158 - BLOOD LACTATE ANALYSES AND STNF-R1 CONCENTRATIONS AFTER ACUTE EFFORT TESTS CARRIED THROUGH IN TWO DISTINCT SWIMMING TRAINING PERIODS

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INTRODUCTION

According Makarenko (2001), the capacity of the swimmer organism to adapt to gradual increasing loads in the training involves the overcoming of the fatigue. It depends, over all, to the possibilities of to speed the systems that can guarantee the energetic metabolism in organism. In this situation of overcoming fatigue, as well as other situations when the athlete's objects win competitions or improve their performances, Bompa (2002) affirms that the procedures to adopt to reach the intentions need to be accurate and measurable. Because of this, the training planning periods are made.

The swimming training seasons planning implies in the separation of the year of training in smaller and malleable units that emphasize the development of some characteristics (MAGLISCHO, 2003).

As Maglischo (2003), in "general endurance period" the emphasis is improve the general aerobic capacity, strong, flexibility, swim mechanics, turned and starts and psychological stress resistance. In the other hand, in the "specific endurance period" the emphasis is in improve the endurance and the majority of training must be carried through in the swimmer main style.

In accordance with Costill et al. (1991) and Laignier et al. (2006), the effective administration of training programs requires the some varieties control like amount of exercise (volume), quality (intensity) and executed frequency that are known factors to determine the training adaptations levels.

To control these possible adaptations, tests are used to evaluate the physiological and immunological variables that are involved in training process (FEBBRAIO e PEDERSEN, 2002; SMITH, NORRIS e HOGG, 2002). This control can assist the better performance acquisition in correctly moment in the season (MUJIKA et al., 2004).

The lactate test is a control and evaluate test of physiological variables that, according to Maglischo (2003), is one of the most certainly and recommendable to monitoring the possible training adaptations in physiological variables. Can be used, according to Pyne et al. (2000), to prescribe, available and control of training and adaptations.

To evaluate and control the immunological responses in exercises can be measures the citokines and receptors concentrations that, in response of effort, presents increase levels, as affirm Febbraio e Pedersen (2002) and Pedersen, Steensberg and Schjerling (2001). The elevation occurs because of an inflammatory induction response caused by exercise (FEBBRAIO e PEDERSEN, 2002). There are several citokines and receptors that acts in specifics situations in immunological responses. The receptor that was analyzed in the present study was the Soluble Receptor of Tumoral Necrosis Factor 1 (sTNF-R1).

Considering that in different phases of training planning the immunological, physiological and performance responses can be different, the aim of this study was evaluate the lactate concentrations after acute effort test in two different training periods. Moreover, evaluate the sTNF-R1 concentrations after effort test in one swimming period.

METHODS

Fifteen athletes had participated. There were four women and eleven men, freestyle specialists. All they are on Brazilian Aquatic Sports Confederation (CBDA) and swimmers by a swim team in Belo Horizonte, Minas Gerais, Brazil.

The volunteers were informed by methods and objects of study and that they could stop their participations at any time without any damage. They sign to participate of this study that was approved by Ethics Committee in Research with Human by Universidade Federal de Minas Gerais.

Two collects were done in two different training days. In the first day of November in two thousand five (01/11/2005) the training period was specific endurance, and in February fifteen in two thousand six (15/02/2006) was general endurance period.

The blood collect for lactate concentration analyses occurred in both days. However, the venous blood collection to analyze the receptor concentrations just occurred in the first period, because there was no authorization to collect.

The collects were done in the proper training local, in the morning.

The test protocol that were used to determine the blood lactate concentration was The Vitesse Blood Test, cited by Maglischo (2003). The swimmers did a standardized warm-up and, after swan four hundred meters in 85% to their best time (MAGLISCHO, 2003). The blood for the lactate analyzes was collected one minute after effort test, and the blood samples to inhibitor receptor cytokine was collected between two and tree minutes after effort test.

According to Maglischo (2003), the collects to lactate analyzes were done tip of the indicating fingers. For each puncture the local were sterilized. The swimmers clean their hands with barren gauze after each test. The responsible researcher used sterilized surgical gloves that were disinfected after each blood collect. The blood samples were placed in straps with specifics reagents to determine lactate concentrations.

The used lactate meter (Accusport Lactate Meter) process and offer results in one minute, needs enter ten and twenty five µl (microliter) of blood and was calibrated after twenty samples analyses, according to standard manufacturer. These procedures were adopts according Pyne et al. (2000).

The blood to evaluate the sTNFR1 concentrations was collect by antecubital vein, with swimmers in seat position. Were collected five mL (milliliter) of venous blood for this analyze. Sterilized needles were used. It was used sterilized surgical gloves that were disinfected after each blood collects.

The blood samples were centrifugated and placed in a - 20ºC in the Microbiology Laboratory of Centro Universitário de Belo Horizonte - UNI-BH.

The laboratory data analyzes were did by kit sTNFRI Biotinylated Anti-human TNF RI Antibody (R&D Systems, Minneapolis, MN, U.S.A), with "Ensyme-linked immunosorbent assay" method (ELISA). This analyze occurred in the Immune Pharmacology Laboratory of Biological Science Institute of Universidade Federal de Minas Gerais.

For statistical analyzes were used statistical programs Prism 3.0 and SPSS 11.0. After data tabulate in tables, were did verification of normality through Shapiro-Wilk test for all variables. The test show normal curve for used dates. The level of significance was by 5%, $p = 0,05$. To compare the mean values for blood lactate concentrations and swim test times, in both periods, it was used paired T Student Test (T-dependent) and two-tailed, for parametric data. To analyze the sTNFR1 concentrations data it was compared the swimmers plasma concentration and average sTNFR1 concentrations values found in literature. Therefore the values

were compared between itself.

RESULTS AND DISCUSSION

When was compared the concentrations of blood lactate taked immediately after the test carry through in distinct periods of training, was found a significant difference (p=0,0002) beside the levels from specific endurance period and general endurance period. The levels of blood lactate from specific endurance period was greater than levels from general endurance period (Fig. 1).

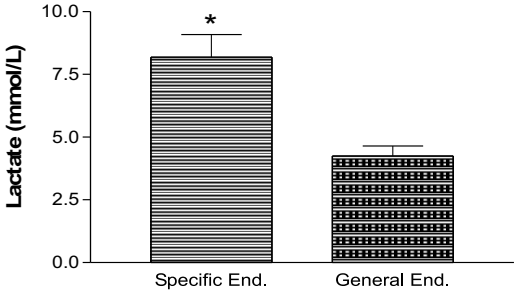

Figure 1 - Lactate level after the Specific Endurance Period and General Endurance Period
* Statistically different to the general endurance period - p = 0,05

The results of this study show that in specific endurance period, the swimmers was most physically prepared and with a greater tolerance to lactate. That was one of the most importants objectives from this period of training (MAGLISCHO, 2003).

A lot of factors can be the causes from accumulate lactate. A bigger intensity of training of swimming during the specific period and the tapering could lead to adaptations of the anaerobic mechanism, resulting in a bigger lactate concentration after the maximum effort (BONIFAZI, SARDELA and LUPO, 2000).

We can affirm that the energy way predominantly used by the athletes for the accomplishment of the tests is a mixing way, a time that Maglischo (2003) it affirms that, as much the anaerobic metabolism how much aerobic they contribute substantially for the supply of energy in 400 and 500 meters tests (4 to 6 minutes of swimming) (MAGLISCHO, 2003).

Therefore, in the intensity guided for the accomplishment of the test, in accordance with the followed protocol, will have accumulation of lactate when this substratum to pass to be produced in a bigger speed that of its elimination.

As amongst some factors that limit the performance in swimming, the anaerobic metabolism is considered excellent for equal or superior distances the 400 meters in all the styles (BONIFAZI, SARDELA and LUPO, 2000), it is pertinent that the individuals have presented bigger blood lactate concentrations in the specific endurance period, demonstrating to bigger tolerance acidosis and fatigue. This affirmation can be made because, when compared the times gotten in the carried through tests of effort in distinct periods of training, a significative statistical difference (p=0,0043) it between the values of the specific endurance period and the general endurance period. The times gotten in the specific endurance period had been presented lesser that the times of the general endurance period (Fig. 2).

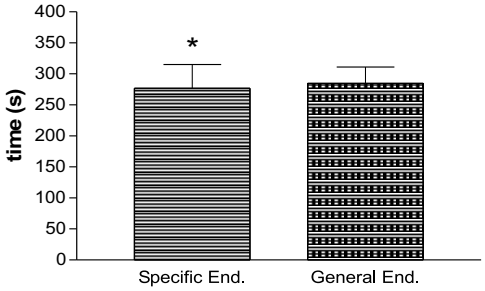

Figure 2 - Time comparison in the effort tests on the Specific Endurance and General Endurance periods
* Statistically different to the General Endurance Period - p = 0,05

Therefore, the times gotten in the tests carried through in the general endurance period had shown a lesser physical performance of the athletes in this period, since they had carried through the two tests to one same intensity and the times gotten in the tests of the general endurance period had been bigger, result this considered significant.

Therefore, the times gotten in the tests carried through in the general endurance period of the training had shown a lesser physical performance due to the peculiar characteristics of each period and different levels of adaptation that they supply, the answers to the tests if present in distinct way in the periods specific and basic of training. Pyne et al. (2000) they affirm that an improvement of the physical performance is indicative of adaptations (GARCÍA, VALDIVIELSO and MILLÁN, 1998) to the training in the physiological scopes, as the alterations in the hearth rate and the tolerance to lactate. This increase of the lactate tolerance as form of training adaptation has been disbelieved in some modalities as swimming, race and cycling, as they affirm Pyne et al. (2000).

The results of this study in blood lactate concentrations in the specific endurance period significantly bigger in relation to the general endurance period (p=0,0002), and times was significantly lesser to specific endurance period that the times of the general endurance period (p=0,0043), that are in accordance with Bonifazi, Sardela and Lupo (2000). They affirm that an increase of the performance of swimmers was associated with a lactate concentration increase in collections carried through in the specific endurance period. Of similar form, Pyne et al. (2000), it demonstrated that the improvement of the lactate tolerance happened, in its study, parallel to the improvement of the performance. In another study of Pyne et al. (2000) a great correlation is cited between a good performance in events of endurance and the lactate concentration in athlete.

When the comparison was carried through between the cytokines basal values average of proposal in literature and the values average verified acute effort after was observed a trend of increase of the concentration of sTNF-R1 in relation to the rest values (Fig. 3).

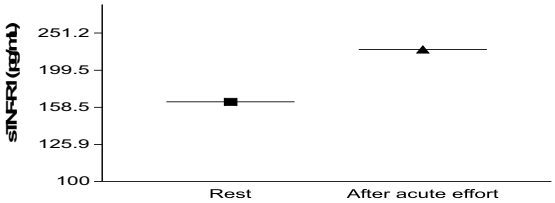

Figure 3 - sTNFR1 level in the rest and after acute effort in the "specific endurance period.

This increase found in plasma concentration of the inhibitory cytokine sTNF-R1, in reply to the production of inflammatory citokines unchained by the acute exercise is in accordance with the information of Pedersen et al. (2000), that they after affirm an increase in plasma concentrations of pro-inflammatory cytokines the intense exercise. This reply it is balanced for the antiinflammatory cytokines concentrations increase.

Moreover, studies cited for Rhind, Shek and Shephard (1995), Pussieldi et al. (2005), and Pussieldi (2006) and had after shown to an increase in the sTNF-R1 plasma levels in response to the submaximal exercise, collections carried through during and the stimulaton. The same resulted it was found in the present study, that evaluated the sTNF-R1 response after the submaximal exercise. Moreover, Rhind, Shek and Shephard (1995) not fund conclusive results about sTNF-R1 in collections carried through during and the maximum exercise.

This increase of the concentrations of sTNF-R1 can have occurred due the activation of antiinflammatory cytokines from a response to the inflammatory cytokines release (OSTROWSKI et al., 1999). This release happens due the components alterations of the immune system that occur when it has intense exercises practice (GLEESON et al., 2000).

Therefore, the increase of the concentrations of the inhibitory cytokine can indicate inflammation in the athletes who had participated of the present study. As the exercise and the training induce disturbances in the immune functions of healthful athletes (MACKINNON, 2000), practical extreme and the intense one of physical activities can become the individual most vulnerable the infections (GLEESON, 2000).

CONCLUSION

This study showed that difference exists between the blood lactate concentrations and the times gotten after acute effort test in swimming athlete. Bigger the blood lactate concentrations had been and lesser time of effort in the specific endurance period when compared with general endurance period. Moreover, an increase in the concentrations of the sTNF-R1 after acute effort in swimming athletes in the specific period of training, in response to inhibitory cytokines increase caused by an increase in the stNFR1 levels, that is e response caused by the exercise.

To leave of these information, one concludes that changeable physiological, as lactate; and immunological, as the receptors, can be used as indicative of possible adaptations to the swimming training process.

One suggests that other studies are carried through comparing concentrations of lactate and sTNFR1 in distinct periods of training using a bigger sample, as well as controlling the period of training between the collections, for verification of the level of adaptation and inflammation that that period of training provided to the athletes.

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ABSTRACT - ANALYSES OF BLOOD LACTATE AND sTNF-R1 CONCENTRATIONS AFTER ACUTE EFFORT TESTS CARRIED THROUGH IN TWO DISTINCT SWIMMING TRAINING PERIODS

The aims of this study were: compare the blood lactate concentrations and times of swimming tests of efforts in two different training periods (general endurance preparatory and specific endurance preparatory), and verify the sTNF-R1 concentrations after acute effort in specific endurance preparatory period. This study was approved by Ethical Committee for Studies with Humans by UFMG. Fifteen swimmers participated and were informed of the risks and purposes of this study before their signed the consent. The Vitesse protocol was utilized to determinate lactate concentration, the blood collects were in both training periods, and the analysis was by Accusport Lactate Meter. The blood samples collected to verify sTNF-R1 concentrations were just in preparatory of specific endurance training period and this analysis were by ELISA. The lactate values of specific endurance were higher than the general endurance values (p=0,0002). The times of swimming tests of efforts in general endurance were higher than specific endurance (p=0,0043). The average of sTNFR1 concentrations after acute effort was higher than basal values. The conclusion is that were alterations in athletes conditionings and increase in inflammatory response after acute effort, in the training periods that were evaluated.

Key words: lactate, sTNFR1, swimming

RESUME - LES ANALYSES DU SANG ALLAITENT ET LES CONCENTRATIONS STNF-R1 APRÈS LES ESSAIS AIGUS D'EFFORT EXÉCUTÉS DANS DEUX DIFFERENTES PÉRIODES DU ENTRAINEMENT DISTINCTES DE NATATION

Les objectifs de cette étude étaient: comparer les concentrations du lactate sanguin et les temps obtenus après des essais d´effort en deux differentes périodes du entraînement de natation (périodes de préparation à résistance générale et spécifique) et vérifier la concentration de la citokine sTNF-R1 en athlètes après léffort aigu pendant la période de préparation à résistance spécifique. Quinze athlètes ont participé de cette étude que a été approuvée par le *Comitê de Ética em Pesquisa com Seres Humanos* de la *Universidade Federal de Minas Gerais*, Brésil. Ces athlètes étaient au courant des risques et des buts de cette étude et leur consentement a été obtenu. Le protocole de Vitesse a été utilisé et les echantillons de sang pour l´évaluation des concentrations du lactate sanguin étaient obtenus pendant les deux périodes d´entraînement stipulées. Les echantillons de sang pour measure les concentrations de sTNF-R1 étaient obtenus seullement pendant la période de resistance spécifique. Les analyses des concentrations du lactate sanguin et de sTNF-R1 étaient realisées par un lactimètre et par le méthose ELISA, respectivement. Les points de lactate sanguin trouvés étaient statistiquement plus grands en la période de resistance spécifique que en la période de resistance générale (p=0,0002). Les temps obtenus après les essais dans la période spécifique d`entraînement ont présenté inferieurs que les temps de resistance générale (p=0,0043). En plus, quand était réalisée la comparaison parmi les points normals de citokines et la moyenne des points vérifiés après l´effort aigu, il y a eu une tendence à augmenter les concentrations de sTNF-R1. Pour conclure, il y a eu changements en les conditionnements des athlètes, ainsi que l`augmentation en la response de l`inflammation après l´effort aigu, dans les périodes évaluées.

Mots-clefs: lactate, sTNFR1, natation

RESUMEN - ANÁLISIS DE LAS CONCENTRACIONES DEL LACTATO DE LA SANGRE Y STNF-R1 DESPUÉS DEL ESFUERZO AGUDO EN DOS PERÍODOS DISTINTOS DE ENTRENAMIENTO EN NATACIÓN

El objetivo de este estudio fueron: comparar las concentraciones del lactato de la sangre y los tiempos de los tests de natación en dos distinctos períodos de entrenamiento (preparatorios de resistencia general y preparatorios de resistencia específica), y verificar las concentraciones de sTNF-R1 después del esfuerzo agudo en el periodo preparatorio de resistencia especifica. Este estudio fue aprobado por el Comité de Eticá en estudios con los seres humanos de UFMG. Quince nadadores participaron y fueron informados de los riesgos y de los propósitos de esto estudio antes de que su consentimiento escrito fuera obtenido. El protocolo de Vitesse fue utilizado para la concentración determinada del lactato, la sangre recogida fueron en ambos períodos de entrenamiento, y el análisis fueron hechas por el lactímetro Accusport. Las muestras de la sangre recogidas para verificar las concentraciones sTNF-R1 fueron hechas en el periodo preparatorio de entrenamiento específico de la resistencia y este análisis fue hecha por el metodo de ELISA. Los valores del lactato de la resistencia específica fueron más altos que los valores de la resistencia general (p=0,0002). Los tiempos de los tests de natación en el periodo de resistencia general fueron más altos que en la resistencia específica (p=0,0043). El promedio de concentraciones del inhibidor de citocina después del esfuerzo agudo fue más alto que en valores básicos. La conclusión es que ocurrieron alteraciones en las condiciones de los atletas y aumentaron la respuesta inflamatoria después del esfuerzo agudo, en los períodos de entrenamiento que fueron evaluados.

Palabras-clave: lactato, sTNFR1, natación

RESUMO - ANÁLISE DAS CONCENTRAÇÕES DE LACTATO SANGUÍNEO E DE sTNF-R1 APÓS TESTES DE ESFORÇO AGUDO REALIZADOS EM DOIS PERÍODOS DISTINTOS DE TREINAMENTO EM NATAÇÃO

O presente estudo teve como objetivos: comparar as concentrações de lactato sanguíneo e tempos obtidos após testes de esforço em dois períodos distintos de treinamento de natação (períodos preparatórios de endurance geral e específica), e verificar a concentração de sTNF-R1 nos atletas após esforço agudo no período de treinamento de endurance específica. Participaram do estudo, que foi aprovado pelo Comitê de Ética em Pesquisa com Seres Humanos da Universidade Federal de Minas Gerais, quinze atletas que assinaram o termo de consentimento livre e esclarecido. Foi utilizado o protocolo Vitesse e as coletas de sangue para avaliação das concentrações de lactato sanguíneo foram realizadas nos dois períodos de treinamento estipulados. Já as coletas de sangue venoso para verificação das concentrações de sTNF-R1 foram realizadas apenas no período de endurance específica. As análises das concentrações de lactato sanguíneo e de sTNF-R1 foram realizadas através de lactímetro e método ELISA, respectivamente. Foram encontrados valores de lactato sangüíneo do período de endurance específica estatisticamente maiores que os valores do período de endurance geral (p=0,0002). Os tempos obtidos após os testes no período de endurance específica de treinamento apresentaram-se menores que os tempos de endurance geral (p=0,0043). Além disso, quando foi realizada a comparação entre os valores basais de citocinas e a média de valores verificada após esforço agudo foi observada uma tendência ao aumento da concentração de sTNF-R1. Conclui-se, que houve alterações do condicionamento dos atletas, bem como aumento da resposta inflamatória após esforço agudo, nos períodos avaliados.

Palavras-chave: lactato, sTNFR1, natação.