Effect of carnosine supplementation on serum adipokines in overweight and obese adults: a pilot randomised trial

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Background

- Adipokines play a role in the pathophysiology of insulin resistance, type 2 diabetes (T2DM) and cardiovascular diseases (CVD).
- We have previously shown that carnosine, an over-the-counter food supplement, prevented worsening of glucose metabolism in overweight and obese individuals.
- The effect of carnosine on serum adipokines has thus far not been investigated.

Hypothesis

We hypothesised that carnosine supplementation improves serum adipokines in overweight and obese otherwise healthy adults, compared to placebo.

Aim

To determine the effect of carnosine supplementation on serum adipokine levels in non-diabetic overweight and obese individuals.

Methods

- Study design:** Randomised, double-blind, placebo controlled trial
- Sample size:** 30 overweight and obese individuals ($\text{BMI} \geq 25 \text{ kg/m}^2$)
- Eligibility criteria:** Non-diabetic, no sign of acute or chronic infection, not taking any medication or food supplements, non-smokers, healthy according to a physical examination and routine blood analyses
- Intervention:** 2g carnosine daily (administered orally divided in two equivalent doses) for 12 weeks
- Comparator:** Matching placebo
- Measurements:**
 - 75g oral glucose tolerance test performed
 - Serum lipid levels determined using commercial diagnostic kits (Roche, Germany)
 - Serum adipokines were quantified by the LEGENDplex™ Human Metabolic 1 bead-based multiplex assay (BioLegend).
 - Triple quadrupole mass spectrometer (TSQ QUANTUM ULTRA, Thermo Scientific, Italy) used to measure urinary carnosine levels.

Results

Participant Baseline Characteristics

- 8 participants excluded (3 protocol violation & 5 high markers of inflammation).
- 22 participants (13 in carnosine group, 9 in placebo group) included in the analysis.
- Overall mean age: 43.4 ± 8.1 years; BMI: $31.3 \pm 4.4 \text{ kg/m}^2$; waist-to-hip ratio: 0.89 ± 0.06
- Groups did not differ in baseline cardiometabolic and carnosine measures.
- There were no differences in serum adipokines between groups at baseline.
- Effect of carnosine on serum adipokines**
 - Carnosine supplementation decreased resistin levels compared to placebo (mean change difference: $-56.15 \pm 29.08 \text{ ng/ml}$, $p = 0.04$) (Fig 1).
 - A trend for reduction in leptin levels was observed after carnosine supplementation compared to placebo (mean change difference: $-111.74 \pm 57.66 \text{ ng/ml}$, $p = 0.06$) (Fig 2).
 - Adiponectin and adipisin levels were not different between carnosine and placebo groups (all $p > 0.1$)

Fig 1. Effect of carnosine on serum resistin levels

Fig 2. Effect of carnosine on serum leptin levels

Relationship between serum adipokines & urinary carnosine levels

- Change in resistin and leptin levels were inversely correlated with change in:
 - Urinary carnosine ($r = -0.75$, $p = 0.001$; $r = -0.71$, $p = 0.0001$, respectively) (Fig 3&4)
 - Carnosine-propanal ($r = -0.56$, $p = 0.005$; $r = -0.63$, $p = 0.002$, respectively)
 - Carnosine-propanol ($r = -0.61$, $p = 0.002$; $r = -0.61$, $p = 0.002$, respectively)

Fig 3. Relationship between resistin and urinary carnosine levels

Fig 4. Relationship between leptin and urinary carnosine levels

- The observed correlations were remained significant after adjusting for age, sex and BMI (all $p < 0.05$) except for resistin and carnosine-propanol levels ($p = 0.1$).
- Change in resistin or leptin levels were not associated with any cardiometabolic parameters (data not shown).

Conclusions

- Carnosine supplementation reduced serum resistin and leptin levels in overweight and obese otherwise healthy adults.

References

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