

## **ELECTROSTIMULATION: ACTIVE RECOVERY WITH THE COMPEX-SPORT**

Compex-Sport offers an Active Recovery program with a duration of twenty minutes. The session is initiated with stimulation at very low frequencies, from 9 to 1 Hz which decrease progressively and automatically every two minutes. The session finishes at a very low frequency of 1 Hz. The reason for this type of progression is as follows: a very specific type of activity is imposed on muscle fibers which allows them not only to recover more efficiently from strenuous activity but also it considerably decreases muscular spasms. Parallel to this decreasing of frequency, there is an automatic increase in the amplitude of the impulses in order to progressively recruit more muscle fibers.

### **Advantages and basis on which this technique works:**

#### **I) Main advantage:**

Electrostimulation does not result in general fatigue or cardiovascular fatigue. It demands muscular effort, but it does not impose excessive osteo-tendinous load and pain in the athlete.

#### **II) Reduction in the lactic acid index:**

Lactic acid accumulation causes muscle fatigue(1,2). Therefore, any process which accelerates elimination of lactic acid does facilitate a more efficient muscle recovery(3). It is known that the elimination of lactic acid is considerably increased by physical aerobic activities of intensities between 30 and 60% of  $VO_2max$  (4,5) (in any case, below the anaerobic threshold!...). The ideal condition for the elimination of lactic acid seems to be a slowly decreasing activity, between 60% to 30% of  $VO_2max$ . In fact, 30 minutes after an effort that lasted 10 minutes to VMA, which created an accumulation of lactic acid with a blood index of 11mlMol/l, this index decreases again to 3.5 after total rest.; to 2 after a constant activity of 35% of  $VO_2max$ ; and it decreases to 1.2 (that is, the normal blood flow in a state of rest), after an activity of decreasing intensity, between 60 to 30% of  $VO_2max$  (6).

Compex-Sport's Active Recovery reproduces the above effect through a program of decreasing intensity. The first few minutes of the stimulation process (done at an intensity of 9 Hz) impose on the muscle fibers an activity relatively high in  $VO_2max$ , which will decrease progressively as the frequency decreases too (7). Compex-Sport's Active Recovery technique, as far as the reduction of lactic acid is concerned, is the ideal protocol of aerobic active recovery. This program reduces the negative impacts of the sport so familiar to many athletes such as mental, general, cardiovascular and osteo-tendinous fatigue.

#### **III) Increase of intra-muscular blood flow:**

The increase of blood flow in any tissue and in any muscle in particular, allows the athlete to speedily restore the function and balance of the cells and the interstitial fluid.

In fact, with the increase in blood flow, toxin elimination is accelerated as well. Both the ionic balance and the reserves of glycogen are restored more rapidly. This process of restoration occurs easiest when there is an intake of nutrients such as water, mineral salts and carbohydrates.

It has been proven that a good quality electrostimulation increases the arterial blood flow in those muscle masses which had been electrostimulated (8). The increase in arterial blood flow which occurs is quite an important factor since the flow at rest is multiplied by four times; this occurs without accelerating the

heart rate and without increasing arterial pressure, that is, without increasing general fatigue (9). This increase occurs at a maximum frequency at 8 Hz (9). On the other hand, the return flow through the veins increases as well by the same proportion as the arterial flow. Thus one can observe a complete venous drainage, particularly efficient against heavy legs sensation. It is also estimated that the mechanical effect of the successive muscular twitches, pressing against vascular structures (pump effect) improves the lymphatic drainage.

#### IV) Analgesic and Endorphinic effects:

The central nervous system produces variable quantities of natural peptides which induce a diminution of pain (analgesic effect) as well as a general relaxation of muscles and a reduction in anxiety. These natural substances are called endorphins and enkephalins. For a few years now, we have known that it is possible to increase the production of these substances by means of different stimuli, particularly, with electrical impulses (10,11,12). That is why this technique is commonly known as electroacupuncture. The frequency of the impulses has a more effective analgesic effect at 5 Hz (13).

Therefore, after the lactic acid elimination (9-10 Hz) and the increase in blood flow (8 Hz), the progressive decrease in frequency results in an endorphinic effect (5 Hz), leading to an elimination of muscular pain.

#### V) Relaxation and Anti-spasmodic effects:

Apart from its analgesic effects, the increase in endorphinic production results in a general muscular relaxation. Stimulation at lower frequencies (from 3 to 1 Hz) also produces a localized anti-spasmodic effect in the muscles being electrostimulated,

The use of medical electrostimulation to modify muscle toning has existed for quite a few years now (14). This anti-spasmodic or tonolytic effect is retained for a few of hours after electrostimulation and allows for a better control of the movements done by the muscles in question (15). Empirically, it is possible to obtain the maximum anti-spasmodic effect on healthy muscles after an intense work out with very low frequencies, from 1 to 3 Hz (16).

## **REFERENCES**

(1) Jacobs, I

Blood lactate: implications for training and sport performance.  
*Sports Med.*, 3:10, 1996

(2) Hogan, M.C.

Increased lactate in working dog muscle reduces tension development independent of pH.  
*Med. Sci. Sports Exerc.*, 27: 371, 1995

(3) MacArdle & Katch

Exercise Physiology  
*Williams & Wilkins*

- (4) Mac Lellan, TM  
Blood lactate removal during active recovery related to aerobic threshold  
*Int. J. Sports Med.*, 3: 224, 1982
- (5) Gladden, L.B.  
Lactate uptake by skeletal muscle.  
*Exercise and Sport Sciences Reviews Vol 17, Pandolf ed. New York Macmillan 1989*
- (6) Dodd, S  
Blood lactate disappearance at various intensities of recovery exercises.  
*J. Appl. Physiol.* 57: 1462; 1984
- (7) Hoppeler H.  
Relation between mitochondria and oxygen consumption in isolated cat muscles (Estimation of oxygen consumption during stimulation)  
*J. Physiol.* 385: 661; (1987)
- (8) Rigaux, P.  
Augmentation du débit artériel fémoral sous électrostimulation neuromusculaire de la jambe.  
*Kinésithérapie Scientifique*, 357: 7-13; 1996
- (9) Rigaux, P.  
Influence de la fréquence de stimulation neuromusculaire électrique de la jambe sur le débit artériel fémoral.  
*Journal des Maladies Vasculaires (Paris)* 20: 9-13; 1995
- (10) Synder-Mackler  
Clinical Electrophysiology 210  
*Williams & Wilkins 1989*
- (11) Holmgren, E  
Increase of pain threshold as a function of conditioning electrical stimulation; an experimental study with application to electroacupuncture for pain  
*Am. J. Chin. Med.* 3: 133; 1975
- (12) Chapman CR  
Effects of intrasymental electrical acupuncture on central pain  
*Pain* 3: 213; 1977
- (13) Andersson SA  
Analgesic effects of peripheral conditioning stimulation: importance of certain stimulation parameters.  
*Acupunct Electrother Res* 2: 237; 1977



(14) Wal J.B.

Modulation of spasticity: prolonged suppression of a spinal reflex by electrical stimulation.

*Science* 216: 203; 1982

(15) Carnstan B.

Improvement of Gait following electrical stimulation

*Scand J Rehab Med* 9: 7-13; 1977

(16) Rigaux P.

Guide pratique du Compex Médical (Compex2)

Médi-Compex, Ecublens Suisse, 2.4.1 - 2.4.8; 1990