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Emerging drugs: mechanism of action, mass spectrometry and doping control analysis.

Thevis M, Thomas A, Kohler M, Beuck S, Schänzer W.

Center for Preventive Doping Research-Institute of Biochemistry, German Sport University Cologne, Am Sportpark Müngersdorf 6, 50933 Cologne, Germany.
thevis@dshs-koeln.de

The number of compounds and doping methods in sports is in a state of constant flux. In addition to 'traditional' doping agents, such as anabolic androgenic steroids or erythropoietin, new therapeutics and emerging drugs have considerable potential for misuse in elite sport. Such compounds are commonly based on new chemical structures, and the mechanisms underlying their modes of action represent new therapeutic approaches arising from recent advances in medical research; therefore, sports drug testing procedures need to be continuously modified and complementary methods developed, preferably based on mass spectrometry, to enable comprehensive doping controls. This tutorial not only discusses emerging drugs that can be categorized as anabolic agents (selective androgen receptor modulators, SARMs), gene doping [hypoxia-inducible factor stabilizers, peroxisome-proliferator-activated receptor (PPAR) δ -agonists] and erythropoietin-mimetics (Hematide) but also compounds with potentially performance-enhancing properties that are not classified in the current list of the World Anti-Doping Agency. Compounds such as ryanodine-calstabin-complex modulators (benzothiazepines) are included, their mass spectrometric properties discussed, and current approaches in sports drug testing outlined.

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