

## **PROJECT REVIEW**

### **“ Potential direct and indirect ergogenic effects of glucocorticoids”**

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Glucocorticoids are widely administered for acute and chronic musculoskeletal pain as well as for several other pain syndromes. Increasing concern in sport has recently been raised due to the common use of glucocorticoids amongst elite athletes. WADA has therefore placed certain restrictions on the use of corticosteroids and presently lists them as a legal medication permitted in the local form only when prescribed by a physician with a simplified therapeutic use exemption, while systemic administration is currently banned. Indeed, the influence of corticosteroids on physiological and psychological variables could theoretically enhance performance and therefore explain their overuse by athletes. They have been shown at rest to increase blood glucose and energy store mobilization and to induce euphoria and erythropoiesis but surprisingly little work has been done to determine whether systemic glucocorticoid administration has a direct or indirect beneficial effect on physical performance in healthy subjects. Controversies remain therefore as to whether elite athletes who use glucocorticoids may gain a competitive advantage after acute or chronic intake.

We propose to contribute to a wider knowledge of glucocorticoid action mechanisms during exercise thanks to a multi-centre project with, in particular, an investigation of the impact of acute/chronic glucocorticoid administration on:

- 1) energy cost and substrate utilization during submaximal exercise;
- 2) eating behaviour;
- 3) psychological aspects and mood change;
- 4) erythropoiesis;
- 5) performance during submaximal exercise with regard to the fatigue status of the subjects.

## **Results and Conclusions**

### **“Potential Direct and Indirect Ergogenic Effects of Glucocorticoids”**

We showed that an acute therapeutic administration of oral prednisolone (20 mg) does not improve the time of cycling until exhaustion during submaximal exercise (70-75% VO<sub>2</sub> max) in healthy moderately trained male volunteers, despite a probable increase in lipid oxidation and decrease in CHO oxidation.

However, our results demonstrated that short-term therapeutic prednisolone intake (60 mg per day for 7 days) does not significantly modify erythropoiesis or eating behavior but improves performance in healthy recreationally men during submaximal exercise (70-75% VO<sub>2</sub> max) both with or without combined intense training. The concomitant alterations in the psychological, hormonal and metabolic parameters analyzed show that short-term administration of this drug had both central and peripheral effects but the complexity of these responses makes dissociation of the possible causal effects on performance difficult to distinguish.

Subsequent research are therefore needed to elucidate the mechanisms of these hormonal and metabolic changes in particular after short-term intake in order to determine which changes may be associated with the marked performance improvement obtained only after this mode of administration. Moreover, to our knowledge, no study has focused on women and a specific gender response to glucocorticoid can be questioned.

We therefore propose to contribute to a wider knowledge of glucocorticoid action mechanisms during exercise with in particular investigation of:

- 1) the ergogenic impact of this drug in women, after both acute and short-term administration with, in parallel, investigation of potential eating behavior change and psychological effects;
- 2) the metabolic and endocrine responses after glucocorticoid administration during longer exercise (3 hours), with regard to the gender status of the subjects in order to elucidate the mechanism(s) of action involved in the improvement in performance occurring after short-term intake.

## **PUBLICATIONS**

1. Arlettaz A., Portier H., Lecoq AM., Labsy Z., De Ceaurriz J., Collomp K. Effects of acute prednisolone intake on substrate utilization during submaximal exercise. *Int J Sports Med*, in press.
2. Arlettaz A., Portier H., Lecoq AM., Rieth N., De Ceaurriz J., Collomp K. Administration de courte durée de prednisolone et sécrétion d'érythropoïétine. *Science et Sport*, 2007: 22: 57-59.
3. Arlettaz A., Portier H., Lecoq AM., Rieth N., De Ceaurriz J., Collomp K. Effects of short term prednisolone intake during submaximal exercise. *Med Sci Sports Exerc*, 2007: 39: 1672-1678

4. Arlettaz A., Collomp K., Portier H., Lecoq AM., Rieth N., Le Panse B., De Ceaurriz J. Effect of acute prednisolone on metabolism and endurance exercise. Br J Sports Med, in press.
5. Collomp K., Arlettaz A., Portier H., Lecoq AM., Le Panse B., Rieth N., De Ceaurriz J. Short-term glucocorticoid intake combined with intense training on performance and hormonal responses. Br J Sports Med, in press.
6. Le Scanff C, Stefan Y, Arlettaz A, Portier H, Collomp K. Effets psychologiques d'une administration de courte durée de prednisolone. Science et Sport, submitted.