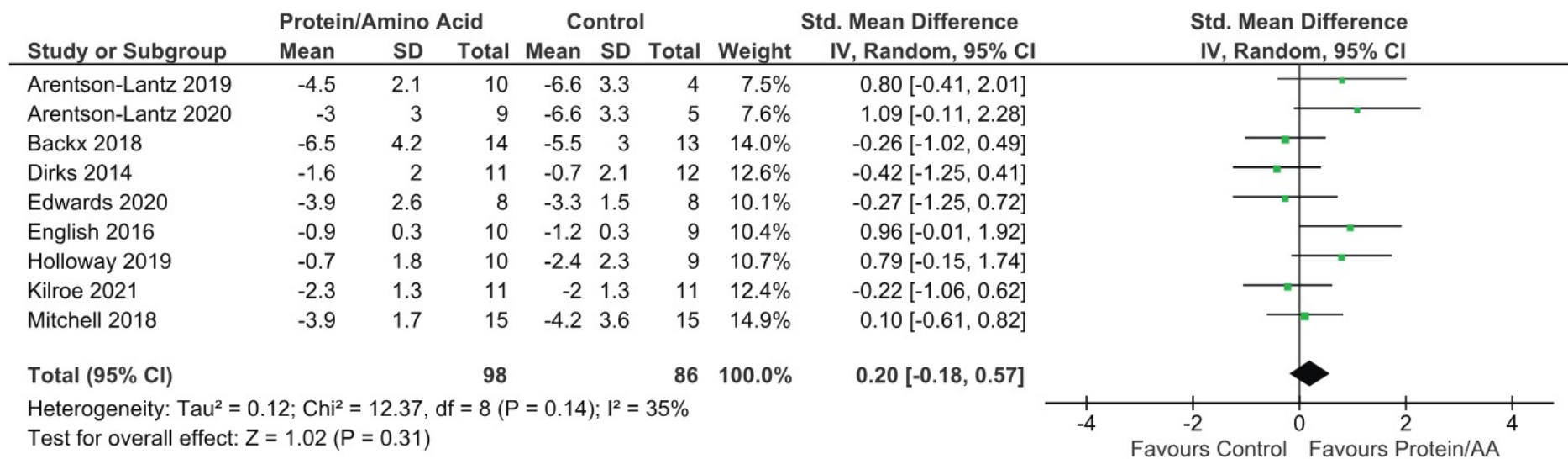
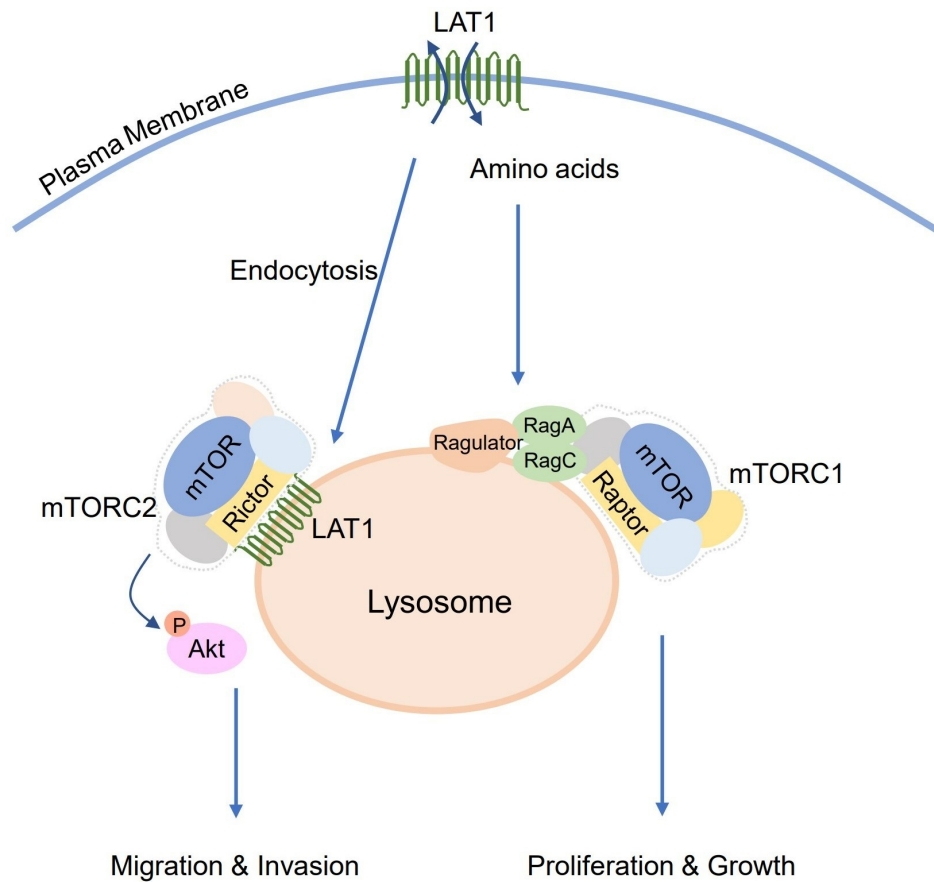


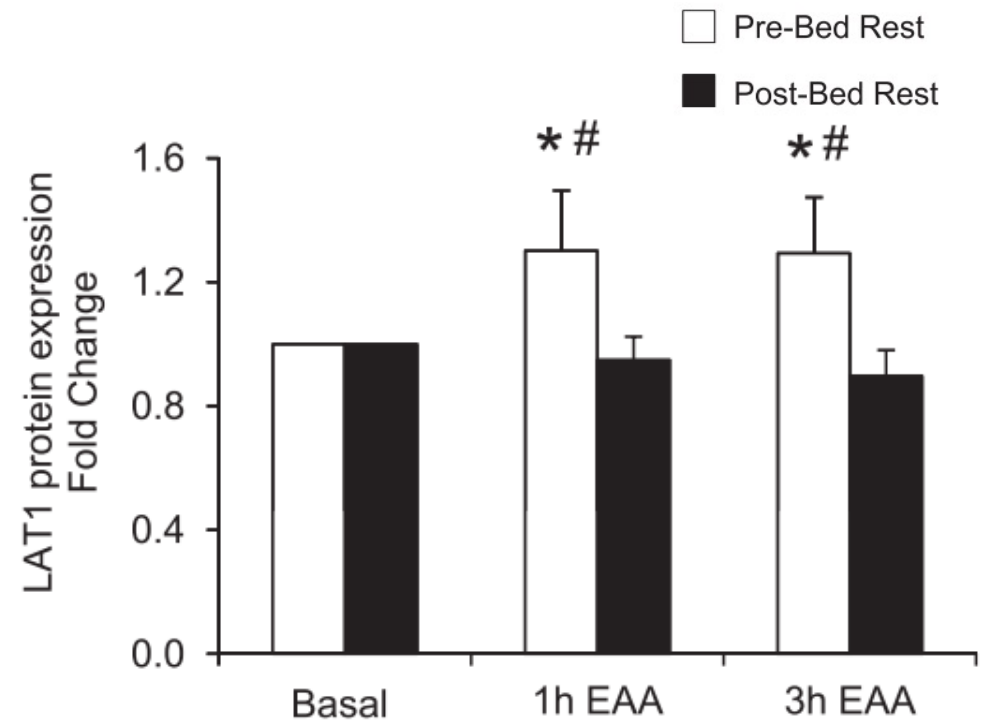
FIGURE 3 Comparison of muscle mass changes (as measured by leg lean mass, muscle cross-sectional area or muscle volume) between the protein/amino acid group and the control group. 'Favours control' indicates that there was a greater loss of muscle mass (as measured by leg lean mass, muscle cross-sectional area or muscle volume) in participants taking the protein supplementation. 'Favours protein/AA' indicates that there was a greater loss of muscle mass (as measured by leg lean mass, muscle cross-sectional area or muscle volume) in participants taking the control supplementation. Abbreviation: AA, amino acid.

Hughes et al. 2024 – Exp Physiol

Aminosyreoptag



7-dages bed rest
Ældre kvinder (n=6), 67 ± 2 år



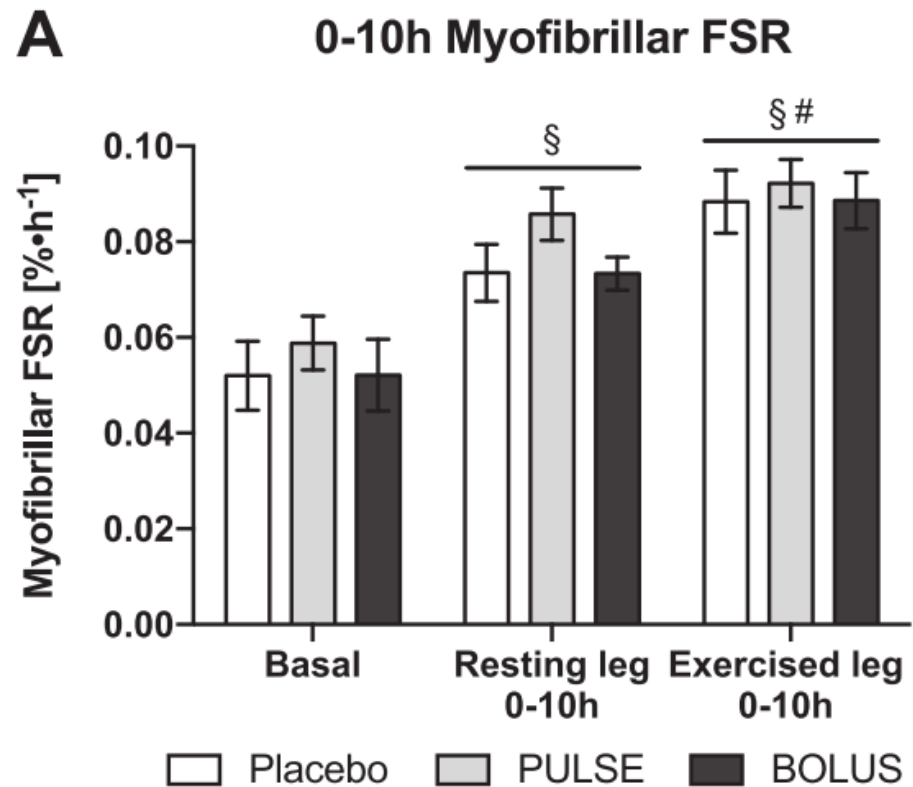
Drummond et al 2013 – Am J Physiol Endocrinol Metab

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Betydningen af fysisk aktivitet

Ældre mænd (n=30), 72.3 ± 4.6 år

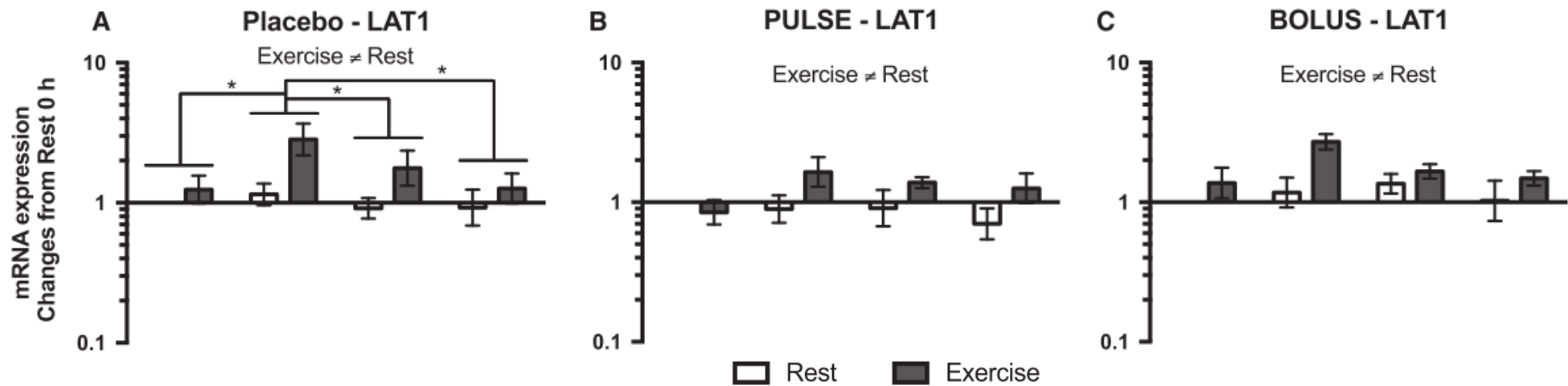
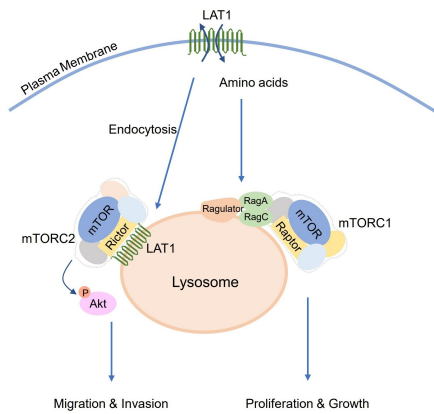
16% 1RM 10 x 36 reps



Agergaard et al 2017 – Am J Physiol Endocrinol Metab

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Betydningen af fysisk aktivitet



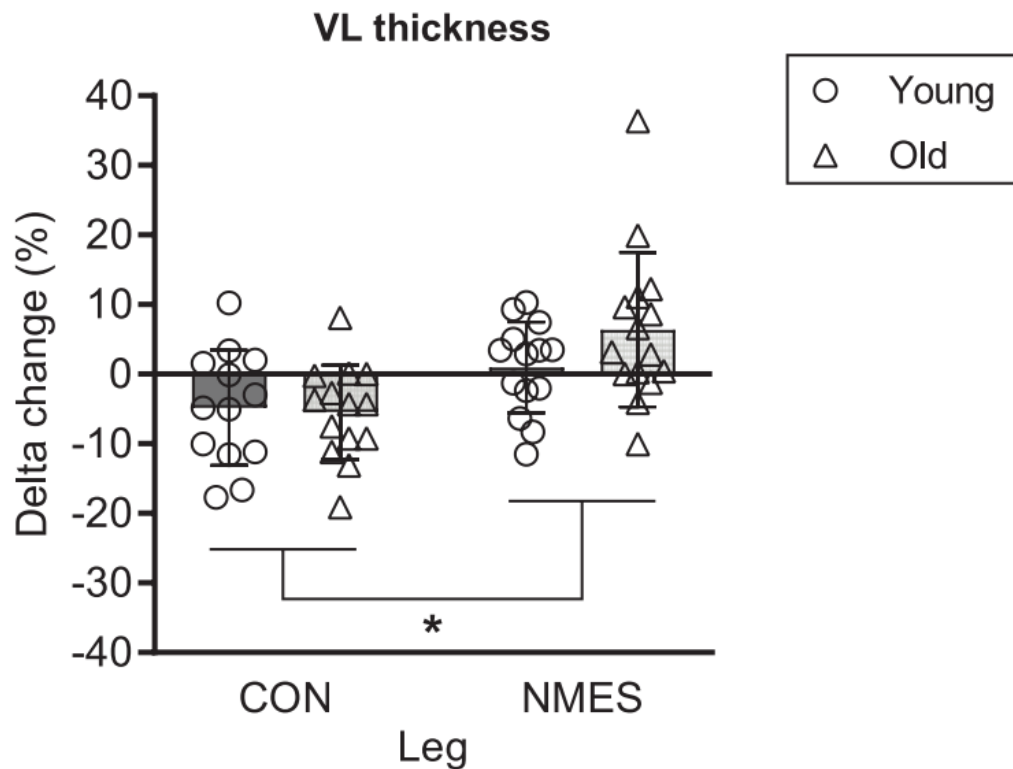
Agergaard et al 2017 – Physiological Reports

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Neuromuskulær elektrisk stimulering

5 days bed rest

Unilateral neuromuskulær stimulering (NMES)



“Større syntese­rate af muskelproteiner i NMES benet i løbet af de 5 dage bed-rest”

Hansen et al 2024 – *Physiological Reports*

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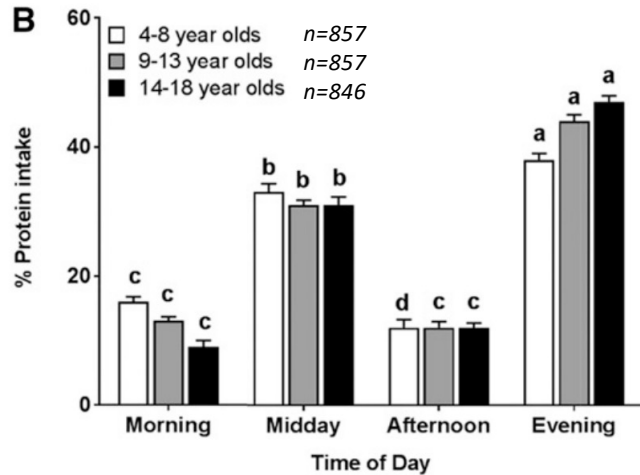
Hansen et al. – *unpublished*

Hvornår skal jeg spise mit protein?



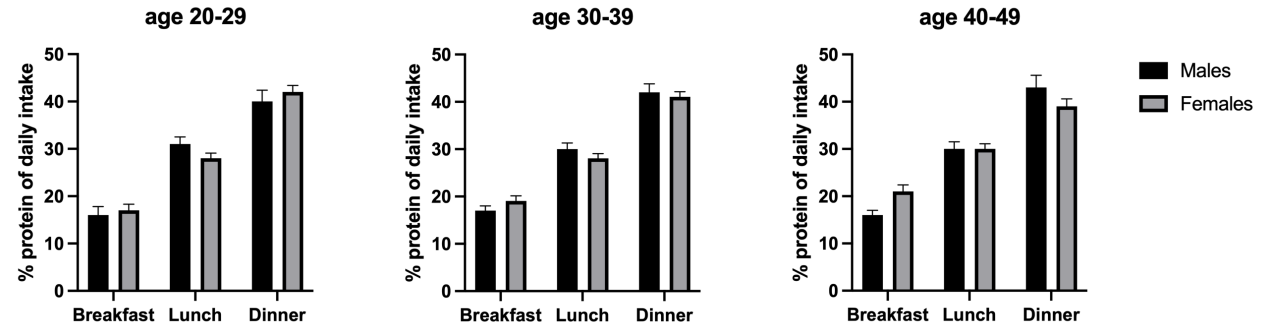
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Fordeling af protein indtag



Mathias et al 2017 – J Nutr

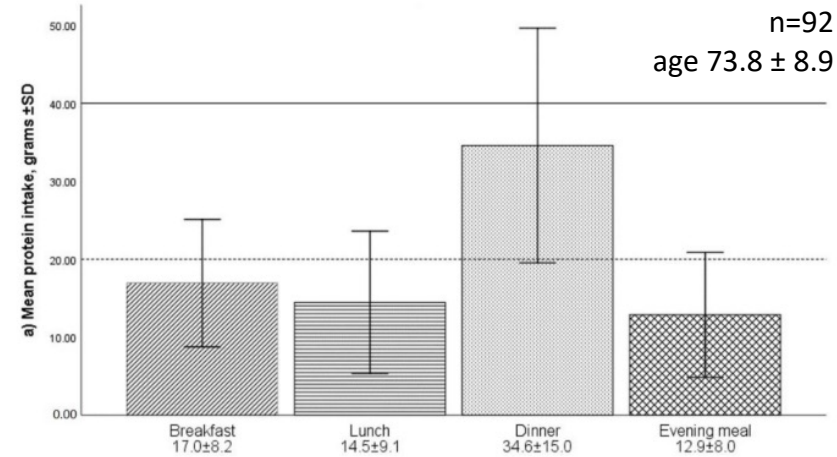
Meal protein distribution



U.S. Department of Agriculture ARS 2018



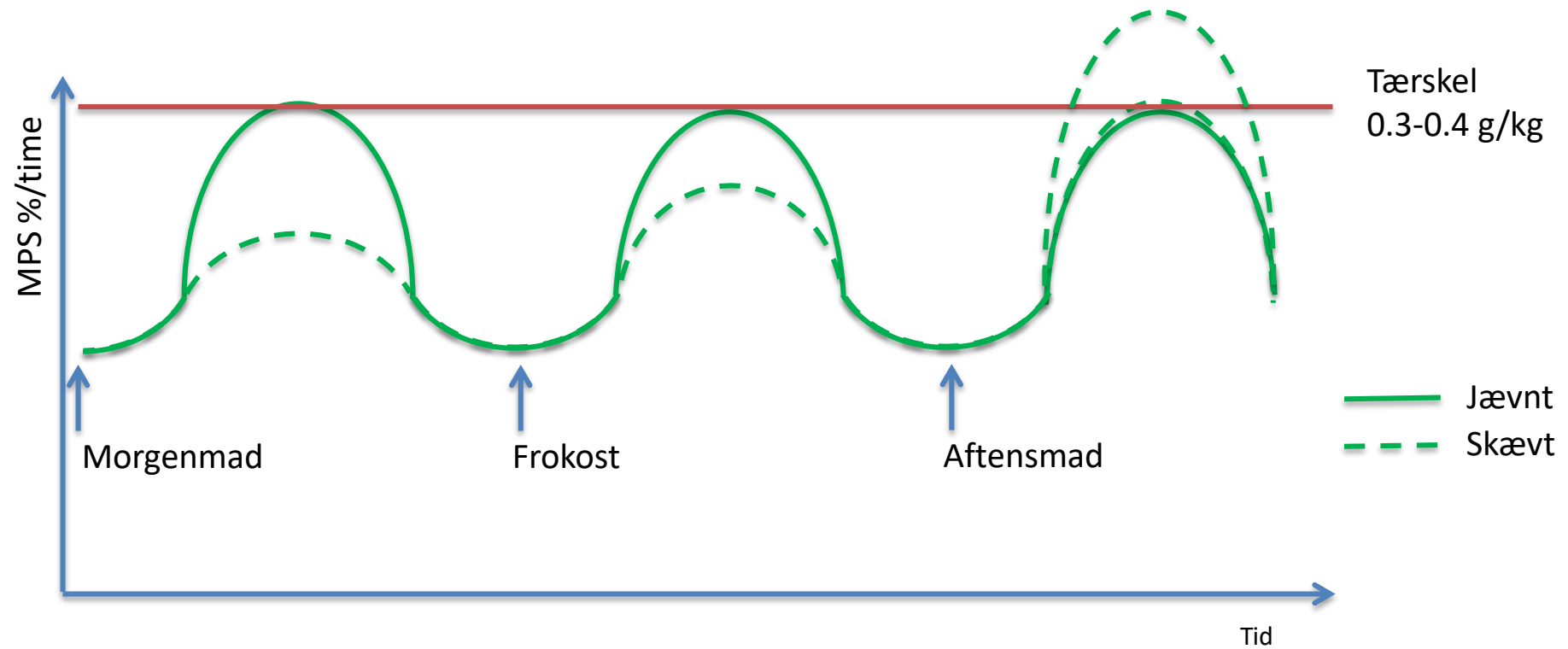
Farsijani et al 2016 – Am J Clin Nutr



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Nygård et al 2020 – Geriatrics

Måltids fordeling



Måltids fordeling

European Journal of Nutrition
<https://doi.org/10.1007/s00394-021-02487-2>

ORIGINAL CONTRIBUTION



Evenness of dietary protein distribution is associated with higher muscle mass but not muscle strength or protein turnover in healthy adults: a systematic review

Simon E. Jespersen¹ · Jakob Agergaard¹

Received: 31 March 2020 / Accepted: 8 January 2021
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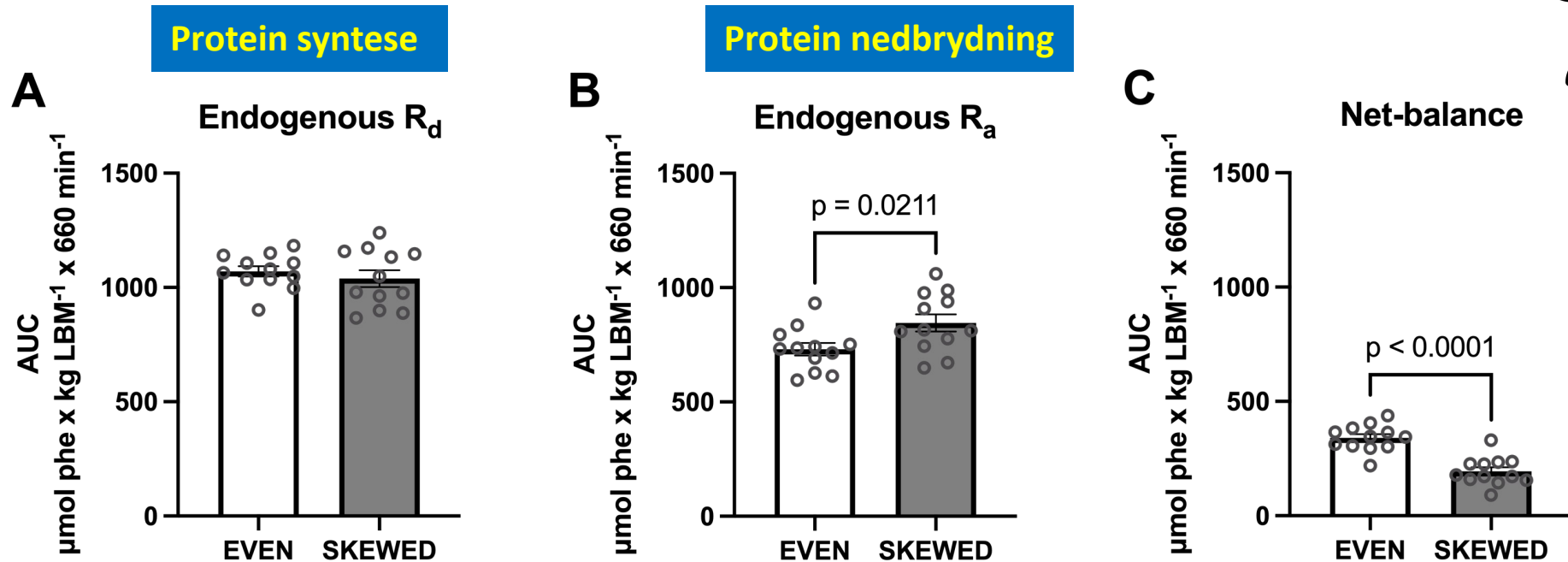
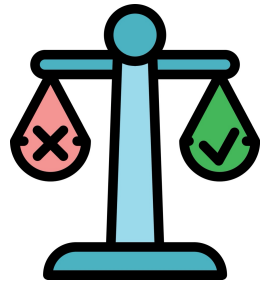
“The strongest association was found for muscle mass although limited to observational evidence. The association between the evenness of protein intake to muscle strength and protein turnover was weak.”

Table 1 Summary of studies by design and outcome

	Muscle mass	Muscle strength	Protein turnover
Cross-sectional studies			
Bollwein et al. [48]		X	
Gingrich et al. [40]	X	X	
Loenneke et al. [41]	X	X	
Mishra et al. [47]		X	
Ten Haaf et al. [49]		X	
Valenzuela et al. [44]	X		
Yasuda et al. [38]	X		
Cohort studies			
Farsijani et al. [43]	X		
Farsijani et al. [46]		X	
Randomised-controlled trials			
Kim et al. [50]			X
Kim et al. [42]	X	X	X
Mamerow et al. [37]			X
Comparative studies			
Arnal et al. [45]	X		X
Arnal et al. [39]			X
Clinical trial			
Arnal et al. [51]			X

EVEN (n=12), 69 ± 4 år
SKEWED (n=12), 70 ± 3 år

Helkrops protein balance



- Immunfunktion
- Restitution efter sygdom
- Vævsheling
- Bibeholde muskelmasse

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Agergaard et al. 2023 Clin Nutr

Take home messages

- Ældre bør indtage cirka 1.2 g protein/kg/dag – dette er opnåeligt gennem en normal kost
- Proteinindtag bør fordeles jævnt gennem dagen via de daglige måltider
- Langt de fleste raske individer får nok protein – men man bør have et **større fokus på ældre, især under indlæggelse og rehabilitering**
- **Et øget fokus på proteinindtag for ældre bør gå hånd-i-hånd med et øget fokus på fysisk aktivitet**