

Young investigator's award (YIA) in the 1st Congress of European College of Sport Science in Niece, France in 1996

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1) Impression of the 1st congress and YIA

I will recall my younger days and write how my presentation in the ECSS was like.

In my oral presentation aiming at passing a primary selection for the award, I have talked about 'Non-invasive quantification of oxygenation and energy metabolism in working muscles. I have reported a significant relationship between muscle oxygenation determined by time-resolved near-infrared spectroscopy and phosphocreatine content by magnetic resonance spectroscopy during voluntary muscle contractions. After my presentation, a potential examiner (prof. Suzan Ward) said that she had 7 questions and mentioned all questions in a row very quickly, which was a little tough to me at that time.

I was supposed to answer each question by referring extra slides, which had primarily prepared and inserted at the end of my official talk just in case. But, all my slides were accidentally took out from the conference room by a staff. Of course, I was embarrassed to a certain extent, but managed to answer all the questions. I had an impression to become a candidate for the award winner because of having got through one of the most famous professors, Susan's attack.

Basically, although the 12 candidates were nominated in the primary selection, only those with the sixth or higher rank were given a chance to have a 20-minute detailed talk in the final competition. Since I was unable to reach the sixth (actually the 8th prize), it was a pity not having proceeded to the final competition.

2) My research area

My research area is the following:

2.1) Control of muscle energy metabolism in humans

There is a significant correlation between muscle phosphocreatine and adenosine diphosphate (ADP) determined by phosphorus magnetic resonance spectroscopy (P-MRS) and the rate of deoxygenation measured by near-infrared spectroscopy (NIRS) during brief arterial occlusion during exercise (Hamaoka et al., *J. Appl. Physiol.*, 1996). It is suggested that phosphocreatine and/or ADP would be a controller of mitochondrial respiration.

2.2) In vivo monitoring of muscle oxygenation and metabolism

We have used NIRS to monitor muscle oxygenation (Hamaoka et al., *J. Biomed. Opt.*, 2000; Hamaoka et al., *J. Biomed. Opt.*, 2007; Hamaoka et al., *Philos. Trans. A. Math. Phys. Eng. Sci.*, 2011) and MRS to monitor high-energy phosphorus metabolites and pH. We found that the rate of muscle deoxygenation during brief arterial occlusion is quantitative muscle

oxygen consumption in human skeletal muscle (Sako et al., *J. Appl. Physiol.*, 2001).

2.3) Effects of muscle immobilization and countermeasures of functional deterioration

We examined whether endurance and/or strength handgrip exercises during 3-week upper limb immobilization preserve muscle oxidative capacity, blood flow response, endurance performance and strength. The endurance [one contraction every seconds at 30% maximum voluntary contraction (MVC) until exhaustion] and strength (70% MVC for 2 seconds with a 2 second rest interval, repeated 10 times) training program during immobilization period used in this experiment was effective in preventing a decline in muscle oxidative function, endurance, and MVC and in increasing muscle endurance (Kitahara et al., *Med. Sci. Sport Exer.*, 2003; Motobe et al., *Dyn. Med.*, 2004; Matsumura et al., *Dyn. Med.*, 2008; Homma et al., *Acta Physiol.*, 2009; Ohmori et al., *Eur. J. Appl. Physiol.*, 2010).

2.4) Effect of creatine supplementation on brain and muscle function

Forearm muscles of twelve healthy male subjects were examined during a 10 sec maximal dynamic handgrip exercise (Ex10) using ³¹-phosphorus magnetic resonance spectroscopy before and after ingestion with 30 g creatine (Cr) monohydrate or placebo per day for 14 days. An increase in total anaerobic ATP synthesis during Ex10 after Cr supplementation positively correlated with the increase in ATP synthesis through PCr hydrolysis. ATP synthesis rate through PCr hydrolysis positively correlated with mean power output during Ex10 in all twelve subjects after treatment (Kurosawa et al., *Mol. Cell Biochem.*, 2003).

We have investigated varying supplementation other than creatine such as the effect of anthocyanin on peripheral muscle circulation (Matsumoto et al., *Eur. J. Appl. Physiol.*, 2005), glycerophosphocholine on growth hormone secretion and fat oxidation (Kawamura et al., *Nutrition*, 2011) and natokinase on coagulation and fibrinolytic system.

3) Message to young researchers

Although Japanese researchers do not have enough command of English, in general, I would recommend young researchers in this area apply the oral competition rather than the poster. Eustress (not too much stress, but an adequate one) is needed to improve your intellectual as well as physical performance (function). To achieve this end, they should travel, study, work abroad and experience a variety of scientific as well as cultural activities.