Supplements, image enhancing substances and grassroots sport

Play by the Rules
making sport inclusive, safe and fair.

Australian Government
Australian Sports Anti-Doping Authority

Australian Government
National Integrity of Sport Unit

Australian Government
Australian Sports Commission

A production of Play by the Rules

In cooperation with

Australian Government
National Integrity of Sport Unit

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Preface

On 1 June representatives from Northern Territory sports organisations and major clubs gathered to attend the Safeguarding the Integrity of Sport forum in the Michael Long Learning Centre in Darwin. The Darwin forum concluded a unique national roadshow, organised by Play by the Rules, which addressed the impact that doping, match-fixing and the use of supplements are having on the integrity of sport at a grassroots and sub-elite level.

The forums were unique in many ways, not least for the extent of inter-agency cooperation that went into staging them. Major partners were the Australian Sports Commission, the Australian Sports Anti-Doping Authority (ASADA), the National Integrity in Sport Unit (NISU) and all state and territory departments of sport and recreation. The initiative was funded via the Committee of Australian Sport and Recreation Officials (CASRO), the collective of federal, state and territory heads of sport. CASRO's support followed recommendations from the Access All Levels report, commissioned by Play by the Rules on behalf of CASRO and produced by Bluestone Edge in 2014.

The report confirmed what CASRO suspected — that doping, match-fixing and the use of supplements were no longer confined to high performance sport.

This ebook is a direct transcript of the presentation from Dr Gary Slater from the University of the Sunshine Coast at the forum that was held in Sydney in May 2015. To view the full video, or major topic session videos, simply go to:

www.playbytherules.net.au/news-centre/projects-sport-integrity/1446-safeguarding-integrity

At the time of producing this ebook we are in the process of planning for the next stage of support in these areas of integrity. If you would like to be kept informed of these initiatives and resources then sign up here – pbtr.com.au/safeguarding/

Thanks

Peter Downs
Manager – Play by the Rules
October 2015

PART 4: SUPPLEMENTS AND IMAGE ENHANCING SUBSTANCES IN SPORT

Dr Gary Slater (University of the Sunshine Coast)

I guess the issues that have occurred over the last couple of years have really raised to the forefront the issues associated with supplementation and the potential for doping with that. For myself, as a practitioner, I work half-time at a university, but also work two days a week for the Australian Rugby Union. It's also facilitated an opportunity for me where, over the last year, I've worked closely with our integrity unit within the Australian Rugby Union to be able to develop a supplement policy that has helped to try and minimize the chances of this sort of issue occurring within rugby union.

When we talk supplementation, I think it's really important that we have an appreciation of what actually we perceive to be a supplement. And I would presume, if I asked people in the audience if you're taking any supplements at the moment, and we broke it down away from things like protein powders, creatine monohydrate, through to things like fish oils, vitamin and mineral supplements, I would presume there would be at least half the audience that are consuming some form of supplementation. Just a showing of hands—who's taking some form of supplement—pill, powder, anything like that? Potentially if you're taking it for a therapeutic reason—there you go.

If I asked that question to a group of athletes, you'd find almost every single athlete would raise their hand.

http://sport-integrity.s3.amazonaws.com/Informed_choice.mp4

Video: Sport supplements include a wide range of products, from protein shakes and creatine through to rehydration or electrolyte drinks, vitamins, and minerals. The target market ranges from elite athletes to weekend enthusiasts to budding young talent. But supplements are also produced for body builders with a greater focus on cosmetics than enhancing sporting performance. These Schwarzenegger gym bunnies have simulated a demand for supplements that may contain ingredients that are banned by the World Anti-Doping Agency with little or no concern for drug testing. Athletes might say, "What's the risk in that?" However, manufacturing of supplements is commonly sub-contracted to third-party manufacturers, who make a wide range of products for a wide range of brands. Whilst brand "B" may be respectable with the intention to be free of banned substances, traces of brand "A" may carry over if it was manufactured just before brand "B" and using the same equipment—bad news if brand "A" contained banned substances!

In addition, pressure on prices will encourage sourcing of raw ingredients from low-cost suppliers with low-cost quality control. Cross-contamination within a storage warehouse can then easily happen. More and more products are also using herbal ingredients, and the chemical makeup of these is often not understood. So, traces of banned substances can easily find their way into legitimate products, and urine samples containing one part per billion of contamination can lead to a positive drugs test, and careers left in tatters.

The answer is simple. Look for the Informed Sport, Informed Choice logo to guarantee a tested product.

Gary: Now, as you can see, that is actually a commercial presentation. It was prepared by Informed Sport, which are an independent testing body that will charge supplement companies to analyse their products to confirm that they're free of doping substances. I'm going to talk a little bit more in regards to Informed Sport. It's very much something that's new within the Australian market, has been around for a few more years within Europe and

the U.S. And I think it's very much a positive move, where we're decreasing the potential of a doping offence through the use of products that are Informed Sport-certified. You don't completely remove the risk, though.

There's a whole range of issues that are raised in their film—one in regards to manufacture. What we often don't appreciate is that the majority of supplements that are produced within Australia come from just a couple of different paired blending facilities. So, if one company has contaminated products, it's highly likely that other companies will also have contaminated products. The increased exposure to botanicals, herbal ingredients, can also carry an increased risk, whether or not they're used in isolation or within these supplements, which carry many, many ingredients. And also, it's a market that isn't driven by science, but is driven by the consumer. What does the consumer want? We'll provide it for them, because it is a commercial entity.

If you want a true definition in regards to a supplement, it's

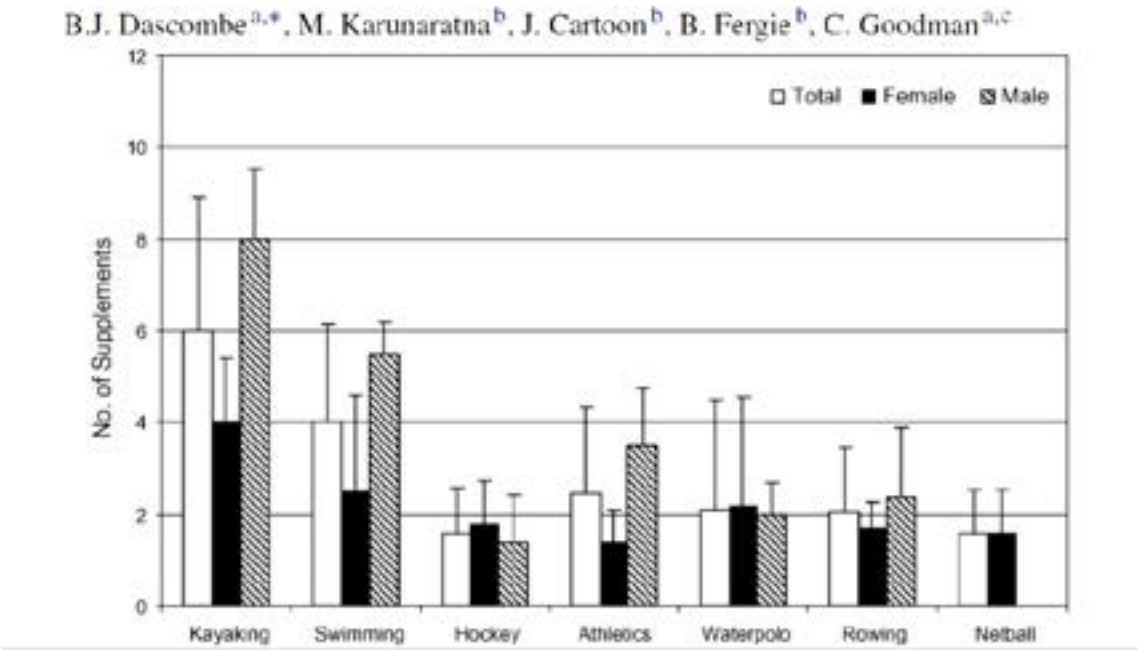
> *"a product which contains one or more purportedly active ingredients, derived from plant or animal sources, for the purposes of expanding dietary intake. It may range in presentation from a formulated food or drink to a pill, powder, fluid, or infusate."*

Would you change your mind in regards to whether or not you're taking a supplement based on that? There's extras!

The reality is that many athletes' perceptions in regards to sports nutrition looks a little bit like this.

Their perception of sports nutrition really is about sport supplementation. And while there is a small range of sport supplements that offer a true performance-enhancing benefit, you're typically only looking at a one- to maybe three-percent improvement in performance, if it can actually be administered appropriately, that is, the right dose at the right time for the right athlete. The reality is that the vast majority of the benefit is going to actually come from the base meal plan that that athlete is working on, using their diet to be able to help support fuelling and recovery goals.

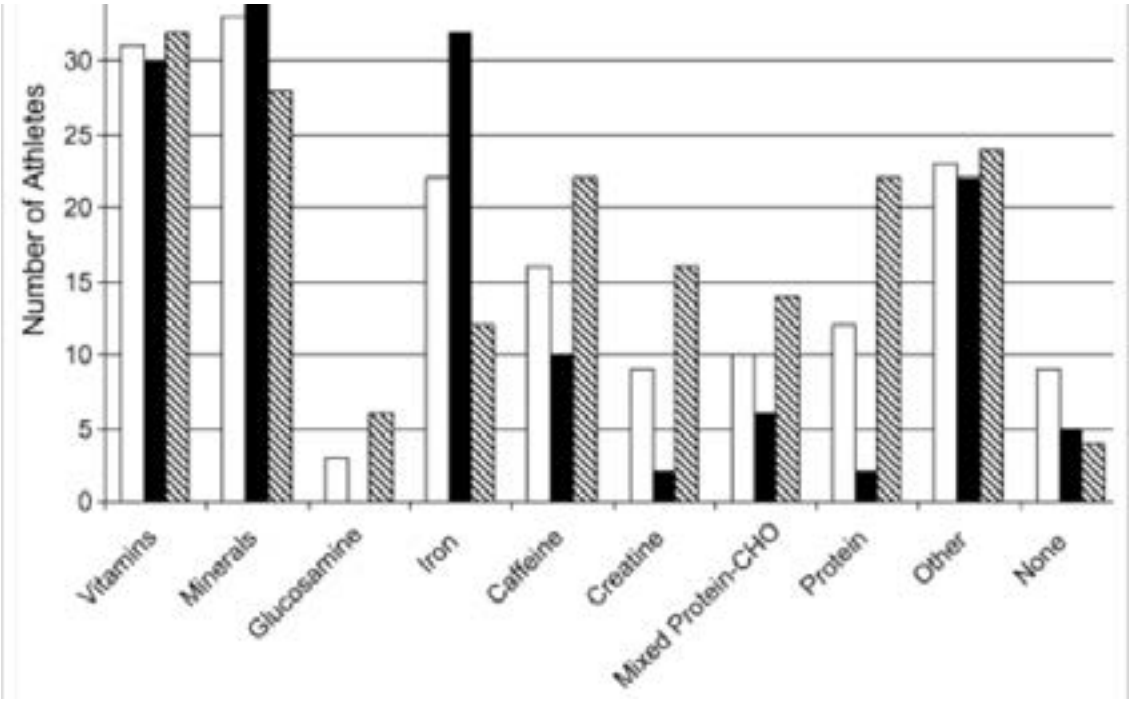
There is no question that athletes are interested in taking supplements. My university training, my academic training, taught me that, in general, people don't need to take supplements. So, when I first moved down to the Australian Institute of Sport in 1996, and I carried over that ethos, then I was finding I wasn't getting any buy-in from the athletes. These guys want to take supplements.



Now, this is an assessment of dietary supplementation practices from the Western Australian Institute of Sport. It covers a range of different sports, including kayaking, swimming, hockey, athletic water polo, rowing, and netball, across both genders. Now, what you can see is that there's about 90% of those athletes acknowledging some form of supplement use. It varies quite markedly between the sports, and while the rates of use might vary a little bit by gender, the big thing that differs between gender is the rationale for use.

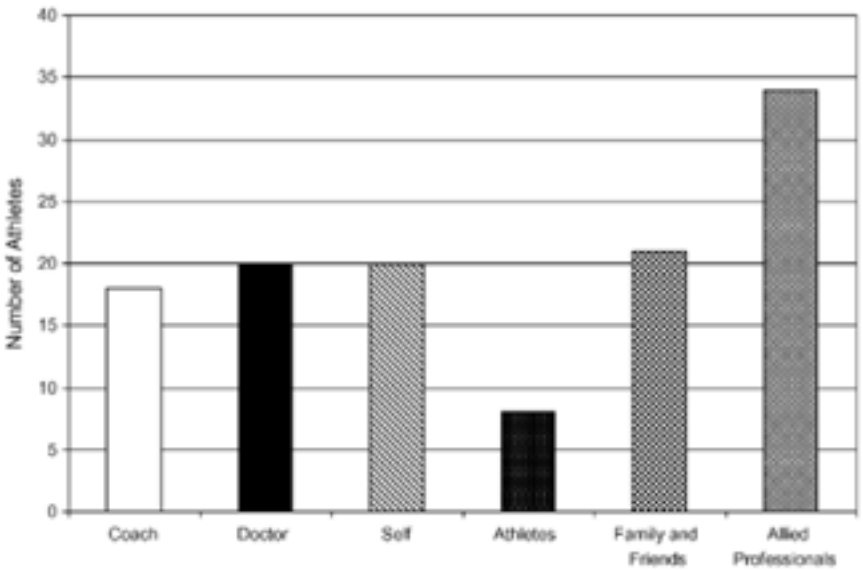
But you can see kayakers, for example—and keep this in mind—the male kayakers are consuming, on average, eight different supplements on a daily basis. What sort of products are they using? Well, you have your general vitamins and minerals, iron supplementation, which you could justify if an athlete had an iron deficiency, things like glucosamine, again, from a health perspective. And these tended to be the main products that were being used, products that might be prescribed according to health or a goal of being able to enhance

their overall health. But you also see products like caffeine, creatine, mixed carbohydrate protein products, as well as protein-only-containing products, being very popular, but especially popular amongst the male athletes, because the males tend to be motivated by performance outcomes, the females being historically more motivated by health outcomes, but that's starting to change, as well.



And again, if we look at the main reason why they're consuming these products, we see that issue in regards to enhancing of health, boosting immunity—the scary ones are things like peer recommendation. These guys are seeking information from fellow athletes, where they know that Johnny is taking product X. Johnny is the current national champion, and it's very easy to make the connection between Johnny's success as an athlete with taking that supplement. The reduced fatigue, the improved performance—ah, sponsorship endorsements for athletes? Again, many of these arrangements with athletes are done purely on a commercial basis.

Where are these guys sourcing their information from?



Now, you need to keep in mind, this is from a state academy of sport, where the athletes have access to sports science, sports medicine support, as part of their scholarship. The great thing to know is that those guys that are in that environment are getting their information primarily from sources that you would classify as being well-informed. And so, the athlete can make an informed opinion. They're getting it from allied health professionals. They're getting it from a dietician. They're getting it from an exercise physiologist. But you're also finding, even with these guys, that they're getting information from less reputable sources.

The coach can be a fantastic person for being able to provide guidance in regards to technical issues. But a coach is not an expert in regards to sport supplementation. Neither is a doctor. The "self"—obviously, that's a Google search. Using other athletes, family, and friends—Mum and Dad are always well-intending, but Mum might not necessarily be the best source of sport supplement information.

Thankfully, along our journey that we've had in recent weeks, there has been lots of information actually come up in the media. This came out of one of the Sydney papers, and it explored the issue in regards to education of athletes, teenage athletes, in regards to caffeine use. And I guess we have this decision to make. Do we bury our head in the sand and pretend like it doesn't exist? Or do we look at actually educating these athletes? And I see analogies associated, I guess, with sex education. We can stick our head in the sand and pretend that it doesn't happen. It will continue. And I think it's the same situation in regards to supplementation.

But this isn't an isolated event. Children competing in an under-12 hockey team drinking Red Bull cans to get an edge—it gives you wings, apparently. A group of 12- to 14-year-old swimmers in the Gold Coast recently suffered from strong withdrawals and side effects, including stomach cramps, to a vitamin pill juice plus that they were put on by their coach. In an elite private school within Brisbane, recently, our dietician gave a talk, and one of the first questions asked by one of the boys was how to source and use protein supplements. That's perceived connection between a protein supplement and performance, or protein supplement and gains in muscle mass.

And it continues on. A Western Australian private school sent a letter to parents informing them of how to buy their sons on the rowing team creatine or protein powder. Private schools contact the Western Australia Institute of Sport to source information about creatine, protein powders, and a banned substance to help their athletes boost performance. And a senior swimmer was encouraging a junior swimmer on a national team to make use of No-doz, which is effectively a 100-mg caffeine tablet, similar to a serve of coffee.

Now, on the other side of that, you have Steve Lawrence, who is the head of the Western Australian Institute of Sport, that is defending the approach they've taken, that is, facilitating athletes being able to make informed opinions in regards to their supplementation practices, because I personally believe if you don't provide that education

for them, they will still take those products, but they will be unguarded and uninformed in regards to how to appropriately use those products. His statement—"we know, in swimming, parents buying supplements for their kids is endemic. In fact, it is in most junior sports." And I'd suggest, from what I've seen with sub-elite athletes that I work with, that that certainly is the case, as well.

This is a big issue. We've done an educational approach. We've said, "Let's not ignore what's out there. Let's show people what they do and how to do it," so again, allowing people to make informed opinions. He said while he does not condone or encourage the use of caffeine tablets like No-doz in children under 18, they would rather inform their school-age athletes of the methodology of using caffeine safely.

This isn't a one-off case. These are examples internationally. 91% of elite junior athletes in Germany have used at least one supplement in the last month. About 2/3 are seeking information, usually from the media, Internet, coaches, and fellow athletes—that is, not reputable sources of information—potentially getting misinformation and getting adverse effects associated. Almost 90% are unaware that supplementation can have adverse effects. And I'll show you some examples.

These are not inert substances, and used inappropriately, they can have adverse effects. 3/4 are unaware of the problem of supplement contamination, which I will again raise with you. And the majority of athletes don't know the supplement's active ingredients, the mechanism of action, potential side effects, or recommended dosage, as a consequence not really knowing how to utilize these products effectively.

Recognizing the issues at hand, my professional organization, Sports Dieticians of Australia, have released a position statement just recently. You can get that off the SDA website. And just a small excerpt from that—

> *"the position of SDA is that it is inappropriate and unnecessary for active and competitive adolescent athletes to consume dietary supplements for the purpose of performance enhancement. The use of supplements in developing athletes overemphasizes their ability to manipulate performance in comparison with other strategies associated with training and diet."*

And that's the cold, hard truth. Even those products that do work—you're talking about maybe a 1, 2, or 3 percent performance enhancement. Getting training right, or getting diet right, you're going to influence performance by 10 to 20 percent. Adolescent athletes

and their support personnel—it's key that we include the support personnel, because that's where they're getting their information from. Or as we've alluded to, the reality is, for a 12-year-old child, the food they get access to, potentially the supplements they get access to, is totally dictated by Mom and Dad. So, we need to make sure that they're incorporated into the overall education process, and the same thing with the coach. They should be aware of the risks associated with dietary supplementation. Organizations involved with adolescent athletes should develop guidelines to regulate supplement use.

So, why have these products become so popular of late? I've been a bit of a gym junkie since I was about 18 years of age, and I think back to supplementation then, before I really ventured down my academic pathway. And there was this mystique associated with products. There was this small stash of products in the back of the shop at the gym, the gym where all the body builders hung out. Wow, this stuff must have steroid-like effects. Amazing!

What you see now, I'm sure it's exactly the scenario with youth in Wales, there are specific sport supplement stores popping up everywhere. The one that I find particularly interesting though, where do you think I've taken that photo?

Woolworths. A whole aisle allocated to sport supplementation. Now the reality is if we look at the top section, where does the person at the supplement store, the retailer at the supplement store, where do they get their sports nutrition information from? The reps, exactly.

So is there a conflict of interest there or what? So I have concerns about that, and I classically see the situation where I have an athlete that I'm working with and we've decided we're going to use a little whey protein isolate for them. And they call me up a day later, and say, I've got this whey protein isolate, but they got me this fantastic pre-trainer, also this testosterone booster as well. You're going to go back to the shop, you're going to take your testosterone booster back and you're going to ask for your money back.

The scary thing is, where does the person who gets their supplements from Woolworth's where do they get their information from? "Price check aisle 3." The other thing that we find is absolute penetration of supplementation and supplement sponsorship within sport. This is an example of a range of different professional sports that have sponsorship arrangements with one single supplement company. I don't want to bore you but there's also another page there showing another group there. And again, you can see that connection. A junior elite athlete looking up to the professional team and seeing these guys choking down these products in and around the training environment. And again, it's very, very easy to make the connection that that product is going to help me to get to where I want to be.

The reality is those products need to taste nice as well and it's very, very easy to be able to make that transition.

You will find it's been raised earlier in the day, I guess the pressure that's coming from society. We've long had an appreciation for the pressures, societal pressures for the young female athlete to be very thin. We see exactly the same situation but perhaps in the opposite direction for the junior elite athlete who's aspiring to put on muscle mass to increase strength and to look aesthetically more appealing. With the presence of things like muscle dysmorphia, there's a constant drive to get bigger, and the perception of self that you're quite small.

We know with those individuals that are suffering from muscle dysmorphia, they're more likely to consume supplements that are also more likely to transition then into using anabolic agents.

Now what I want to be able to give you here is a balanced approach to this. As a sports dietician, I'm a real advocate for appropriate use of sports supplements. I work with an elite sport environment and the professional teams that I work with typically have arrangements with supplement companies that might allocate 80 to $100,000 retail of product per annum to put around them. Now granted, I'd be happy to be able to make use of whole foods in many of those situations but the club isn't going to give me $100,000 worth of Woolworth's vouchers. And so that's the environment that I work with in. But again, I want to try and give you a balanced approach, this is not just a hack out on supplements.

Cons associated with supplementation, a mode of marketing emphasizing pseudo-science. I find this is an absolute classic one. It was in the 80s where the supplement industry was still a little bit of a wild west and it really tells a story in regards to a research study where they had a group of post-menopausal females who were deficient in boron. When they gave them a boron supplement, they found this, "Boron supplementation markedly elevates the serine concentrations of estradiol and testosterone." What did the supplement manufacturers think of that? 'Hello'. If I produce a boron supplement, I can use the information from that study to be able to suggest that my supplement increases blood testosterone levels.

Well surprise, surprise, when you look at the target audience of this supplement, that is a 20 year old male who's not boron deficient, taking a boron supplement does what to their blood testosterone levels? Absolutely nothing. Did the product work? No it didn't.

Now I want to show you this video, it's from the U.S. but it absolutely has context within Australia. The issues are the same and I think it's also important to recognize that given the issues with—well it's perhaps not quite the same at the moment, but the strength of the Aussie dollar, that we have absolute penetration of U.S. products within the Australian marketplace. Because of that strength of the Aussie dollar, those U.S. products can come within the Australian marketplace and compete price-wise. And that's really changed the supplement industry within their country.

https://www.youtube.com/watch?v=50QBwi1 IncE

Video: Why do you believe that you need dietary supplements? Do you think that they give you a performance edge? Do you use them because you think everyone else uses them? Do you think they just work? How careful are you when you choose one? How much do you really know about the dietary supplements that you might use?

Unlike drugs, the FDA does not evaluate dietary supplements for safety or effectiveness before they're sold. So you can't count on the FDA alone to protect you from unsafe or tainted products. You need to be an informed consumer. Let's explore.

Here's a fictional product that contains features found on actual products marketed as dietary supplements. Let's look at this product together. Products may make promises that are too good to be true. Keep in mind this is a profit-driven industry. Supplement companies want you to buy their products. Do you really believe the promises made here? This says clinical trials prove this supplement is effective, but who designed and conducted the study? Have you seen the study? Just so you know, studies conducted by the companies themselves are more likely to find positive results than studies conducted by independent organizations.

Are you swayed by endorsements by famous athletes? Most athletes endorse products after they've become successful so the product probably played no part in their success. Remember, endorsements are a business arrangement between an athlete and the supplement company.

And what about the ingredients? A supplement facts label identifies this product as a dietary supplement but beware, there are products containing undeclared prescription

medications or steroids that are sold as dietary supplements. We have seen them online, in health food stores, in drugstores, even in grocery stores. A wolf in sheep's clothing may be hiding among legitimate dietary supplements. Can you tell the difference? Look closer.

This product says it contains the ingredient 3-17 etiocholanotriene, the name gives it away as a steroid. Note the numbers and the –E-N-E ending. But the name does not properly describe a chemical structure. The manufacturer either has a poor understanding of basic chemistry or has made a deliberate attempt to confuse the consumer. But wait, this product is guaranteed to be steroid-free. What's behind this guarantee? Has the product actually been tested be a reputable, independent, third party or is this just a decorative decal made up by the company? If there is certification from a third party testing agency, what did the testing program cover? Was this exact batch tested? It is important for you to learn all that you can about any testing program or guarantees made about a product.

What else is in this product? Let's look at the all-natural energy blend. The word "natural" does not necessarily mean safe. After all, poison ivy is all-natural too. Some botanical ingredients may be safe when used as the whole plant but concentrated extracts of those same botanicals can have very different and sometimes negative effects. Are you familiar with the safety profiles of these botanical ingredients? What about the herbal ingredients in your supplements?

Speaking of herbal ingredients, let's look at the geranium oil listed here as an ingredient. Some companies list geranium oil on the label but then spike their product with synthetically produced methylxanthines, a stimulant prohibited in sport. The phrase "all-natural energy blend" may not mean what you think it does.

Do you recognize DHEA on this label? It is spelled out as dehydroepiandrosterone. DHEA may be legally sold as a dietary supplement but it is prohibited in sport as an anabolic agent and can make you test positive.

What about proprietary blends? Only the total amount of the proprietary blend needs to be listed on the label, not the quantities of the individual ingredients. How much creatine are you getting here anyway? You can't tell. And look at the energy blend, there are several ingredients here with stimulant effects but since you don't know how much you're getting, how can you be sure it's safe for you?

Let's step back a moment, are we giving this label too much credibility? We're assuming that the label accurately reports what's in the product yet some dietary supplements contain ingredients not listed on the label or contain different amounts than what is stated on the label. To combat this, some third party testing companies test for substances prohibited in sport and also conduct what's known as label verification to make sure that the label and the contents match.

By law, supplement companies must comply with good manufacturing practices or GMP. This product is GMP certified. Or is it? Has this company actually been audited? It's very

difficult to tell from the label which supplements have been produced according to the law. Even so, many products are decorated with a stamp such as this one. You cannot rely on the label, you need to do your homework. This company has posted a warning on their product which is good in a way, but if you see a lengthy health warning, don't you wonder what's in it that can cause these side effects?

Companies are required to report to the FDA any serious adverse events or health problems associated with their products. Have you researched the adverse event reports for the supplements you use? And what about the company, is this company really committed to quality? Have you checked the FDA or FTC website to see if there have been any warning letters or enforcement actions against this company? Does this company have any criminal proceedings against them? Have you researched the company's owners? What you find may surprise you.

So the question becomes, "What is actually in the bottle?" In this example, you can't really tell. Is it worth the risk? There are steps that you can take to help you decide whether to assume the risk of using dietary supplements. You will find these on USADA's website focused on dietary supplements. Don't be the next positive doping test and don't trade your money for health problems or false hopes of amazing results. Be an informed consumer when considering dietary supplements, it is ultimately your decision and it can be a risky one.

Gary: A whole lot of issues rise with that video, it is freely available on the USADA website and there's also some really good resources for the Australian version for ASADA in regards to supplementation issues.

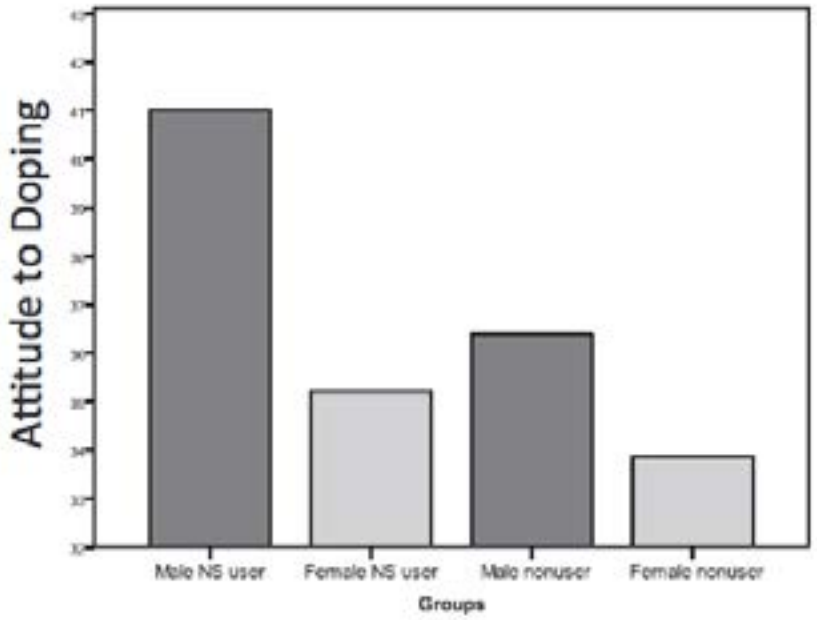
Second con, distraction of resources, whether they be financial or time. An example here of a financial constraint, two products, thankfully the top product doesn't exist anymore, creatine monohydrate, it's a supplement in which there's a significant amount of research supporting its use and also some research suggesting that the co-ingestion of creatine with carbohydrate enhances the uptake into the muscles by about 60%. As a consequence, supplement companies produce products such as the myocytin which is effectively created with some carbohydrate added to it.

My concern again, and this comes down to the financial constraints, if you actually look at the cost of the creatine per 100 grams according to each of those different products, this product here, you're paying $93.27 for 100 grams of creatine or you're paying $6.99 for 100 grams of this creatine. It can be equally effective just to take this product and co-ingest it with your meals and snacks throughout the day.

From a time perspective, it's my belief that athletes only have a defined attention span for any one particular thing at a time and if they're focusing their energies in regards to supplementation, especially if it's inappropriate supplements, they can be better off focusing their time on recovering modalities or skill acquisition, for example.

Anti-doping violations, whether they be direct or indirect; so an example here, this is the attitude to doping amongst males and females of those that are consumers of nutritional supplements versus those that are not consumers of nutritional supplements.

S. H. Backhouse[1], L. Whitaker[1], A. Petróczi[2,3]



And what you find is that doping incidents is about 22% among supplement users but only 6% among non-supplement users. And the take home message from that investigation was that athletes who engage in legal performance enhancing practices appear to embody an at-risk group that are more likely to dope into the future.

Hans Geyer,[1]* Maria Kristina Parr,[1] Karsten Koehler,[2] Ute Mareck,[1] Wilhelm Schänzer[1] and Mario Thevis[1]

Table 1. Nutritional supplements cross-contaminated with anabolic-androgenic steroids (prohormones) in different countries in 2001/2002[23,24]

Country	No. of analyzed products	No. of cross-contaminated products	Percentage of cross-contaminated products
Netherlands	31	8	25.8
Austria	22	5	22.7
UK	37	7	18.9
USA	240	45	18.8
Italy	35	5	14.3
Spain	29	4	13.8
Germany	129	15	11.6
Belgium	30	2	6.7
France	30	2	6.7
Norway	30	1	3.3
Switzerland	13	–	–
Sweden	6	–	–
Hungary	2	–	–

This is a highly publicized study that was commissioned by the international Olympic committee. They went and sourced out 634 supplements across Europe and the U.S. and they analysed them for the contamination of doping substances. Nothing on the list of ingredients that would suggest there was doping substances within them but they found on average, about 15% of the products that were tested contained sufficient amounts of doping substances to result in a positive doping test. Now you can see the incidents there

is according to the country and again, perhaps that shouldn't be surprising given the vast majority of supplements from each of those respective countries are going to come from just one or two different powder blending facilities.

Again, we've got the issue within Australia, how much context does this have within the Australian marketplace? Well the reality is the strength of the Australian dollar has meant that there is a significant amount of products from overseas within the Australian marketplace. We were kind of isolated for a long period of time and it wasn't until things like Jack 3D, if you guys have heard of that before, it was a very popular as pre-training supplement that contained DMAA in it which is a banned stimulant. And that was, I guess, the first time when one of our athletes could go down to our local health food store or supplement store, pick up a product off the supplement shelf and it'd have within it a banned doping substance that was actually on the ingredient list.

Are there particular products that are more likely to result in a positive doping test? Absolutely. Those pro hormones, products that are claiming to enhance blood testosterone levels, for example, typically contain added amounts or are more likely to contain anabolic agents that are not, obviously, on the label.

More recently, this was an investigation that was just published this year, an analysis of 30 different diet supplements having their components assessed through chemical analysis to see if they contained any banned substances. And despite them not being on the label, the vast majority of them contained anabolic agents, things like testosterone, DHEA for example, stanizol, that would result in a positive doping test. Again this is out of the U.S., does it have context within the Australian marketplace, I believe so.

On the video that I showed you before, you might have remembered seeing an ingredient called geranium oil. Geranium oil is the natural term used for the DMAA, the banned stimulant. Again, this is information that was just released this year where 12 or 14 pre-training supplements, the products that people would consume before exercise to hype them up, if you like, contained DMBA, which is effectively a derivative of DMAA, again, which would result in a positive doping test.

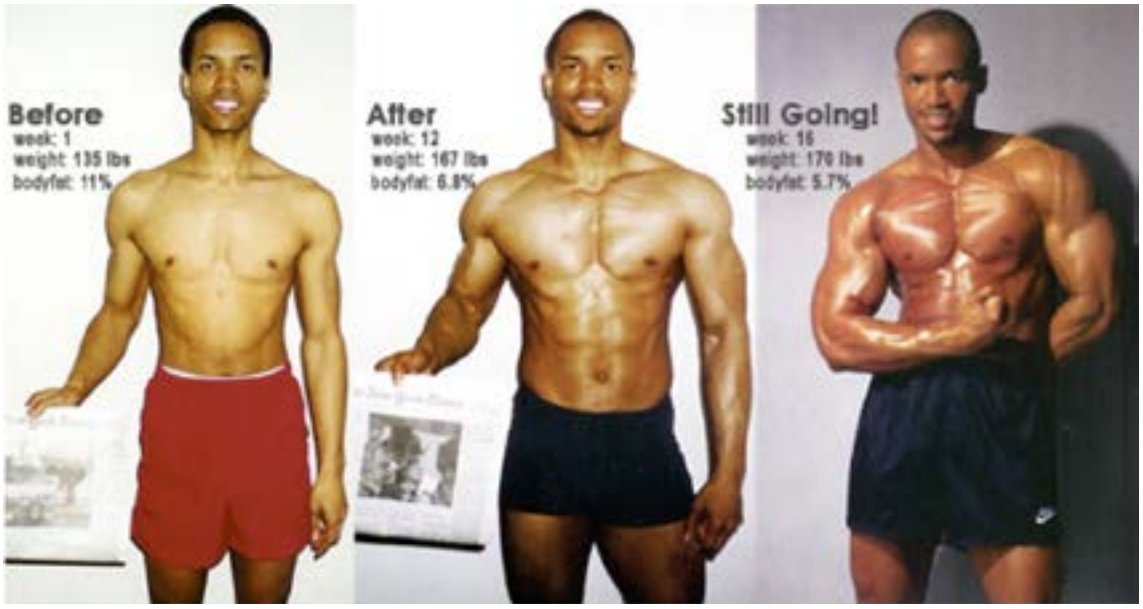
Potential side effects, again, I've mentioned before these are not inert substances. An example of a body builder over a three day period consuming 7 ½ grams of caffeine in an attempt to cut up presenting with a grand mal seizure at a hospital, 7 ½ grams of caffeine, that's equivalent of about 75 cups of coffee over a three day period. I like my coffee but I don't like it that much.

Yohimbine, which is a product that supposedly enhances blood testosterone levels. Again, a person presenting to accident and emergency with vomiting and loss of consciousness.

AAKG, which is quite often used in these pre-training products, again, presenting to A&E as a consequence, nausea and vomiting and loss of consciousness.

And some information out of the U.S. looking at 15 of the most common protein supplements, divvying out three serves a day and then assessing those products for contamination of heavy metals and they found out that five of those 15 contained amounts of heavy metals that were above levels considered safe for human consumption.

On the opposite effect, appropriate use of antioxidant supplementation and the perception that an antioxidant supplement like vitamin C, like vitamin E, couldn't have any detrimental effects. The reality is, there's some quite compelling research showing now that even 1000 milligrams of vitamin C a day, I'm sure there's some people in the audience that are taking that, suppressing training adaptations. Your body gets exposed to free radicals when you do exercise. As a consequence, your body wants to up-regulate its own antioxidant defence system. By taking high doses of vitamin C, it completely suppresses your body's own up-regulation of antioxidant defences, compromising training adaptations. So there can be adverse effects.



That culture of quick fix, classic example of what might be used in marketing strategy for a weight gain protein supplement, this was supposedly over 16 weeks. I'd be gobsmacked if it occurred over 16 months. And again, that perception, giving people that perception that they can achieve that in such a short period of time and when they don't achieve that by themselves through training and diet because it's just not physiologically possible, they start to look at other options.

The tainted public perception, this is an interesting one for mine because I worked with George Gregan for a number of years as a Brumby's athlete as well as the captain of the Wallaby's. And he explained one day in a media interview his use of caffeine, which I'd educated him on so that we looked at maximizing his performance and minimizing the adverse effects, that we used No-Doz as a means of being able to achieve that caffeine. Why did we use that? Because it's got a very defined amount of caffeine and it's a very, very small

volume. And he did everything exactly in line with what I'd recommended. But it provides that perception—now if he'd taken that as coffee, do you think there would have been a different perception in regards to his use of caffeine?

I'm certainly guilty of using caffeine to enhance my cognitive function when it's on the decline in the afternoons. But again, it comes back to that perception and we've looked at other ways of being able to get around that because while I'm providing George with that information to optimize his performance as a Wallaby, would I be providing the same advice to a 12 year old rugby athlete? Of course not.

What are the potential values associated with strategic use of supplementation under the guidance of an informed health care professional like myself? Obviously, it has valid application clinically. If an athlete is diagnosed with an iron deficiency, anaemia, it's absolutely appropriate that they should be given an iron supplement to help resolve that issue.

Practical nutrition support within the sporting context, I've already alluded to earlier in the presentation that carbohydrate ingestion during exercise of longer than 60 minutes can enhance exercise performance. Now by rights, that could be via a bowl of rice, it's just particularly difficult to get access to that bowl of rice on the bike. And that's where products such as sports drinks, gels, sports bars might offer a practical alternative to be able to achieve that nutrition support.

There's absolute recognition that appropriateness of some dietary supplements when provided in the correct amount and right time with the right athlete, can enhance exercise performance. There's very clear evidence that creatine monohydrate supplementation can enhance recovery within an exercise session that is characterized by repeats bouts of high intensity work. The rugby union athletes that I work with are a classic example, the creatine enhances recovery within the session and allows them to do more work at the back end of the exercise session.

I've already alluded to the performance benefits associated with caffeine and as a performance focused nutrition professional, caffeine is probably the substance that I use the most with the athletes that I work with. But it's always trialled in training and we always start with a very minimal dose and then increase right up thereafter because we certainly know now through research, the amount of caffeine you need to enhance exercise performance is much, much less than we'd known previously.

Changing acid base status, whether that be using things like bicarbonate supplementation or beta alanine, again, there's compelling research for the potential value of that within specific sports. And again, even within a specific sport, trialling it with the athlete in training to confirm that they tolerate it and have a perception of enhanced exercise performance.

Through to simple things like manipulation of carbohydrate intake during exercise, or certainly in the last five to 10 years, the use of protein supplementation, if any of you guys

go to a commercial gym, it seems like it's unanimous amongst every single person that goes into the gym whether or not they're trying to lose weight, gain weight, enhance fitness, they need to take their whey protein shake after every exercise.

And then the power of the placebo, or making the athletes that you work with have the perception that we're doing everything we possibly can to be a cutting edge program. To use an example, here this is the game day supplementation practices potentially and all athletes might not be consuming your products, in preparation for a game for Rugby Union athletes. So we reinforce the importance of their actual dietary intake, manipulation of their carbohydrate intake so their muscle glycogen stores are optimized in preparation for a game.

We look at a nitrate rich supplement, there's research to suggest that they can enhance running economy, for example. For the Queensland Reds, the start of the super rugby season, can still be played in hot environments and we know through research that we did in advance of Beijing that using a sports drink slushy can help decrease body temperature to roundabout the same amount as going into a hydrotherapy or plunge pool. You'll be glad to know that we don't actually go down to the 7-11 and get a slushy, we do specifically use a sports drink slushy.

The strategic use of caffeine in preparation for the game, we know that caffeine levels reach their peak within 60 to 90 minutes of consumption so we'll have that prior to the warm up. Supporting the use of carbohydrate during exercise and then potentially, for those guys that feel like they need an additional top up for the second half of the game, using things like caffeinated gum and the reason why we use caffeinated gum over a No-Doz is because the caffeine gets into the bloodstream about twice as quick when it gets absorbed through the oral cavity as opposed to being absorbed through the stomach.

But again, every single one of those strategies is used in isolation in the trial matches and in training for every single athlete to make sure that we optimize the strategy for them. Now that's again, at an elite level. Would I advocate that for a school athlete? Absolutely not.

So our summary there, supplements are very efficiently effectively promoted within the marketplace, very, very emotive of marketing and the reason why they're so popular and it's an ever-expanding environment, they're likely distract attention away from a food first philosophy to performance nutrition strategies and certainly within the Australian Rugby Union, we've taken that food first philosophy. The reality is athletes have access to a much wider range of products domestically and internationally and as a consequence, when they're travelling internationally for training or competition, they need to have an appreciation of the increased risk associated with the acquisition of products perhaps overseas.

The risks associated with supplement use are very real, whether that be from a doping perspective but also from an adverse event potential but when used as part of an integrated meal plan that is giving absolute consideration to the person's food and fluid intake, specific

supplements can make a valuable contribution to overall performance success of the athlete. But it's not really going to do anything if it's used in isolation. The expert guidance of a sports nutrition professional is strongly recommended.

So while athletes might have this perception in regards to sports nutrition, the reality is it should be like this, trying to focus absolutely in regards to a meal plan where the energy density of the meal plan adjusts, increases and decreases to reflect training loans.

When they've got that box ticked, they start to explore the potential use of sports foods, that is, foods that provide macronutrients, carbohydrates, fats, proteins, similar to what they might be able to achieve through whole food but in a convenient package.

And when they've ticked that box, and only then, should they be considering exploration of those few products – the nutritional ergogenic aids - the caffeine, the creatine, etc, that might add that one or two percent.

Because of the issues at hand, a number of sporting organizations have now developed supplement policies that form part of their high performance agreement. A small excerpt from the Australian Rugby Union, one that I've developed over the last year – the ARU acknowledges the use of supplements in rugby and is committed to establishing best practice protocols for the use of supplements based on the core principles of player safety, evidence based science and compliance with a wider prohibited list.

There is no expectation or requirement that any individual associated with rugby must use supplements - and we don't have any squad prescription for products, it is always something that is discussed with the individual athlete because it also means we need to give consideration of their dietary intake as well.

The ARU approves of the appropriate use of supplements to support a nutrition program and promotes the food first message which is that a person is more likely to benefit from a health and performance focused, outcome driven meal plan which should be established with an accredited practicing dietician.

And finally, some links for you where you can go to for more information, the supplement 411 if you a Google search for that, you'll find the USADA videos. There's also some excellent

information on the ASADA website. Sports Dieticians Australia provide a wide range of valuable resources in regards to supplementation that are free to access. The Australian Institute of Sport and Nutrition program and their supplementation framework is an excellent resource to explore and also, the Informed Sport Program.