

## The relation of overtraining Syndrome to immunity of long distance athletes

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**Abstract:** Overtraining is a process of excessive training, that may lead to overtraining syndrome. The aim of the study is to provide a practical aspects of the relationship of overtraining syndrome to immunity. The researchers used the experimental method of one group of athletes subjected to intensified training program for one month, T.wbcs, Neutrophils, basophils, Eosinophils, lymphocytes, monocytes, Immunoglobulins (IgG, A, M) and interleukin6, glutamine were measured pre-post program. The results indicated a significant differences between pre-post program in all parameters. In conclusion: Overtraining might induce immunosuppression of different elements, cells and Immunoglobulins, interleukin6 and glutamine.

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**Keywords:** Overtraining Syndrome, immunity, T.Wbcs, Immunoglobulins, interleukin6, glutamine.

### 1. Introduction:

Overtraining is a process of excessive exercise training, in high performance athletes that may lead to overtraining syndrome, which is characterized by persistent fatigue, poor performance despite continued training, changes in mood and neuroendocrine factors, frequent illness such as respiratory tract infection (Budget et al, 2000, Hackney and Battaglini (2007). To study overtraining syndrome, Laurel MackiNon (2000) suggest two models, in one model, athletes may be assessed at various times throughout a competitive season, usually lasting 3-8 months. In the other model, training is intensified for up to 4 weeks, which is the maximum time that athletes can withstand intensifying high training loads (Raglin and Barzdukas, 1999, Budgett, 1988), Where Pizza et al, (1995) suggested exhaustive performance of 10 days of running at 200% of normal training volume. Brooks and carter (2013) reported a direct link between stress and the adrenal gland and hormones produced in these glands to become depleted. This was also reported by Ganong (2000) (Carfagno et al, 2014).

Overtraining is of great importance to the high performance athlete. Prolonged period of persistent fatigue interfere with optimal preparation for major events. Inconsistent or poor performance at critical times in an athletes career may influence selection for representative teams, led to loss of private sources and prematurely retire from sport (Laurel, 2000).

Athletes and coaches associate over training with frequent illness, a single bout of acute intense exercise may suppress immune parameters for several hours after wards. Such immune suppression results from overtraining syndrome or rather from long terms stress of intense daily exercise training (Budgett et al, 2000, Hackney and Battaglini (2007).

It is unclear as to the exact physiological mechanisms responsible for inducing the Overtraining syndrome, there are several theories. The muscle glycogen hypothesis central fatigue hypothesis, glutamine hypothesis sympathetic parasympathetic hypothesis, hypothalamic pituitary hypothesis the later one is recognized by many scientists as the prevailing hypothesis in understanding of the overtraining syndrome phenomenon [Fry et al, 2005, Robson et al, 2006].

The researcher will examine cytochrome hypothesis as the prevailing hypothesis in understanding of the overtraining syndrome phenomenon and investigate the possible role of cytochrome which act directly and indirectly upon multiple physiological system to promote alterations in metabolism, behavior, endocrine functions protein synthesis rates and other immune functions (Papacosta and Nassis, 2011).

The aim of this study is to provide a practical aspects of the relationship of overtraining syndrome to immunity.

### Research hypothesis:

There are a significant differences Pre- post overtraining in some immunosuppression elements.

### 2. Research Methods:

The researcher used the experimental method as it is suitable to the nature of the study, of pre-post measurement of one groups of athletes of National team.

The pre measurement were executed in the period 8/3/2014, blood sample withdrawal for laboratory examination of immunity elements post measurement were done after the program of high

intensity for one month 9/4/2014 in a club in Cairo (Olympic Center for national team).

Research sample: 10 long distance athletes of National team participate to the study.

**Table (1) Basic characteristics of the players**

Basic measurement	Mean	SD	Skewness
Age (y)	23.2	3.5	0.35
Height (cm)	179	8.6	-0.16
Weight (kg)	76.8	7.3	-0.19
BMI	20.1	2.6	-0.57

In Table (1) Skewness were between (-0.57-0.35) which is laying ( $\pm 3$ ) indicating natural distribution of the athletes.

Measurements of the study:

Blood cell were measured using coulter counter in a special lab. (T.wbcs, Neutrophils, Esinophil, basophils lymphocytes, monocytes).

Immunoglobulins (IGg, IGm, IGA) were determined using radiating plates and a loop and measured scale to determine the concentration of the immunoglobulins.

As for Interleukin6 any glutamine determination kits were used and Eliza technique.

To study overtraining syndrome, Laurel Mackinnon (2000) suggested a model, that training is intensified for up to 4 weeks, which is the maximum time that athletes can withstand intensifying high training loads.

Materials and equipments used:

- Eliza technique
- Centrifuge
- EDTA anticoagulant
- Syringes and tubes, alcohol, cotton
- Coulter counter for wbcs- and differentiation
- Ice box, refrigerator
- Radiating plates
- Kits for interleukin6 and glutamine steps for the main study:

The researcher search for the scientific references and preceeded study to determine the training program,

training units, time of each unit and method of training and loads and reach the following conclusion.

- The training duration of the study: one month (30 days – No of weeks: 4 weeks
- No of units in each week 3 units
- Duration of each unit 90 minutes including warm up (10m.) main training (75m.) cooling down (5m.)
- Method of training intensified

**Bases of the training program:**

- Determination of the aim of the program and each stage.
- Individual variations of the players
- The prioritie of the training and grades
- The suitability of the program for age
- Distribution and stability of training
- Equilibrium of general and special training
- Using intensity
- The practical application of the program
- Direction to the load needed
- Taking Care of the suitable warm up and cooling down.

**Adaptation:**

**Statistical data:**

- Using SPSS program
- Mathematic mean
- Standard deviation
- Skewness
- T test of one group

**Table (2) Leucocyte values before and after overtraining**

Cells	Pre		Post		T
	M	SD	M	SD	
Wbcs (thous/mm3)	9.2	2.4	8.1	3.2	3.1
Neutrophils (thous/mm3)	5.4	1.3	4.9	0.9	2.8
Esinophils (No)	275	9.01	152	10.92	9.6
Basophils (No)	32	2.1	23	1.9	7.8
Lymphocytes (No)	2750	311	2015	140	6.2
Monocytes	542	24	455	15	5.7

P < 0.05 indicating statistical differences for the sake of Post program

**Table (3) Immunoglobulin values before and after overtraining**

Parameters	Pre		Post		T
	M	SD	M	SD	
IGG $\mu\text{g/ml}$	12.100	166	10.200	147	3.8
IGM $\mu\text{g/ml}$	961	81	743	90	4.1
IGA $\mu\text{g/ml}$	2364	128	2014	136	5.9

P< 0.05 Indicating statistical difference for the sake of post program

**Table (4) Immunoglobulin values before and after overtraining**

Parameters	Pre		Post		T
	M	SD	M	SD	
Interleukin6 (u/ml)	96	5.8	75	4.8	8.4
Plasma glutamine (uM)	558	10.3	494	11.4	6.7

P< 0.05 Indicating statistical difference for the sake of post program

### 3. Discussion

#### Hypothesis:

There is significant difference pre-post overtraining in some immunosuppression elements.

When exercise is performed on a regular basis, adaptation occurs and the athlete's performance improves.

This is the training effect. All exercise elicits a stress response and results in a degree of short term fatigue, from which the athlete recovers.

However, if exercise periods are too frequent, too intense and too prolonged, possibly with inadequate nutrition and psychological stress, recovery after each exercise bout is not complete, less adaptation and less improvement in performance occurs. (MacLeod et al, 1993).

Table (2-3,4) indicated a suppression in immunity element, leucocyte, differentiation wbc, immunoglobulin Igg, IGA, IGM, together with cytokine, interleukin6, and glutamine in post overtraining effects compared to pre condition.

Keast et al, (1998) Lewicki et al (1998) reported that exercise of high intensity and /or long duration is associated with adverse effects on immune function. As it reduce the magnitude of post exercise leukocytosis. The response of T lymphocyte to mitogenic stimulation in vitro may therefore be decreased. Immunoglobulin levels in blood and saliva decreased post exercise in trained subjects, also decreases in neutrophil and monocyte. (Van Wersch et al, 1989).

Hackney and Koltun (2012) introduce the immune system response that the innate and adaptive immune responses are associated with the production of cytokines mainly interleukin-1 and interleukin - 6, as being the key of physiological mediators for the development of many symptoms associated with overtraining syndrome (Robson et al, 2004, Robson et al, 2007).

The production of proinflammatory cytokines also lead to upregulation of humoral immunity and suppression of the cell - mediated immunity components of the adaptive immune responses (Abbas and Lichtman 2005). Because of its immune system role, development of cell mediated immunosuppression increases the risk of illness or illness like syndrome and symptoms such as upper respiratory symptoms (URS) and infections (URI). These symptoms are associated with compromises in physical performance capacity as athletes find exercise training or competition difficult or impossible under such conditions (Walsh et al 2011, Czepluch et al, 2011).

Table (4) Showed that glutamine decreased after overtraining compared to pre training subjects, the decrease glutamine levels might result in immunosuppression. (Parri - billings et al, 1999) reported that the decreased glutamine may contribute to the impairment of the immune function observed and that overtraining syndrome is rarely seen in sprinters and power athletes, but affects endurance athletes, suggested that repeated prolonged exercise is a predisposing factor. Thus, glutamine may play a key role in the pathophysiology of the condition (Newshome et al 1995), Newshome and Parry billings, 1991).

#### In conclusion:

Overtraining might induce immuno-suppression which is caused by decreased leucocytes and different wbc, and due to decreased immunoglobulins and probably due to cytokines and glutamine decrease levels.

#### Recommendation:

It is recommended to practice regularly on scientific basis to prevent overtraining syndrome and immunosuppression. Also of importance to

supplement athletes with amino acids mainly glutamine as a prevention substance.

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