Contribution of Climbing up to High Altitudes Subsequent to Co-enzyme Q10 Completing on Mallon-di-aldehyde Variations in the Serum of Male Mountaineers

Shahla Hojjat[1*], Morteza Moghimi Oskouei[2], Mir Hamid Salehian[3]

[1.] Department of Physical Education and Sport Sciences, Karaj branch, Islamic Azad University, Karaj, Iran
Corresponding Author: Shahla Hojjat
[2.] Department of Physical Education and Sport Sciences, Karaj branch, Islamic Azad University, Karaj, Iran
[3.] Department of Physical Education, Tabriz branch, Islamic Azad University, Tabriz, Iran
E-mail: dr.sh.hojjat@gmail.com; Email: mortezamoghimi15@gmail.com
+989144139893; E-mail:mh_salehian@yahoo.com; +989144174072

Abstract: The aim of this research was to study the climbing effect into high altitude contribution as subsequent to supplement of Q10 coenzyme on Mallon-di-aldehyde rate in male mountaineers' serum. Thus, 14 experienced and skilled male mountaineers (average 181 cm height, 25.5 years old, 75 kg, Body mass index 22, Percent of hypodermic fat 10 cm in Ave., VO_{2Max} 80.5 lit/min, with experience of 5-15 years) were selected randomly and divided into 2 Experimental and Control groups. Before climbing, they consumed Q10 supplement and Placebo for 14 days. Their blood samples were analyzed in 4 different altitudes; 1500m, 2800m, 4300m and 5671m during climbing to Damavand summit. The results were considered by special kits of laboratory and auto-analyzer machine. Data were analyzed by F Test (as variance test with repeating in related factor). The relation among Q10 supplement hasn't a meaningful relation with Mallon-di-aldehyde rate but altitude variations are in meaningful relationship for both of the groups.

[Shahla Hojjat, Morteza Moghimi Oskouei, Mir Hamid Salehian. **Contribution of Climbing up to High Altitudes Subsequent to Co-enzyme Q10 Completing on Mallon-di-aldehyde Variations in the Serum of Male Mountaineers.** *Life Sci J* 2012;9(4):1389-1392] (ISSN:1097-8135). http://www.lifesciencesite.com. 210

Key words: high altitude, coenzyme of Q10, Mallon-di-aldehyde, mountaineering

1. Introduction

Mountaineering is an exercise with useful benefits and effects such as increasing and improving in Hemoglobin rate or a great resistance in cardiovascular system. Also, there are other harmful and negative effects as particular disorders like acute mountain sickness (AMS) or high altitude brain edema. Some of the mountaineers face with following disorders and problems, too: Diarrhea, Headache, Vomiting and Oxygen deficit around of the site (Armstrang, 2000; Bahrami, 2004). In the summer of 1968, during of the Olympics games of Mexico-City, altitude contribution on athletes" performance was noted by the media and reporters seriously (Fox and Mathius, 1992). Based on the reports, Hypoxia emanates from high altitude climbing and this event plays a considerable role to make oxidative stress (Dosek, 2007). Getting more and excessive exercises will increase the need for oxygen and hence your body will consume a lot of oxygen. Excessive oxygen consuming means more free radicals formation. This problem cause to damage and obliterate the cells and lastly physical fatigue at this time, our body begins to use from the anti-oxidants in our around to defend against the oxidants and free radicals. There is no problem if we provide our need for these substances well. But if the body faced with anti-oxidants deficit in inner site then we couldn't get any hope to save the cells against of oxidation danger (Safari, 2005). So, practice and exercise in high altitude could be effective to make free radicals (Cooke et al., 2008). Using anti-oxidative supplements such as vitamins and semi vitamins nutrients are very important factors basically (Subudhi et al., 2004). Due to the reports, anti-oxidant Q10 effects and vitamin E are considered for fighting against free radicals resulted from excessive exercises (Cooke et al., 2008). Co-enzyme Q10 is a kind of dissoluble vitamin in the fat and it is available in all of the cells. In fact, co-enzyme Q10 plays a great role for electrons' transmit in mitochondria site, oxidation cycle, ATP producing and a strong anti-oxidant in reproducing of other anti-oxidants (Damia et al., 2001; CPDDP, 2007). In other hands, i.e., measuring index of Mallon-di-aldehyde states oxidative stress rate and free radicals in altitude and shows the peroxidation rate of the fats (Malek Zadeh 2004; Benzie, 2004). According to the studies in 2005 about of anti-oxidants and their relationship with oxidative stress and free radicals, it was found that anti-oxidants are as defensive factors and they reduce the cells as a resistant force against of free radicals and oxidative stress (Anjana, 2005). They prevent from the anti-oxidants' changes against oxidative stress. Also, they can create a balance among of the cells and play an important role as an

agent substance inside of the cells (Inhumanexperiment, 2008). Generally, they have two important roles as follows:

1. To participate and provide of the oxygen in the cell and oxygen synthesizing with the cells during of the cell reactions and their activities.

2. To maintain and protect of the cell against of oxidative stress effects and another oxidative factors in the cell (Inhumanexperiment, 2008).

By the previous studies, Free radicals could get damage for the brain and blood cells and lastly cause altitude disorders like AMS (Benzie & strain, 1996). In athletes, Q10 shortage made metabolic stress as free radicals increasing in severe practices (Nazirolu et al., 2004). Due to the studies done in 2005 about of vitamin E effect on the serum of six mountaineers in Himalaya region(after climbing into Pomori summit,7161m , for 3weeks), it was shown that vitamin E as an oxidant can prohibit from mitochondria disorder arising from Hypoxia (12). Although Cook et al studied co-enzyme Q10 contribution on exercised people and not exercised ones' performance, but they could conclude that short time consuming of the supplement can increase viscosity of inner muscles of Q10 and decrease oxidative stress. Also, MDA rate increasing during of the practice and after that would be possible (Cooke et al., 2008). Another researcher man as named of Magalhase et al reported that Hypoxia and oxygen deficit have been made increasing the oxidative stress and free radicals in mitochondria of the cell and decreasing of oxidative phosphorylation capacity (Magalhase et al, 2005). Whereas Subdehi et al (2004) reported that anti-oxidants couldn't get any effects on oxidative stress indices and free radicals in high altitudes (Subdehi et al, 2004). Contrastive results about anti-oxidants effects on mountaineers' practice in high altitudes are great reasons for the recent researcher to pay attention to this study and it encouraged me to study on possible effects of supplement Q10 consuming with climbing into Damavand summit on Mallon-di-aldehyde changes rate in the serum of male mountaineers.

2. Methods

Recent research is a semi-experimental study and 24 experienced male mountaineers with climbing record of 5-15 years, with no disorder at the height were chosen randomly. Some of them were chosen with following specifications:

Anthropometric and physiological indices such as VO2max, BMI, Hypodermic, Fat, Age, size, weight, type and procedure in mountaineering sport, experience, knowledge and educational level about of the height and mountaineering, strength of body, cardio-vascular power, body fitness for mountaineering and activity on the height. They were divided into two groups based on anthropometric and physiological factors: experimental group (n=12) and controlling group (n=12). According to the team specialist and physician advice, experimental group consumed pure Q10 coenzyme made in Webber naturals Factory of Canada, with 100mg daily (consumed concentration was considered by the age) for two weeks before climbing into the height. Placebo group consumed placebo Dextrose with 100mg in a day for two weeks before climbing into the height.

Blood sampling was considered with 5cc rate in each stage under the completely controlling of nutrition in the test before climbing to the summit and during of the climbing and also with consuming of Q10 and placebo as follows:
(from anticobital of the tests in 4 steps).

For two weeks before climbing into the height in fasting status with 1500m.

In the base camp of Damavand at the height of 2800 m in fasting status.

Before climbing into Damavand at the height of 4300 m and in fasting status.

After climbing into the summit in the height of 5671m and backing.

Blood samples of persons were taken to the laboratory after safe packing and freezing. They were put into the special kits such as blood sugar kit, Frap kit from Germany brand with 0.0001 as an accuracy and sensitivity. Expected results obtained through auto-analyzer machine (cell counter) from U.S.A manufacturer after the related experiments doing.

2.1. Statistical methods

Firstly, we used Kolmogorov- Smirnov test for data homogeneity and then it was used from F test (variance with test operation) at the following stage. Following test (Bonferroni Test) was also considered for meaningful data values. All the statistical estimations were analyzed by Spss16 with $a<0.05$, as a meaningful level. We used descriptive report to detect the statistics, data and individual species for the athletes.

3. Results

Test F (variance analyzing with iteration test evaluating) in stage 4 showed that there wasn't a meaningful difference between co-enzyme Q10 completing and Mallon-di- aldehyde changes rate ($P<0.05$). But the altitude as independent factor and separated from Q10 co-enzyme showed a meaningful difference on Mallon-di-aldehyde changes rate

Table 1. Difference between co-enzyme Q10 completing and Mallon-di- aldehyde changes in both groups

Group		Control (N=7)			
Altitude	1500 m	2800 m	4300m	5671m	
Mallon-di-aldehyde	2.5 ± 0.18	2.77 ± 0.2	2.9 ± 0.23	2.47 ± 0.18	
Group		Experimental (N=7)			
Mallon-di-aldehyde	2.51 ±0.2	3.5 ± 0.41	2.7 ± 0.19	2.51 ± 0.3	
P≥ 0.05		St. dev.		Mean	
Within group	Within Altitude	Control	Experimental	Control	Experimental
0.33	0.029	0.98	0.14	2.64	2.78

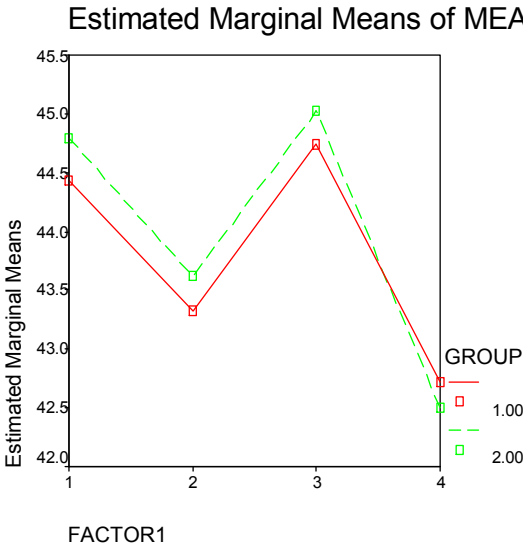

Figure. Co-enzyme Q10 completing and Mallon-di-aldehyde changes in both groups

4. Discussions

Due to the results from the recent research, it isn't observed any meaningful difference between co-enzyme Q10 completing and Mallon-di-aldehyde changes rate of male mountaineers after climbing up to high altitude (Damavand summit, P<0.05). But there was a meaningful difference in Mallon-di-aldehyde changes rate of the groups by increasing or decreasing of altitude and its effect as an independent variable. It was related to altitude effects without of the supplement interference at this case. Perhaps, relation of co-enzyme Q10 completing and Mallon-di-aldehyde changes rate of male mountaineers after climbing up to high altitude isn't meaningful but it is meaningful among of altitude changes in blood serum which it isn't observed changes in fats peroxidation rate since it depends to stability, practice rate of people or cortisol hormone secretion in altitude (Damian et al., 2001; Armstrang, 2000). Studies have been shown that balance of oxidant and anti-oxidant decays in the body by altitude (Magalhaes et al., 2005). (As oxygen deficit) Finally, signs of oxidative stress will be possible in the cells and body. Oxidative stress in altitude is a kind of oxygen reaction in the cell that it can get damage to the cell contents such as: lipid membrane, mitochondria, practical and structural proteins and even the cell nucleus and DNA (Magalhaes et al., 2005). Carl Marshal studies detected that people who they live in low altitudes or mountaineers face with Hypoxia states, have more stress hormones as cortisol whereas low altitude residents have more cortisol rate rather than people who they live in high altitudes. Some of effective factors are: altitude diseases, to increase of climbing up speed, spent distance of altitude, stability time in altitude and physiological states (Armstrang, 2005). Moreover, another problems and disorders such as water deficit, decomposition of protein, diet variation, unfavorable food situation, ultra violet ray, air pollution, low pressure site of oxygen and weight lost and etc., help to form (increase/decrease) oxidative stress and anti-oxidant power in the body (Armstrang, 2005; Magalhaes, 2005). In fact, measurement index of Mallon-di-aldehyde rate defines oxidative stress, free radicals producing in altitude and peroxidation rate in the fats (Benzie & Strain, 2004; Malek Zadeh, 2004). Peroxidation of the fats occurs when oxidative stress rate or free radicals producing in the cells increases Subsequently, this event breaks double bonds of the fats (Malek Zadeh, 2004). When we are dealing to mountaineering in high altitudes and since we are climbing from low sites to high ones, thus cortisol hormone secretion increases because of oxygen shortage and some of variations in central nervous system. This state is also increasing by stability rate and activity severe in altitude. So there is a direct relation between cortisol rate of plasma and duration time in altitude. More duration in altitude make to increase its rate. It is possible that co-enzyme Q10 could be an effective factor as ideal anti-oxidant on blood serum of male mountaineers and save and protect them against of damages into the cells and tissues. When exercise activity is in low or moderate level, there isn't any change in cortisol secretion rate but in inverse state, it differs. As above mentioned, it seems that increasing of cortisol secretion could be a general response to physical stress (Armstrang, 2000). So, it is possible that this study is adapted with other studies. In fact, cortisol hormone is responsible of the liver's fats conducting and using for quick energy making in the cells (MalekZadeh, 2004). This research case hasn't any coordination with the studies dated on 2008 about Mallon- di-aldehyde rate in sports (Inhumanexperiment, 2008). Since this study and other ones have been done in

normal conditions whether they are adapted with our new study or not, following cases could be effective factors in the fats peroxidation perfectly: Water deficiency, unfavorable food situation, glucose rate of the blood, air stiff, contamination, emotional state of a person, hormones' secretion, disorders in central nervous system as a result of high altitude (Armstrang, 2000). Hence, Q10 supplement hasn't a meaningful relation with Mallon-di-aldehyde rate but altitude variations are in meaningful relationship for both of the groups. Main reason is related to "Altitude" about of meaningful difference in Mallon-di-aldehyde rate of the groups. At the end and after the recent study findings in a short conclusion, it was recognized climbing up contribution to high altitude subsequent to Q10 supplement on Mallon-di-aldehyde variations rate of male mountaineers' serum obviously. The results showed that there is no evidence on meaningful relation between climbing up to the summit of Damavand and Q10 supplement consuming on Mallon-di-aldehyde variations rate. By supposing of altitude as an important and independent variable at this study, we could define a meaningful difference in Mallon-di-aldehyde variations rate subsequent to altitude variations. The aim of this research was to study the effect of Q10 co-enzyme contribution on Mallon-di-aldehyde variations rate by climbing to Damavand summit and to detect of effective factors like altitude on Mallon-di-aldehyde rate in male mountaineers' serum. Hopefully, we could detect other effective factors and decrease damages into human's body in mountain sites and altitudes. So, mountaineers will be able to improve and promote their abilities and sports activities against of Hypoxia, diseases and stresses from climbing to high altitudes.

References

1. Anjana Vij, G., Ruma Dutta, and Narinder Satig K. (2005). High Altitude. *Medicine & Biology*. 6(4), 301-310.
2. Armstrang, L. (2000). Environment contribution on the sport activities translated by: Abasali Gaeeni, M.R.Hamidi Nia, M. Koushki Jahromi, First Edition, Samt publishing Tehran.
3. Bahrami, L. (2004). Public health of mountaineers women comparison to non – athletic ones in Tehran, MA thesis in physical education field, Karaj Azad university of Iran.
4. Benzie I.F., Strain J.J. (1996). The ferric reducing ability of plasma (FRAP) as a measure of (antioxidant power); the FRAP assay analans of biochemistary. 239(1), 70- 6.
5. Cooke M., Iosia M., Buford T., Shelmadine B., Hudson G., Kerksick C., Rasmussen C, Greenwood M., Leutholtz B., Willoughby D., Kreider R. (2008). Effects of acute and 14-day coenzyme Q10 supplementation on exercise performance in both trained and untrained individuals. TX, USA. 4: 5-8.
6. Curr Pharm Des Department of Physiology, Royal College of Surgeons in Ireland, st. Stephen's Green, Dublin 2, Ireland. (2007). The role of hypoxia and platelets in air travel-related venous thromboembolism, 13(26):2668-72.
7. Damian M., Hley B., Bruce D. (2001). Acute Mountain .High Altitude sickness: Prophylactic Benefits of Antioxidant vitamin Supplementation at High Medicine & Biology Altitude .2 (10) 21-29.doi.10.1089.
8. Dosek A., Ohno H., Acs Z., Taylor A.W., Radak Z. (2007). High altitude and oxidative stress. Respiration Physiology Neurobiology. 158(2-3):128-31.
9. Fox A.H., and Mathius, M. (1992). Sport Physiology, second volume, translated by: Asghar Khaledan, Tehran university publications.
10. Inhumanexperiment, (2008). *Coenzyme Q10, Exercise and Oxidative Stress. Inhuman Experiment jLL Klo Tunnisteet antioxidants, exercise, supplements, i*nhumanexperiment. blogspot.com/**2008**/.../**co**...
11. MalekZadeh, J. (2004). Oxidative stress comparison with anti- oxidant potential in athletes and others, physical education Thesis in M.A degree, Karaj Azad university.
12. Magalhaes, J., Ascensao, A., Marques, F., Soares J.M., Ferreira R., Neuparth M.J., Duarte J.A. (2005). Effect of a high –altitude expedition to a Himalayan peak (Pumori.7, 161 m) on plasma and erythrocyte antioxidant profile. 93 (5-6);726-32.
13. Magalhães J., Ascensão A., Soares J.M., Ferreira R., Neuparth M.J., Marques F., Duarte J.A. (2005). Acute and severe hypobaric hypoxia increases oxidative stress and impairs mitochondrial function in mouse skeletal muscle. *Journal of Applied Physiology*. 9(4):1247-53.
14. Nazirolu M., Simek, M., Kutlu, M. (2004). Moderate exercise with a dietary vitamin C and E combination protects against streptozotoc in-induced oxidative damage to the blood and improves fetal outcomes in pregnant rats. *Journal of Clinical Chemistry and Laboratory Medicine,* 42(5):511-7.
15. Subudhi, A.W., Jacobs, K.A., Hagobian, T.A., Fattor, J.A., Fulco, C.S., Muza, S.R., Rock P.B., Hoffman, A.R., Cymerman A, Friedlander AL.(2004) .Antioxidant supplementation does not attenuate oxidative stress at high altitude. *Aviatation, Space and Environmental Medicine*. .75(10):881-8.
16. Tannheimer, M., Fusch, C., Böning, D., Thomas, A., Engelhardt, M., Schmidt, R. (2009). Changes of hematocrit and hemoglobin concentration in the cold Himalayan environment in dependence on total body fluid, 40, (890) 81.
17. Safari, M.R., Rezaei, M. and Taherkhani, M. (2005). Effects of Ubiqinol-10 and β-Caroten on the invitro susceptibility of low– density Lipoprotein to copper–induced oxidation, *Medical Journal of the Islamic Republic of Iran*. 19, 2, 169-174.

9/6/2012