150 - THERMOTHERAPY IN HEMATOLOGIC RESPONSE AFTER RESISTANCE EXERCISE IN BODYBUILDERS

ANDRÉ DE OLIVEIRA TEIXEIRA[1]
FABIANO MARQUES MARTINS[1]
GISELE RODRIGUES MACHADO[1]
FELIPE DA SILVA PAULITSCH[2]
LUIS ULISSES SIGNORI[1]
1. Federal University of Rio Grande - FURG,
Post Graduate Program in Health Sciences
2. Santa Casa Hospital of Cardiology of Rio Grande
Rio Grande, Rio Grande do Sul, Brazil
Andreteixeira_EF@yahoo.com.br

INTRODUCTION

Exercise induces an inflammatory response that in general, comes from tissue damage of a mechanical and/or metabolic action, which triggers a cascade of physical and chemical reactions that result in the repair of muscle tissue (OLIVEIRA SCHNEIDER AND CD AR, 2004; CRUZAT et. al., 2007). In the resistance exercise (RE) this response also came from ischemia reperfusion, which is caused by catabolism of purines during tissue hypoxia (AH BLOOMER RJ & GOLDFARD, 2004). This process results in oxidative stress, which activates chemical mediators, which, increased circulating leukocytes and adhesion molecules of vascular endothelium (SAHNOUN et al., 1998) resulting in the invasion of these cells in the injured tissue (AOR et al. 2004). Leukocytosis tissue increases the production of reactive oxygen species and nitrogen (ERON) favoring the secondary muscle damage (PIZZA et al., 1998).

These mechanisms alter the homeostasis of several tissues, among these the hematopoietic, which shows an increase of inflammatory markers such as creatine kinase and lactate dehydrogenase (WILLOUGHBY ET AL, 2003; HOWATSON et al. 2009), as well as the observed leukocytosis after the execution of the ER (SCHNEIDER CD AND RA OLIVEIRA, 2004). However, these responses are dependent on the volume and intensity of exercise performed (SCHNEIDER AND OLIVEIRA, 2004;WANG AND HUANG, 2005).

These physiological changes arising from the exercise are associated with DOMS, which frequently affects athletes (SELLWOOD, KL, et al., 2007) and especially newcomers to physical activity because this symptom is related to missing and/or discontinuation of programs exercise (CHEUNG et al., 2003). To minimize the inflammatory response after exercise, several interventions have been used, among them the use of thermotherapy agents, such as hypothermia (PC CASTLE et al. 2006; SELLWOOD, KL, et al. 2007; POURNOT H. et al. 2011) and hyperthermia (DJ COCHRANE, 2005; POURNOT H. et al. 2011). These thermotherapy interventions have not been compared when applied after the practice of RE in bodybuilders. The objectives of this study were to study the hematological (white blood cells, red cells and platelets) and electrolyte (sodium, potassium, magnesium and calcium) secondary to the ER and the thermotropic effects of agents in this response.

METHODS

The project was approved by the Ethics in Healthcare (CEPAS), Federal University of Rio Grande (FURG), Case Nº 23116.002536/2010-48 in accordance with Resolution (Nº 196/96) of the National Health All volunteers read, agreed and signed the consent form. Sampling occurred in the weight room of the Sports Center of our institution and the blood samples were processed and analyzed in the Clinical Laboratory Association of Charity of the Holy House of the Rio Grande.

Were invited to participate in the study: fit and healthy volunteers after medical assessment, aged 20 to 35 years, body mass index> 30 (BMI: kg/m2), who practice weight training exercises for more than six months, not present restrictions on physical activity assessed by the PAR-Q (THOMAS et al, 1992) and not be participating regularly in other exercise programs. Volunteers in the use of any dietary supplement, vitamin supplements, ergogenic aids, medications (fifteen days before the collection), previously diagnosed chronic diseases and/or allergic reactions and the smokers were not included. On the day of data collection were excluded those that presented leukocytosis, symptoms of musculoskeletal disorders, changes in lipid and that physical activity performed 72 hours before. The sample consisted of 12 volunteers who underwent assessments of muscle strength, RE session control (CONT), RE session followed by hypothermia (HIPO) and RE session followed by hyperthermia (HIPER). Samples were collected in 12-hour fast and with an interval of seven days between sessions. The anthropometric variables and physical measurements were performed on day in the assessment of muscle strength, and we used a calibrated scale (Filizola, model PL 200, Brazil) and a stadiometer (Sanny, Brazil).

ASSESSMENT AND PRESCRIPTION OF EXERCISE SESSIONS

The test of 10 repetitions maximum (10RM) was adopted for the evaluation and prescription of training protocol with controlled overhead (KRAEMER et al, 2002). The apparatus (Physicus®, Brazil) selected to perform the exercises were the leg extension, squat and the leg press45°. The value of maximum loads in the 10RM test was obtained during three to five attempts, when the volunteer had concentric failure framework for dynamic movement. Thus, validated as the maximum load to which it was obtained in the last run. Each new attempt is performed adding progressive increments of 5kg. During the evaluation of muscle strength recovery time between sets and between exercises was 5min.

The exercise sessions were performed in four series of 10RM with one minute between sets and two minutes between the units. In order to reduce the margin of error in the 10RM tests and data collection, standardized instructions were given before the test so that the volunteer take all the science that involved the experimental procedure, such as instructions on the technique of the exercises, verbal stimuli during evaluations and exercises to maintain the highest level of stimulation.

INTERVENTIONS

Hypothermia (HIPO) consisted of ice packs applied to damp towel at a controlled temperature between 2-5 ° C (PC CASTLE et al., 2006). Hyperthermia (HIPER) was applied through the bag with hot water, and the temperature of the wet towel controlled between 44 and 46 ° C (citation). Temperatures were measured with a thermometer (make, country) positioned between the towel and the muscle. Temperature control was by adding or removing sources thermotherapy. The application time was 10min of thermotherapy and interventions were performed immediately after the ER. The control intervention (CONT) was to stand for 10 minutes.

COLLECTING AND HEMATOLOGICAL MEASURES

The blood samples were taken before exercise (baseline), immediately after the ER (Exercise) and after the intervention (intervention). The collection was previously sterilized in a room, comfortable and controlled temperature between 20° to 24 ° C. Blood samples were divided into two aliquots, one for assessment of blood counts that were conditioned and homogenized in a commercial vacuum tubes (Vacutainer - Brazil) containing (2.5% EDTA) and the other aliquot was reserved for the measurement of electrolytes and the blood was placed in a vacuum without anticoagulants francs.

To observe the morphology and differential counts of white blood cells, in which the assessors were blind to the experimental protocol, it was a smear of blood on the blade, which received the Romanowsky stain. Once washed and dried at room temperature, the slide was examined under optical microscope (Olympus). Measurements of the total number of leukocytes were performed in 60-ADIVA hematology analyzer Bayer, while concentrations of lymphocytes, neutrophils and monocytes were determined by microscopic counting on slides previously prepared hematologic. 100 cells were counted following the zig-zag technique Shilling, the values expressed in x103/mm3. The cell count was the appliance Cell Counter. To determine the number of red blood cells per mL of blood was used to NEWBAUER chamber, with the macrodilution technique. The liquid Marcano was employed as a diluent for counting erythrocytes and 4 ml of diluent used for 20 mL of blood through the erythrocyte count in the five square mean from the central square and multiplying it by 10,000, and the values expressed in mg / dL. In determining the hematocrit, a microhematocrit tube was filled with blood in about 3/4 of its capacity and sealed at one end with the aid of a Bunsen burner. Then, the capillary was placed in a microcentrifuge for 5 minutes, to 3,000 rpm, and where the reading in the specific card. Assessments of triglycerides, total cholesterol, HDLc, LDLc and electrolytes magnesium (Mg++) and calcium (Ca++) were performed by commercial kits LABTEST and analyzed in the LABMAX®240 device. The Sodium (Na+) and potassium (K+) were observed in the device ROCHE 9180 ELECTROLYTE ANALYZER. For quantification of hematological variables samples were counted twice and the values expressed by the average of the measures. In the event of a difference greater than 10% between the results the procedure was repeated.

STATISTICAL ANALYSIS

Values are expressed as mean and standard deviation. Normality was checked by Shapiro-Wilk test. The electrolyte and hematological variables were compared across sessions (CONT vs HIPO vs HIPER) and collections (Basal vs Exercise vs Intervention) by two-way ANOVA for repeated measures followed by post hoc Bonferroni. It was considered a significance level of 5%.

RESULTS

The twelve volunteers (26 ± 5years) were male (79.2 ± 14kg, 178 ± 6 cm), with a mean body mass index of 25 ± 4kg/m2 normotensive (SBP: 114 ± 6 mmHg, DBP: 74 ± 3 mmHg), lipid profile within normal limits (104 ± 21mg/dL triglycerides, total cholesterol: 157 ± 17mg/dL, HDL-C: 50 ± 6mg/dL, LDLc 89 ± 15mg/dl) and normoglycemic (87 ± 8mg/dL).The hematologic variables evaluated did not differ between sessions (CONT, HIPO and HIPER) studied (Table1). The blood collections (Basal vs Exercise vs Intervention) over time did not change the concentrations of Na+ and K+. Exercise increased the hematological and electrolytic other variables analyzed. The ER increased by approximately 38% of total leukocytes (P<0.001), where respectively 32% segmented neutrophils increased (P<0.001), lymphocytes 57% (P<0.001) and monocytes by approximately 50% (P<0.001). Interventions thermotherapy (P<0.001) reduced the total leukocytes from baseline, which did not occur in the control session. Segmented neutrophils in the thermotherapy interventions reduced their values in relation to the exercise by approximately 18% returning to baseline in the control session values decreased over the years, but returned to baseline. Lymphocytes were reduced to baseline levels by hypothermia after the ER, the interventions reduced the hyperthermia control and values in relation to exercise, but not enough to reach the baseline. Interventions in the values of thermotherapy monocytes reached the basal levels, which did not occur with the control session. Basophils (Session: P=0,996; Collections: P=0,860) and eosinophils (Session: P = 0,998; Collections: P=0,458) did not change during the sessions and interventions, and the values were smaller than 1% during the entire experiment (data not shown). The hematocrit, red blood cells and hemoglobin increased approximately 5% after the ER (P<0.001), however, these values decreased after the intervention in all sessions (CONT, HIPO, HIPER). At the sitting CONT, platelets did not return to baseline after the intervention (P<0.001).

Table 1. Haematological and electrolyte resulting from resistance exercise sessions and interventions

Variables	Sessions	Blood assay			ANOVA 2-way (p value)	
		Baseline	Exercise	Intervention	Session	Blood Assays
Total leukocytes ($x10^3/mm^3$)	CONT	7367 ±2473	10767 ±3255#	9275 ±2931#*		
	HIPO	7159 ±2076	10232 ±3451#	8174 ±2808*	0,586	<0,001
	HIPER	7317 ±1542	9342 ±1912#	7692 ±1687*		
Neutrophils ($x10^3/mm^3$)	CONT	5357 ±2306	7047 ±2766#	6397 ±2445#		
	HIPO	4755 ±1939	6596 ±2644#	5419 ±1615*	0,511	<0,001
	HIPER	4809 ±1615	6079 ±1960#	4941 ±149*		
Lymphocytes ($x10^3/mm^3$)	CONT	1615 ±345	2841 ±976#	2195 ±550#*		
	HIPO	1831 ±359	2886 ±1049#	2107 ±759*	0,863	<0,001
	HIPER	1902 ±345	2482 ±495#	2066 ±576#*		
Monocytes ($x10^3/mm^3$)	CONT	360 ±102	798 ±236#	604 ±174#*		
	HIPO	491 ±169	668 ±198#	568 ±177	0,743	<0,001
	HIPER	546 ±74	698 ±164#	610 ±163		
Hematocrit (%)	CONT	42,4 ±2	45,1 ±2#	43,6 ±3*		
	HIPO	44,3 ±2	46,9 ±2#	44,8 ±2,2*	0,170	<0,001
	HIPER	44,3 ±2	46,2 ±3#	44 ±2,3*		
Erythrocyte (mg/dL)	CONT	5,0 ±0,3	5,3 ±0,3#	5,1 ±0,4*		
	HIPO	4,9 ±0,2	5,2 ±0,2#	5 ±0,3*	0,324	<0,001
	HIPER	4,9 ±0,4	5,2 ±0,3#	4,8 ±0,3*		
Hemoglobin (g/dL)	CONT	14 ±0,7	14,9 ±0,7#	14,7 ±1,1		
	HIPO	14,6 ±1	15,6 ±0,7#	14,8 ±0,7*	0,160	<0,001
	HIPER	14,8 ±1	15,4 ±1#	14,6 ±0,7*		
Platelets (uL)	CONT	238,3 ±23	288,5 ±33#	272,3 ±26#		
	HIPO	285,5 ±66	329,5 ±77#	304,2 ±87	0,123	<0,001
	HIPER	266,9 ±22	293,6 ±24#	279,8 ±41		
Na^+ (mEq/L)	CONT	143,2±1,2	145,5±1,6	142,3±1,5		
	HIPO	142,3±5,9	143,7±6,3	143,5±12,5	0,217	0,333
	HIPER	146,2±1,7	146,5±2,3	145,6±3,8		
K^+ (mEq/L)	CONT	3,7 ±0,3	3,8±0,3	4,0±0,7#		
	HIPO	3,7 ±0,4	3,9 ± 0,2	3,8±0,3	0,206	0,004
	HIPER	3,6±0,2	3,8 ± 0,3	3,7±0,3		
Mg^{++} (mEq/L)	CONT	2,1±0,1	2,2± 0,1#	2,1±0,1*		
	HIPO	2,1 ±0,1	2,3± 0,1#	2,1± 0,1*	0,696	<0,001
	HIPER	2,1±0,1	2,3± 0,1#	2,1±0,1*		
Ca^{++} (mEq/L)	CONT	9,2±0,5	9,7± 0,6#	9,2±0,4*		
	HIPO	9,2±0,5	9,7± 0,6#	9,3±0,6*	0,970	<0,001
	HIPER	9,4±0,5	9,9± 0,5#	9,0±0,5#*		

Data expressed as mean and standard deviation. # P <0.05 vs. baseline, * P <0.05 vs. exercise.

Potassium (P=0.004) remained high in the session in relation to the intervention CONT thermotherapy. The ER increased blood concentrations of Mg++ (P<0.001) and Ca++ (P<0.001), respectively 10% (P<0.05) and 5% (P<0.05), but after the interventions they returned to baseline, and the HIPER Ca++ was lower than baseline concentrations. The reduced Ca++ in relation in the exercise in three different interventions (P<0.05), being more evident in HIPER.

DISCUSSION

The exercises provide high-intensity changes in homeostasis that lead to the reorganization of the response of various tissues, among these the hematopoietic, leading to increased concentration of circulating leukocytes (SUZUKI, 2002) observed during and after the exercises (MCCARTHY & DALE, 1988). Leukocytosis after the ER is due to increases in neutrophils, lymphocytes (WANG & HUANG, 2005; CGR SIMONSON SR & JACKSON, 2004) and monocytes (CRUZAT, et al. 2007; POURNOT H. et al. 2011), as part of the inflammatory lesions of muscle tissue, as evidenced after the ER in our study. These hematological changes observed after ER was mainly due to increased ischemia reperfusion (GOLDFARD BLOOMER RJ & AH 2004), where during muscle relaxation, there is an increase of tissue blood flow and CONSEQUENTLY a greater supply of oxygen resulting in the formation of species Reactive oxygen and nitrogen (ERON) (RIETJENS et al., 2008), and when they are generated above the antioxidant activity (enzymatic and nonenzymatic) tissue, promote oxidative stress, leading to injury of cellular components and / or serving as indicators or triggers of the inflammatory response (CRUZAT, V F. et al. 2007; SCHNEIDER CD AND RA OLIVEIRA, 2004).

The physical activity programs with ER promote an expected increase in hematocrit, and hemoglobin in erythrocytes (HU M, et al., 2008) arising from the improvement in functional capacity. However, our study showed a sharp increase in these variables and platelets. We believe that this fact is due to reduced plasma volume. Ahmadizad S. and El-Sayed M.S. (2005) showed that after one session of ER plasma volume decreases 10%, leading to an increase of 5.6%, 5.4% and 6.2% in erythrocyte count, hemoglobin and hematocrit, respectively, Data similar to those found in our study. The data suggest that post-intervention changes in hematocrit and red blood cells should be partial recovery of plasma volume, and the thermotherapy sessions were more effective in returning plasma concentrations of platelets. The ER stimulate the inflammatory response through the production of ERON (RIETJENS et al., 2008), which activates chemical mediators and adhesion molecules of vascular endothelium (SAHNOUN et al., 1998) for the chemotactic attraction of muscle tissue damaged by leukocytes (AOR et al., 2004), increasing muscle damage secondary (PIZZA et al., 1998). This mechanism explains the reduction of leukocytes after the interventions, and thermotherapy are slightly more effective in this reduction. The reduction in temperature reduces the blood flow, metabolism and demand for O2 by muscle tissue (BURKE et al., 2000), events after reperfusion could reduce the formation of ERON and leukocytosis (POURNOT et al. 2011), which is changes found in our study. These effects reduce muscle damage after eccentric exercise (ESTON & PETERS, 1999; POURNOT et al. 2011). The previous results (PC CASTLE et al. 2006; SELLWOOD, KL, et al. 2007; DJ COCHRANE, 2005; POURNOT H. et al. 2011) found favorable in the application of this therapy were not clearly identified in our study, believe that the time, the area of application of hypothermia reduced the level of training of volunteers, different from previous studies, are responsible for the diminished effects of this therapy. Hyperthermia results in increased temperature, blood flow and local metabolism (PRENTICE, 1999), and these mechanisms allow a greater supply of O2 and favor the removal of metabolites (ZULUAGA et al. 1995). We believe that these mechanisms favoring a reduction in circulating leukocytes due to increased fixation these in the muscle tissue, as has been evidenced the increase of antibodies in the tissue (ZULUAGA et al. 1995). The study Pournot H. et al. (2011) who compared immersion in water at 10°C, 36°C and contrast (42°C and 10°C) after intermittent exercise showed that only hypothermia reduced the leukocytes (neutrophils and monocytes) circulating after 1h recovery, and 24 h after hyperthermia resulted in increased DOMS. Our results show that 10 minutes after the interventions do not occur differences between these thermotherapy.

The limitations of this study lie in application of exercise and assistance intended solely for the muscles to a specific muscle group in the absence of assessment of chemical mediators (oxidative stress and inflammatory markers) responsible for signal transduction and muscle tissue in the analysis that would allow assess the amount of leukocytes that invaded the muscle tissue, and this information would be conducive to a better understanding of the interaction between ER and thermotherapy interventions.

CONCLUSION

The ER promote the increase of leukocytes (neutrophils, monocytes and lymphocytes), erythrocytes, platelets and electrolytes (K+, Mg++ and Ca++) checked immediately after the exercise protocol. Thermotherapy interventions applied locally for 10 minutes restored the platelet and plasma concentrations of K+. These interventions have discrete effects on leukocytosis observed after the ER in bodybuilders.

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Address: Rua das Caravelas, Nº.198,
Parque Marinha, Rio Grande / RS,
CEP 96215400, Phone: 053 3201 7362.

THERMOTHERAPY IN HEMATOLOGIC RESPONSE AFTER RESISTANCE EXERCISE IN BODYBUILDERS

SUMMARY

Resistance exercise (RE) induce the inflammatory response and leukocytosis, however the thermotherapy may decrease the effects of this response. The objectives of this study were to evaluate the changes caused by the ER and the effects of interventions thermotherapy on the concentrations of cells (white, red and platelets) and electrolytes (Na+, K+, Mg++ and Ca++) blood in trained volunteers. The sample was composed of twelve volunteers (26 ± 5years, BMI: 25 ±4kg/m2) bodybuilders for more than six months. The quadriceps muscle strength was evaluated by testing 10 repetition maximum (10RM) in the leg extension, squat and leg press. Were performed three exercise sessions at intervals of seven days, being a non-intervention (CONT), intervention with hypothermia (HIPO: 2 to 5°C) and hyperthermia (HIPER: 45 to 47°C). Thermotherapy was applied to the quadriceps muscle for 10 minutes. The blood collections were performed: baseline, after exercise and after the intervention. The ER induced an increase in all variables studied hematological and electrolytes Mg++ and Ca++, and the sessions (CONT vs HIPO vs HIPER) showed no differences. Control intervention in platelets, neutrophils, monocytes and K+ did not return to baseline. The ER promotes leukocytosis and electrolyte abnormalities, and the thermotherapy interventions favoring those hematological recoveries after these exercises.

KEYWORDS: induced hypothermia, hyperthermia induced hematology.

THERMOTHÉRAPIE DE LA RÉPONSE HÉMATOLOGIC ET APRÈS EXERCICES DE RÉSISTANCE CHEZ LES PRATIQUANTS DE LA MUSCULATION

Les exercices de résistance (ER) induisent une réponse inflammatoire et la leucocytose, néanmoins ces phénomènes n´ont pas été étudiés chez les pratiquants de la musculation. Les objectifs de cette étude a été d´évaluer les altérations provoquées par les ER et les effets des interventions thermothérapeutique sur les concentrations de cellules (blanches, rouges et plaquettes) et des électrolytes (Na+, K+, Mg++ e Ca++) sanguines sur des volontaires entraînés. L´échantillon a été composé de douze volontaires (26 ±5ans; IMC: 25 ±4kg/m2) pratiquant la musculation depuis plus de six mois. La force musculaire du quadriceps a été évaluée avec un test de 10 Répétitions Maximum (10RM) de la chaîne musculaire d'extension, en accroupissement et sur presse à cuisse. Trois séances d´exercices ont été réalisés avec des intervalles de sept jours dont l´une sans intervention (CONT), une seconde en hypothermie (HIPO: 2 a 5°C) et une troisième en hyperthermie (HIPER: 45 a 47°C). La thermothérapie a été appliquée sur la musculature du quadriceps durant 10 mn. Les collectes de sang ont été réalisées : avant et après les exercices ainsi qu´après les interventions. Les ER ont induit une augmentation de toutes les variables hématologiques étudiées ainsi que les électrolytes Mg++ e Ca++. Les séances n´ont pas présenté de différence de résultat entre les interventions, néanmoins dans l´intervention contrôle, les plaquettes, les neutrophiles, les monocytes et le K+ ne sont pas revenues aux valeurs des collectes initiales. Les ER promeuvent la leucocytose et des altérations électrolytiques, sachant que les interventions thermothérapeutiques favorisent la récupération de ces altérations hématologiques après ces exercices.

MOTS-CLÉS: hypothermie induite, hyperthermie induite, hématologie.

TERMOTERÁPIA EN LA RESPUESTA HEMATOLÓGICA, DESPUÉS DE EJERCICIOS DE RESISTENCIA EN PRACTICANTES DE LEVANTAMIENTO DE PESO

RESUMEN

Los ejercicios de resistencia (ER) inducen tanto repuesta inflamatoria como leucocitocis, a pesar de esto, estos fenómenos aun no han sido estudiados en practicantes de levantamiento de peso. Los objetivos de este estudio fueron evaluar las alteraciones generadas por los ER y los efectos de las intervenciones termoterápicas en las concentraciones de células (blancas, rojas y plaquetas) y electrolitos (Na+, K+, Mg++ y Ca++) sanguíneos en practicantes voluntarios. El grupo de estudio estaba compuesto por doce voluntarios (26±5 años, IMC 25±4kg/m2), practicantes de levantamiento de peso por mas de 6 meses. Las fuerza muscular del cuádriceps, fue evaluada por el test de 10 Repeticiones Máximas (10RM) en las máquinas de ejercicios en la extensión de la pierna, siéntese en cuclillas y prensa de la pierna leg press. Se realizaron tres sesiones de ejercicios con intervalos de siete días, siendo una sin intervención (CONT), intervención con hipotermia (HIPO: 2 a 5°C) y con hipertermia (HIPER: 45 a 47°C). La terapia térmica fue aplicada en los músculos cuádriceps por 10 min. La recolección de muestras de sangre fue realizada: antes del ejercicio, después del ejercicio y después de las intervenciones. Los ER, produjeron un aumento en todas las variables hematológicas estudiadas, también de los electrolitos Mg++ y Ca++. No se presentaron diferencias entre las intervenciones, mientras que en el control plaquetas, neutrófilos, monocitos y el K+ , no retornaron a los niveles de las colectas antes del ejercicio. Los ER promueven la leucocitosis y alteraciones electrolíticas, siendo que las intervenciones termoterápicas favorecen la recuperación de estas alteraciones hematológicas después del ejercicio.

PALABRAS CLAVE: Hipotérmia inducida, hepertérmia inducida, hematología.

TERMOTERAPIA NA RESPOSTA HEMATOLÓGICA APÓS EXERCÍCIOS RESISTIDOS EM PRATICANTES DE MUSCULAÇÃO

RESUMO

Os exercícios de resistência (ER) induzem a resposta inflamatória e a leucocitose, entretanto a termoterapia pode atenuar os efeitos secundários desta resposta. Os objetivos deste estudo foram avaliar as alterações provocadas pelos ER e os efeitos das intervenções termoterápicas sobre as concentrações das células (brancas, vermelhas e plaquetas) e dos eletrólitos (Na+, K+, Mg++ e Ca++) sanguíneos em voluntários treinados. A amostra foi composta por doze voluntários (26 ±5anos; IMC: 25 ±4kg/m2) praticantes de musculação a mais de seis meses. A força muscular do quadríceps foi avaliada pelo teste de 10 Repetições Máximas (10RM) na cadeira extensora, no agachamento e no leg press. Foram realizadas três sessões de exercícios com intervalos de sete dias; sendo uma não intervenção (CONT), intervenção com hipotermia (HIPO: 2 a 5°C) e com hipertermia (HIPER: 45 a 47°C). A termoterapia foi aplicada na musculatura do quadríceps por 10min. As coletas sanguíneas foram realizadas: basal, após os exercícios e após as intervenções. Os ER induziram a um aumento de todas as variáveis hematológicas estudas e os eletrólitos Mg++ e Ca++, sendo que as sessões (CONT vs HIPO vs HIPER) não apresentaram diferenças. Na intervenção controle as plaquetas, os neutrófilos, os monócitos e o K+ não retornaram aos valores basais. Os ER promovem a leucocitose e alterações eletrolíticas, sendo que as intervenções termoterápicas favorecem a recuperação destas alterações hematológicas após estes exercícios.

PALAVRAS-CHAVE: hipotermia induzida, hipertermia induzida, hematologia.