Drug Testing and Analysis

(www.drugtestinganalysis.com) DOI 10.1002/dta.77

Editorial

The introduction of drug testing to competitive sports began in earnest at the 1964 Summer Olympics and urine testing is now an accepted part of most organized sports. Since that beginning, sport has experienced a predictable and cyclical pattern of performance-enhancing drug use by athletes, technological advances in testing followed by changing patterns of drug use to avoid the newly designed tests. In the early stages, the main concern was anabolic-androgenic steroids. The application of gas chromatography/mass spectrometry in the 1980s markedly improved the detection of synthetic anabolic steroids. Athletes then began using endogenous steroids, such as testosterone, and undetectable designer anabolic steroids.

The emergence of recombinant DNA synthesis led to the medical breakthroughs that allowed endogenous hormones such as erythropoietin (EPO) and human growth hormone (hGH) to be synthesized and available for the treatment of disease. Almost immediately, athletes seized on these compounds for performance enhancement. Owing to the fact that these drugs are almost identical to their natural counterparts, detection was virtually impossible. The introduction of isoelectric focusing in 2000 led to a reliable method of detecting the abuse of recombinant EPO and analogs such as darbepoetin.

Solving the detection puzzle of recombinant EPO left hGH as the major hurdle for performance-enhancing drug testing as the new century began. Although the use of hGH had been rumoured in body-building circles since the 1980s, the increasing availability of recombinant hGH and the improved ability to detect anabolic steroids led to reports of increasing use in mainstream athletes.

The use of hGH has been subject to much controversy. It has been very difficult to determine the extent of its use, whether it is effective as a performance aid, how it is taken, in what doses and whether it was combined with other drugs. A detection method using blood testing was introduced at the 2004 Summer Olympics and this has also engendered controversy.

What is clear, however, is that hGH does appear to be abused by athletes and effective, widely available and easily administered testing has been elusive. In order to address these issues, a growth hormone summit was convened in November of 2008 in Los Angeles, California. The conference was hosted by the David Geffen School of Medicine at UCLA and sponsored by Major League Baseball and the law firm of Foley & Lardner. Fourteen speakers from around the world were invited to present their perspectives on various aspects of growth hormone. The speakers had a variety of backgrounds; they included World Anti-Doping Agency Laboratory directors, scientists, ethicists, lawyers, physicians and doping-control officers. Together, they provided an outstanding overview of this complex issue. In addition to members of the public, scientists and physicians, the conference was attended by representatives of many different sports organizations such as the National Football League, the World Anti-Doping Agency and professional players' unions, to name a few. This reflects the growing concern that the issue of hGH abuse has raised.

Following the conference, the speakers were invited to contribute to a special issue of *Drug Testing and Analysis* devoted to hGH. We have been fortunate to have seven authors contribute to this issue to answer a variety of the questions posed by GH. Dr Richard Holt, an endocrinologist by training, begins the issue with an overview of growth hormone and attempted to answer the difficult question as to whether hGH is in fact ergogenic. From there, Dr Thomas Perls tackles the larger issue of hGH use that goes beyond its use in athletes. Although athletes garner the publicity regarding their illicit use of hGH, they are just the tip of the GH iceberg and represent only a fraction of the millions of users in the US. Dr Perls confronts the multi-pronged combination of pharmaceutical companies, unethical doctors, black-market sources and people who violate the laws governing the use of hGH.

From there, the issue moves to the problem of hGH detection. Dr Holt returns for an article discussing the current state of serum testing for hGH using the isomer method, as well as an alternative detection method utilizing biomarkers. Traditionally, sports drug testing has employed urine as its substrate and testing methods using serum represent a marked departure for sport. The next two articles examine the effect of this change from a legal and practical aspect. Mr Matt Mitten is the director of the Sports Law Center at Marquette University and his article discusses the legal ramifications of blood testing in this arena. Following that, Mr Frank Uryasz, director of the National Center for Drug Free Sport, writes about how sports could adapt to performing blood testing at athletic venues.

The last part of the issue deals with alternative testing methodologies. It has been suggested that one method of detecting recombinant endogenous drugs would be for the pharmaceutical manufacturer to 'tag' the molecule in order to allow its detection. Dr Alan Goldhammer examines this concept in his article. The penultimate article is by Dr Don Catlin, one of the pioneers in the field of drug testing. Dr Catlin has investigated the potential methodologies for urine testing of hGH and the potential for a biomarker method using urine as the substrate. The final article is by Claudia Fredolini and a combined team from Italy and Virginia that has done research on nanotechnology and how this novel approach could overcome hurdles that would allow for hGH isomer testing in urine.

This issue is yet one more chapter in the ongoing cycle of performance-enhancing drug use and efforts to maintain the integrity of sport. *Drug Testing and Analysis* is fortunate to have an excellent array of contributors to address this major obstacle in sports drug testing. The issue of hGH abuse in sports has brought together not only scientists from around the globe, but many different sports organizations as well. That latter point is reflected in the introductions to this issue that have been provided by Travis Tygart of the United States Anti-Doping Agency and Robert Manfred, executive vice president for Major League Baseball. I hope that you enjoy this issue of *Drug Testing and Analysis,* that it answers some questions and also that it serves to continue research on this topic.

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