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ORIGINAL ARTICLE

Impact of aerobic water running training on peripheral immune-endocrine markers of overweight-obese women

Impact de la formation en cours d'eau sur les paramètres immunitaires endocriniens des femmes en surpoids obèses

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KEYWORDS

Overweight-obesity;
Women;
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T cells

Summary

Objective. – The purpose of this study was to evaluate the effect of water running training on immune-endocrine parameters evaluated in peripheral blood of overweight-obese women.

Methods. – Eleven sedentary overweight-obese women (age 48.81 ± 12.87 years; body mass index $34.56 \pm 4.08 \text{ kg/m}^2$) participated of 12-week of aerobic water running training in a heated swimming pool (70 minutes/session; 3×/week). In addition, nine women matched to age and body mass index were recruited to sedentary control group (age 49.9 ± 10.5 years; body mass index $33.05 \pm 3.45 \text{ kg/m}^2$). Serum levels of interleukin-6 (IL-6), interleukin-10 (IL-10), interleukin-17a (IL-17a), interferon-gamma (INF- γ), tumor necrosis factor-alpha (TNF- α), salivary cortisol, and the peripheral frequency of CD3+CD4+ and CD3+CD8+ T cells were evaluated before and after 12 weeks in exercised individuals and after 12 weeks in control subjects. In addition, anthropometric measurements (body mass, % of body fat and trunk circumferences) and functional capacity ($\text{VO}_{2\text{Peak}}$ and time to exhaustion) were also evaluated.

Results. – After 12 weeks of exercise training, serum adiponectin ($P=0.030$), IL-10 ($P=0.01$) and TNF- α ($P=0.004$), and CD8+ T cells frequency ($P=0.03$) increased significantly, while salivary cortisol reduced ($P=0.003$) in exercised women. After 12 weeks of training, exercised

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individuals had higher TNF- α levels ($P=0.02$), CD4+ ($P=0.03$) and CD8+ ($P=0.04$) T cells than control group. In addition, exercised women reduced the waist circumference ($P=0.030$) and improved the time to exhaustion ($P=0.003$).

Conclusion. — In conclusion, deep water running was able to modulate immune-endocrine parameters in absence of significant improvements in body composition or VO_{2Peak} in overweight-obesity women. This training could be an interesting tool to control the obesity-related chronic low-grade inflammation.

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Résumé

Objectif. — L'objectif de cette étude était d'évaluer l'effet de la formation d'eau courante sur les paramètres immunitaires et endocriniens du sang périphérique chez les femmes en surpoids obèses.

Méthodes. — Onze femmes en surpoids obèses sédentaires (âge $48,81 \pm 12,87$ années ; indice de masse corporelle $34,56 \pm 4,08 \text{ kg/m}^2$) ont participé de 12 semaines de formation en cours d'exécution de l'eau dans la piscine chauffée (70 minutes/session ; 3×/semaine). En outre, neuf femmes appariées aux l'âge et l'indice de masse corporelle ont été recrutés pour groupe témoin sédentaire (âge $49,9 \pm 10,5$ ans ; indice de masse corporelle $33,05 \pm 3,45 \text{ kg/m}^2$). Les niveaux de l'interleukine-6 (IL-6), l'interleukine-10 (IL-10), interleukine-17a (IL-17 a), l'interféron-gamma (IFN- γ), facteur de nécrose tumorale alpha (TNF- α), cortisol salivaire et la fréquence périphérique de CD3+CD4+ et CD3+ cellules T CD8+ ont été évaluées avant et au bout de 12 semaines chez des personnes exercées et au bout de 12 semaines chez les sujets témoins. En outre, les mesures anthropométriques (masse corporelle, pourcentage de graisse corporelle et circonférences du tronc) et la capacité fonctionnelle (VO₂ Peak et le temps de l'épuisement) ont également été évaluées.

Résultats. — Après 12 semaines de formation d'exercice, l'adiponectine sérique ($p=0,030$), IL-10 ($p=0,01$) et le TNF- α ($p=0,004$), et les lymphocytes T CD8+ ($p=0,03$) ont augmenté de manière significative, alors que le cortisol salivaire réduit ($p=0,003$) chez les femmes exercées. Après 12 semaines de formation, les individus avaient exercé des niveaux de TNF- α plus élevés ($p=0,02$), CD4+ ($p=0,03$) et CD8+ ($p=0,04$) des lymphocytes T que le groupe témoin. En outre, les femmes exercées réduit la circonférence de la taille ($p=0,030$) et d'améliorer le temps de l'épuisement ($p=0,003$).

Conclusion. — En conclusion, l'eau courante profonde était capable de moduler les paramètres immunitaires endocriniens en l'absence d'améliorations significatives dans la composition corporelle ou de la consommation d'oxygène. Cette formation pourrait être un outil intéressant pour contrôler l'inflammation de bas grade chronique liée à l'obésité.

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MOTS CLÉS
Surpoids-obésité ;
Les femmes ;
L'exercice ;
Immunitaire ;
Les cellules T

1. Introduction

Chronic low-grade inflammation, an increase in order to 2–3 fold of pro-inflammatory mediators such as cytokines, is implicated in the physiopathology of obesity and associated diseases, like type 2 diabetes and atherosclerosis [1]. While the exact molecular mechanisms of inflammation is controversy, metabolic disruption due to weight gain have been shown to affect adaptive immunity and neuroendocrine systems [2,3]. Impairment in T cell function, reduced peripheral frequency of cytotoxic T cell (CD8+) and an increase in Th1 T helper phenotype in detriment of Th2 phenotype are some changes visualized in obesity [3]. Due to these alterations, obesity has been identified as independent risk factor for cancer, cardiovascular diseases and virus infection [4]. In the recent H1N1 influenza epidemic, obesity was associated with increased hospitalization and infection severity [5]. Obesity also presents elevated circulating cortisol levels due to two mechanisms:

- dysfunction in hypothalamic-pituitary-adrenal axis with block of negative feedback;
- high glucocorticoids synthesis by adipocytes [6].

Collectively, these findings suggest that obesity may cause impaired immune-neuroendocrine responsiveness.

Systematic physical training is able to improve a series of metabolic health and decreases the risk of numerous diseases in overweight-obese individuals [7]. In the past years, studies suggested that exercise have immunoregulatory effects. Some of these effects are likely attributable to reduction of adipose tissue, since that adipocytes are the main sites of release of inflammatory cytokines in obesity [8,9]. For the other hand, recent evidences shows that exercise, in absence of weight loss, can influence phenotype of immune cells and inflammatory mediators [10]. However, few studies have focused on peripheral T cells or immune-endocrine communication [11–13]. Recently, we demonstrated that 12 weeks of concurrent training was able

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