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ORIGINAL ARTICLE

Exercise training lowers serum chemerin concentration in obese children

L'entraînement physique diminue la concentration plasmastique de chemerine chez les enfants obèses

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KEYWORDS
Obesity;
Chemerin;
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Summary
Objective. — The purpose of this study was to examine the effects of 16-week exercise program on serum chemerin concentrations in obese children.
Equipment and methods. — Thirty-two overweight and obese male children were randomly assigned to either a twice-per-week exercise training group (ExG = 16) or a nonexercising control group (CG = 16) for 16 weeks. Body mass index (BMI), body composition, waist circumference (WC), glucose, insulin, insulin resistance index (HOMA-IR), lipids and serum chemerin were measured before and after intervention.
Results. — Exercise training significantly improved BMI, body composition, WC, glucose, insulin, HOMA-IR and lipids' profile in ExG. Serum chemerin concentrations were high at baseline in both groups, but exercise training reduced its levels after 16 weeks to 168.9 ± 12.6 ng/mL ($P < 0.001$). Also, significant correlations were found between changes in chemerin serum concentration and BMI, WC, percentage of body fat, HOMA-IR (respectively; $r = 0.78$, $P = 0.03$; $r = 0.86$, $P = 0.03$; $r = 0.91$, $P = 0.05$; $r = 0.75$, $P = 0.03$).
Conclusion. — In conclusion, the 16-week training program used in this study was very effective for producing significant benefits to body composition, insulin resistance and lipids' profile, as well as lowering chemerin levels in these obese children. Therefore, our data suggests that chemerin serum concentrations are associated with insulin resistance.

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MOTS CLÉS
Obésité ;
Chemerine ;
Résistance à l'insuline ;
Adipokine

Résumé
Objectif. — Le but de cette étude était d'examiner les effets d'un programme d'entraînement physique de 16 semaines sur les concentrations plasmatiques de chemerine chez des enfants en surpoids ou obèses.
Matériel et méthodes. — Trente-deux garçons en surpoids ou obèses ont été assignés au hasard, soit à un groupe suivant un programme d'entraînement (ExG = 16) (deux exercices fois par semaine) ou d'un groupe témoin (CG = 16) ; l'intervention a duré 16 semaines. L'indice de masse corporelle (IMC), la composition corporelle, le tour de taille, le glucose, l'insuline, l'indice de résistance à l'insuline (HOMA-IR), les lipides et la chemerine plasmatiques ont été mesurés avant et après l'intervention.
Résultats. — Le programme d'activité physique a significativement amélioré l'IMC, la composition corporelle, le tour de taille, le glucose, l'insuline, HOMA-IR et le profil de lipides. Les concentrations plasmatiques de chemerine étaient élevées au début de l'expérimentation dans les deux groupes, mais l'entraînement a permis de réduire ses concentrations plasmatiques après 16 semaines (de $174{,}8 \pm 12{,}8$ ng/mL, à $168{,}9 \pm 12{,}6$ ng/mL, $p < 0{,}001$). En outre, des corrélations significatives ont été retrouvées entre les deltas de concentrations plasmatiques de chemerine et l'IMC, le tour de taille, le pourcentage de graisse corporelle, l'HOMA-IR (respectivement ; $r = 0{,}78$, $p < 0{,}05$; $r = 0{,}86$, $p < 0{,}05$; $r = 0{,}91$, $p < 0{,}05$; $r = 0{,}75$, $p < 0{,}05$).
Conclusion. — En conclusion, le programme d'entraînement de 16 semaines utilisé dans cette étude était très efficace pour corriger la composition corporelle, la résistance à l'insuline, le profil lipidique, ainsi que l'abaissement des concentrations plasmatiques de chemerine chez les enfants obèses (ou en surpoids sévère). Par conséquent, nos données suggèrent que les concentrations sériques chemerine sont associées à la résistance à l'insuline.

1. Introduction

The prevalence of childhood obesity has been increasing throughout the world during the past few decades [1]. Childhood obesity is recognized as a major public health concern since the simultaneous increase in obesity is paralleled by an increased prevalence of impaired glucose tolerance [2], metabolic syndrome [3], and type 2 diabetes [4] in youth. Childhood obesity can be tracked into adulthood [5] and has significant adverse health consequences [6].

Adipose tissue represents an active endocrine organ that releases a large number of bioactive mediators (adipokines) which signal to organs of metabolic importance including brain, liver, skeletal muscle, and immune system, thereby modulating homeostasis, blood pressure, lipid and glucose metabolism, inflammation, and atherosclerosis [7]. It has been demonstrated in numerous studies that obesity markedly changes adipose tissue endocrine production [8,9].

Chemerin is a chemoattractant protein that acts as a ligand for the G-protein coupled receptor CMKLR1 (ChemR23 or DEZ) [10]. In humans, it is highly expressed in white adipose tissue, liver, and lung, while its cognate receptor CMKLR1 is predominantly expressed in immune cells as well as adipose tissue [11]. Interest in chemerin has grown since it was discovered in fat tissue as a novel adipokine secreted by adipose tissue [12]. Chemerin was first discovered as a chemotactic peptide directing macrophages and dendritic cells toward sites of inflammation, being involved in both adaptive and innate immunity [7]. Chemerin has been associated with autocrine/paracrine signaling for adipocyte differentiation and maturation as well as with glucose uptake and lipolysis stimulation in adipocytes [10]. Some results also indicate that chemerin and chemerin receptor could have an important biological role in the formation of white adipose tissue during normal development and in pathological states such as obesity [13,14]. Chemerin serum concentrations are elevated in obese, insulin-resistant, and inflammatory states in vivo and suggested to be an obvious cause of insulin resistance [15,16]. Serum chemerin levels were positively correlated with key metabolic syndrome markers such as elevated levels of body mass index (BMI), fasting serum glucose (FPG), fasting serum insulin (FSI), homeostasis model assessment for insulin resistance (HOMA-IR), serum triglyceride (TG), and low-density lipoprotein (LDL) [17,18]. Some studies provide strong evidence that physical activity alone, without dietary intervention, can have a positive, significant impact on insulin resistance risk and potentially prevent the development of type 2 diabetes in overweight and obese youth [19,20]. In addition, evidence from epidemiological studies of healthy populations has demonstrated an inverse association between physical activity and markers of low-grade systemic inflammation [21—23]. It is therefore important to encourage sustainable physical activity habits in children, and further reinforcing these habits in adolescents, which will help establish desirable healthy lifestyle patterns that continue into adulthood [24].

While we know a lot about the mechanisms by which adiposity leads to insulin resistance [25] and how exercise increases insulin sensitivity [26,27], it has not been yet reported about the exercise-induced changes in chemerin concentrations in obese children which may provide a link between obesity and insulin resistance. Also, developing effective exercise programs for the pediatric population is a strategy for decreasing obesity and is expected to help in eventually limiting obesity-associated long-term health

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