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## **Stable Carbon Isotope Ratio Profiling of Nandrolone and Boldenone Ester Preparations**

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### **Abstract**

The World Anti-Doping Agency (WADA) 2012 Prohibited List precludes the use of anabolic steroids including nandrolone and boldenone. In some individuals, the metabolites of nandrolone and boldenone can be found to occur naturally at low concentrations. Gas Chromatography- Combustion-Isotope Ratio Mass Spectrometry (GC-C-IRMS) is the preferred method for confirming doping for steroids that can be produced both naturally and synthetically. The isotope ratio analysis of steroids relies on the assumption that exogenous steroids are depleted in <sup>13</sup>C compared to those produced *de novo*. Previously, we have presented at the Cologne Workshop detailed isotopic profiling studies of commercially marketed and illegally derived testosterone preparations sourced from Australia and abroad. In this study, we expanded the profiling study by analysing a total of fifty seized samples and twelve commercially marketed nandrolone and boldenone ester preparations by GC-C-IRMS. A novel hydrolysis approach was necessary to be developed and validated for nandrolone and boldenone preparations. The results obtained demonstrated that none of the nandrolone or boldenone preparations displayed  $\delta^{13}\text{C}$  values within the range generally reported for endogenous urinary steroid metabolites (-17.3‰ to -25.8‰). These findings validate the assumption that exogenous nandrolone and boldenone are depleted in <sup>13</sup>C compared to endogenous urinary steroids.