

MODERN DAY CHALLENGES WITH SPORTS SUPPLEMENTATION

A VIEW FROM THE INDUSTRY AND ELITE PERFORMANCE

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INTRODUCTION

Since the late 1990's, sports supplements have been identified as possibly career damaging and a potential risk to athlete health from the presence of prohormones and other prohibited substances. To date a number of high-profile cases across multiple sports have been testament to this ongoing real and present risk. Literature has continued to support the possible risk not only to elite athletes, but also the wider sport community. The last notable white paper was completed in 2015, which resulted in Dutch Ministry of Health intervention to take specific products off the shelves due to the presence of substances at levels deemed dangerous to health.

Since 2016, only sporadic proven cases of athletes receiving an Anti-Doping Rule Violation (ADRV) sanction directly from consuming a contaminated sports supplements have been reported. This then poses a question. As the global supplement industry continues to grow at pace, increasing numbers of athletes continue to use sports supplements, and supplement ingredients now appearing in diverse

formats including food, what has changed over the last prolonged Olympic Cycle?

Based on a roundtable discussion, this commentary aims to directly talk about the real and present issues. Using experience in both industry and elite performance, it offers a practical field-based consensus on the current status and difficulties that sports supplements present for athletes and support staff.

Q#1 Sports supplements are still a big draw for all kinds of athletes, why is this?

The purchasing behavior of different groups towards sports supplements has been the subject of many global studies. From a physiological perspective, sport supplements remain popular as a recovery aid after what they perceive as hard exercise. Large scale use is also reported to gain maximum adaptations from a completed exercise session, including stimulating muscle protein synthesis following an exercise bout.

In the context of attitudes towards sports supplements, the impact that marketing and social media have on decision making

of the wider sport community shouldn't be ignored. Sports supplements are often linked with the picture of a healthy lifestyle. Label claims such as "high protein" and perceptions of diets on health often go some way towards the decision-making process to consume or not. In fact, today the aptly termed "better for you" and functional foods sector are two of the biggest global drivers of the nutrition market currently. This raises a question, "are athletes buying more supplements or functional foods"?

Within elite sport, sports supplements such as creatine, caffeine and various muscle or blood buffers have stood academic rigor. For these reasons, they remain popular "ergogenic aids" to performance. As Mike explains "Another reality at the elite level behind an athlete choosing to use a sport supplement is the "fear" they may be missing out". As margins between win and lose, qualification or not become finer this fear is always present. Specifically, "toeing the line" at the start of an event in the knowledge that other competitors have taken a supplement that is specifically designed and may have

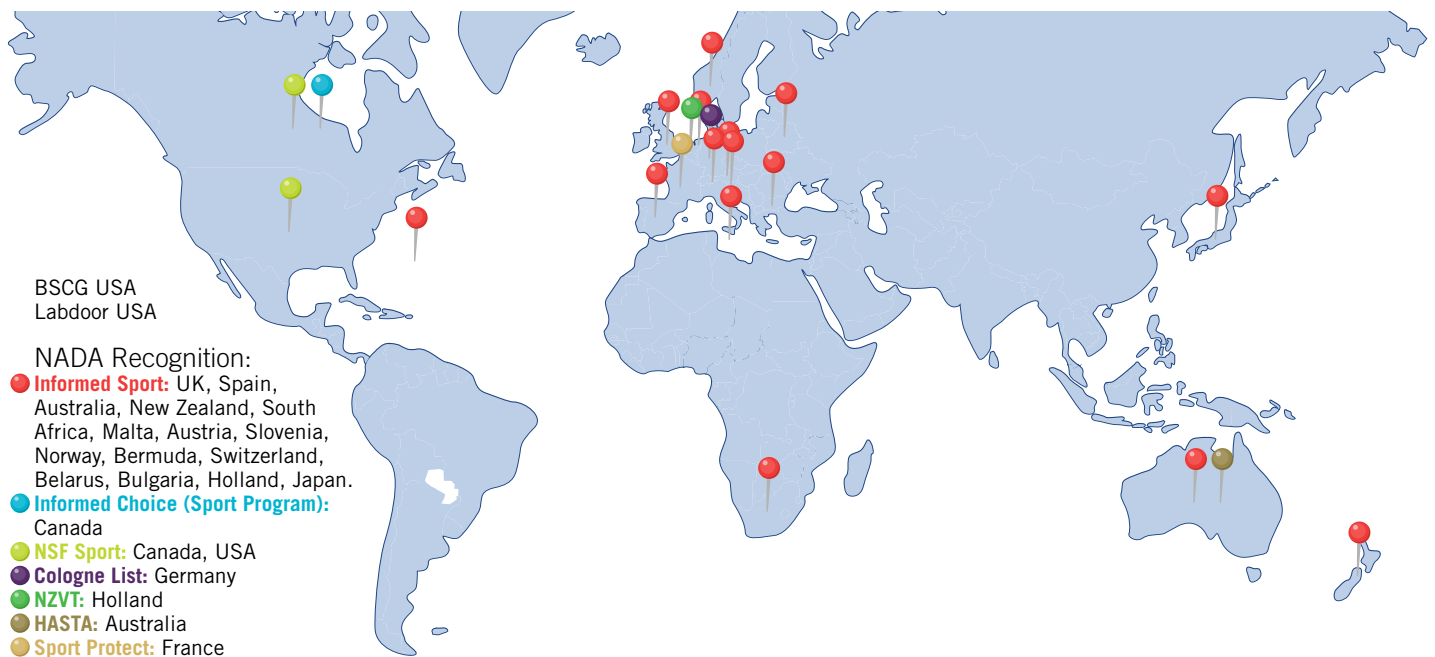


Figure 1: World Map of known 3rd Party Testing Laboratories and implementation Currently Active.

some strong evidence to impact on that performance.

He goes on “in some cases, it is difficult to solve everything with food related to performance. Consequently, a food first not food only remains the adopted approach”. Creatine, vitamin D and iron are good examples of this for periodic use to achieve a performance or health related outcome.

Q#2 What have been the biggest trends in sports supplements since the last Olympics?

To answer the question a definition of a supplement is needed. Specifically, a clear line drawn when something is a supplement or not. There isn't really a “right or wrong answer” but a universally accepted definition of a supplement remains elusive. A recent IOC consensus statement recognised dietary supplements come in many forms¹. In the context of supplements used by athletes in sport, practically, many are often referred to based on their intended use or in some cases single ingredients. The most common include sports foods (e.g. gels, sports bars, drinks), single nutrients with vitamins or minerals (e.g iron, vitamin D), ergogenic aids (e.g. caffeine, creatine, buffers), functional foods, superfoods and herbal / botanical products.

However, the “borders” have become greyer and regulators slow to make the lines clearer despite lobbying by professional groups. Take for example Cannabidiol (CBD) which is one of the biggest trends seen since

the last Olympics. CBD is one of over 100 cannabinoids contained within cannabis but most importantly, since 2018, the only cannabinoid not classed as a prohibited substance (in and out of competition) by WADA. Today CBD products are used by some athletes in contact sport for pain relief and recovery². The highlighted concern here being the presence of other prohibited cannabidiols tetrahydrocannabinol (THC), Cannabinol (CBN) or Cannabigerol (CBG). THC has been found in significantly higher quantities and greater variations than the 10ng legal levels and what labels suggest in some commercially available products. For athletes and support staff this raises concerns about the possible effect on THC urine concentrations from taking varying amounts of CBD and potential for an antidoping violation.

Other significant trends appear to be less directly related to performance per se as Nick summarises.

“Referred to by some as “an elixir for life”, collagen has seen a significant increase in popularity partly leveraged by its link to beauty. In sport, the use of different collagen preparations focused on impacting tendon integrity continues to be researched extensively and used by many as part of rehabilitation protocols. The gut and the link to brain and immunity continues to be an evolving area of interest. In recent times probiotics and prebiotic supplements have focused on microbiome modulation

and been commercially very significant. Probiotics have become questionable in their efficacy but despite this, seem to be randomly added into a wide variety of foods. Prebiotics remain of interest, but today “postbiotics” (described by some as dead probiotics) are seemingly becoming the next level to alter the gut microbiome³. Other supplements receiving increased attention linked to immunity are plant botanicals such as Quercetin”. Ross agrees “herbal preparations have continued to trend up and be increasingly promoted, yet the risk to benefit of these remains questionable with the added analytical complications during third party testing”. Finally, linked to the rise of the ketogenic diet and its potential wider health claims for some audiences, this period of time has also seen a considerable rise in the Ketone ester and salts market.

Q#3 Are novel ingredients added into foods useful to athletes? Are they safe?

Another example according to Nick of the “grey area” and challenges created by “supplement sprawl”. Functional foods using novel ingredients have seen a dramatic growth over the last 5 years and had a significant global influence. Advances in food technology science and taste make it possible to put anything into a food, in any format. Fueled by a lens of “food is best” and it could be argued a convenience factor, the everyday general consumer has moved

away from the traditional engineered form of supplements e.g. pills, powders towards functional foods.

For athletes, the large-scale replacement of engineered supplement forms to functional foods is less evident. Functional foods provide “an option” as part of a busy lifestyle to support their needs at particular times. They are not “a replacement” for food. Mike describes this well when asked practically about working with athletes and the availability of these foods.

“It’s really all about working back from performance and understanding what they are trying to achieve. Then building foods that can help health or performance – near enough every time you can achieve those goals without going into those “grey areas”.

In the context of anti-doping, evidence is missing on the safety and risk to athletes from foods containing functional ingredients. Fortification is currently limited mostly to vitamins. This itself is sending a mixed message in the eyes of the athletes, with ingredients that would, if encapsulated, require testing, but if added to a food not. Ergogenics such as creatine and Beta alanine are not finding ways into foods. However, proteins and other novel ingredients including pre and probiotics and most recently CBD have in formats which themselves are perceived as “low risk”. The site of manufacture has to be a key consideration for risk. Unlike supplement contract manufacturers which involve processing multiple products using a large selection of ergogenic ingredients (including those potentially prohibited by WADA) the risk during the manufacture process in a food facility is likely to be lower. As Nick explains

“Here the risk is limited to the purity of the raw novel ingredient. Many food companies are choosing not to use externally tested novel ingredients, instead their own due diligence and quality assurance programs are relied on. This is an interesting position for ingredients that have historically part of a testing process, so it really goes back to the supply chain and ingredient resourcing.”

Ultimately, as Ross highlights, “technology is constantly developing, and detection has improved to 1000’s of substances. WADA list is open ended from a testing point which itself is risk minimization rather than mitigation.” Risks still exist. It would be good to see some industry collaboration

TABLE 1

<i>Third Party Testing Programs</i>	<i>Details</i>
<i>Human and Supplement Testing Australia (HASTA)</i>	www.hasta.org.au
<i>Dutch safeguards System for Dietary Supplements in elite Sport (Referred to as NZVT)</i>	www.dopingautoriteit.nl/nzvt
<i>Informed Sport</i>	www.sport.wetestyoutrust.co.uk
<i>Informed Choice</i>	www.choice.wetestyoutrust.co.uk
<i>Cologne List</i>	www.koelnerliste.com
<i>BSCG</i>	www.bscg.org
<i>NSF Certified for Sport</i>	www.nsf sport.com

Table 1: List of 3rd Party Testing Programs linked to Accredited Laboratories.

and research on cross contamination of functional foods / quality of ingredients especially by companies who do their own internal testing on things which have historically required externally tested.

Q#4 What are the current education challenges on the risks of taking supplements and the need to recognize safe choices?

Having accurate and up to date information that is consistently relayed, preferably as part of aligned simple hard hitting and impacting campaigns, is crucial to minimize risk of ARDV. In the context of sports supplements, the most concerning gap in applied research appears to be knowledge relating to the attitudes and beliefs of athlete support personnel who are often the “first line” that athletes turn to. Today, social media makes spreading inaccurate or false information easy, so access to unbiased professionals who are well briefed and have the skills and competence needs to be in place. This is especially important in sport where high coach turnover can often bring supplement practices from other countries in the belief that they are safe. In the UK, standards are high as Mike explains “all professionals working with high level athletes have to have the UKAD accreditation as a minimum standard”.

Going beyond simply relaying messages and truly understanding the industry in more detail is perhaps an additional

level to work towards. On this topic, Nicks experience suggested some simple changes could make all the difference. “Some practitioners would really benefit more from seeing and understanding how the industry works. The elite group is a small area, and requirements placed upon a supplement consumption use in athletes is so unique compared to what the commercial market demands. If they knew more about the process that would help them relay more for the information to athletes around the risks and where it comes from”. Mike agreed “for example, engineered supplements and plain food become simple conversations when educating athletes as the consensus is clear. However, a greater knowledge of the wider supplement space is crucial when it comes grey areas like functional foods and supplements with single addition ingredients such as CBD and botanical ingredients”.

Finally, being able to access tested products is a big challenge and often a significant frustration. Resourcing often requires use of multiple portals as not all products are tested. Even after ordering, increased border control can often be a limitation to access in countries that rely on imported products due to a lack of manufacturing in their own country. Notably, health authorities regulate sports supplements as either a food or a medicine inconsistently. Consequently, import regulation can have different audit

requirements for country access or retail permissions often delaying safer products, in some cases making import not possible.

Q#5 How frequent are sports supplements actually causing an ADRV?

In truth, globally the answer to this question over the last 6 years isn't known. Between 2003 and 2015 doping cases attributed to supplement use were reported 6.5-8% of ADRV⁴. Australia has continued to offer insights on its incidence during this time. Notably, that up to half of the relatively low number of total ADRVs for the country are reported as being a result of a sports supplement equivalent to 1 athlete per month.

The reality is that, evidence shows a gulf between responsible manufacturers who commit products to voluntary 3rd party testing programs and those who don't. For example, in July 2020, HASTA reported contamination rates in the products they were asked to test "lower than 1%" compared to when they purchased off the shelf from online stores and got an incidence of 15-20% in the same period.

Supplements are often initially reported as the cause of inadvertent doping by an athlete. These need careful navigation. Unfortunately, this is an excuse used by the innocent and the guilty, so it carries no weight. When cases are investigated other causes are frequently established as the cause of inadvertent doping. Where an ADRV is directly linked to a sports supplement, there are several reasons why

this has occurred. Constituents in a product not being disclosed entirely or at the levels stated on the label remain the biggest challenge of working with athletes and sports supplements. Ultimately, athletes have 100% liability when consuming a sports supplement to include a product that unknowingly contains a prohibited substance.

Sports supplements promoted for "muscle building", fat loss preparations and products with multiple plant botanicals continue to be considered the greatest risk not only to athletes but also the wider sport community from a health point.

Q#6 So, if the cases of ADRV linked directly to consumption of a contaminated sport supplement appear to have reduced, what has happened? Are they more regulated now?

Regulation of sports supplements has not improved. Nick explains, "any reductions in ADRV incidence are more likely to be as a result of greater supplement company awareness that they cannot access athlete groups without some form of testing. Over time, processes have become stronger with more people across the supply chain e.g. contract manufacturers, increasing testing to protect their reputation and business". This has become crucial as ingredients are sourced from further afield in attempt to keep costs low. The question is now "how does a product end up on the market with something that it shouldn't have in" with some of the contract manufacture size and reputation"

For athletes, consuming a sports supplement that has been cross contaminated during the production process remains the biggest threat. Today, very few sports supplement focused companies produce their own products in house. Many are outsourced to large contract manufacturers who not only make supplements consumed for athletes but also for the wider fitness industry and markets such as beauty where the threat of an ADRV to individuals does not exist.

Thankfully, so it would appear the numbers of athletes with an ADRV linked to a sport supplement are less. As Mike went on to explain "I don't think this is by accident. We believe that a primary cause of that is better education for athletes and having key strategies in place". Such strategies include there more appropriate and timely use and accessible information in relation to 3rd party laboratory tested sports supplements.

Q#7 Is third part laboratory testing of sports supplements a "game changer" for athletes?

There is no doubt that 3rd party laboratory testing programs (Table 1) have been one of several useful tools for professionals working with athletes who are subject to doping control. Others being the recent IOC consensus statement which is a significant piece of work to aid effective decision making. Finally, through inclusion in Article 10, the progressive acknowledgement by WADA referencing the use only of "a recognized 3rd party testing laboratory" tested product where an athlete accepts the risks and wishes to take a supplement (Table insert showing an athlete's due diligence).

Ultimately, 3rd party laboratory testing is focused on getting to the supply chain which is essential if sports supplements are to get safer. Some countries have their own laboratory and system e.g. Germany, Holland (See Table 1), while others adopt surrogate global testing programs with accredited facilities for testing in different regions e.g. informed Sport which sport organisations then adopt as a standard.

However, 3rd party testing "marques" are not without challenges. Individual program nuances remain and it's crucial that professionals take the time to understand. As Ross explained in some detail.

"For example, different countries have different analytes, testing frequencies, thresholds and supply chain audit processes.

THIRD PARTY TESTING

Supplements that are part of a "third party testing" program, are those which are part of an audit process that at a minimum includes final product testing by an independent accredited Laboratory for prohibited substance. Accredited laboratories involved in supplement testing have extensive ingredient analytic expertise and databases and are not permitted to be associated with WADA for conflict of interest reasons. Upon successful completion, a certificate of analysis is provided to the company for that particular batch. The certificate serves as evidence and should be obtained and stored as part of the athletes/support staff's due diligence around reducing the risk of inadvertent doping. Some laboratories include additional measures in certification programs, such as audits of the manufacturing processes and supply chains. Products that have undergone and met requirements of a third party testing program are able to carry the name of the testing program on the product label (e.g. Informed Sport, Informed Choice, NSF Certified for Sport

WHY IS BANNED SUBSTANCE TESTING NECESSARY?

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3rd Party testing laboratories also differ in what they offer. For example, most recently, in addition to their Informed sport status which covers the entire supply chain, there is now Informed ingredient and informed manufacture.

“Further that some programs test to the higher frequency recognized by another similar program but retain their own marque which external states that testing frequency is less. Confusing, yes, but nuances could be a positive or negative, so professionals need greater awareness themselves to navigate. I have also seen misleading cases where brands infer they had achieved the highest status of full supply chain audit just because a product was manufactured using a facility that has been part of a full audit status approval”.

It’s clear that 3rd party testing remains “clunky” at best and needs improvement to help professionals access information on their programs more readily. The weight that 3rd party testing carry’s in markets is low and many just see the costs associated with these as prohibitive. Until such a time it’s always going to be “clunky”. In some countries, the decision on which 3rd party testing program to use is clear as some National Anti-Doping Authorities (NADA) have state exactly programs they support e.g. USADA and NSF for Sport. Perhaps this is the best practice way forward, however this is an approach which does potentially limits product availability from certain parts of the world.

For countries looking to develop best practice, at the time of writing this, there is no accessible global picture available on what testing programs are recognized by different NADA and or sport organisations. As the gatekeepers to safer sports supplement access there is also a notable absence of any yearly publicized facts on the frequency of supplements crossing analytical thresholds and failing to be released that they test. It is hoped that given the recognized importance of 3rd party testing programs to athletes, this and other gaps highlighted in this commentary can be addressed through greater collaboration urgently.

PRACTICAL PEARLS ON SPORTS SUPPLEMENTATION

1. Any sports supplement is not 100% safe
2. Letters from supplement company’s stating a product is free from prohibited substances as an act of assurance carry no weight
3. Sports supplements that are not part of a 3rd party testing program have a higher risk of containing prohibited substances.
4. Supplements promoted for muscle building, fat loss and herbal products carry the highest risks to athletes.
5. The slightest change in the manufacturing process such as personnel, can create adverse analytical findings in tested products.

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