

Long-term physical activity modulates adipin and ANGPTL4 serum levels, a potential link to the lipid metabolism.

Lenz Max, MD^{1,2}; Schönbauer Robert, MD¹; Stojkovic Stefan, MD¹; Lichtenauer Michael, MD, PhD³; Paar Vera, Dr.³; Gatterer Constantin, MD¹; Schukro Christoph, MD, PhD¹; Emich Michael, MD⁴; Fritzer-Szekeres Monika, MD⁵; Strametz-Juraneck Jeanette, MD⁶; Sponder Michael, MD, PhD¹.

1) Division of Cardiology, Department of Internal Medicine II, Medical University of Vienna, Vienna, Austria. 2) Ludwig Boltzmann Cluster for Cardiovascular Research, Vienna, Austria. 3) Department of Cardiology, Clinic of Internal Medicine II, Paracelsus Medical University of Salzburg, Salzburg, Austria. 4) Austrian Federal Ministry of Defence, Austrian Armed Forces, Vienna, Austria. 5) Department of Medical-Chemical Laboratory Analysis, Medical University of Vienna, Vienna, Austria. 6) Rehabilitation Centre Bad Tatzmannsdorf, Bad Tatzmannsdorf, Austria.

Background:

Within the presented prospective study, we aimed to illuminate the effect of long-term physical exercise on serum levels of adipin and angiotensin-like 4 (ANGPTL4). Although past studies already outlined the effects of acute exercise, our trial design aimed to depict the development under long-term physical activity conditions.

Methods:

98 participants were included in the study and were asked to perform eight months of moderate physical activity for at least 150 minutes/week and/or vigorous-intensity exercise for at least 75 minutes/week. According to initial performance and performance gain throughout the study period, four groups were formed and subsequently compared. Blood sampling for the determination of routine laboratory parameters was done at baseline, after 2, 6, and 8 months. Additionally, adipin and ANGPTL4 serum levels were concurrently quantified using commercially available ELISA kits.

Results:

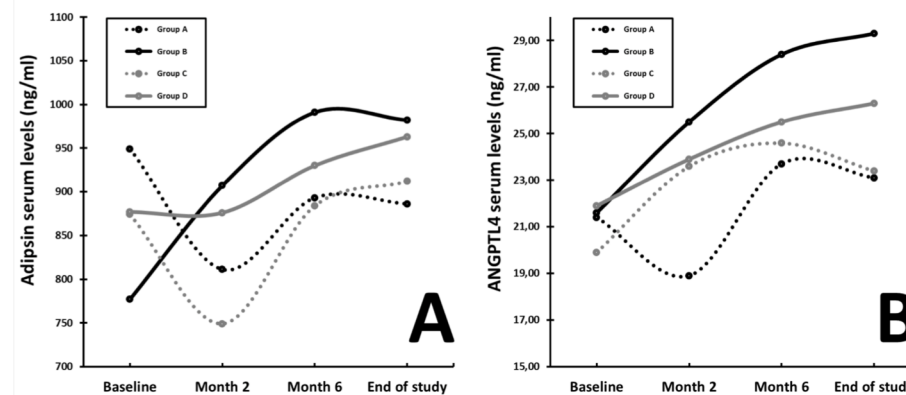


Figure 1: Adipin (A) and ANGPTL4 (B) serum levels were monitored over the course of the study. Groups A (n=9, dotted black lines), group B (n=32, solid black lines), group C (n=18, dotted grey line), and group D (n=39, solid grey line) are depicted in both panels. Adipin levels in groups B and D displayed a highly significant increase over the study period (panel A, $p < 0.001$, respectively). ANGPTL4 levels showed a similar increase in group B and D (panel B, group B: $p = 0.002$, group D: $p = 0.024$). In all panels, values are depicted as mean. Wilcoxon signed rank test was performed to test for significant differences between baseline and end of the study, with $p \leq 0.05$ considered significant.

Adipin Risk factor	Group A Gain $\leq 2.9\%$ (n=9)	Group B Gain $> 2.9\%$ (n=32)	Group C Gain $\leq 2.9\%$ (n=18)	Group D Gain $> 2.9\%$ (n=39)
Diabetes mellitus	$p = 0.222$	$p = 0.313$	$p = 0.222$	$p = 0.615$
Hypertension	$p = 0.262$	$p = 0.049$	$p = 0.291$	$p = 0.284$
Hypercholesterolemia	$p = 1.000$	$p = 0.220$	$p = 1.000$	$p = 0.569$
Overweight	$p = 0.381$	$p = 0.151$	$p = 0.250$	$p = 0.120$
Family history of CVD	$p = 0.381$	$p = 0.464$	$p = 0.730$	$p = 0.558$
ANGPTL4 Risk factor	Group A Gain $\leq 2.9\%$ (n=9)	Group B Gain $> 2.9\%$ (n=32)	Group C Gain $\leq 2.9\%$ (n=18)	Group D Gain $> 2.9\%$ (n=39)
Diabetes mellitus	$p = 0.444$	$p = 0.063$	$p = 0.444$	$p = 0.769$
Hypertension	$p = 0.548$	$p = 0.235$	$p = 0.102$	$p = 0.384$
Hypercholesterolemia	$p = 0.714$	$p = 0.535$	$p = 0.724$	$p = 0.701$
Overweight	$p = 0.548$	$p = 0.018$	$p = 0.616$	$p = 0.361$
Family history of CVD	$p = 0.024$	$p = 0.866$	$p = 0.340$	$p = 0.700$

Table 1: Associations of adipin and ANGPTL4 serum levels with preexisting cardiovascular risk factors. In Group B (n=32), adipin levels were significantly higher in probands with preexisting arterial hypertension. In group A (n=9), participants without a family record of CVD displayed higher circulating serum levels of ANGPTL4. Further, group B showed significantly increased values of ANGPTL4 in overweight subjects. The Mann-Whitney U test was used to reveal the described differences. Values of $p < 0.05$ were considered statistically significant.

The study cohort consisted of 98 participants (61.2% male) with an average age of 49.3 ± 6.7 years. Adipin and ANGPTL4 were found to be strongly influenced by long-term physical exercise. Participants displaying a performance gain of $> 2.9\%$ throughout the study showed significantly increased serum levels of both biomarkers.

Conclusion:

Serum levels of adipin and ANGPTL4 were closely tied to the individual performance gain of the participating probands. An association of adipin levels, initial performance, and serum triglycerides was found at baseline. Interestingly, this interrelationship was not detectable after eight months of physical training. This finding might indicate adipin's involvement in linking triglyceride-balance to individual performance and energy demands in a homeostatic state.

The authors declare no conflict of interest