



Australian Supplement Survey Summary



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Introduction

LGC, an established international life sciences measurement and testing company, has been analysing nutritional supplements for substances prohibited in sport for more than 10 years. To date, LGC has tested in excess of 50,000 samples and is the parent company of industry-leading nutritional supplement certification programmes Informed-Sport and Informed-Choice.

During this time, LGC has performed regular market research, conducting analytical surveys to support both manufacturers of sports supplements and consumers alike, ensuring that the risks associated with potential supplement contamination are fully understood. These surveys have been conducted across a number of territories and previously have indicated that up to 1 in 10 supplement products may contain substances deemed prohibited within sport; these substances not being declared within product descriptions or labelling.

Whilst some sports advise caution around the use of supplement products, it is well recognised that the majority of athletes continue to use nutritional supplements, whether to improve performance or speed up recovery. In addition, athletes and consumers of such supplements are exposed to an array of products, covering a wide range of functionalities.

A growing concern among many sports organisations relates to the inadvertent consumption of substances prohibited within sport that potentially place an athlete's career in jeopardy. This can and has occurred, with many documented instances of athletes failing doping control tests following the use of contaminated and/or adulterated supplement products. By understanding the risks, sports organisations can ensure their athletes are properly educated when sourcing nutritional supplements.

The following study focuses on nutritional supplements commonly available in the Australian market.

Selection of Products

Following a review of the Australian market, 67 supplement products were purchased from a range of internet sites and retail stores. Product selection was primarily based on market share (based on statistical data obtained relating to leading market brands). Products known to be part of an existing testing program were excluded from the survey.

The products were selected from a range of functional categories (as depicted within Table 1) and covered a variety of formulations such as bars, capsules, gels, liquids, powders and tablets, as shown in Table 2.

Table 1 – Distribution of products tested by functional category

Functional Categories	Number of Products (%)
Amino Acids	8 (11.9%)
Creatine	6 (9.0%)
Weight Management	7 (10.4%)
Hormone Booster	4 (6.0%)
Intra-Workout	2 (3.0%)
Minerals	3 (4.5%)
Multivitamins	4 (6.0%)
Post-Workout / Rehydration	4 (6.0%)
Pre-Workout	7 (10.4%)
Protein	19 (28.4%)
Well-being	3 (4.5%)

Table 2 – Distribution of products tested by product formulation

Product Formulation	Number of Products
Bars	2 (3.0%)
Capsules	8 (11.9%)
Gels	1 (1.5%)
Liquids	1 (1.5%)
Powders	46 (68.7%)
Tablets	9 (13.4%)

Analysis of Products

All 67 products were analysed using LGC's ISO/IEC17025 accredited nutritional supplement screen, utilising the diagnostic techniques of liquid chromatography mass spectrometry (LC-MS/MS) and gas chromatography mass spectrometry (GC-MS/MS). All products were screened for a wide range of substances prohibited within sport, including substances such as anabolic agents (exogenous and endogenous), Beta-2 agonists, diuretics, and stimulants. The results obtained were reviewed against current acceptance criteria for the Informed-Sport and Informed-Choice testing programmes.

Results

Of the 67 products tested, 13 (19%) showed evidence for one or more substances which would be considered prohibited within sport (the findings also not meeting acceptance criteria for the Informed-Sport/Informed-Choice testing programmes).

The most common finding observed was the stimulant 1,3-dimethylbutylamine (also known as AMP Citrate) which was identified in 7 products (10%). As can be seen in Table 3, the findings observed were limited to two compound classes, anabolic steroids (25% of findings) and stimulants (75%).

Of the 13 products showing evidence for prohibited substances, 11 produced data indicative of potential low-level cross-contamination and/or natural occurrence within complex botanical ingredients, with findings estimated in the low parts per billion (ppb) region.

Of the 67 products tested 13 products (19%) showed evidence of containing one or more substances considered prohibited within sport and which would not meet the requirements for acceptance onto either Informed-Sport or Informed-Choice programmes.

However, two products (from the individual functional categories pre-workout and weight management) were found to contain the stimulants 1,3-dimethylbutylamine and methylhexaneamine at concentrations well in excess of this. In fact, concentrations were so high that modified extraction and analysis procedures were employed to limit the risk of laboratory contamination. By performing standard addition experiments on the two products, concentrations greater than 7 mgg⁻¹ for 1,3-dimethylbutylamine and greater than 2 mgg⁻¹ for methylhexaneamine were estimated.

Table 3 – Tabulation of findings by type and occurrence

Analyte	Type
1,3-dimethylbutylamine	Stimulant
Methamphetamine	Stimulant
Methylephedrine	Stimulant
Methylhexaneamine	Stimulant
Nopseudoephedrine	Stimulant
Oxilofrine	Stimulant
Selegiline	Stimulant
Strychnine	Stimulant
1,4-androstadiene-3,17-dione	Anabolic Agent
5(6)-androstene-3,17-dione	Anabolic Agent
DHEA	Anabolic Agent

Conclusions:

Of the 67 products tested, 13 were found to contain one or more substances prohibited in sport. This represented 19% (or approximately 1 in 5) of products tested. The findings were observed across a range of functional categories and product formulations.

The weight management functional category yielded the most findings, with screening findings identified within 4 products, which represented 31% of the total findings. Pre-workout supplements gave the second highest incidence of findings, with 3 products being identified (23%). Of the formulations tested, powders gave the highest number of findings (69%) with only capsules and tablets yielding further findings. However, as shown in Table 2, a greater number of powder samples were included within the survey compared to other formulations. Tables 4 and 5 provide a complete breakdown of the number of findings by both functional category and formulation.

The presence of unlabelled stimulants at such elevated levels not only poses a significant risk of an athlete failing a doping test, but also has the potential to cause serious health problems.

The most common observation was for the stimulant 1,3-dimethylbutylamine, which has become increasingly used following the ban imposed on the use of methylhexaneamine within nutritional supplement products. However, as the results of this survey indicate, methylhexaneamine is still an ongoing issue.

Whilst most findings observed were noted within the low ppb region, two products were identified with significantly elevated levels; both at mgg^{-1} concentrations (one product identified as containing the prohibited stimulant 1,3-dimethylbutylamine and the other the prohibited stimulant methylhexaneamine). On review of product declarations/ingredient claims for both products, no reference to either compound was noted. Based on the estimated concentrations observed within both products, high level product contamination/deliberate product adulteration cannot be ruled out.

The presence of unlabelled stimulants at such elevated levels not only poses a significant risk of an athlete failing a doping test, but also has the potential to cause serious health problems.

This survey has once again shown that athletes remain at risk of a potential career-ending doping violation by taking products which are not subject to rigorous banned substance screening. It is therefore vital that athletes who are subject to routine doping control ensure they select only those products which have been subject to appropriate quality control/testing programs.

Table 4 – Distribution of screening indications by functional category

Functional Categories	Number of Indications (%)
Amino Acids	1 (7.69%)
Creatine	--
Weight Management	4 (30.8%)
Hormone Booster	1 (7.69%)
Intra-Workout	1(7.69%)
Minerals	--
Multivitamins	1 (7.69%)
Post-Workout/Rehydration	1 (7.69%)
Pre-Workout	3 (23.1%)
Protein	1 (7.69%)
Well-being	--

-- no indications detected

Table 5 – Distribution of screening indications by product formulation

Product Formulation	Number of Indications (%)
Bars	--
Capsules	3 (23.1%)
Gels	--
Liquids	--
Powders	9 (69.2%)
Tablets	1 (7.69%)

-- no indications detected



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