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Poster presentation

Exercise training effects on vascular reactivity and metabolic parameters of high caloric-fed Wistar rats

Angelina Zanesco*[1], Camila de Moraes[1], AP Davel[2], LV Rossoni[2], Gilberto de Nucci[3] and Edson Antunes[3]

Address: [1]Department of Physical Education; Institute of Bioscience, São Paulo State University, Rio Claro (SP), Brazil, [2]Department of Physiology and Biophisics, Institute of Biomedical Sciences (ICB-I), University of São Paulo, São Paulo (SP), Brazil and [3]Department of Pharmacology, Faculty of Medical Sciences, University of Campinas, Campinas (SP), Brazil

Email: Angelina Zanesco* - azanesco@rc.unesp.br

* Corresponding author

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Background

An impairment of relaxing response to a variety of agonists is observed in vascular smooth muscle from animals submitted to a consumption of high energy diets. This reduction has been associated with endothelial dysfunction. Additionally, the beneficial effect of exercise training on the cardiovascular disease has been associated with improvement of nitric oxide bioavaiability.

Purpose

The aim of this study was to investigate the preventive effect of exercise training on vascular reactivity of rat aortic rings submitted to hyper caloric diet.

Methods

Male Wistar rats were divided into four groups: Sedentary (SD); Trained (TR); Sedentary diet (SDD) and Trained diet (TRD). Trained groups were submitted to physical preconditioning for 4 weeks. After that, the animals were treated with normal chow or cafeteria diet for further 8 weeks concomitantly with exercise. Training sessions consisted of run in a treadmill at intensity between 70–80% VO_{2max} during 60 min, 5 days/week for 12 weeks. After an overnight fasting, rats were sacrificed and serum levels of triglycerides, glucose and plasmatic nitrite/nitrate concentration were measured by commercial kits. Insulin concentration was measured by radioimmune assay. Aortic artery rings were isolated and concentration-response curves to acetylcholine (ACh) in presence or absence of L-NAME and Sodium Nitroprusside (SNP) in presence or absence of ODQ were obtained. The potency (EC_{50}) and maximal responses (E_{max}) were determined. Expression of eNOS, nNOS and CuZn SOD were detected by Western blotting.

Results

Exercise training reduced weight gain even in TRD group (SD: 478 ± 9; TR: 401 ± 8; SDD: 538 ± 11 and TRD 452 ± 14 g). Hyper caloric diet increased triglycerides concentration (SDD: 216 ± 25 mg/dl) and exercise training reduced (TRD: 89 ± 9 mg/dl). Run training significantly reduced insulin level (TR: 0.54 ± 0.1 and TRD: 1.24 ± 0.3 ng/ml) as compared to SD groups (SD: 0.87 ± 0.1 and SDD: 2.57 ± 0.3 ng/ml). On the other hand, glucose concentration was not modified by diet or physical exercise (SD: 126 ± 6; TR: 140 ± 8; SDD: 156 ± 8 and TRD 153 ± 9 mg/dl), as nitrite/nitrate concentration (SD: 27 ± 4; TR: 28 ± 6; SDD: 27 ± 3 and TRD: 30 ± 2 μM). Functional data showed that hypercaloric diet did not impaired the relaxing response of aortic rings to ACh, but exercise training improve relaxation about 28% for TR and 16% to TRD group. The pEC_{50} level was not modified and the addition of L-NAME abolished the responses similarly in all groups. Neither potency nor E_{max} were changed in aortic rings for SNP in

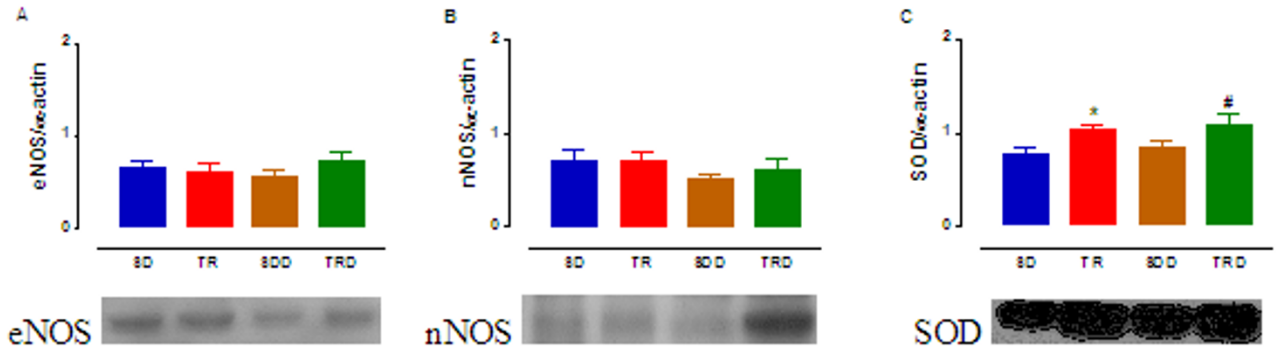

Figure 1
Exercise training effects on aortic expression of eNOS **(A)**, nNOS **(B)** and Cu/Zn SOD **(C)**. Arbitrary units of blot densitometry. Data are means ± SEM of n = 7–8 per group. SD: sedentary, TR: trained, SDD: sedentary diet, TRD: trained diet. *different from SD; # different from SDD. $P < 0.05$.

all groups. The addition of ODQ abolished the responses to SNP in all groups. Western blot data showed no differences in eNOS and nNOS expression in aorta artery, but the Cu/Zn SOD expression was significantly augmented in trained groups about 30% (Figure 1).

Conclusion

Physical preconditioning improved the endothelium-dependent relaxing responses in aortic artery rings from hyper caloric fed rats and this response appers to be related to an improvement in NO bioavaiability.

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