



Australian Government
**Department of Regional Australia,
Local Government, Arts and Sport**

Committee Secretary
Senate Rural and Regional Affairs and Transport
References Committee
PO Box 6100
Parliament House
Canberra ACT 2600

Dear Committee Secretary

Thank you for providing the opportunity to provide supplementary information to the Committee's inquiry into the practice of sports science in Australia.

The following paper was prepared by the Department of Health and Ageing and was written in response to the findings of the Australian Crime Commission's report on Project Apero. The paper summarises some of the available evidence on the health effects of some commonly used substances in sport.

Should you have any queries please contact Ms Natasha Cole, Assistant Secretary, National Integrity in Sport Unit. Ms Cole can be contacted on _____ or at _____

Yours sincerely

Andrew Godkin
First Assistant Secretary
National Integrity of Sport Unit

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THE HEALTH EFFECTS OF NEW PERFORMANCE AND IMAGE ENHANCING DRUGS IN SPORT

Purpose of this paper

This paper briefly examines what is known about the health effects of new Performance and Image Enhancing Drugs (PIEDs) used in sport, based on a review of recent evidence from the high quality, peer-reviewed scientific literature up to March 2013. The report by the Australian Crime Commission (ACC) on *Organised Crime and Drugs in Sport(2013)* was the impetus for this work.

A literature search was conducted, framed around the set of problematic drugs listed in the ACC's report and their known health effects. Hence, the main focus was on PIEDs and in particular the class of drugs known as 'hormones and peptides'. Given that many drugs are anecdotally reported to be used in combination with other well-known agents (e.g. illicit drugs, prescription drugs, complementary medicines and dietary supplements), the search included any interaction effects and their health impact. Both positive and negative health effects were considered.

Methodology, scope and coverage

A search was conducted of the scientific literature, published over the last decade to 15 March 2013. Preference was given to the collection of systematic review papers, meta-analyses and randomised control trials. Comparative studies and single effect papers were also considered, along with any papers that documented interaction effects.

Overall findings, caveats and limitations

The literature search yielded 297 articles, but they mostly related to drug detection, anti-doping methods, immediate impact on endurance sports and improved athleticism over very short time periods. Overall, there was very little good scientific literature available about the health impact of the newer PIEDs referenced in the ACC's report. As some of these drugs are very new and mostly unregistered or illegal, there is extremely limited robust, scientific evidence on their health impact (positive and negative; short and long term). The few relevant articles refer only to hormones and immediate performance enhancing effects. Evidence on the health impact of these newer drugs is thus either absent or hypothesised on the basis of the known effects of other similar drugs within the same therapeutic class. The literature includes concern about the safety and quality of these drugs (e.g. there are no bioequivalence data) together with anecdotal reports of multiple drug use with unknown effects. The predominant view expressed in this sparse literature is that, while the short term impact may be enhanced physical performance (and even these benefits are either mostly not quantified or unknown), the likely longer term health effects are expected to be negative and akin to other known adverse reactions documented in drug reports over many decades.

The literature that does exist focuses on the two primary categories of potential PIEDs available to modern athletes: drugs and nutritional supplements. Drugs are associated with a variety of side effects that can lead to enhanced performance, physical changes, psychological disturbances, morbidity, and even mortality. The side effects of nutritional supplements are not as well studied. A commonly expressed view in the literature is that negative effects on athletes' health are partly

related to high doses of the performance-enhancing agents they use, but also to the relentless and strict training to which elite or amateur athletes put their muscles, bones, and joints.

Most of the information gained from this literature review came from the large mature and high quality and older review papers on the health effects of the drug classes to which the newer agents belong, or have similar properties. For example, there are numerous good articles on steroid use, growth hormone impacts and the short and long term effects of using anabolic androgenic steroids. Typically, the research shows that use of hormones builds lean muscle, strength, body weight with improved athleticism and endurance. The harmful effects however are many and serious: cardiovascular damage including some cases of sudden cardiac death, musculoskeletal damage, skin problems, mood disorders and aggression, mental health issues and liver damage, including cancer.

There is evidence of a growing literature on the potential impact of ergogenic agents (i.e. performance enhancing drugs, aids and nutritional supplements) but it is of variable quality and often focuses on more mainstream use of these agents by the broader community, not only use by elite athletes. Some articles document adverse health impacts but generally, the focus is on the ostensible positive performance enhancing qualities of these products. Many reports are not robust scientific studies. In addition, little is written about any interaction effects of these substances with illicit drugs and prescription medicines, but the general view is that they are most likely to be taken together. Thus, more research is needed on the interactive effects of current multiple drug use.

A review of the health issues associated with ingestion of commonly promoted dietary supplements found that, while most of the supplements investigated appeared safe when using the recommended dose, the impact of higher doses (as often taken by athletes) on health effects was unknown, and further research is warranted. Some researchers suggest that athletes often ingest more than one dietary supplement but very little is known about the potential adverse effects of ingesting multiple supplements. Those that have been demonstrated to be safe and efficacious when ingested on their own may have adverse effects when combined with other supplements.

There are important features missing in this literature. One aspect is the potentially different impact of method of drug use: injection (intra-muscular or intra-venous), dermal creams, and/or the ingestion of tablets, liquids, solids etc. Detailed data on PIEDs injection are difficult to obtain because of the illicit and unsupervised way in which many PIEDs are used, and the hidden nature of the group. Overall, there is little good information in the literature on method of drug use for PIEDs, but they have the potential to be a significant public health issue because of injecting risk behaviour and related harm among people who use drugs, dietary supplements and gene doping. Another important missing feature is the dose-related and toxicity impact of a drug alone, or in interaction with other substances. The pharmacological information suggests that dose and the therapeutic index (the ratio between the toxic dose and the effective dose—a measure of the margin of safety in using a drug) are both very important variables in determining health effects but again, there is little coverage in the scientific literature about these safety aspects.

Finally, this literature is hard to assess: highly technical, very complex, covering vastly different disciplines and disparately located (the sources range from pharmacology textbooks to molecular biology and biochemistry papers to public health commentaries and sports journal analyses). It requires a sophisticated understanding of the biochemistry of new peptides and hormones, current knowledge of drug use in sport and a comprehensive understanding of the biological health effects.