

## **Project Review**

### **"Prohormones: market survey analysis, distribution and dissemination of information"**

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Anabolic steroids are widely misused in sports. Recently, several new anabolic steroids have appeared on the "nutritional supplement" market. Some of these steroids can be classified as designer steroids (e.g. madol, THG) that were specifically designed to circumvent detection in doping control laboratories, while others are structural analogues of steroids previously produced as pharmaceuticals (e.g. superdrol as an analogue of drostanolone).

Via the internet these steroids are rapidly distributed world-wide. Unlike for pharmaceutical preparations, no clinical studies need to be performed for these substances and they can be introduced onto the market without delay. Hence, it is of key importance to the anti-doping community that the introduction of such new steroids is detected as early as possible.

Moreover, the chemical names attributed to the active ingredient of such supplements is usually incorrect. Hence, the supplements need to be tested to identify exactly their content.

This project would aim at identifying new anabolic steroids introduced on the supplement market and disseminate this information as well distribute reference solutions of these compounds to all WADA-accredited doping control laboratories, to accelerate their incorporation into detection methods.

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### **Results and Conclusions**

For the project over 40 different supplements were purchased and analyzed using different techniques (LC-MS and GC-MS) for the presence of known and unknown steroids. Several new steroids were identified. In many cases, it was shown that the labelled steroids/substances were not present or that other steroids were present. However, for several preparations "new" steroids were detected. These included 3 $\beta$ -hydroxy-androst-5-ene-17-one, 1,4,6-androstene-3,17-dione, 11-oxo-androstenedione, 17 $\alpha$ -methyl-5 $\alpha$ -androstane-17 $\beta$ -ol, 6 $\alpha$ -bromo-androstenedione, 6 $\beta$ -bromo-androstenedione, 2 $\alpha$ ,3 $\alpha$ -epithio-17 $\alpha$ -methyl-17 $\beta$ -hydroxy-5 $\alpha$ -androstane, 4-chloro-17 $\alpha$ -methyl-androst-4-ene-3,17 $\beta$ -diol, 3 $\alpha$ -hydroxy-androstane ethyl ester and 17 $\alpha$ -methyl-5 $\alpha$ -androstane-3 $\alpha$ ,17 $\beta$ -diol. Moreover, the survey also revealed that steroids that were officially removed from the market were still present (e.g. madol, superdrol).

All of the newly detected steroids were distributed to the WADA-accredited laboratories and information on their existence (including analytical data) was disseminated via different forms of communication (presentations at conferences (3), scientific publications (3) and multiple personal communications). During these communications the importance for the incorporation of several of these substances was stressed. In several cases besides the parent compound, useful metabolites were identified and reported to the community of accredited laboratories.

Several of the newly reported steroids have since then been incorporated into methods used in doping control laboratories and a few adverse analytical findings have been reported for some of these steroids (e.g. 1,4,6-androstatriene-3,17-dione).

For several others, it was shown that the regular screening procedures would be satisfactory to detect their misuse, but that the new substances needed to be taken into consideration when the results are interpreted.

### **Publications**

- Van Eenoo P, Lootens L, Van Thuyne W, Deventer K, Pozo-Mendoza O, Delbeke FT. Results of several (small) research projects at DoCoLab in 2006. Manfred Donike Workshop, Cologne, 2007.

- Van Eenoo P, Van Thuyne W, Pozo-Mendoza O, Deventer K, Lootens L, Van Renterghem P, Delbeke FT. Results of several (small) research projects at DoCoLab in 2007. Manfred Donike Workshop, Cologne, 2008.

- Van Eenoo P, Van Thuyne W, Pozo-Mendoza O, Deventer K, Lootens L, Van Renterghem P, Delbeke FT. Results of several (small) research projects at DoCoLab in 2008. Manfred Donike Workshop, Cologne, 2009.