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UNIVERZITA KOMENSKÉHO V BRATISLAVE

Active ageing

The influence of a high protein diet and strength training on the plasma proteome in older adults

Dr. Bernhard “Billy” Franzke

Bratislava 2022

Institut für Remobilisierung und funktionelle Gesundheit
Kaiser Franz Josef Spital

NutriAging

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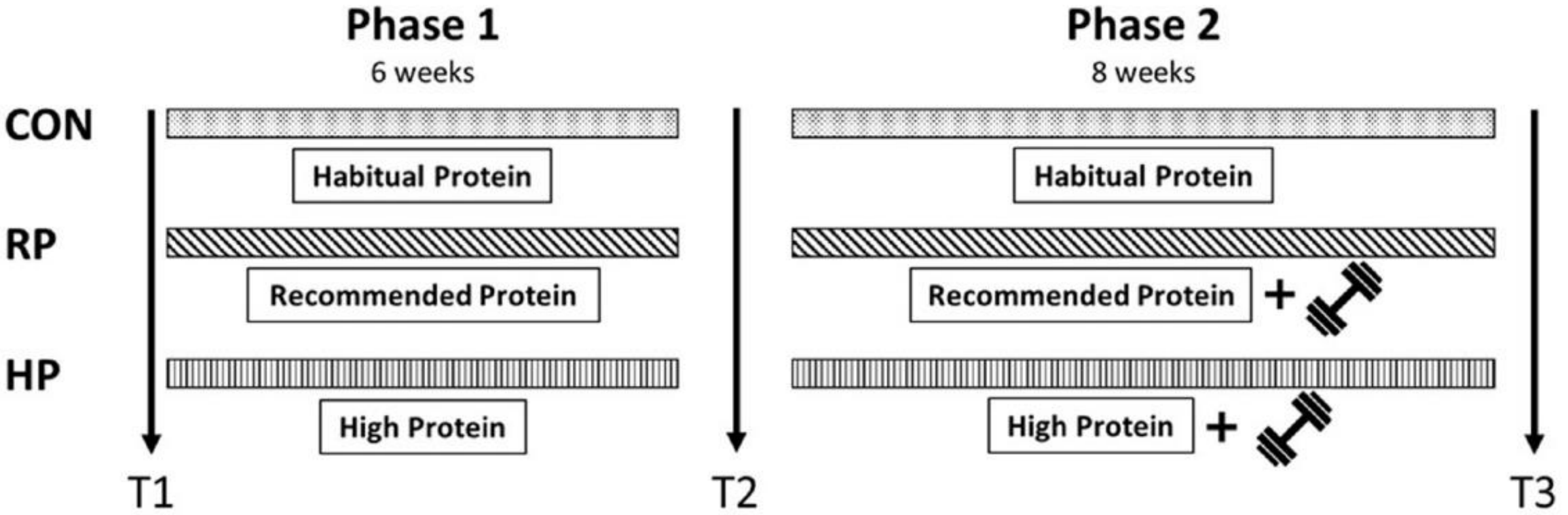
Häuser zum Leben

Study Design – NutriAging Protein Study



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Protein & non-protein sources and products

Company	Protein Products	Control Products
Chiefs	Protein Drink	n.a.
Chiefs	Protein-Pudding	n.a.
NÖM	Fasten Protein Drink	NÖM2Go Milk-drink
NEOH	Protein bar	Gittis Fruit bar
ÖLZ	Protein bread	Bread
Handl-Tyrol	Bacon-Chips	n.a.
Findus	GoVital Protein Soup	GoVital Protein Soup
Findus	Pea-Protein Sticks	n.a.
AnovonA	Veganeo, plant-protein powder	Bulkpowders (Maltodextrin, Dextrose)
Uni Vienna (selfmade products)	Salty protein muffins and patties	Salty muffins and patties

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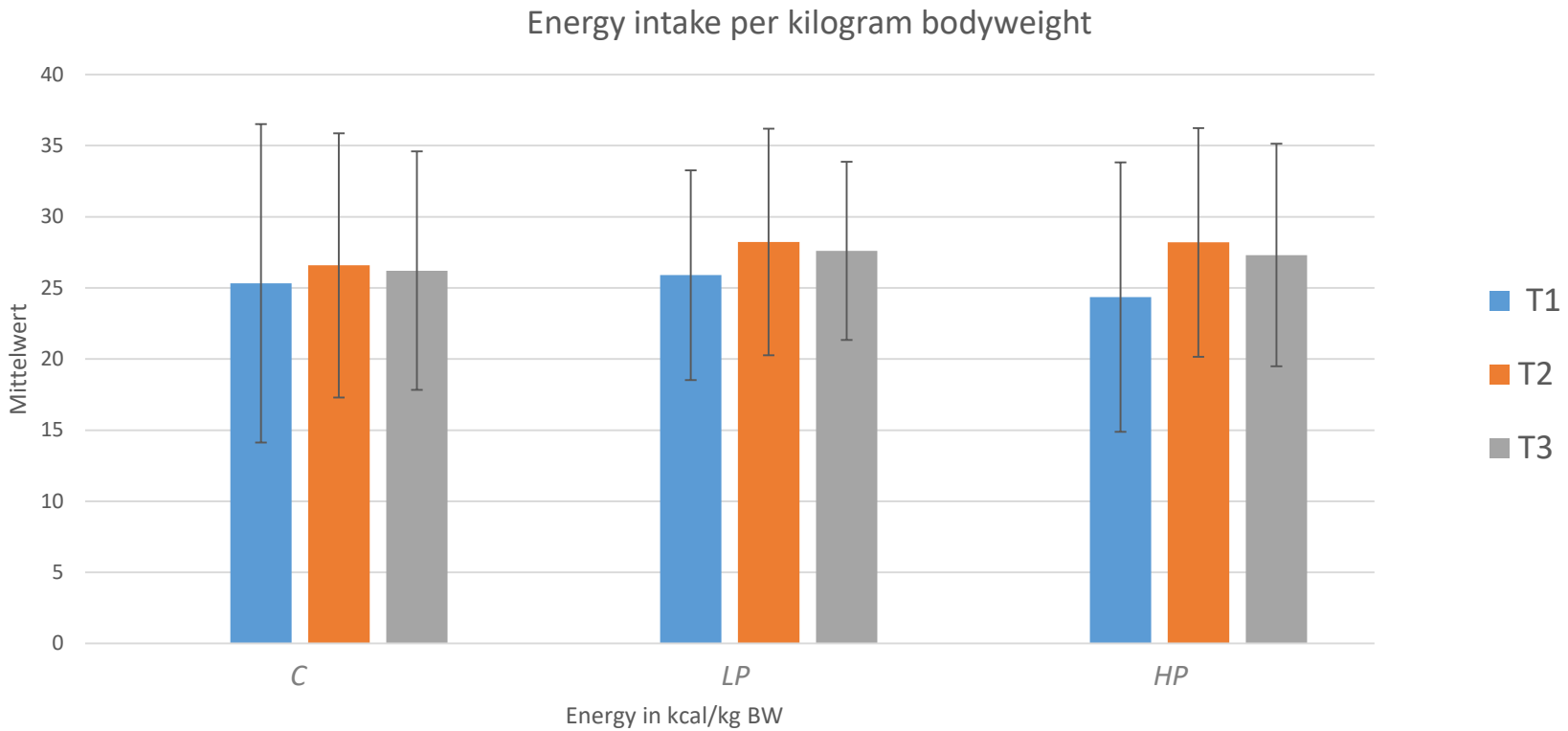
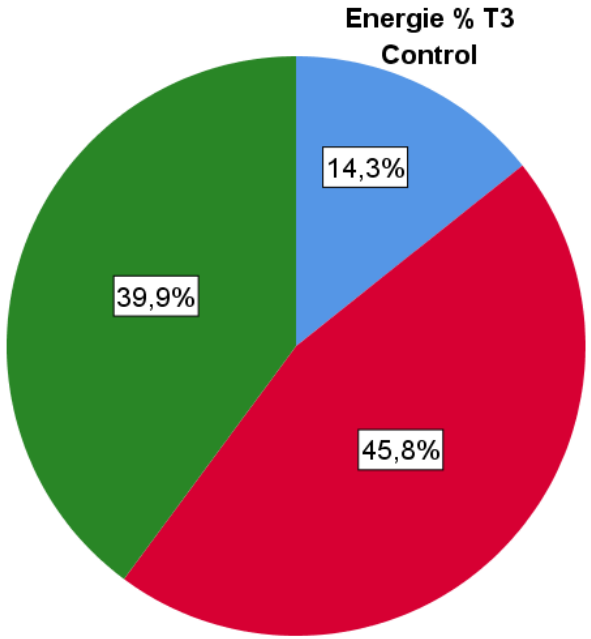
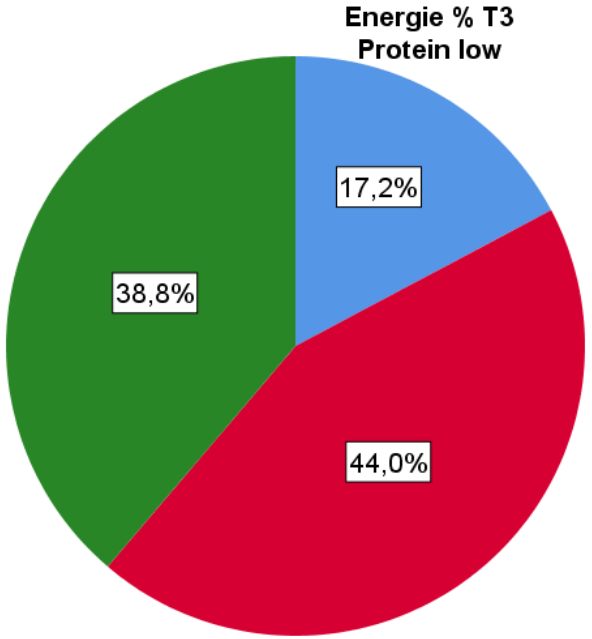
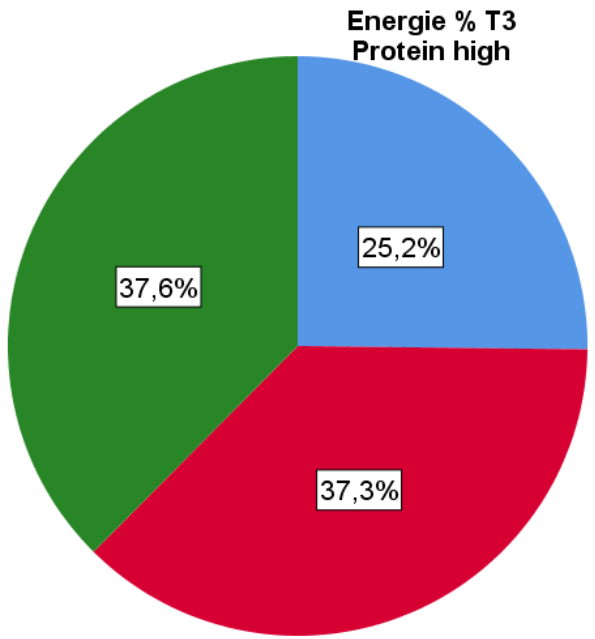
Energy & Nutrients









Protein
Carbohydrates
Fat

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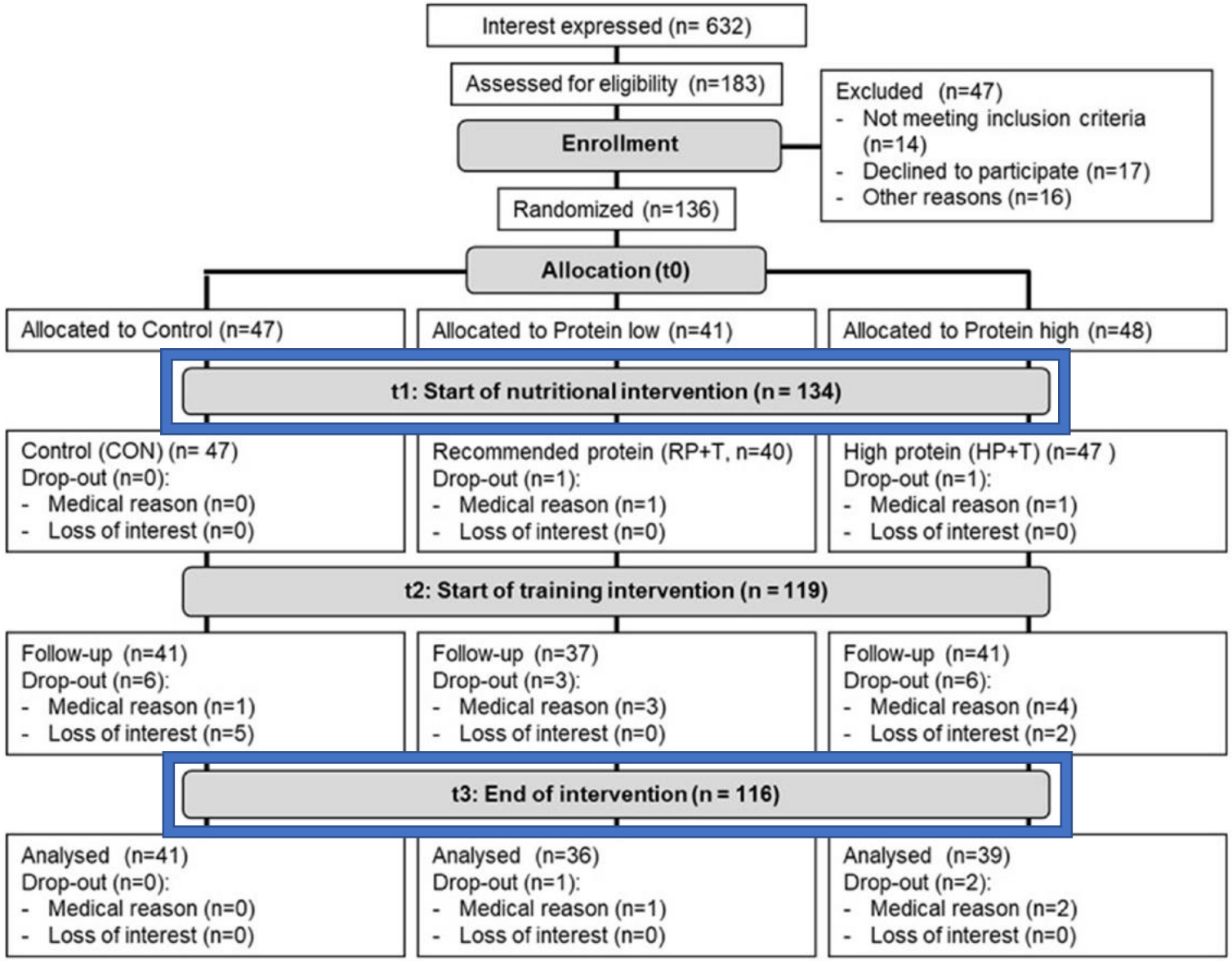
Study Design – NutriAging Protein Study



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Recap…

Clinical Nutrition 41 (2022) 1034–1045

Contents lists available at ScienceDirect

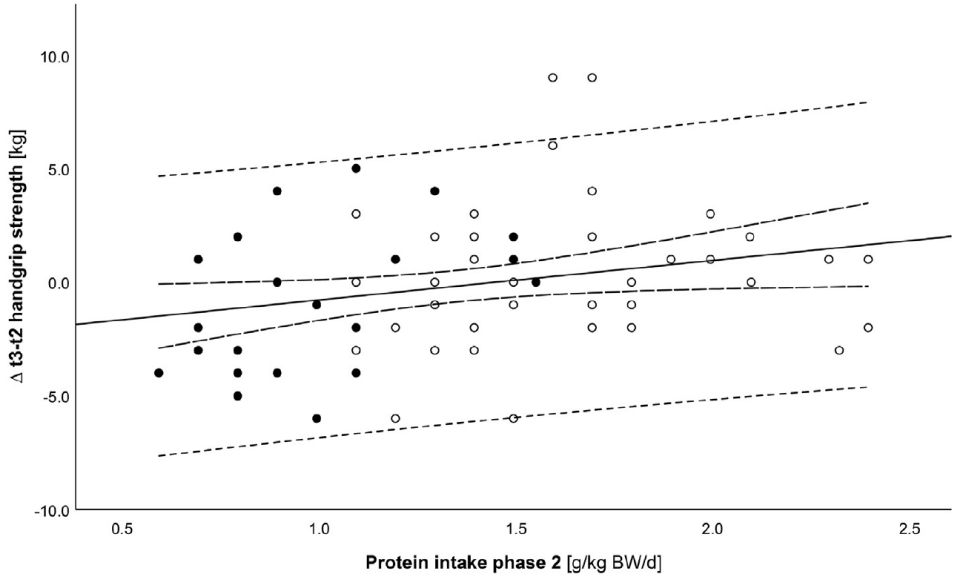
Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Randomized Control Trials

Effects of an increased habitual dietary protein intake followed by resistance training on fitness, muscle quality and body composition of seniors: A randomised controlled trial

Sandra Unterberger [a, b], Rudolf Aschauer [a, b], Patrick A. Zöhrer [a, c], Agnes Draxler [c], Bernhard Franzke [a, c], Eva-Maria Strasser [d], Karl-Heinz Wagner [a, c], Barbara Wessner [a, b, *]



…participants got somehow stronger

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Recap…

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Randomized Control Trials

Effects of an increased habitual dietary protein intake followed by resistance training on fitness, muscle quality and body composition of seniors: A randomised controlled trial

Intervention effects on anthropometry and body composition parameters.

Parameter	Group	Mean (95% confidence interval)			time p-value (partial η^2)	group p-value (partial η^2)	time x group p-value (partial η^2)	Phase differences	
		Baseline (t1)	8 weeks (t2)	17 weeks (t3)				Δ (t2 − t1)	Δ (t3 − t2)
Body weight [kg], n = 116	CON	73.7 ± 12.4	74.2 ± 12.4	74.2 ± 12.2	< **0.001** (0.110)	0.598 (0.009)	**0.001** (0.078)	0.47 ± 1.33	0.03 ± 1.07
	RP + T	75.9 ± 15.6	76.2 ± 15.3	77.2 ± 15.9$^{***,\infty}$				0.37 ± 1.24	0.92 ± 1.35
	HP + T	73.3 ± 13.4	73.2 ± 13.1	73.5 ± 13.1				0.15 ± 1.82	0.24 ± 1.29
BMI [kg/m^2], n = 116	CON	26.0 ± 3.9	26.2 ± 3.9*	26.2 ± 3.8	**0.001** (0.060)	0.764 (0.005)	**0.002** (0.077)	0.20 ± 0.51	−0.02 ± 0.50
	RP + T	26.4 ± 4.3	26.5 ± 4.2	26.7 ± 4.4$^{***,\infty}$				0.12 ± 0.41	0.26 ± 0.43
	HP + T	25.9 ± 3.6	25.8 ± 3.6	25.9 ± 3.6				0.03 ± 0.73	0.03 ± 0.49
Body fat [%], n = 109	CON	24.8 ± 7.7	25.7 ± 7.5*	26.1 ± 7.5**	< **0.001** (0.057)	0.476 (0.014)	0.592 (0.013)	1.00 ± 2.47	0.37 ± 2.25
	RP + T	24.7 ± 7.2	25.4 ± 6.4	25.8 ± 7.5				0.72 ± 2.51	0.35 ± 2.73
	HP + T	22.9 ± 7.2	24.3 ± 7.9	23.7 ± 7.9				1.37 ± 4.29	−0.61 ± 2.79
Body fat [kg], n = 109	CON	18.3 ± 6.8	19.2 ± 6.8*	19.4 ± 6.7*	< **0.001** (0.094)	0.495 (0.013)	0.379 (0.020)	0.86 ± 2.06	0.24 ± 1.74
	RP + T	18.7 ± 7.7	19.3 ± 7.1	19.9 ± 8.1*				0.58 ± 1.83	0.59 ± 2.21
	HP + T	17.0 ± 6.7	18.0 ± 7.1	17.5 ± 6.9				1.02 ± 2.85	−0.47 ± 2.12#
SM [kg], n = 109	CON	25.0 ± 6.8	24.6 ± 6.6	24.4 ± 6.7*	0.018 (0.039)	0.829 (0.004)	0.333 (0.021)	−0.45 ± 1.60	−0.13 ± 1.22
	RP + T	25.6 ± 7.7	25.4 ± 7.5	25.6 ± 7.8				−0.20 ± 1.65	0.22 ± 1.59
	HP + T	25.9 ± 7.1	25.1 ± 7.0	25.6 ± 7.4				−0.80 ± 2.27	0.51 ± 1.57#
ASMM [kg], n = 109	CON	19.8 ± 4.2	19.6 ± 4.1	19.5 ± 4.1*	0.124 (0.020)	0.826 (0.004)	0.217 (0.027)	−0.20 ± 0.87	−0.08 ± 0.58
	RP + T	20.2 ± 5.0	20.2 ± 5.0	20.5 ± 5.1				−0.06 ± 1.03	0.27 ± 0.84
	HP + T	20.1 ± 4.5	19.8 ± 4.4	20.0 ± 4.6				−0.28 ± 1.16	0.23 ± 0.78
Phase angle [°], n = 109	CON	5.2 ± 0.6	5.1 ± 0.6	5.1 ± 0.6	0.716 (0.003)	0.730 (0.006)	0.311 (0.022)	−0.03 ± 0.39	−0.06 ± 0.34
	RP + T	5.2 ± 0.8	5.2 ± 0.8	5.3 ± 0.9				0.01 ± 0.67	0.11 ± 0.41
	HP + T	5.1 ± 0.6	5.2 ± 0.7	5.1 ± 0.7				0.12 ± 0.62	−0.06 ± 0.34

…participants got somehow more muscular

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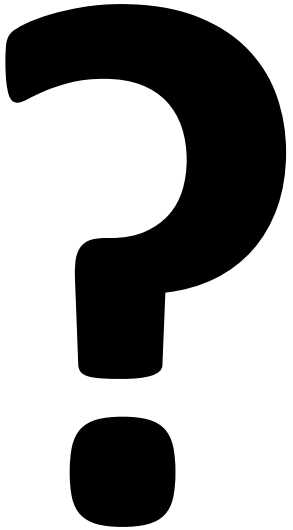
Questions still to answer…



What is the solely effect of the dietary intervention?

-> Is there a benefit of a high protein diet?

What is the effect of combined dietary and exercise intervention?

-> Is there a benefit of a high protein diet?

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… decided to go some levels deeper and look at systemic protein expression patterns

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The plasma proteome is favorably modified by a high protein diet but not by additional resistance training in older adults: A 17-week randomized controlled trial

Bernhard Franzke[1,2*†], Andrea Bileck[3,4†], Sandra Unterberger[1,5], Rudolf Aschauer[1,5], Patrick A. Zöhrer[1,2], Agnes Draxler[2], Eva-Maria Strasser[6], Barbara Wessner[1,5], Christopher Gerner[3,4] and Karl-Heinz Wagner[1,2]

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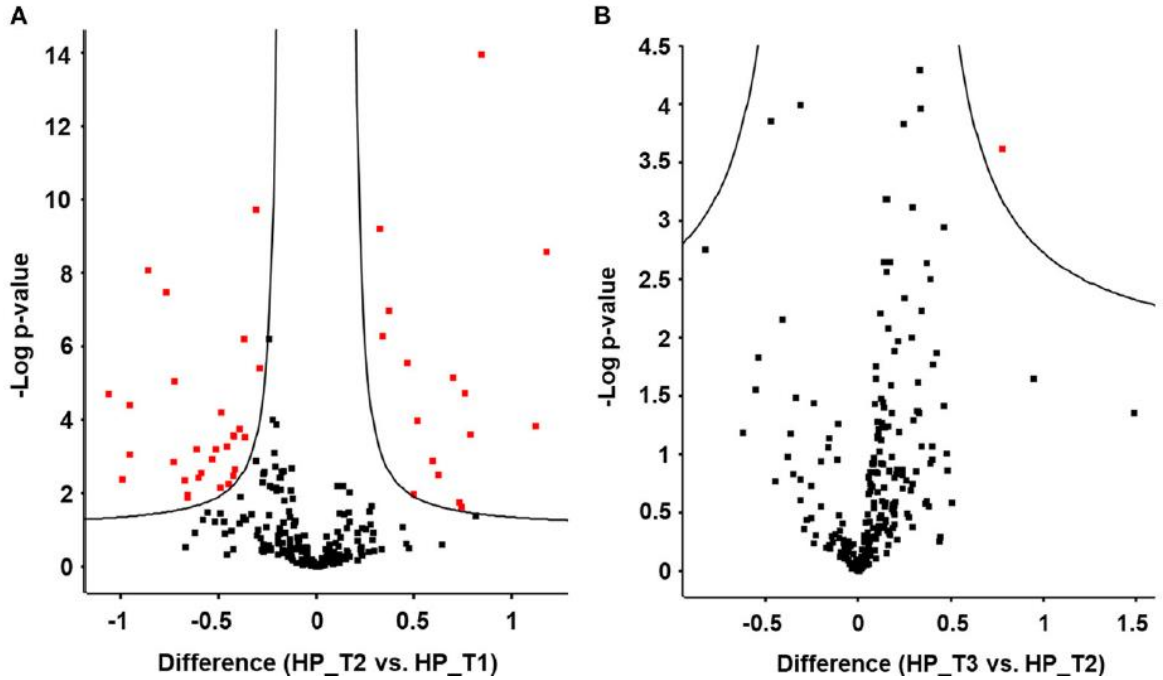
Plasma Proteomics

- LC-MS
- Data analyses identified **255 proteins**
- After further filtering final identification of **14 proteins** that were significantly **affected specifically by diet, but not by additional exercise**



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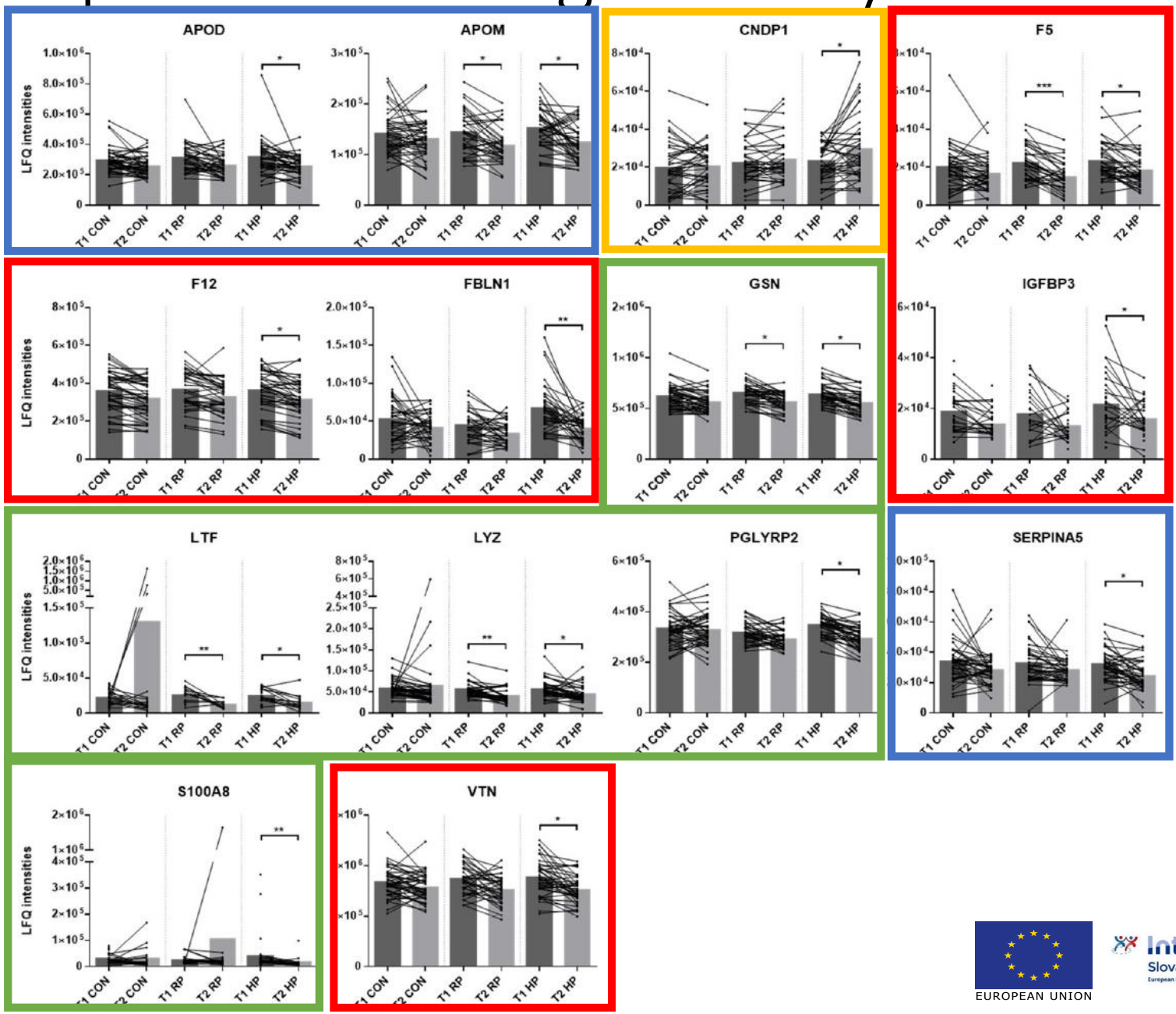
Significantly changed proteins through dietary intervention

- Blood coagulation
- Immune function
- Lipid transport
- Carnosinase



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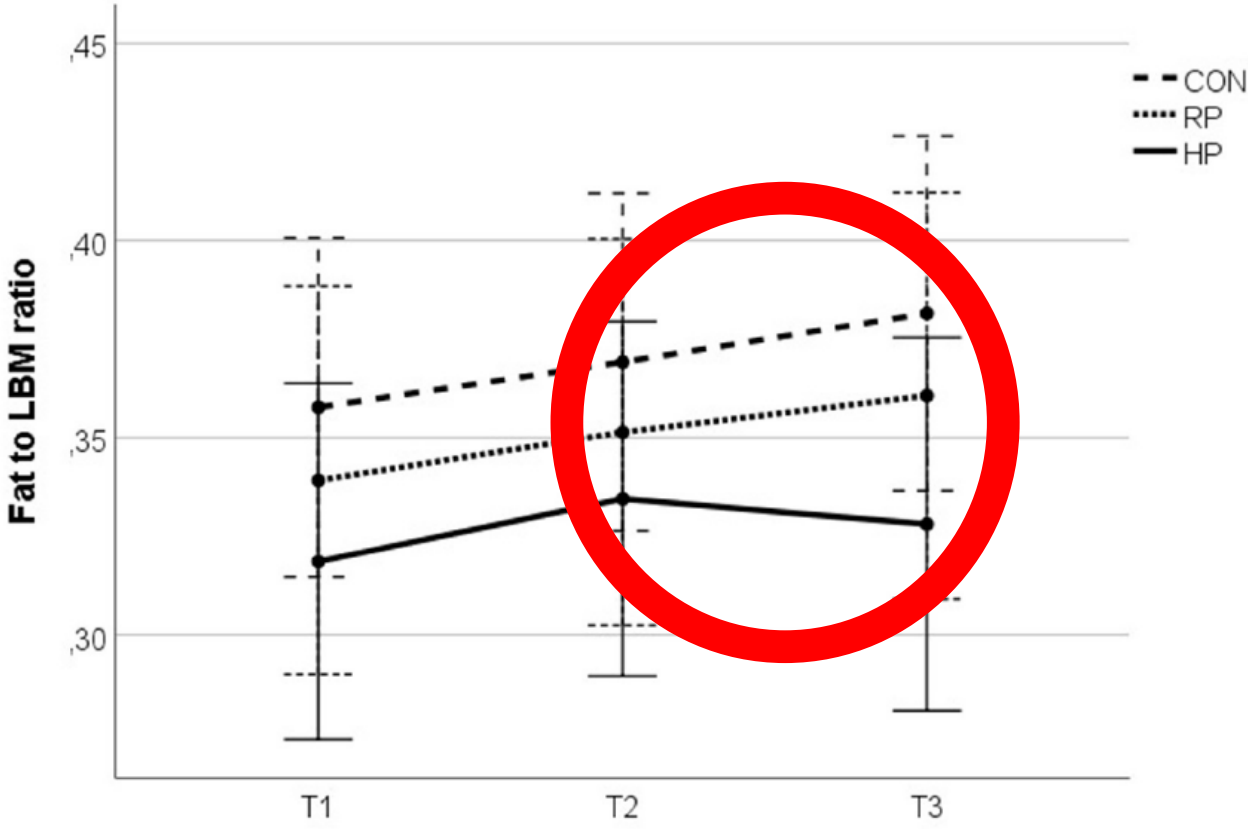
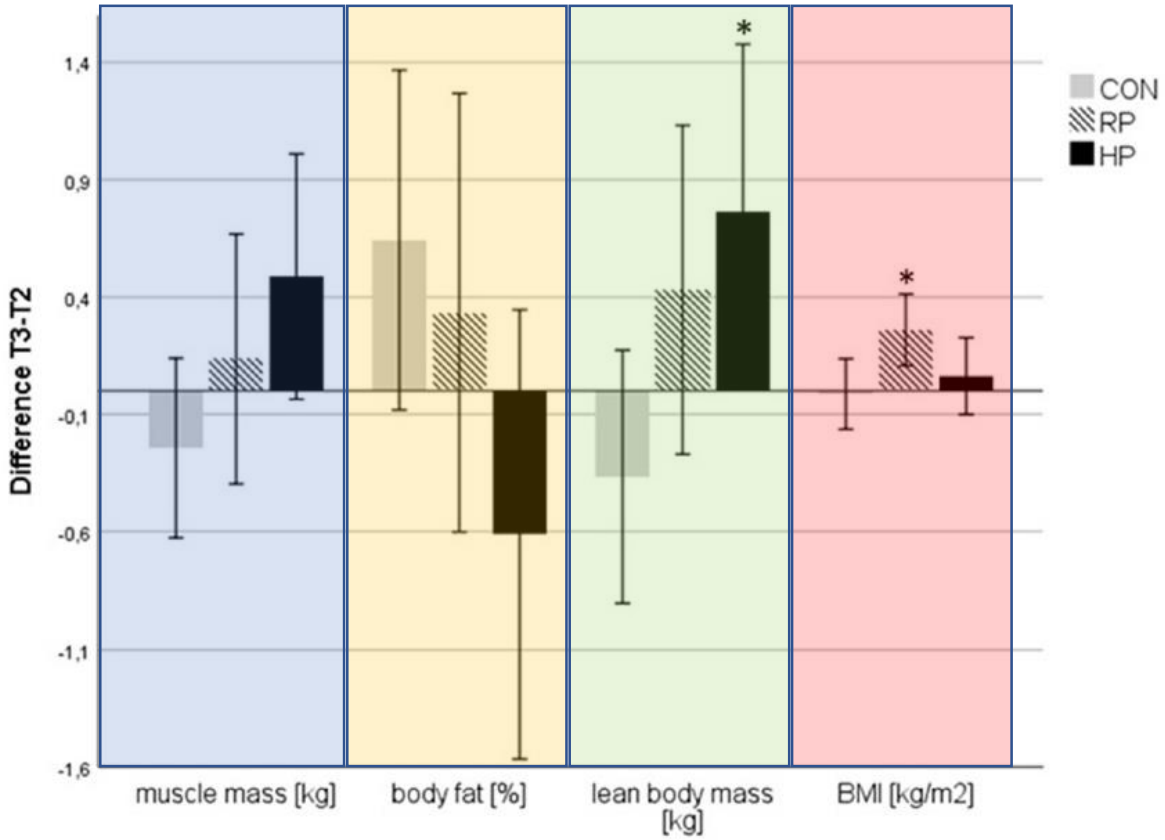
Changes in body composition





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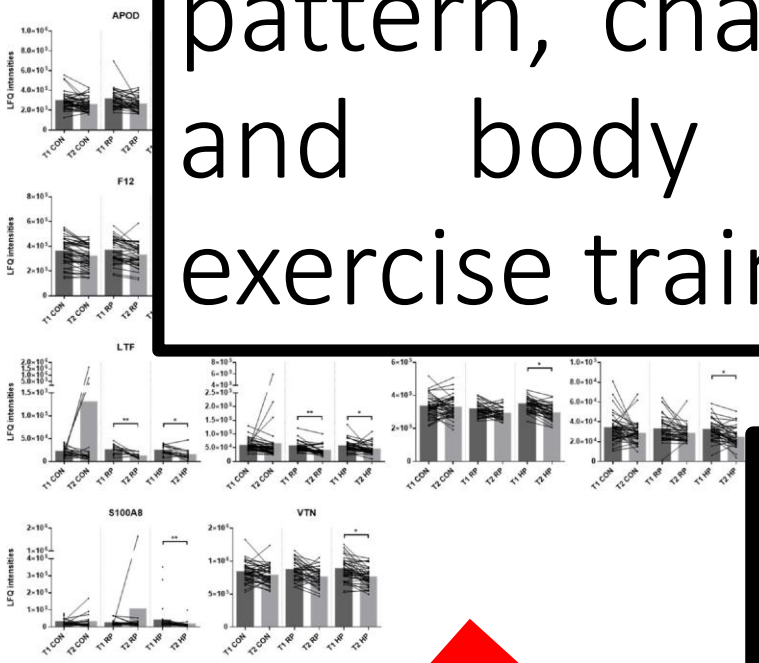
Is there a link between the protein expression pattern, changed during dietary intervention and body composition, changed during exercise training?



Maybe...!?

Dietary Intervention

Dietary & Exercise Intervention

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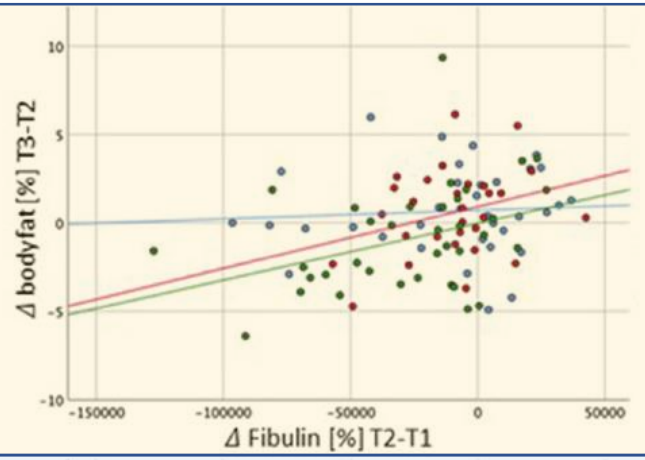
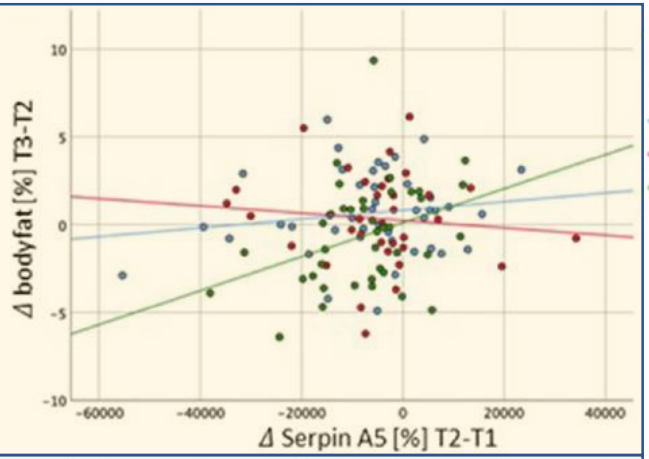
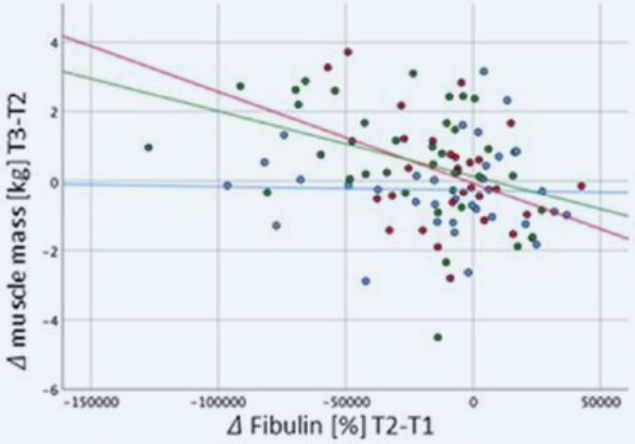
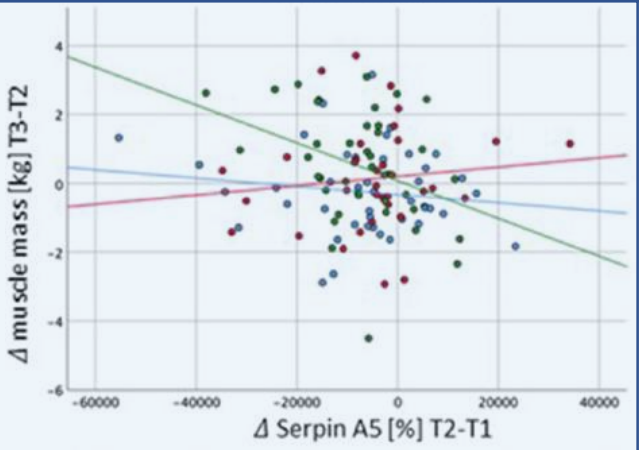
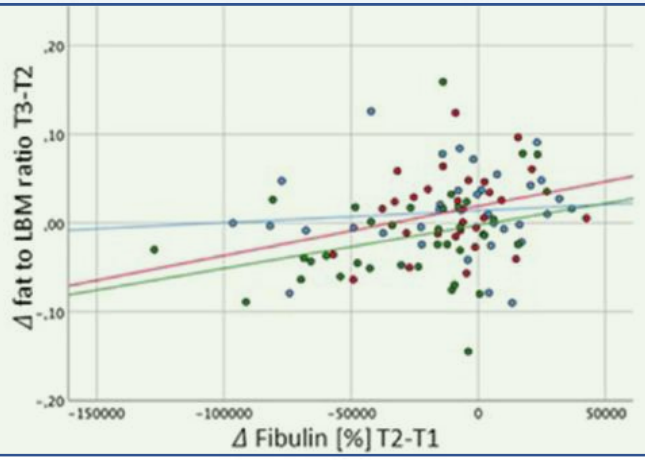
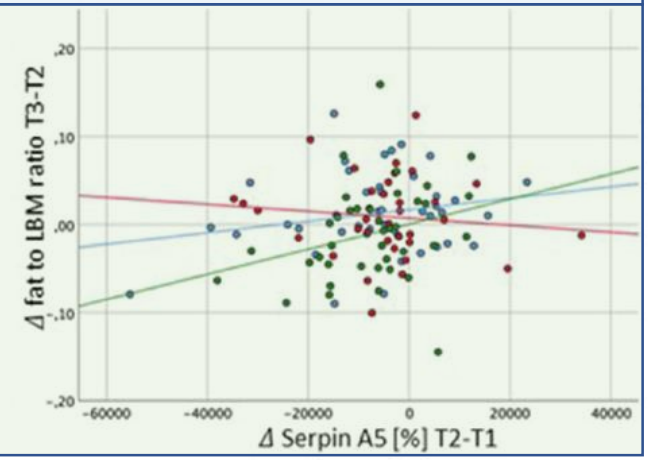
	Blood Coagulation	Lipid Transport
Bodyfat [%]		
Muscle Mass [kg]		
Fat to LBM ratio		

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Conclusion

- A high **protein diet combined with resistance training** seems to induce favorable changes in **body composition**.
- The **plasma proteome** is significantly affected by a **high protein** diet, but **not by additional resistance training.**
- **Innate immune system, lipid transport** and **blood coagulation** seem to benefit from changing to a high protein diet.
- **Changes in body composition** through combined diet & exercise seem to be **linked to changes in the plasma proteome**. Yet, changes in the plasma proteome were predominantly induced by a high protein diet.

…in older adults

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