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The influence of creatine on the changes of lactate and cortisol in elite wrestlers' blood

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Physical exercises can have both positive and negative effects on immune system strength against infections. So, long-term and severe physical exercises increase the chance of catching infectious diseases and on the contrary moderate and regular exercises decrease the chance of catching them [10]. Intense physical training exercises without an appropriate nutritional plan can decrease immune system function and lead to upper respiratory tract infections and finally drop off athletes [6, 10]. Keeping the blood glucose level at the normal levels prevents the enhancement of stress-induced hormone like cortisol and release of interleukin-6 and therefore prevents suppression of the immune system. Reduction in blood glucose level is a major factor in effects of cortisol release, before, during and after the physical training exercise. Consumption of carbohydrate drinks increases the level of glucose and cortisol [12].

Lactate threshold is a good indicator of the potential of athletes in activities requiring endurance. The lactate threshold (LT) is the exercise intensity at which lactate (more specifically, lactic acid) starts to accumulate in the blood stream. The reason for the acidification of the blood at high exercise intensities is two-fold: the high rates of ATP hydrolysis in the muscle release hydrogen ions and also bicarbonate stores in the blood begin to be used up. This happens when lactate is produced faster than it can be removed (metabolized).

This point is sometimes referred to as the anaerobic threshold (AT), or the onset of blood lactate accumulation (OBLA). The lactate threshold is a useful measure for deciding exercise intensity for training and racing in endurance sports (e.g. long distance running, cycling, rowing, swimming and

cross country skiing), but varies between individuals and can be increased with training.

Wrestling is weight classification sport and due to the time of competition various energy systems are involved in it. Nutrition is very effective in the performance of an athlete during exercise, competition and weight loss period. Therefore, most of athletes have attended to take nutritional supplements such as creatine and glutamine to improve their athletic performance.

Creatine has been used by many successful athletes, particularly in track and field athletics, and in many other sports as well. There are many excellent reviews of the effects of creatine supplementation, but the picture changes rapidly as new information emerges in this topical area [4, 7, 8, 14].

In spite of numerous researches done in the field of the effects of nutrition on the athletes' performance, it is still not obvious whether taking nutritional supplements such as creatine and glutamine are necessary for the improvement of athletic performance, or if the wrestlers acquire the knowledge of how to use proper nutrition, they will achieve the same efficiency and none of these supplements will be required anymore.

The aim of this study was to investigate the influence of creatine on wrestlers' blood cortisol and lactate level.

Materials and Methods

The subjects for this study were 18-27 years old elite wrestlers from Mazandaran province (Iran). A questionnaire was administered to evaluate medical history and health conditions of participants. Further, related data about the samples' recent nutritional diets and also their meals within the last 24 hours were collected. The volunteers were divided into creatine supplement and control groups. Accurate measurements of height, weight of the participants and also the measurement of subcutaneous fat with a caliper were carried out before the experiment. Blood samples of all subjects were collected before participation in the experiments, immediately after the end of each exercise, and after a 2-hour recovery period. Samples were taken from the right hand and arm, without any deflation and sent for measurement of cortisol and lactate. After two weeks, another blood sample was collected from the subjects under the same condition. The subjects of the experimental group received creatine supplement (0.3 g/kg of body weight of each subject) for 15 consecutive days. The creatine powder was consumed with 250 cc water in 5 consecutive days per a week (4 times in each day). Then, 5 g creatine in one session at night was administered. To

determine intra-group differences independent t-tests were performed. Statistical analyses were performed through SPSS (version 15; SPSS, Inc., Chicago, Ill.) and significance level of 0.05 was used for all statistical tests.

Results and Discussion

Exercise stress increases the concentration of stress hormones such as cortisol which are associated with effects on safety. Cortisol decreases the transfer of white cells of blood to inflamed area and damaged cells of phagocytes. The reason is that cortisol reduces the production of prostaglandins and leukotrienes that could dilate vessels, penetrability of capillaries and invigoration of white blood cells. Besides, cortisol reduces the number of blood eosinophils and lymphocytes, whose level is a standard for cortisol hormone secretion level. Cortisol also has a negative-feedback effect on interleukin-1.

Analyses of the cortisol concentration levels in different groups showed significant difference before, immediately and two hours after exercise in pre- and post-test in creatin supplement and control groups (Tables 1, 2).

It was shown that in pre-test group there was a significant difference between the data obtained before, immediately and 2 hr after the exercise. It was shown the tendency to increase of cortisol level immediately after exercises, followed by its further increase 2 hr after exercise.

Table 1

Creatine supplement influence on cortisol level in blood in pre- and post-test subgroups

Group	Test procedures	Cortisol average±SD (pre-test) ng/ml	Cortisol average± SD (post-test) ng/ml
Experimental	before the exercise	11.13±65.82	19.09±83.84
	after the exercise	*11.81±103.64	*10.02±110.05
	two hours after exercise	**14.15±68.68	**±77.02 12.3
Control	before the exercise	14.05±72.28	18.40±79.14
	after the exercise	*112.10 19.4±	*114.95 ± 15.84
	two hours after exercise	**75.14 12.3±	**82.48 11.24±

* significant difference between before and immediately after exercise,
** significant difference between immediately and 2 hours after exercise

The results of the present study correspond with the findings of some researchers that found significant increase in cortisol level after high-intensive physical exercise [10,11]. The results indicated that administration of carbohydrate prevents the elevation of cortisol level [1, 6, 12]. It was shown that plasma cortisol concentrations in athletes who used carbohydrate drinks were lower than in their counter-parts that received a placebo drink [9], suggesting that plasma cortisol concentrations negatively correlated with plasma glucose levels immediately after physical exercises [13].

Lactate is a ubiquitous substance that is produced and removed from the body at all times, even at rest, both with and without the availability of oxygen. It is now recognized that lactate accumulates in the blood for several reasons, not only when oxygen supply to the muscle is inadequate. Lactate production and removal is a continuous process; it is the change in the rate of one or the other that determines the blood lactate level.

During the exercise lactic acid is produced in skeletal muscle cells by glycogenolysis, typically caused by an inadequate oxygen supply to the mitochondria and the accumulation of lactic acid causes decline of intracellular pH. This lactic acidosis develops at a metabolic rate that is specific to the individual and the task being performed [13]. During supramaximal exercise contracting skeletal muscles produce and accumulate lactate and proton ions. Lactate is either removed by oxidation in the muscle fibers or is released to the blood and removed by other cells according to the cell-cell lactate shuttle, which is facilitated by membrane-bound monocarboxylate transporters [2, 3, 5]. So the role of lactate and its measurement in exercise testing and prescription is equally important.

The results of the investigation of the blood lactate level in the pre-test showed significant differences before, immediately and after two hours of activity (at rest) in creatine and control groups ($p < 0.05$) (Table 2).

Table 2

Blood lactate level immediately and 2 hours after activity in creatine and control groups

Groups	Test procedures	Lactate average±SD (pre test)	Lactate average± SD (post test)

		Mg/dl	Mg/dl
Experimen-tal	before the exercise	*23±8.58	*28.85±7.88
	after the exercise	**29.85±9.40	**62.71±5.91
	two hours after exercise	24.14±8.11	32.85±6.36
Control	before the exercise	*27.42±12.50	*24.14±5.63
	after the exercise	**13.32 36.14±	**61.57±3.59
	two hours after exercise	14.27 29.85±	12.53 47.14±

* significant difference between before and immediately after exercise,
** significant difference between immediately and 2 hours after exercise

The results of the study indicated that in pre-test group there was a significant difference between the data obtained before, immediately after and 2 hr after the exercise. It was shown the tendency to increase of cortisol level immediately after exercises, followed with its decreasing 2 hr after exercise. Such tendency was found out both for creatin supplement and control groups.

It was shown that in creatin administration group lactate level after activity significantly increased compared with pre-test subgroup followed by its decreasing 2 hr after activity. In pre- and post-test subgroups the level of lactate was similar.

Therefore, in post-test subgroup it was shown that immediately the level of lactate in wrestlers blood increased two times on the background of 15 days administration of the creatin supplement, compared with pre- and post-exercise subgroups. This could be explained by accumulation of lactate during exercises in blood. However 3 hr after exercise the level of lactate both in control and creatin supplement groups became very close to pre-test subgroup's data.

Comparing blood lactate level between creatine supplement and control groups showed significant increase immediately and 2 hours after activity ($p < 0.05$) (Table 2).

By analysis of cortisol and lactate levels in blood in pre- and post- test subgroups was shown that on the background of creatin supplement administration in post-test subgroup the level of cortisol in the immediately post-test subgroup decreased while lactate level demonstrated two fold increase compared with pre-test group. It was also shown that in the rest period lactate lavel rapidly decreased while in pre-test group before creatine

administration there was demonstrated a very slow decreasing of lactate level.

The magnitude of post-exercise changes in elite wrestlers' blood lactate depends on creatine, especially in the post-test and in the rest subgroups. However creatine supplement administration doesn't have significant effect on cortisol level changes in post- and rest subgroups. The correlation between post-exercise blood lactate and cortisol were not significant in pre-exercise subgroup, but was significant in after and 2h after exercise subgroups.

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Կրեատինի ազդեցությունը բարձրակարգ ըմբիշների արյան կաթնաթթվի և կորտիզոլի քանակի վրա

Մ. Աբբասալիփուր, Ս.Մ. Մինասյան

Մեր հետազոտության նպատակը եղել է բարձրակարգ մարզիկների արյան կորտիզոլի և կաթնաթթվի քանակների վրա կրեատինի ազդեցության ուսումնասիրումը: Հետազոտվել են Մազանդարան քաղաքի 18-25 տարեկան բարձրակարգ ըմբիշներ՝ ստուգիչ, որպես սննդային հավելում կրեատին ստացած և կրեատինով հարուստ սննդակարգ օգտագործած խմբերով: Կորտիզոլի քանակը մարզումներից անմիջապես հետո գլյուկոզի քաղցի առաջացմանը զուգահեռ զգալի ավելանում է օրգանիզմում, ինչը հատկապես ընդգծված է ստուգիչ խմբում: Կրեատինը կանխարգելում է այս երևույթը, քանի որ նպաստում է մկանների ֆիզիկական մարզվածության բարձրացմանը: Սակայն մեր հետազոտությունները բացահայտեցին, որ մարզիկները կարող են նույն ցուցանիշներին հասնել՝ առանց «սննդային հավելում» կրեատինի: Բավական է նրանց համար կազմել ճիշտ սննդակարգ, որը պարունակում է անհրաժեշտ քանակությամբ կրեատին:

Влияние креатина на уровень лактата и кортизола в крови у элитных борцов

М. Аббасалипур, С.М. Минасян

Целью нашего исследования было изучение воздействия креатина на уровень лактата и кортизола крови. Исследовались элитные борцы в возрасте 18-25 лет города Мазандарана в Иране тремя группами – контрольная, борцы, которые получили креатин в качестве пищевой добавки, и спортсмены, которые питались продуктами, богатыми креатином. В связи с физической нагрузкой и понижением в крови глюкозы у всех групп повышался уровень кортизола, что особенно выражалось в контрольной группе. Креатин предотвращает это явление, поскольку способствует увеличению мышечной силы. Полученные данные показали, что наилучших результатов спортсмены могут достигнуть и без употребления креатина в качестве пищевой добавки, используя только правильно выбранную пищу.

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