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SARU SUPPLEMENT GUIDELINES

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## **SARU SUPPLEMENT GUIDELINES 2011**

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Although thousands of supplements are available, there are only a few that offer either practical or physiological benefits to rugby players. The challenge is to identify the product(s) that may offer these advantages, as there is often a big gap between the suggested claims and product features compared to the proven benefits, dosages and applications. Another challenge is to understand players' specific needs and their individual responses, as this varies from player to player. There are also a number of other very important considerations to bear in mind when contemplating supplements, such as legality, quality, safety and purity.

In 1994, the Dietary Supplement Health and Education Act (DSHEA) essentially gave "free license" to anyone to market and sell a variety of products as supplements, and as a result there has been an exponential growth in the dietary supplement industry worldwide, with sales estimated to contribute in excess of \$270 billion to the global economy<sup>(57)</sup>. In 2007, a survey of 39 companies in South Africa reported an average total sales of R78.5 million<sup>(24)</sup>. Simultaneously there has also been a global increase in the contamination of dietary supplements with "banned substances" such as testosterone, benzodiazepines, powerful diuretics and potent stimulants<sup>(1, 32, 37)</sup>.

The supplement industry is poorly regulated both internationally and locally. Unlike drugs, there is no legislation requiring companies to prove the efficacy of their supplement before it is marketed or sold. The intention of Good Manufacturing Practice (GMP) regulations, which supplement companies may claim to adhere to, are in fact very general and open-ended and allow each manufacturer the flexibility to decide on how to implement controls. Although GMP standards may provide some assurance with regard to documentation of manufacturing processes, they do not guarantee that the product has been tested for banned substances.

In practice, this means there is only limited control over the production, labelling, importation, distribution, and marketing of supplements and there is also no system to ensure products are safe and effective before they are sold. There have been numerous cases of supplements either being incorrectly labelled, or containing negligible amounts of declared ingredients. Some supplements may even contain undeclared ingredients with potentially harmful side-effects. There have also been several cases of athletes testing positive after having used supplements and, unfortunately, this has undermined the image of the industry as a whole<sup>(12, 15, 16, 33)</sup>.

## **WHAT IS A SUPPLEMENT?**

The DSHEA defines a dietary supplement as “a product, other than tobacco, which is used in conjunction with a healthy diet and contains one or more of the following dietary ingredients: a vitamin, mineral, herb or other botanical, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients and dietary supplements are products that are labelled as a dietary supplement and is not represented for use as a conventional food or as a sole item of a meal or the diet”<sup>(10)</sup>.

Typically, dietary supplements are available in the form of tablets, capsules, soft gels, liquids, powders and bars and may include vitamins, minerals, herbals, protein and carbohydrate powders, fat-cutting remedies, sports bars and drinks or powders, to more specialized products such as amino acids, creatine, HMB (beta-hydroxy-beta-methylbutyrate) and glutamine, either on their own or in combination with other ingredients.

## **SARU**

SARU does not condone or endorse the use of supplements. SARU does not and will not provide supplements to members of SARU national teams and High Performance squads, other than sports drinks. A “Sports Drink” is defined as a fluid beverage that contains only carbohydrates and electrolytes and that has met the required **COMPANY STANDARDS**. SARU recognizes that the only way rugby players will be risk-free is NOT to use supplements at all.

Despite having this policy in place, there are indeed some supplements that do have proven performance-enhancing and/or practical benefits, but since the industry is currently so poorly regulated, use of these supplements carries a huge risk and does not protect the player. However, players are always looking for a competitive advantage and supplements have great appeal in trying to meet this need. The industry uses this desire to perform better when marketing and advertising their products, often making false claims with regard to the potential performance benefits, and without highlighting the potential risks involved.

This document provides a scientific, evidence-based review of supplements and also provides a best practice approach that rugby players need to consider if they, against SARU’s best practice recommendations, choose to use a supplement. This review does not constitute an endorsement or recommendation of any of the supplements discussed. These guidelines provide the player with the necessary information to make an informed decision and to minimize the risks involved. Players are however reminded about the strict liability principle which means that players use supplements at their own risk. SARU will not and cannot be held responsible for players testing positive as a result of using contaminated supplements.

## **COMPANY STANDARDS**

To minimize the risk to rugby players who go against SARU's policy and recommendations, and choose to use supplements, SARU encourages all supplement-producing companies to ensure that their products comply with and meet the international best practice standards and regulations that will ensure that the product is free of any contaminants and prohibited substance(s) and is safe for player consumption.

To do this effectively, companies should adhere to the following processes:

1. All raw materials must be sourced from reputable suppliers, and companies must have industry-standard, acceptable documents to support this.
2. Companies must ensure that only a single supplement product is produced on a production line. Proof of this needs to be supplied, as well as an audit process that ensures the buyer that the supplement was monitored at all of the different stages of production. This audit process should preferably be independent and outsourced.
3. All packaging of the product needs to be controlled and audited.
4. It is advisable that the final product is screened and receives the necessary documentation to prove that this process indeed took place and that the product is free of prohibited substances. The company screening the product needs to have a laboratory that complies with ISO standard of ISO17025.
5. The supplement production company should provide the required certificates for each batch and each product produced in their manufacturing line. For example, the manufacturing facility must be registered with Informed Sport UK, the product must be registered with Informed Sport UK and the product must have a certificate of analysis from the HFL Sports Science Ltd – all three certificates should be able to be produced upon request for any product and batch number.
6. Furthermore, the company producing the supplement needs to get in writing, from the laboratory screening the product, a list of all the substances they screened for, as well as a list of all those substances that were not screened for. The laboratory also needs to indicate whether the complete supplement range was tested, or if the supplement was batch-tested only. If only a particular batch was screened, the batch numbers need to be supplied to the player so that they can cross-check the batch number with the certificate of analysis following the screening and then with the actual product itself.

7. The company must provide independently and scientifically researched evidence of the efficacy of the supplement to the player.
8. The company must abide by the Consumer Protection Act and act honestly and ethically by only claiming the researched and proven facts concerning the gains and effects of using the supplement. The company must provide players with legally binding documentation that the company accepts full liability for a positive doping test as a result of the use of their product. This document of guarantee should include but not be limited to the following:
  - Be on a company letterhead and address the player by name.
  - Be dated and signed by the company's CEO or senior management.
  - All the quality control certificates must accompany this letter.
  - Include contact details for the person responsible for issuing the guarantee.<sup>(29)</sup>

## **RECOMMENDATIONS**

There is no way for rugby players to know with 100% assurance what is in a supplement. Some manufacturers do have better quality controls and may to some extent be committed to having their products tested for banned substances. However, in many instances loopholes exist in the system (e.g. when only one specific flavour in a range has been tested, yet in the advertising this is not made clear; or the laboratory testing the products is not ISO 17025 accredited). Players still however need to question if using the supplement is necessary, and/or does the supplement have performance-enhancing benefits.

A best-practice and systematic, risk reduction approach to the use of supplements is therefore recommended (Figure 1). Players need to **get the basics right first** (i.e. periodised diet and training regime) as this is where the biggest potential for performance enhancement lies. After professional consultation, players can **only then** consider supplements and only if the appropriate medical professional has identified:

- That there are gaps in the diet that cannot be resolved with food and drink
- That there is a clinical or medical reason

These decisions always need to be made in consultation with a registered dietician with sports nutrition experience, or with a sports physician. Only supplements that fulfill **ALL FOUR** of the following criteria should be considered.

1. Only if they are prescribed on a case-by-case basis by a registered dietician with sports nutrition experience or a sports physician only once it has been determined that the habitual diet is unable to meet these additional nutrient requirements.
2. They do not adversely affect health
3. They are effective in offering practical and/or physiological benefits, e.g. sports bars and gels are portable for travelling; caffeine may offer some players a small but significant advantage - see notes on caffeine; and
4. They are legal and have met the **COMPANY STANDARDS** requirements (as many as 1 in 4 supplements may result in a positive test because of contamination with steroids, stimulants and other illegal drugs). Quality assurance required for supplements is far more complex than a simple GMP statement from the manufacturer (as has been outlined in the points 1 - 8: **COMPANY STANDARDS**).

It should at this point again be reiterated that this process will only limit or reduce, and will never completely remove, the risk of ingesting a contaminated supplement which has the potential to cause a positive drug test. **By advising on this stepwise risk reduction process SARU does not endorse or support the use of supplements in any way.** Supplements are generally not recommended for younger players (< 18 years) as there is a greater potential for performance enhancement through maturation and experience, and supplements may be a gateway to substance abuse. Supplements should only be considered if medically indicated and monitored.

**FIGURE 1: Supplement decision-making process and key watch points.  
Narrowing down the choices to maximize the benefits whilst minimizing the risks.**

**YOU MUST CONSULT WITH A REGISTERED DIETITIAN OR SPORTS PHYSICIAN**

- ✓ Supplements should only be prescribed on a case-by-case basis by a registered dietitian/sports physician with sports nutrition experience



**SUPPLEMENTS?**

- ✓ Cross-check diet (Are you eating correctly to meet your energy demands?)
- ✓ Is there a food/fluid solution?
- ✓ Supplements will not correct a bad diet!
- ✓ Weigh up the cost of the benefits versus the risks

If, after you have consulted with your registered sports dietician and/or sports physician, and you still want to use a supplement, the following areas need to be addressed as they will contribute to the RISK being **substantially increased**, if not adhered to.



**DO THEY WORK?**

- ✓ What scientific research evidence is provided?
- ✓ Was the research performed independently?
- ✓ Was the research performed using a randomized and double-blinded clinical control trial?
- ✓ Is the science valid and relevant? Is it a laboratory- or field-based study?
- ✓ Does the amount and form of the active ingredient claimed to be present in the supplement match that used in the study?
- ✓ Who are the subjects – athletes, rugby players or sedentary subjects?
- ✓ Is it a well-designed study with statistically significant results?
- ✓ If the study shows an effect, has the supplement been tested for contamination?
- ✓ Have the results been replicated elsewhere?



**ARE THERE ANY HARMFUL SIDE-EFFECTS?**

- ✓ Is the product safe and will it compromise the health of an individual?
- ✓ Sport supplements, just like vitamins and minerals, are not risk-free.
- ✓ Supplements marketed as 'natural' are not necessarily healthy or less risky.
- ✓ Herbals may have negative side-effects.



**ARE THEY LEGAL?**

- ✓ Is the product illegal or banned?
- ✓ Does the manufacturer provide quality control (GMP) and certification programme details – is this batch-specific?
- ✓ What is the policy on sourcing raw materials to final product?
- ✓ Independent secure back-up batch for re-analysis
- ✓ Independent and not self-regulated  
*(Although some brands may be part of an international testing programme, where they are tested in a laboratory that has the WADA ISO17025 standard).*
- ✓ Did the laboratory test the product for all the prohibited substances on the WADA list?
- ✓ Did the laboratory provide certification that is batch and product specific – if so you need to be fully aware that this does not mean that the entire range has been tested to this level and is safe to use.
- ✓ Muscle gainers, fat cutters and herbal supplements are especially high risk from a drug testing point of view.
- ✓ Has the company providing the product adhered to the process outlined under the heading: **COMPANY STANDARDS.**

### **THREE (3) ESSENTIAL SUPPLEMENT RULES:**

#### **1. FOOD FIRST**

Even when supplements are needed, this is only a short-term solution while dietary changes are being implemented.

#### **2. IF THERE IS NO DIETARY SOLUTION**

Always follow the supplement decision process (Figure 1).

#### **3. AVOID HAPHAZARD SUPPLEMENT USE OR SUPPLEMENT STACKING**

Limit the use as the more you take, the bigger the risk!

### **WHAT ARE YOU LIKELY TO GAIN FROM TAKING SUPPLEMENTS?**

There is currently supporting evidence for only a limited number of supplements that have any potential benefit for rugby. These are outlined in alphabetical order below. Other supplements that have potential benefits in other sports will not be discussed.

#### **Buffers**

Sodium bicarbonate and sodium citrate may be effective ergogenic aids by acting as buffers in the blood. Buffers play a role in acid-base balance and in delaying fatigue but cause unpleasant side-effects such as diarrhoea<sup>(30,34)</sup>. There is a reasonable theory, with some preliminary evidence, to support the use of beta-alanine (an amino acid usually found in “white meat” like chicken breast and fish) supplements which increase the intracellular buffer, muscle carnosine<sup>(23, 25)</sup>. Studies have shown there are benefits after taking split doses of ~ 65mg/kg for 4-10 weeks. However, this is preliminary advice. There is uncertainty about optimal doses for different situations (e.g. age, training status, diet - vegetarians may need more and the effect of combining intake with other nutrients like carbohydrate and creatine) as well as about long-term safety. Therefore it is still too soon to make any definite, specific recommendations<sup>(6, 26, 43, 45)</sup>.

#### **Caffeine**

Caffeine at a dose of 2-6mg/kg body weight taken one hour before exercise has been shown to enhance performance in several sporting activities, including rugby<sup>(4, 21, 43)</sup>. Note that a caffeine dose of 2-3 mg/kg body weight is well within the normal intake of the general population. Caffeine is found in a variety of foods and beverages – 1 cup of coffee contains 60 – 100 mg; a 340 ml can of Coca Cola contains 49 mg; a can of Red Bull 80 mg; 1 cup of tea 27 mg and 1 chocolate bar has up to 50 mg caffeine.

The response to caffeine and its effects on performance varies from person to person and may also be dependent on the form (chewing gum, tablets and powder is more effective than coffee) and habitual

intake<sup>(19, 28)</sup>. At high doses (> 6-9 mg/kg) caffeine can cause nausea, diarrhea, trembling, headaches, insomnia, visual disturbances, anxiety and nervousness and so may impair performance<sup>(21, 43)</sup>!

There are several mechanisms by which caffeine seems to improve performance. The primary effect is that it alters perception of fatigue<sup>(9, 14)</sup>, but it also increases alertness, improves reaction time and may increase fat metabolism, thus sparing glycogen<sup>(13, 39, 43)</sup>.

Players should therefore experiment in training, starting off with lower doses. They need to be aware of all caffeine-containing foods and beverages as well as herbal sources of caffeine (coffee, tea, soft drinks, energy drinks, chocolate, cocoa, guarana, kola nut, and supplements) and should take extra fluid to compensate for the diuretic effect of caffeine, when using tablets or powders. Habitual caffeine drinkers should not suddenly withdraw their intake before a competition.

### ***Carbohydrate supplements***

Carbohydrate has two important features – (i) it is the supplement which has the most scientific evidence supporting the ergogenic effects when used as a supplement before, during and after exercise, and (ii) it is a macro-nutrient found in many foods such as cereals, grains, legumes, fruit, starchy vegetables, many dairy products and sugar-rich foods.

Carbohydrates are a primary source of fuel with different functions; when taken during exercise carbohydrates delay the depletion of carbohydrate stores in the liver and muscles and therefore delay the onset of fatigue. When ingested after exercise, carbohydrates promote recovery and replenish muscle glycogen stores. High-carbohydrate diets also support the immune system by lowering stress hormone levels<sup>(18)</sup>. Carbohydrates taken in combination with water (i.e. a sports drink) have an even greater performance-enhancing benefit in comparison to water or carbohydrate taken alone<sup>(6)</sup>.

Total body carbohydrate stores are limited and it is therefore important to consume carbohydrate at every meal and snack. The total amount of carbohydrate (g) required is always more than any other macro-nutrient (protein and fat) requirement. Amounts need to be periodized according to training demands to avoid unnecessary weight gain. Players should always give preference to nutrient-dense carbohydrate food choices, only using supplements to boost intake.

There are many situations when it may be challenging for players to achieve the required carbohydrate intake via food alone. Carbohydrate supplements (drinks, gels, powders, glucose polymers, low-fat sports bars) are a convenient option when training loads are high, there are demanding match schedules, when travelling and/or if players lack appetite. Many of these supplements can be manipulated to suit individual players' needs and taste preferences. For example, glucose polymer powders can be used to add carbohydrate without affecting the taste; sports drinks may offer additional taste and flavour and sports bars are portable.

The ideal sports drink should contain 4-8% carbohydrate (and electrolytes), carbohydrate-rich bars should provide between 40-50g carbohydrate (with minimal fat and fibre) and gels, 25g carbohydrate/sachet.

**Note: these products may contain caffeine and/or other compounds that may not be safe or legal and some may cause gastro-intestinal problems (e.g. products containing Medium Chain Triglycerides – MCTs). Players should choose straightforward, uncomplicated options with a pleasant taste.**

**Chondroitin** – see Glucosamine and Chondroitin

### **Creatine**

There are still many unanswered questions about the exact mechanisms and long-term safety and side-effects of creatine<sup>(40, 48)</sup>. Studies show that only 70% of creatine users will derive any benefits from the substance. For those users who are “responders”, creatine increases lean muscle mass and strength, provides fuel, especially during intense exercise, buffers hydrogen ions (H<sup>+</sup>), aids recovery, and enhances training adaptations.

To rapid-load, the current guidelines recommend a total of 20-25 g creatine (approx 0.3 g/kg/day) divided into 4 doses for 3-5 days to be taken with 50 – 100 g high Glycemic Index (GI) carbohydrate, followed by a 2-5 g/day maintenance regime. To prevent rapid weight gain, slow loading with a dose of 2-5 g/day (approx 0.03 g/kg/day) for 28 days with 50 – 100 g high GI carbohydrate and adequate fluid post-exercise is recommended. During the supplementation period, it may be advisable for players to take a 4-week break from using creatine every 4-6 weeks<sup>(33)</sup>.

There is no evidence to support the advantages of different forms of creatine used<sup>(31)</sup>. Moreover, it is premature to make recommendations on creatine in combination with beta-alanine.

Players with renal impairment, elevated blood pressure levels, thermal stress and if taking non-steroidal anti-inflammatory medications, should avoid creatine supplements. There have been anecdotal reports of nausea, gastric upset, headaches, muscle cramps and strains, and there is no data documenting the safety of creatine in children and adolescents.

### **Glucosamine and Chondroitin**

Many supplements are promoted as being good for joint health, including glucosamine and chondroitin, which have been reported in some studies to slow cartilage degeneration and reduce the degree of joint pain in active individuals. However, there is no evidence to support the view that these supplements will be preventative.

### **Melatonin**

Melatonin (3-5 mg daily for 5 days) may be used in combination with other strategies to reduce the symptoms of jet lag and travel fatigue. Although melatonin can be purchased over the counter, it should only be used if prescribed by the team doctor and should not be used in combination with sleeping pills or warfarin or by players with a history of migraine or epilepsy. Melatonin may cause headaches and dizziness.

### **Omega-3 Fatty Acids**

Omega-3 fatty acid supplements include alpha-linolenic (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), with the latter two being the preferred options as they are better absorbed. Although relatively few studies have examined omega-3 intake and the modulation of exercise-induced inflammation, there is some research that suggests that omega-3 intake may decrease inflammatory markers<sup>(42)</sup> and therefore be a potentially useful supplement for athletes with exercise-induced broncho-constriction<sup>(35)</sup> or with rheumatoid arthritis<sup>(7)</sup>. Although there is no specific dose that can be prescribed to athletes based on the current body of literature, players who do not consume fatty fish twice a week, or foods fortified with significant amounts of omega-3, may need to consider supplements at levels recommended for heart health.

### **Probiotics**

Probiotics are specific live micro-organisms in food or supplements that survive the passage through the gut. They improve microbial balance in the large bowel, are used to manage symptoms associated with lactose intolerance and other food allergies, and are also thought to have immune benefits. Probiotics are found in milk, yoghurt and other dairy products and are also marketed as capsules and tablets, as well as powders with varying combinations and concentrations. There are many different species, but lactobacillus acidophilis and bifidobacterium bifidum are the two main probiotics used commercially.

The effects are strain-specific and more information on the dose and duration of treatment for these various strains is needed before making specific recommendations. Indications for use include travel, as a preventative measure for traveller's diarrhoea, and when using antibiotics.

### **Protein and Amino Acids**

There are stages during the season when rugby players have a higher requirement for protein (in the range of 2-3 g/kg body weight, depending on factors such as phase and level of training) than the recommended daily allowance (RDA) for the general population (0.8g/kg body weight). However, a well-planned diet may be able to meet the increased protein requirements and there may be no further advantage to using protein or amino acid supplements<sup>(38,47)</sup>.

To optimize the benefits that protein offers, rugby players need to focus on the quantity of protein as well as the quality of protein and timing of intake. They also need to ensure adequate carbohydrates are ingested.

Protein is essential for growth and development, to build and maintain muscle, repair muscle damage and together with carbohydrate it aids recovery and may decrease muscle soreness<sup>(11, 46, 55)</sup>. Many of these benefits, specifically the increase in protein synthesis and the reduction in the rate of protein degradation, have been linked to leucine, one of the branched-chain-amino-acids (BCAA's)<sup>(2,5,41)</sup>.

Protein supplements help rugby players achieve their desired intake of protein without increasing fat intake. Protein supplements also offer a practical solution when appetite may be limited in the recovery period. By adding small amounts of protein to carbohydrate in the recovery period, players can consume smaller volumes of food, while still achieving their required intake during recovery.

Depending on the situation, there are different types of protein supplements with specific characteristics that may be beneficial:

- Whey protein is more rapidly digested than soy protein and contains virtually no lactose. Whey isolates, concentrates and hydrolysates are a more concentrated source of essential amino acids, including leucine, which together are needed to manufacture new muscle. Whey protein may also be added to products like higher protein sports bars and drinks.
- Casein hydrolysate, like whey protein, is also rapidly absorbed and provides all the essential amino acids. There are casein hydrolysate products that can be easily mixed into different fluids and sports drinks and are relatively low in bitterness and are suitable for individuals allergic and/or intolerant to dairy products.
- Milk-based protein shakes, meal replacements and milkshakes. Many of these ready-to-drink products are fortified with vitamins and minerals and differ in the amount of carbohydrate, protein, and fat they contain. Players need to use their discretion if products contain additional ingredients such as herbals as they are often marketed to promote weight gain, enhance weight loss, and improve performance. Depending on individual product features, these convenient meal replacements and shakes can offer players a concentrated and nutrient-dense snack and players can also use them to help control energy (kilojoule) intake when trying to gain or lose weight. There is some evidence to suggest that higher calcium dairy-based diets may have a positive role on weight/fat loss, but the exact mechanisms are unknown<sup>(56)</sup>.
- Soy-based meal replacements and bars may be useful for players allergic or intolerant to dairy produce.

When protein intake is high it is not appropriate to compromise carbohydrate, as this will have a negative impact on performance. It also has the potential to cause a gain in weight. Individual amino acids should not be used as a substitute for a protein supplement because high doses can be toxic<sup>(33)</sup>.

### ***Vitamins and Minerals***

The use of vitamin and mineral supplements will not improve performance in players whose diets are nutritionally adequate<sup>(31, 52)</sup>. However, in situations where dietary intakes may be sub-optimal (for example if energy intake and food choices are restricted to reduce body fat or to prevent weight gain, or if players have limited food choices when travelling), a broad-spectrum, low-dose multi-vitamin and mineral supplement may help ensure that essential nutrient needs are met.

Single-nutrient supplements (e.g. iron) can do more harm than good, especially if their use is random and uncontrolled, and should therefore only be prescribed by a sports physician or dietitian. As a general rule, vitamin and mineral supplements should only be used when a deficiency has been confirmed, which may include blood analysis, and then only as a short-term solution while dietary changes are being implemented<sup>(33)</sup>.

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