Effect of ubiquinol on the biochemical changes induced by strenuous physical exercise

Disco
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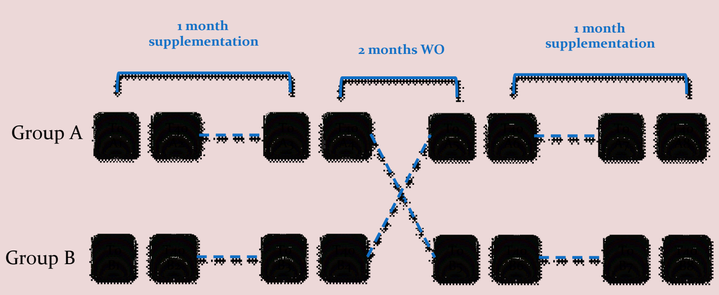
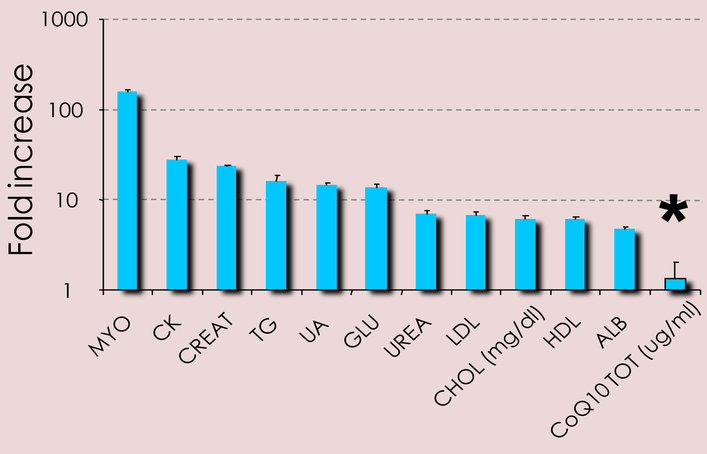
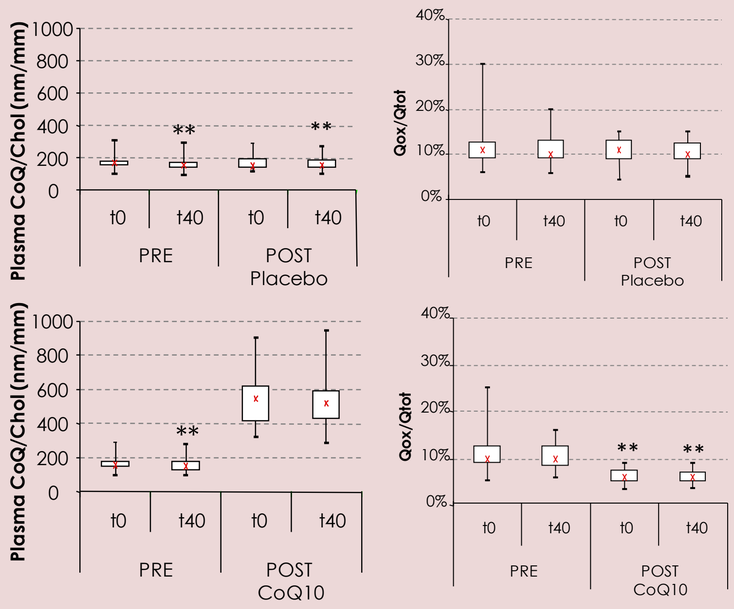
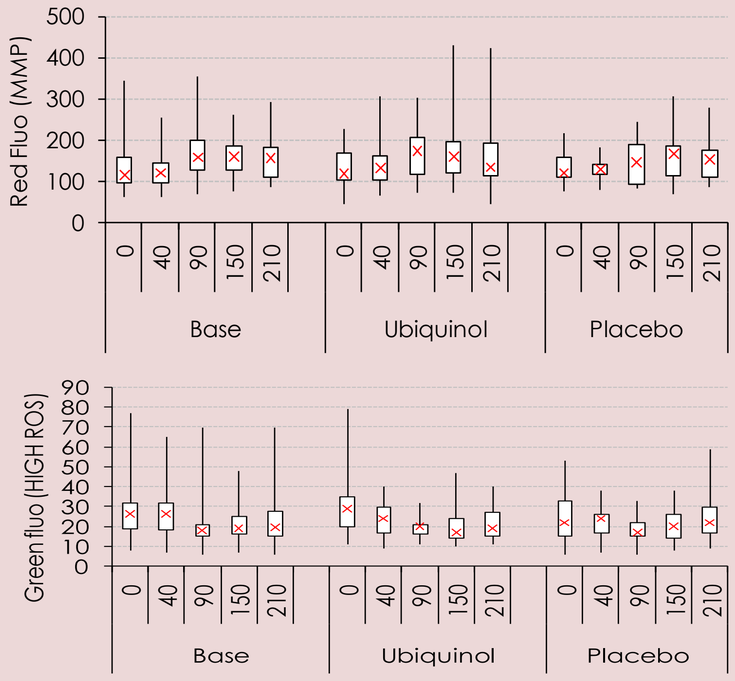
Regular exercise is able to modulate antioxidant defence system and improve energetic metabolism in mitochondria. On the other hand, exhaustive exercise might be associated with increased ROS production causing oxidative damage. Mitochondria, in this respect, represent a sensible target of oxidative damage and their impairment might lead both to decreased energy production and enhanced ROS formation. However, free radicals not only cause damage but also have a physiological role in cell signaling underlying adaptation to stress and training. A tight control of redox status is therefore critical in preserving pivotal cellular functions.









The aim of the present study was to investigate whether supplementation of mitochondrial nutrient Ubiquinol affected cellular antioxidant activity and mitochondrial functionality in trained individuals before and after a single bout of intense physical exercise. Investigation has been conducted on 21 athletes from a local Rugby team enrolled in a double blind crossover study. Athletes were randomized to take either 200 mg ubquinol per day for 4 weeks or placebo and then treatment was switched in a crossover manner, following a washout period of 8 weeks. Samples were obtained before and after a single bout of intensive exercise defined as 40 minutes of run on a treadmill set at a speed able to produce an heart rate of the volunteer equivalent to 80% of the maximal heart rate calculated according to Karvonen formula that takes into account both age and basal heart rate reserve of the subject. During the exercise indexes of physical performance such as speed and heart rate have been recorded and blood samples were collected at rest and immediately after the run. Moreover whole blood was maintained at 37°C for up to 210 minutes in order to evaluate biochemical indexes in an ex-vivo recovery phase. Biochemical analyses were conducted on plasma and included lipid profile, antioxidant levels and markers of muscular stress such as creatin kinase and myoglobin. At cellular level investigations were conducted on peripheral blood leukocyte that represent a easily accessible, but also relevant cell type to measure intracellular ROS levels and mitochondrial functionality using fluorescent probes and flowcytometric analysis.

Comparing plasma profile before and after the exercise stimuli, with the exception of CoQ10 content, remarkable changes are evident mainly in relation to muscle protein release, an index of tissue sufferance, and concentration of analytes. Intriguingly analysis of CoQ10 content at lipoprotein level also indicated a lowered content in lipoprotein, probably due to enhanced requirement by tissues. This hypothesis is supported by the literature; in fact plasma CoQ10 has been proposed as a reserve pool for tissue vehiculation similarly to other lypophilic compounds. Concerning markers of oxidative imbalance in plasma, we did not observe any changes in CoQ10 oxidative status associated with physical exercise proposed.

In the above mentioned setting 200 mg/day ubiquinol for one month were able to prevent exercise associated LDL CoQ decrease associated with a single bout of physical exercise highlighting the role of supplementation in buffering exercise induced variation in plasma CoQ content. Moreover ubiquinol supplementation improved plasma oxidative status before and after physical exercise in terms of Ubiquinol/tot CoQ10 ratio. At cellular level in PBMC significant transitory antioxidant and bioenergetic modulations were observed. In particular, a mitochondrial hyperpolarization was observed during the 150 minutes following the exercise (recovery phase) probably associated to a mild uncoupling underlying a slight bioenergetic stress. Moreover a decrease in cellular reactive oxygen species was observed during the early recovery phase, probably due to a modulation of antioxidant systems in a adaptative manner. supplemented subjects showed an improved control of bioenergetic process with a quicker recoupling of mitochondria as suggested by a ripristination of physiological membrane potential within the studied recovery phase. Finally natural modulation of the cellular antioxidant machinery by physical exercise seemed to be potentiated by ubiquinol supplementation in light of a quicker and more persistent decrease in intracellular ROS.

Di chi sara' il mondo di domani?
Di chi oggi canta in coro.

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