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## Advances in equine sports testing

As with human sports, prohibited substances are used in equine sports to enhance the performance of horses. The emerging drug trends share similarities in both the human and equine arenas, although the effect of administration is not often proven or recognised on horses as it is in its human equivalent. A unique dimension of animal drug testing is the growing concern regarding animal welfare which requires the surveillance of abused substances and new categories for prohibition (e.g. anti-inflammatory analgesics). Central to this is the requirement to distinguish between legitimate medical treatment and equine doping. The challenge is to establish testing schemes, sample collection and selective matrices, as well as analytical methods and results management to determine fraudulent use and to ensure that *bona fide* medicines are administered with sufficient recovery time from injuries or illnesses.

The ideal sample collection is fluent and prompt, a straightforward stress-free process for the horse and the veterinarian. There has been an increased interest in the suitability of blood for routine doping control. One indisputable explanation for this is the scarcity or absence of certain compounds in urinary excretion such as recombinant human erythropoietin (rhEPO) and recombinant equine growth hormone (reGH). In addition, blood samples have the advantage of enabling an evaluation of the pharmacological effect of substances and as such can assist in establishing concentration limits and withdrawal times for the therapeutic substances.

The analytical challenges of equine doping control are superficially the same as in human sports, e.g. rapid response time, absolutely reliable results, limited sample matrix and a wide range of target analytes with high variation in physico-chemical properties. The range of compounds that should be included in

routine test menus balanced with sensitivity, analysis time and sample consumption. As a consequence, the current analytical screening developments often aim at achieving minimal sample preparation combined with a mass spectrometric detection of wide range of target analytes. Increased sensitivity empowered by advances in liquid chromatography/tandem mass spectrometry have extended the screening possibilities of prohibited substances providing several significant breakthroughs, especially in protein and peptide identification.

As described in the articles of this issue, detailed understanding of equine metabolism and differences between species are important to target the relevant marker metabolites in a certain biomatrix. Recent developments of the *in vitro* simulations with tissue or enzyme preparations have significantly assisted in overcoming the problems connected to costs, ethical permissions and response times of traditional *in vivo* excretion studies. The reference material and metabolic information obtained in these assays may benefit also pharmacological and toxicological studies of veterinary drug development.

The challenges in equine doping control are not only analytical. Horse racing legislation varies between countries and sports organisations which all have their own strategies and drug surveillance programs to ensure fair play. Collaboration in research and development is of the utmost importance in achieving the international harmonisation of analytical methods and race regulations for clean equine sports.

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