Editorial

The papers presented in this special issue of the Journal of Chromatographic Science *exemplify many aspects of the work of the scientists involved in testing samples collected from sports competitors for the identification of prohibited substances. These laboratories are accredited to ISO 17025 and the World Anti-Doping Agency (WADA). WADA publishes a list of prohibited substances each year (http://www.wada-ama.org) and also specifies the penalties that apply when a doping violation has been proven ranging from a warning to a life ban from sport. Because the finding of a prohibited substance requires a disciplinary hearing for the sports competitor concerned, the laboratory will frequently have its work scrutinized in the courtroom. Thus the analytical work must be performed to the highest standards, often within a very limited time period. At the same time, the laboratory scientists are striving to find more sensitive and effective analytical tools to help with the control of drug abuse in sport. Because the sample matrix is complex (either urine or blood), chromatographic techniques are invaluable in separating the vast number of substances present to be able to identify analytes in concentrations typically of the order of nanograms per milliliter from a few milliliters of sample.*

Many sports competitors take a range of nutritional or dietary supplements. However, a number of commercial dietary supplements have been shown to be contaminated with substances prohibited in sports, mainly because of poor manufacturing processes. Furthermore, because many sports doping tests are extremely sensitive, even with normal good manufacturing practices, particular care has to be taken to avoid the smallest contamination. Unfortunately, in many countries, legal regulation of the products is minimal (see for example the Dietary Supplements and Health Education Act 1994 of the United States). This has resulted in a number of sports doping cases in which contaminated dietary supplements have been implicated as the cause. Two papers describe analytical methods for detecting and identifying contaminants in nutritional supplements. The first, by Van Thuyne and Delbeke, details a sensitive gas chromatography (GC)–mass spectrometry (MS) screening method for anabolizing agents in aqueous nutritional supplements. The second paper is by Wu and colleagues and describes the use of a variety of chromatographic, spectrometric, and spectroscopic techniques to identify a contaminant discovered in very large quantity in a dietary supplement.

Liquid chromatography (LC)–MS is starting to be used to an increasing extent in WADA-accredited laboratories, and the paper by Shpak and co-workers illustrates the use of the very sensitive ion trap detector in MS–MS and MS^3 modes to detect the prohibited substance mesocarb in human plasma and urine. This is followed by a timely review by Thevis and Schänzer of the current uses of LC–MS–MS in doping control for a wide variety of prohibited substances.

The administration of pseudoendogenous substances is a particular challenge in doping control. These substances are identical, apart from possible differences in carbon isotope abundance, to substances produced naturally in the body. The administration of some of these substances, such as the anabolic androgenic steroids testosterone and dehydroepiandrosterone, are prohibited in sport. It has been suggested that the body might fractionate these isotopes naturally, and the paper by Cawley and co-workers provides a valuable insight into this area. The final paper, by Goebel and co-workers, deals with one of the most recent doping control problems, that is to detect the use of hemoglobin-based oxygen carriers. Some of the methods described in this paper were adopted as one of the new methods employed during the 2004 Olympic Games in Athens.

As might be expected, the use of chromatographic techniques is often a critical part of the methods illustrated in these papers. These techniques are used daily in doping control laboratories and thus have to be robust. Although the main analytical technique is still GC–MS, this is likely soon to be replaced by LC–MS. It is likely that in the near future the use of micro-LC techniques, at least using the newer 1.7-µm particle size columns, coupled with MS, will be used to further improve the resolving power of the columns enhancing sensitivity and, perhaps, to provide faster analysis. Furthermore, the use of charged derivatization reagents to impart a charge to the analytes of interest for the enhancement of sensitivity in electrospray ionization will probably also soon be routine.

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