PROJECT REVIEW

"Increasing the sensitivity of GC-QTOF screening by using chemical ionization"

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In 2018, the current GC-QQQMS routine screening method (i.e., initial testing procedure) for human doping control was successfully converted into an equivalent and complete GC high resolution acquisition screening method for routine purposes by using low energy electron ionization (EI) GCQTOF. This GC-QTOF screening method is compliant with the WADA requirements and allows the detection of 294 target compounds (and 14 internal standards), including diuretics, stimulants, narcotics, beta-2-agonists, beta-blockers, hormone modulators, anabolic agents and the quantification of 14 endogenous steroids in a single fast run (14.1 min). Because of the full scan high resolution data acquisition ability of TOF technology (and the corresponding retrospective capabilities), this proved to be a big step forward in comparison with the current GC-QQQMS routine screening methods. Taking into account that anti-doping samples can be stored and reanalyzed for up to ten years, the retrospectivity and sensitivity offered by GC-QTOF opened the door to a cleaner sport. Sensitivity is obviously compound depended, but in general the sensitivity of the low energy EI GCQTOF is situated between EI GC-QQQMS and CI GC-QQQMS.

Chemical ionization (CI) is a softer ionization than low energy EI and has the potential to further increase the sensitivity, in parallel with our previous EI/CI work on GC-QQQMS. Combining GC-QTOF with CI is the next logical step and this project aims at exploring, testing and exploiting the potential of CI GC-QTOF in all its aspects. This will result in the development of a high-resolution acquisition screening method with higher sensitivities. Higher sensitivities lead to more flexibility, longer detection times and a more extended list of compounds that can be monitored.