Project review

"$^{13}C/^{12}C$ analysis of urinary boldenone and its main metabolite in trace amounts"

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Boldenone is a well known anabolic steroid mainly used in cattle mast or equine doping. Although it is not clinical approved for human beings, some athletes have been found positive for boldenone abuse in the recent years and have been punished for their delinquency.

More than ten years ago the suspicion raised that some individuals have the ability to produce trace amounts of boldenone endogenously. This suspicion has never clearly been confirmed because there never was the ability to distinguish between endogenous or exogenous boldenone.

The method of choice in this situation is the measurement of the ratio of the two stable carbon isotopes ^{12}C and ^{13}C by gas chromatography / combustion / isotope ratio mass spectrometry (GC/C/IRMS). The method is employed routinely to discriminate endogenous from exogenous testosterone. Unfortunately it requires minimum amounts of carbon that are corresponding to about 10 to 100ng per compound. So there was not enough boldenone in the specimens for a valid measurement.

Nowadays it is possible to measure the $^{13}C/^{12}C$-ratio of trace amounts of anabolic steroids, if a high grade of purification with a concomitant high recovery is achieved. The aim of this project will be the development of a suitable method belonging to these requirements.

$^{13}C/^{12}C$ Analysis of Urinary Boldenone and its Main Metabolite in Trace Amounts

Results and Conclusions

The described method enables the measurement of d13C values of urine samples containing low amounts of Bo and BM1. The LOD so far is 2 ng/mL, by using larger specimens it might be even lower. With this tool it is possible to elucidate the origin of these steroids and to distinguish between an endogenous Bo-production and an intake of prohibited substances. As there is the possibility for artificial Bo with $\delta^{13}C$ values close to the endogenous ones, this is not a clear proof for endogenous Bo-production, but it can be taken as a hint for this kind of abnormal steroid metabolism. Further preparations will have to be analysed in order to minimize the chance of Bo-preparations with a d13C values near to the ERC.

Publications

Piper T, Hebestreit M, Flenker U, Geyer H, Schänzer W. In : Schänzer W, Geyer H, Gotzmann A, Mareck U (eds.), Recent Advances in Doping Analysis – 25th Cologne Workshop on Dope Analysis. Sport&Buch Strauß, Cologne, 2007; 169-178.