

Position Statement of the South African Institute of Drug Free Sport (SAIDS) on the use of supplements in sport in school-going YOUTH



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Background

Supplement availability and use by school-going youth (<18 yrs) are increasing and it is clear that children are exposed to these products and substances at younger ages than in years past ¹. This is of great concern in lieu of the increase in the number of detrimental health effects and positive doping tests related to supplement use ¹⁻³.

The sporting population (youth and adults) offer a lucrative market for 'designer sports supplements' offering a range of alleged benefits, from enhanced health, development and scholastic performance, to enhanced sporting performance. There is also a good proportion of adolescent 'non-athletes' that use supplements (and related anabolic agents) to improve their appearance ⁴. Aggressive marketing of these products at school, recreational and elite-level has led to large numbers of children and adolescents (and parents) willing to pay for and use these products in the hope of enhancing various aspects of human physiology (increase energy levels, concentration, muscle building, weight loss), improve exercise capacity and ultimately sporting performance ⁵.

Research shows that adolescents are particularly susceptible to advertising messages and are therefore easily targeted and exploited by the irresponsible misleading marketing practices often seen from supplement manufacturers. There is also a gross lack of proper age-specific nutrition education, that is scientifically sound and evidence-based. This, together with many misconceptions around nutrition and supplementation, the increasing pressure to perform at all costs and the culture of looking for a 'quick-fix' put adolescents at high risk for supplement use.

Pressure and Misconceptions behind supplement use by youth

- Peer pressure ('my friends or opponents are using it, so should I')
- Pressure to perform at higher and higher levels in sport
- Securing school / varsity scholarships
- Clever marketing strategies by supplement companies
- Advertorials of professional adult athletes 'glamorising' supplement use
- Misconceptions:
 - '...I need to use supplements to perform better'
 - '...my diet cannot provide the same benefits'
 - '...there is no nutritional value in today's food and produce'
 - '...to stay healthy'
 - '...make up for poor diet and lack of training'
 - '...to build muscle'
 - '...it is natural / safe / legal – cannot do any harm'
 - Supplements bought or provided by a well-known store, pharmacy, website, supplement company / sales representative, must be safe and legal.

However, contrary to marketing claims, there is very little / no scientifically justifiable evidence for the majority of supplements and their alleged performance benefits that are being sold to youth, nor evidence to prove aspects of health and safety. It is generally unethical to test such supplements on <18 yr populations due to the known and unknown risks of potentially damaging any aspect of health, growth and development (short and long-term) ⁶. Even for the adult population the majority of supplements on the market also remain untested and their claims of

efficacy and safety cannot be guaranteed.

Due to the substantial risks (known and yet unknown) related to supplement use, we support international consensus that sports supplements should not be used in persons <18 yrs of age (NFHS Position paper; ACSM position paper).

The products that collectively form the sports supplement industry are typically also referred to as “dietary (or nutritional) supplements”, “ergogenic aids”, “health supplements” or “sports supplements”.

SAIDS define ‘Sports Supplements’ as sources of nutrients and/or other substances, marketed and sold as such in the field of amateur and/or professional sport, with a nutritional or physiological effect whose purpose it is to supplement the normal diet, directly or indirectly alter / enhance body composition, enhance sporting performance, and/or assist with recovery following sporting activity.

What you need to know

- ***There is a lack of supplement manufacturing and marketing legislation, locally and globally***

Supplement companies do not need to test and prove that their products are effective, pure and most importantly, safe before they are put on the market. Products sold as ‘nutritional supplements’ (including sports supplements) can be advertised and sold with misleading claims, incorrect labelling, and lack of scientific-grade efficacy and safety evidence. The burden of proof lies with the regulating local authority, which of course, does not have capacity or resources to undertake the well-controlled research that is necessary to investigate the various health and performance claims made about these products.

Even in established and sophisticated countries such as the USA and UK the lack of supplement legislation, governance and enforcement are problematic and a source of concern. In fact, the reality is that products are only removed / banned from the market once a critical number serious ill-health or injury reports are received. The lack of consumer awareness in this regards means that consumer demand for these products remains high, with little impetus for supplement companies to change the status quo.

- *Supplement manufacturers may indeed quote or reference ‘scientific’ evidence, but at closer inspection the evidence may be insufficient, irrelevant, misinterpreted, not applicable to youth, or in the worst, fabricated.*

Studies which rigorously test the efficacy and safety of a particular supplement are necessary to substantiate the claims made by supplement companies. Furthermore, these studies need to be examined by the scientific peer-review process and then published in an appropriate journal. Such studies are very rarely done / available.

- *‘Testimonials’ cannot be used as proof of efficacy and safety and is not equivalent to scientific evidence.*

Testimonials from successful athletes, coaches, or people cured from previous ill health are often used as the main ‘proof’ for the alleged benefits of the supplement. It is important to realise the limitations of a testimonial, even when supplied by a person who seems independent. It is not sufficiently objective, it does not control for or evaluate many of the factors affecting health or performance, nor does it control for the power of positive thinking (the so-called ‘placebo’ effect). The majority of people who feel excited and positive about a new product will report beneficial effects in the short term, irrespective of an actual improvement and ‘blinded’ to its potential harmful effects.

Therefore, be aware that supplements can contain prohibited and harmful substances without it being indicated on the label - the label does not guarantee efficacy and safety, and that supplement use can pose a risk to health and being banned from participating in competitive sport.

WADA's principle of strict liability applies in sport meaning that innocent ingestion of prohibited substances is not an acceptable excuse, and athletes testing positive are liable to be sanctioned.

- ***Therefore, the supplement label does not guarantee safety***

In one of the first investigations into the extent of the problem, the IOC commissioned a study where a total of 634 so-called 'non-hormonal' supplements were bought in 13 countries - the majority from retail shops (578) and the rest via the internet (52 products). Alarming, 94 products were contaminated with and tested positive for anabolic-androgenic steroid hormones (mainly pro-hormones) that were *not declared on the label*⁷. Why and how these hormones ended up in these products remain unanswered. Subsequently, many further investigations confirmed that advertent and inadvertent contamination of supplements is a world-wide problem⁸. Furthermore, it has also been shown that the actual amount of a particular supplement ingredient may vary between 0% (containing none of the active ingredient) to 150% of what is indicated on the label.

The safety in terms of harmful, banned substances and actual dosages you are ingesting can therefore not be guaranteed.

- ***There is an alarming increase in the number of reports of damaging health effects and positive doping tests related to supplement use in SA (and globally)***

Health risks may include allergic reactions, toxic effects from self-medicating, over-dosing or poisoning due to contaminants found in the products⁹. Examples from the past include a number of reported deaths and medical problems resulting from the use of tryptophan supplements¹⁰ and medical problems and deaths relating to products containing *Ephedra* and caffeine¹¹.

Supplements may only get pulled from market once substantial adverse effects have been reported e.g. Mahuang (ephedra) where 23 consumer reports of severe adverse effects (including 10 deaths) were reported amongst athletes over a 2 yr period; 2 of these were from <18yrs individuals¹². This resulted in Mahuang being banned from USA market in 2004, however, it can still be found in supplements from other markets. Examples can also be found in the SA setting where recently a widely marketed slimming product were banned from the market only after it had caused severe health effects.

Apart from serious health risks, for elite-level athletes there is also the risk of testing positive for a banned substance that can ruin a sporting career and discredit their reputation and that of the sporting code and country they represent. The rise in the number positive drug tests stemming from alleged sport supplement use has raised concerns amongst several sporting bodies, locally and internationally (SAIDS, SARFU, Olympic Committee (IOC), IAAF).

There are many on-going examples (locally and globally) of untested, harmful supplements being launched into the market that are only prohibited or banned from the market once a critical number of public reports of serious adverse side-effects / medical problems and/or fatalities were received.

The same goes for the increasing number of failed drug tests in SA sportspeople (and globally) - most recently the members from the national rugby team tested positive after using a product from a well-known sport supplement company, marketed as 'tested to be safe and effective'.

- ***Even apparently 'harmless' or legitimate dietary supplements may be problematic***

Firstly, there is evidence that even apparently 'harmless' supplements (such as vitamin and

mineral supplements, protein supplements) may also contain harmful ingredients (e.g. anabolic steroids / pro-hormones, stimulants) that are not declared on the label and could be harmful to health and/or are prohibited by the doping regulations ¹³.

In 2005 vitamin C, multivitamin and magnesium products sold in effervescent tablet form were found to contain high amounts of anabolic steroids ¹⁴. In fact, since 2002 there has been a growing number of apparently harmless nutritional supplements containing high amounts of 'classic' anabolic steroids detected on the supplement market (likely sourced from Chinese pharmaceutical companies which sell anabolic steroids in bulk) ¹⁵. It is predicted that in the near future supplements cross-contaminated with the newer forms of 'designer steroids' will appear on the market ¹⁵. Apart from resulting in positive doping results, these substances have the potential to cause serious adverse health effects ¹⁴.

These studies demonstrate the extent of *insufficient surveillance in the manufacturing of dietary supplements available on the local and global market*.

Secondly, the ingestion of nutrients above levels naturally occurring in foods can be toxic and harmful. It is very difficult to reach toxicity levels from diet alone, but easy to do when taking supplements. For example, excessive intake of vitamins / minerals such as vitamin A and iron can be toxic and cause damage to several organs in the body, particularly in youth. Evidence from adult athletes suggest that 1000 mg of Vitamin C per day may promote cellular damage ¹⁶. There is also adult data that strongly suggests that vitamin C supplementation taken immediately post-injury may increase tissue damage and oxidative stress ¹⁷. Furthermore, 1 g of Vitamin C supplementation 2 hrs pre-, and for 14 days post-downhill running resulted in *delayed* recovery compared to the group who ingested a placebo ¹⁸.

▪ **Caution should also be taken with products that allege to be 'natural', 'herbal', or 'safe'**

No product that is presented in a pill, tablet, or powder form, that has undergone any form of processing, extraction, purification, dehydration (etc.) can be regarded as 'natural' anymore. Further, one cannot associate herbal with natural or safe, as there are many herbal components that have potent harmful side-effects, can lead to harmful interactions with other herbals or medications, and/or can result in a failed drug test (marihuana, ephedra (ephedrine), Tribulis Terrestris, Saw palmetto (pro-hormones) etc.). The dosages of these products are often also varied and it is not uncommon to reach toxic levels that could lead to serious organ damage and/or death (e.g. mahuang, kava-kava).

▪ **Reliance on supplements shifts focus away from the more critical and proven methods of achieving optimum sporting performance (and health, growth and development).**

Children and adolescents can easily get side-tracked from the true elements of success in search of the easy, unfounded short-cuts that the sport supplements promise ⁵.

Optimising one's training, overall dietary intake, rest, recovery and sleep patterns can have a far bigger impact on physique, performance and health than any sport supplement tested to date can; nor can 'skimping out' on any of these aspects be replaced by the use supplements as is often claimed by the supplement advertising.

Supplements commonly used by youth athletes include:

1. Vitamins / minerals
2. Protein shakes ... 'Mass builders' ...
3. Creatine
4. Pro-hormones
5. Stimulants: Ephedrine and related (see discussion under 'energy drinks')
6. 'Sports' and 'Energy drinks'

7. 'Herbals'

Provided below are evidence for / against the use of these products and related risks in youth:

1. Vitamin / Mineral supplements...

May be indication in youth athletes with poor appetite, lack of balanced nutritional intake (especially fruit and vegetable intake), but the best approach is that a valid need for such supplementation should be established and done after dietary intake is optimised.

Potential risks:

Supplementation could in itself result in other vitamin / mineral imbalances. Some nutrients can block the absorption and/or function of other nutrients and create a deficiency, or it can promote the absorption / storage which can lead to toxicity. This is of particular concern when single vitamins / mineral supplements are used, or a range of supplements (and/or nutrient 'enriched' or 'fortified' products) are used. This could easily result in reaching levels above the Recommended Daily Allowance (RDA) or Dietary Reference Intake (DRI). Toxic effects can harm growth, immune function, health and performance.

A good guideline to follow would be not to take supplements containing single vitamins or minerals, especially in large dosages. Instead, if nutritional insufficiency is a concern, it is generally better to take a multi-vitamin and mineral supplement that provides nutrients in dosages that ideally do not exceed 1.5 x RDA or DRI. Keep in mind though that many supplements may use adult RDA or DRI levels. Where there a specific nutrient deficiency is diagnosed, the cause of the problem should first be addressed, appropriate dietary optimisation should be done, and short-term supplementation could be necessary.

2. Protein shakes

In general, youth who have an optimal appetite and eat a variety of foods, can easily meet their protein requirements through diet alone. Further, the protein provided by supplements is not superior compared to what is found in food.

There may be an indication for use in youth athletes with poor appetite (cannot eat sufficient amounts of dietary protein), strict vegetarian / vegan eating patterns, 'fussy' eaters where it may be difficult to meet needs through dietary intake alone. However, optimising dietary intake is a pre-requisite before a protein supplement is considered, and there are many ways in which dietary protein sources can be used in the form of a 'protein supplement'. Should a protein supplement *per se* be needed, care should be taken to identify 'low risk' options (see later).

Potential risks:

The risk of supplement contamination with 'harmful' ingredients is of great concern - protein powders (and amino acid supplements) have been found as a common source of illegal substances (e.g. nandrolone)^{2,3}.

Too much protein can contribute to dehydration (and youth are already at an increased risk of heat-related illness). It may be placing an increased stress on liver and kidneys (long-term). Protein may be taken at the expense of sufficient carbohydrate, which may deprive the body of critical energy provision needed for optimal growth, sustain training, concentration. On the other hand, excess protein in lieu of sufficient energy intake may result in excess calorie intake, which may negatively affect body fat. (*See more on 'Amino Acids' later*).

There is no evidence that protein from a supplement is 'superior' than dietary protein - it is at best an imitation of what is provided by food. Protein supplements are also very expensive and with the high risk to low potential benefit ratio it should be done only after careful consideration of alternative options.

Recommendation: There is no need for supplementation in majority of youth athletes (with healthy appetite). Protein supplementation should not be used unless a specific deficiency is identified and dietary intake optimized. Lastly, bear in mind that research indicate that total energy (and carbohydrate) intake has a powerful impact on muscle mass and combined with appropriate exercise are the key components needed for muscle and overall growth and development.

3. Creatine Phosphate ...

Commonly known as 'creatine', is a source of fuel stored within the body that provides energy at a very fast rate, used to fuel the initial couple of seconds of maximal-intensity exercise efforts. The body produces its own creatine and you can also get it from eating animal protein (meat, poultry, fish), which is more than sufficient to meet the body's requirements.

Creatine is one of the most popular supplements amongst adults and youth. A survey done overseas indicated that 8% of youth aged 14-18 yrs were using it and, even more alarmingly, 75% of them did not know how much they were using or were taking more than what was suggested on the supplement label ¹⁹. A survey in a high-school population indicated that 25 to 78% of athletes used creatine (NCAA, 2001; www.PDRhealth.com/drug_info).

Potential risks:

Despite evidence of potential efficacy in adult athletes under select exercise conditions, creatine has not been proven to be effective nor safe in a youth population - and the potential risks may outweigh any possible benefits ¹. As such, we concur with the American College of Sports Medicine (ACSM) Position Stand that creatine supplements should not to be used in <18yr youth due to the unknown potential adverse health effects ²⁰.

Furthermore, in the USA coaches, health providers, supplement representatives etc. are prohibited from encouraging and/or supplying youth athletes with creatine (or any other supplements) ¹.

4. Pro-hormones ...

These include products / ingredients that refer to 'androstene-dione' or 'androstene-diol', 'DHEA', 'ZMA' and the herbal forms such as 'Saw palmetto' and 'Tribulus terrestris'. These products claim to increase testosterone levels, boost muscle growth and strength, reduce body fat and ultimately enhance performance.

Pro-hormone and 'steroid precursor' nutritional supplements have not been proven to be anabolic or enhance any measure of athletic performance, whereas they raise the risk for negative health consequences ^{1,7,21,22}.

Potential risks:

Further evidence on the extent of supplement contamination and that labels do not guarantee safety come from a study where the composition of 103 dietary supplements bought on the internet were analysed ⁸. The supplements were grouped into four different categories according to their contents listed on the label - creatine, pro-hormones, "mental enhancers" and branched chain amino acids (BCAA). All the supplements were screened for the presence of stimulants and the major known anabolic steroid compounds, and the precursors and metabolites of testosterone and nandrolone. Three products were found to contain very high amounts of an anabolic steroid (metandienone) and their ingestion resulted in high quantities of steroid metabolites in urine which constitutes a positive doping test. One creatine product and three of the "mental enhancers" contained traces of hormones or pro-hormones not claimed on the labels. Intake of the creatine product revealed the presence of the two main nandrolone metabolites in urine (19-norandrosterone and 19-noretiocholanolone). Fourteen of the pro-hormone products contained substances other than those indicated by the manufacturer ⁸.

Again, due to ethical reasons these products have not been tested in a youth population. Nevertheless, there is ample scientific evidence from adults indicating that pro-hormone use does not support manufacturer claims, and due to its substantial health risks, in particular its toxic effects on the liver, promotion of certain cancers, and risk of cardiovascular disease (increase LDL/HDL ratio), and should not be taken by youth (nor adult) populations ²³.

In addition to the above, other negative side effects include in *men* include: testicular atrophy, impotence, development of female characteristics e.g. breast enlargement, prostate cancer; in *women*: development of male characteristics e.g. male pattern baldness, deepening of voice, increased facial hair, blood clots, increased risk for breast and endometrial cancer; in *children*: All of the above, and risk of early onset of puberty and of premature cessation of bone growth.

5. Stimulants: Ephedrine (or herbal form 'Ephedra') ...

Ephedrine and ephedra (derived from ephedra herbs) – also known as mahuang - stimulates the central nervous system (CNS) and works similarly to amphetamines. Pseudoephedrine is closely related ^{12,24} – also has CNS stimulant properties (used in cough syrup / decongestants).

Claims typically include weight loss, increased energy and performance (speed / power). However, the majority of evidence show no performance-enhancing effect; very modest weight loss (~2 kg's) in adults, whereas they do impart many risks to their users ¹.

In a study on 270 high school athletes in the USA, 26% girls and 12% boys had tried ephedrine (Kayton et al., MSSE, 2002). A large number of collegiate hockey players were also found to be using metabolic stimulants despite knowledge of potential negative side effects and that it is banned by sporting authorities ²⁴.

Potential risks

Ephedrine on its own or combined with caffeine pose a significant health risk, including hypertension, arrhythmias, anxiety, tremors, insomnia, seizures, paranoid psychoses, cerebral vascular accident (stroke), heart attack, kidney damage and death ²⁵.

Ephedra, the herbal form of ephedrine, is associated with a greatly increased risk for adverse reactions compared with other herbs - though products containing ephedra represented only <1% of herbal product sales in the US in 2001, it was implicated in 64% of adverse herbal reactions ¹². In one investigation as many as 140 reports of adverse events were received by the FDA over a 2-year period which included 10 deaths and 13 events of permanent disability. Hypertension was the single most frequent adverse effect (17 reports), followed by heart palpitations, tachycardia, or both (13); stroke (10); and seizures (7 reports). Ten of these users were <18 yrs ²⁵.

It is a banned substance in sport, and with mounting evidence concerning the substantial health risks the sale of ephedra-containing product were banned in the USA in April of 2004 ²⁶. Yet, it is still available in many products produced elsewhere and sold on the SA market.

(Effects of caffeine are discussed below).

6. 'Sports drinks' and 'energy drinks' - are they safe?

For this discussion 'sports drinks' refer to flavoured drinks that mainly contain carbohydrate, minerals, electrolytes and sometimes vitamins; and 'energy drinks' refer to those drinks that typically contain stimulants such as caffeine and guarana, with varying amounts of carbohydrate, protein or amino acids, vitamins, minerals and sometimes electrolytes (e.g. sodium). Sports and energy drinks are aggressively marketed to children and adolescents - for sports drinks the claims are to enhance performance, fluid and electrolyte replacement during and after exercise, and energy drinks are promoted for boosting energy levels, mental alertness and concentration ²⁷.

Sports drinks:

Careful consideration is needed when choosing what and how much to hydrate with before, during and after physical activity in order to prevent excessive sugar and calorie intake that could contribute to overweight / obesity and dental caries ²⁷. For the average child or adolescent involved in routine physical activity, a sports drink is typically unnecessary and water (clean, safe) is encouraged for optimal hydration instead. However, those youth engaged in vigorous, long-duration and/or high-volume training could benefit from a sports drink that is carefully considered and planned within a well-balanced dietary intake.

Appropriate use of a sports drink:

Where exercise and daily activity levels are high (i.e. prolonged vigorous-intensity exercise), a sports drink (and other concentrated sources of carbohydrate) could be beneficial to help meet carbohydrate and energy needs (selected based on 'low risk' principles) ²⁷. Carbohydrates is the most critical source of energy during daily life and in particular during intense exercise. Seeing that bodily carbohydrate stores are small, adequate carbohydrate and fluid replenishment could help to sustain exercise capacity and performance in youth and adults alike ^{27,28}. The degree to which concentrated carbohydrate sources (such as sports drinks) are included should be carefully considered and calculated by a nutrition expert. Factors to consider would be:

- Sufficient daily intake of wholesome carbohydrate sources (high nutrient value, vitamin and mineral-rich) and other nutrient rich foods from a variety of food groups to meet baseline nutritional requirements;
- The daily / weekly training load; overall activity levels i.e. overall energy need;
- Type of exercise? Short-duration vs. prolonged activities?
 - There is good indication for use during endurance exercise, especially when its performed in the heat ²⁰.
- Growth and development goals?
- Body composition: underweight vs. overweight / obesity?
- There unfortunately is no "one size fits all".

As far as electrolyte replenishment goes, sports drinks typically do not contain very high amounts of these, but replenishment can typically be done effectively by eating 'normal' foods (meals) before / after exercise ²⁷.

Potential risks:

Similar to regular cooldrinks, excessive sports drink ingestion adds significant calories without adding any other nutritional value. This could compromise optimal growth, development, body composition and health, especially in those who do not exercise sufficiently (volume/duration) to warrant sports drink ingestion ²⁷.

A well-balanced dietary intake is encouraged as the best and safest way to get the full range of nutrients the body needs for energy, growth and development. Water, 2-3 cups of low fat milk and limited intake of fruit juice (~1 cup) should form the corner-stone of daily hydration.

The quantity of water needed to maintain hydration is influenced by various factors such as diet, health conditions, exercise time and intensity, environmental factors (heat, humidity, sun exposure), individual sweat rate (that is highly variable) and degree of heat acclimatisation ²⁷. Children and adolescents should have free access to water during the day and during exercise, and should drink water routinely as the first beverage of choice, as long as daily dietary calorie and nutrients needs are being met.

Seeing that the majority of sport and energy drinks have a pH in the acidic range (pH 3-4), and combined with the effects of citric acid frequently found in these drinks, it could contribute to dental erosion and dental caries (these effects has been found to continue even after the pH are neutralised). Nevertheless, it is always good to rinse the mouth (and gum-guard) with water afterwards, and/or regular brushing afterwards ²⁷.

In lieu of the rise in childhood overweight and obesity, sports drinks (and regular cooldrinks and 'energy drinks') should ideally not be used during meals; nor to replace the 2-3 cups low-fat or fat-free milk or dairy per day that should form part of a healthy diet; and/or should not be drunk routinely throughout the day instead of water^{27,28}.

'Energy drinks':

'Energy drinks' often contain large and varied amounts of caffeine - one of the most popular stimulants taken in daily life and many young people intentionally ingest large amounts of caffeine in a variety of forms despite its potential negative health effects²⁷. In adults, evidence has shown that caffeine could enhance performance in certain types of sports, but effects are variable and in some it may actually hamper performance. Most importantly, the effects of caffeine has not been studied in children and adolescents.

From a thorough recent (2011) review of the literature done by the American Academy of Pediatrics Committee on Nutrition (CON) and Council on Sports Medicine and Fitness, the conclusion was drawn that due to the risks involved, stimulant-containing 'energy drinks' have no place in the diets of children or adolescents²⁷.

A big marketing strategy for these types of drinks is to boost energy - yet, the body's need for carbohydrate and energy should best be met through balanced dietary intake.

The caffeine content on many of the energy drinks are not always easily identified on the label - the content may either not be indicated, or expressed in percentage form which makes it less clear to the average consumer, or it is not directly listed as 'caffeine' (e.g. kola nut, guarana, tea extract - all these are sources of caffeine).

Potential risks

Caffeine is absorbed by all body tissues and result in effects such as increased hear rate, blood pressure, speech rate, motor activity, alertness, increased secretion of stomach juices, diuretic effect and increased temperature. Caffeine can cause sleep disturbances, increase anxiety and can trigger heart arrhythmias. There are concerns regarding the effect of caffeine on the developing neurologic and cardiovascular systems of children and adolescents, as well as the risk of physical dependence and addiction²⁷.

There are increased reports of caffeine use, abuse and even toxicity in children and adolescents. In 2005 the American Association of Poison Control Centers received more than 4600 calls regarding caffeine, of these, 2600 involved <19 yr olds, and 2345 required treatment²⁷.

Therefore, because of the potentially harmful effects of caffeine, the intake thereof should be discouraged for all children and adolescents^{27,29}.

Extensive education is needed to make youth and parents aware of the risks of caffeine intake. Note the symptoms of caffeine withdrawal including headache, fatigue, decreased alertness, drowsiness, difficulty concentrating, decreased desire to socialise, flulike symptoms, irritability, depressed mood, muscle pain or stiffness and nausea or vomiting³⁰. Therefore, it is recommended to wean off caffeine in a slow and step-wise manner instead of a 'cold-turkey' approach.

Guarana, a plant extract that contains caffeine, is also often found in energy drinks and marketed to promote energy levels, enhance performance and for weight loss. A gram of guarana is equal to 40 mg of caffeine, and would therefore be a cause for concern as it can dramatically increases the total caffeine content of the energy drink²⁷.

Amino Acids/Protein are added to some sports and energy drinks with various claims. Protein

(or amino acids) added to sports drinks are promoted for ‘muscle recovery and muscle building’. However, the best approach is to ensure that protein is ingested as part of meals / snacks throughout the day as part of a normal diet to allow the body free access to a variety of amino acids and other components in food that promote growth, development, muscle recovery and ‘building’. Contrary to the marketing messages from supplement manufacturers, the majority of children and adolescents can easily meet their dietary protein requirements (1.2-2g /kg body weight / day) through eating ‘normal’ foods ²⁷. Furthermore, recent evidence has proven that due to its unique mixture of carbohydrate, protein and other nutrients, milk (dairy e.g. low-fat flavoured milk, yoghurt, drinking yoghurt) is an ideal and superior ‘sports beverage’, and can be used before or after workouts to boost recovery and muscle growth / repair ³¹.

Potential risks

Excessive intake of protein can contribute excess calories that may have an unfavourable impact on body composition (overweight / obesity).

Specific amino acids e.g. taurine, glutamine, arginine, added to energy drinks and heavily marketed to, for example, enhance the effects of caffeine, to promote immune function and muscle building and recovery, vasodilation, fat burning etc. are not supported by scientific evidence. Drinks containing single amino acids or combinations thereof are discouraged for children and adolescents.

7. Herbals

The effects of some herbals have been discussed above. Due to the substantial lack of proper scientifically validated research on the effects, side-effects (short-and long-term), ideal dosaging etc. of the majority of herbals (single or in combination), particularly in the <18 yr population, the use thereof in this age group is strongly discouraged. When used for medicinal reasons such use should be done under the supervision of a registered medical doctor.

How to minimise the risks associate with supplement use

Before money is spent on supplements, consumers are advised to rather seek the help of a Registered Dietitian, who is the only profession uniquely trained and qualified to give individualised dietary advice and prescription. Dietitians are registered with the Health Professions Council of SA that ensures that their guidance adhere to sound, credible and evidence-based standards, is ethical and individualised to the best interest of the individual. A registered dietitian with sports nutrition expertise can be a valuable resource to help make informed choices on the applicability of supplement use within the context of meeting the particular individual’s goals for optimal health, growth, development, exercise training and performance.

The ‘SAIDS Guidelines for Parents’ information sheet series provides practical dietary recommendations for healthy, active children and adolescents. However, bear in mind that the growth, development, circumstances, needs, goals of children and adolescents can vary quite considerably, which makes a ‘one-size-fits-all’ approach problematic. The recommendations provided should be used as guidelines, but should specific concerns arise then an individualised approach with the help of a dietitian would be warranted.

Guidelines to lower the risk associated with using sport supplements:

The following guidelines should be used to help reduce the risk of ingesting harmful and/or prohibited substances.

- Children and adolescents should stay clear of supplement use as far as possible -
 - only where a specific dietary gap is identified by a health profession expert may *select supplementation be used *in conjunction with dietary optimisation*, *such as vitamin and mineral supplementation, carbohydrate sports drinks, -gels, -bars, concentrated sources of

carbohydrates for those doing prolonged vigorous sports activities, chosen according to 'low risk' criteria and ideally done with the guidance of a registered dietitian ³².

- Use of 'energy drinks' (as defined previously) should be strongly discouraged.
- Carbohydrate supplements (drinks, gels, energy bars) are generally low risk, but be careful when mixed with other substances; choose reputable brands and evaluate the manufacturer track record / history (see below). These products are generally only warranted for those who train hard / frequently / for long hours / at high intensities.
- Be aware that there are reports of vitamin / mineral supplements found to be contaminated with banned substances. Choose vitamin and mineral supplements from a reputable company, and it should only be used if a dietary gap has been identified.
- Be extremely cautious with regards to the following:
 - Supplements advertising 'muscle building' and 'fat burner' effects - these are likely to contain banned substances such as anabolic steroids (or pro-hormones) or stimulants and should be avoided at all costs. Examples:
 - ⊗ 'DHEA'; Androstene-dione or -diol; '19' or '19-nor' products;
 - ⊗ Mahuang; Ephedra (or ephedrine); Guarana or products high in caffeine;
 - ⊗ Claims of 'anabolic' effects and/or that it 'boosts testosterone' or 'growth hormone' levels (even if it says it does so 'naturally' or that it is in 'herbal' form)
 - ⊗ Products of unknown origin and/or without a label.
- Products like creatine and caffeine are not banned substances, however, it has not been proven to be safe and effective in children and adolescents and should not be used. Apart from that, it may be contaminated with banned / harmful substances not indicated on the label.
- Investigate the manufacturing practices and history of the company, the range of products that it produces (e.g. company that does not produce other products containing banned substances); company that follows responsible marketing and advertising practices;
- Request *certification that verifies the ingredients within the product as well as amounts (dosage), where these ingredients were sourced as well as manufacturing practice of the producer. However, be aware that there are issues with fraudulent certification, inaccurate or incomplete testing of the range of substances, or that it is out-dated. Further, certification and testing should be done for *each batch of product* that is produced, as well as testing for all individually known harmful and prohibited substances. The practicality and feasibility of doing this is, however, problematic (especially in SA).
- A registered dietitian can assist with optimising nutrition for performance and identifying low-risk products.
- Individuals closely involved with youth athletes (trainers, coaches, teachers, etc.) to become distributors and sell 'performance-enhancing' supplements to children and adolescents is considered a serious conflict of interest and should not be guarded against.
- SAIDS cannot guarantee the safety of any supplements.
- *Supplement and nutrition education are important*
 - We need to teach youth the 'myths and facts' behind supplement use – based on sound health and nutrition principles and credible knowledge;
 - This should be done by health professionals with appropriate credentials, objectivity, ethical standards and up-to-date knowledge on the topic;
 - It needs a multi-disciplinary approach that involves everyone involved with the child or adolescent athlete, from the teachers, coaches, medical professionals to the parents and families.

In conclusion

Consumers should be aware of the risks involved with supplement use, both in terms of health and risk of being banned from sport. This Position Statement aims to create awareness and education in this regard to minimise the risks associated with sports supplement use in youth. Safer and more effective alternatives such as proven nutritional strategies to optimise adaptations to training, enhance training capacity, recovery, sporting performance and sustain long- and short-term growth, development and health are promoted. Ultimately this should assist active individuals in making informed, evidence-based decisions on supplement use.

The key take-home message is that despite the large range of supplements and their alleged benefits (and availability through various sources), *the fact remains that the majority of supplements on the market have not been tested according to sound, scientific and objective standards, and as such their claims of superiority, efficacy and safety are not proven and cannot be guaranteed. This is true for adults, but even more so for the <18 yr old population*

Athletes are encouraged to seek advice from qualified professionals such as a registered dietitian with sports nutrition expertise who is uniquely qualified to provide effective nutritional strategies to maximise growth, development, health and training and performance goals of the individual. Lastly, it is our hope that the information contained in this document will help minimise the number of adverse health effects (long-and short-term), as well as the number of positive doping tests related to the use of sports supplements.

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