

## **Sports And Performance Nutrition**

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**Week-05**

### **Lecture-25: Supplements and ergogenic aids**

Hello everybody, in this lecture we are going to be talking a very interesting topic on supplements and ergogenic aids. What are nutritional supplements and what are performance and ergogenic aids? Who needs to take them? How? How much and when? Most importantly the safety. Let us understand more. What are supplements? As the name suggests it means in addition to or what is consumed as extra. So, should an athlete or a sports person consume supplements or is it bad? There are several misconceptions and myths around supplements and also a lot of wrong information around this broad topic. As practicing sports dietician, I personally do believe that nutritional or performance supplements can be of importance when used judiciously.

First and foremost, the safety of the athlete is the utmost priority. So when working with supplements it is very crucial to understand who needs it and why one needs it. Also equally important is planning the right amounts in appropriate dosages as per the age. In addition to the scientific approach to supplement protocol it is very important to keep in mind the ethical aspect.

So it is best to stick to the use of supplement when someone absolutely requires it. Also it is best to periodize or use the supplement for a stipulated time where the athlete can get the maximum benefit of its use. Also ensuring this periodized approach can prevent overuse or abuse and prevent toxicity. All supplement use must be based on sound science and evidence based data just because you may see endorsements or advertisements which can propagate the use of a supplement and athletes needs to be well informed about the evidence if the supplements works or is it banned. As a practicing spokesperson and a registered dietician in over 20 years of my work as preventive nutritionist our forte is to ensure that athletes choose the right type of food and nourishment and only then when there is a need do we add the supplements to augment or fortify what is missing.

So for those who skip eating meals and look at supplements as a replacement this is a very wrong approach and I am sure you know it too. So please address your food first and improve your lifestyle and when there is a need you can always look at the right supplement protocol. Now of the supplements when there is a nutritional deficiency we look at addressing them through nutritional or medicinal supplements and to improve the sports performance we use performance supplements. So supplements can be useful when there are low blood levels of a certain nutrient like minerals or vitamins also many times and also the prescribed ranges ideal for athletes is different for athletes from a layman. Hence since athletes have a higher training demand and thus the nutritional intake needs to be higher and many times food alone cannot suffice to meet this need.

In that scenario say a pre-competition or a peak competition season or when the athlete is unwell and needs to make up for higher values or larger intakes supplements can be useful. Similarly if there is a requirement for enhanced performance strategic use of scientifically planned supplement protocol can help high performance. So periodized supplement protocol can be of importance to prevent injuries and to improve the health of an athlete. If you recollect the chapters where we dealt vitamins and minerals and the importance of these nutrients for athletic performance when the levels of blood is very low for example iron or vitamin B12. There can be iron induced anemia which causes severe fatigue and can lower the exercise capacity.

Similarly vitamin B12 is very important for nerve conduction and for energy and with very low levels an athlete can be highly fatigued in fact can even have symptoms of giddiness to tingling sensation of fingertips and other concerns which can compromise his training. Low levels of calcium can lead to increased risk of bone fracture. Low levels of vitamin D can lead to very poor immunity where the athlete can be susceptible to frequent infections and not only that the body aches pains and the risk of bone injury. In the situation of low levels of a nutrient deficiency when we cannot meet large intakes only by food nutritional or medicinal supplements become an absolute must. Some of the other nutritional supplements are omega 3, multivitamins, zinc, magnesium and probiotics.

There are several sports supplements and these supplements can really impact performance. In competitive sports every second is vital for winning a game. So these ergogenic aids enhance performance and can be timed around the peak season or competition cycle for competitive athletes. Some of the most common performance supplements are protein, caffeine and beetroot juice. We already touched upon protein supplements in detail.

We also have discussed the use of sports drinks, gels in endurance workout. Peter alanine and sodium bicarbonate are also evidence based ergogenic aids which can prevent the build up of hydrogen ions and prevent acidosis. Creatin monohydrate is another performance supplement that can be very useful in high intensity workouts. Of the sports supplements, the very basic is a sports drink and we discussed this where athletes have a need beyond an hour, higher need for carbohydrates or electrolytes. A flavoured drink as a sports drink can be very appetizing and can quench the thirst and meet the requirement of carbohydrates and electrolytes.

I am often asked do young children need sports drink? It is best to use a homemade electrolyte drink when there is a high requirement of rehydration in travel account or between several matches or during a hot humid environment, during a half time or the water break in outdoor sports. Perhaps then an adolescent is justified to use a sports drink. Also sports drink become easy and convenient to carry for a match day. Another quick and convenient option to refuel and rehydrate is a high molecular weight carbohydrate. These are available as powders that can be very quickly stirred up in water and can be consumed during a high intensity workout or immediately thereafter for recovery.

So when and which of the sports supplements does an athlete need? Do athletes need to use a varied concoction? Each sport and individual is different and the supplement approach also needs to be tailored to that individual athlete and sport. Several athletes consume black coffee to get the caffeine. For that matter even gym goers consume black coffee shots before hitting the gym. One challenge with using an instant coffee powder is very difficult to quantify how

much caffeine is present in a mug of coffee. In competitive sports there are several other ways also to consume coffee.

Be it coke to red bull that is typically used in endurance events like marathon or caffeine gums where the caffeine can get easily absorbed within the mouth of the buccal cavity and also the sports gels which come with added caffeine. You don't need to dunk yourself with heavy dose of caffeine to get the best outcomes. Research suggests as little as 1 mg per kg body weight of caffeine can be an ergogenic aid. On an average 3 to 5 mg of caffeine per kg body weight also works best which is roughly about 200 mg caffeine per dose. You know caffeine is also a genetic response there are fast responders and slow responders and that depends on how one can metabolize caffeine which is genetically decided.

However the recommendation is you can consume planned amounts of caffeine dose roughly about 30 to 45 minutes prior to an event as the body takes that much time for the caffeine absorption. Also in endurance sports or in events where the matches or sports can last longer caffeine can be very useful towards the fag end when you are bonking and fatigue sets in. Caffeine is no longer a diuretic so don't worry about getting dehydrated and caffeine is neither banned by WADA anymore. In fact it is an evidence-based performance supplement recommended but do keep in mind caffeine is a stimulant so it can irritate the gut particularly athletes may have the urge to defecate or feel like going to the washroom. Especially in impact sports or running like marathon when athletes consume high dose of caffeine some of them are very sensitive and have to take several breaks for washroom.

Caffeine can cause alertness and increase your focus as is a central nervous system stimulant. Caffeine also enhances glucose absorption from the gut thereby has a glycogen sparing effect. This can explain why caffeine prolongs exercise time and can prevent fatigue. Similarly in endurance events caffeine can also enhance fat oxidation or burning fats for fuel. What are buffering agents? An athlete can prolong exercise time by taking care of his carbohydrate intake, hydration, electrolytes.

In addition to that focusing on buffering agents that can take care of the hydrogen ions can be an important strategy. What is acidosis? In high intensity workout or in speed endurance when there is anaerobic activity where the body is using up a lot more energy and the oxygen supply falls short. We studied this in the energy systems the aerobic and anaerobic glycolysis where the glucose is being broken down. So in this kind of a high intensity workout a lot of energy is being used. This is where buffering agents as beta alanine and sodium bicarbonate come to play.

If you remember the basic chapters of energy or even the energy metabolism the currency of the cell is ATP or adenosine triphosphate. So when the ATP is being broken down a lot of hydrogen ions are formed. So the buildup of these hydrogen ions can cause fatigue and lower performance. So buffering agents like beta alanine convert to carnosine or they neutralize these hydrogen ions thereby preventing the acidosis or buildup of acidic condition. A small dose of about 1 to 3 mg beta alanine can be used in about 3 to 6 grams each day.

Do note that the use of beta alanine can cause a side effect of paresthesia or a tingling sensation which can be quite uncomfortable. So it is best to start with smaller doses and use it for longer duration. Sodium bicarbonate is another buffering agent. It is nothing but the cooking soda that is being used in some recipes as even idli and dosa. But a word of caution here consuming

about even 1820 grams of sodium bicarbonate in about 1 to 2 liters of water 1 or 2 hours before the main event can be very cumbersome.

To give you a context imagine being on the beach and jumping into the sea water and glugging two liters of it and you can relate to that and it is not just water it is salt water. So obviously there is a huge inconvenience and gastric distress to this. So it can lead to challenges with the upper digestive tract as nausea vomiting and also the lower digestive tract issues of diarrhea. So this requires a lot of practice and patience and the willingness to not only take care of your carbohydrate intake and water prior to your event but also then consuming a buffering agent as sodium bicarbonate. So this buffering agent can help in activities that can last up to 15 minutes.

The next supplement I will be discussing is a very popular one, creatine monohydrate. If you are a gym rat or an athlete who is looking to increase muscle mass or is looking for powerful explosive energy I trust that you have already heard about creatine monohydrate or perhaps are already using it. Creatine monohydrate is a supplement that gives energy for intense bursts of activity that last very few seconds up to 10 seconds. This supplement needs to be taken ideally with a high carbohydrate meal and can help increase muscle mass when coupled with strength training. But please do note that the purpose of creatine monohydrate is not just for powerful bursts of explosive energy but it is also a very good antioxidant that can enhance recovery, help repair muscle tissue and also have an influence on the brain function and cognitive abilities.

So do you need to load up 20 grams of creatine for about a week to reap the maximum benefits? Not necessarily. High amounts of creatine can lead to a bit of abdominal discomfort and bloating and also cause stiff muscles. So it is best to consume about 3 to 5 grams daily and it works also long term when used for about 4 to 12 weeks. The next on the evidence based performance supplement is the beetroot or the nitrates. If you are an athlete who abhors the very word beetroot or is put off by the very strong flavor of a beetroot juice, I sympathize and I hear this feedback on a daily basis.

So is beetroot the only nitrate rich vegetable? Well in my simple days even the radish leaves which are currently discarded were consumed with joa rotis as a salad and of course the modern days choice of nitrates being lettuce, arugula or rocket leaves to the baby spinach or the palak leaves. The dark green leafy vegetables contain a high amount of nitrates. So please don't get excited, hear me out completely. Nitrates need to be consumed raw. The cooking process destroys the nitric oxide forming ability.

So once this conversion is no longer useful, a cooked vegetable is not a source of nitrates. So the recommendation is to aim for about 400 mg of nitrates in a day. So to meet this target an athlete must consume 2 large beetroots which is roughly about half kg. To add to this complexity you also need to time the intake of nitrates to 2 and a half hours prior to your workout. That is the time taken for the nitrates to convert to nitric oxide in the body.

So nitric oxide is a vasodilator meaning it expands the artery walls. So it is a given that it lowers the blood pressure thereby it increases the oxygen carrying capacity or the  $V_{2\max}$  thereby the strategic use of nitrate rich vegetables in copious large amounts taken long term and not one day before the match for over a month or so can be very useful to improve the performance in sprint activities and also endurance. I already did touch upon glutamine in the

protein chapter and if you already consume healthy balanced meals with good amount of protein you really do not need the glutamine supplement. However in over trained athletes with poor gut immunity or the ones with poor immunity who are unwell many times, glutamine supplement can be a value addition to enhance the nutritional status and health. How does one ensure their safety when consuming supplements? The world anti-doping agency and also the national anti-doping agency ensures dope free sporting.

Vada and Nada offer policies and practices to support fair competition. Also athletes must practice due diligence and this begins by avoiding cheap supplements a concoction of 20 ingredients in it reading the food label very carefully keeping a note of the product details and the bills also noting down the batch number and keeping one portion of the supplement aside in case there is a need for testing is the best way an athlete can ensure if he is competing at a national international level and represents the country. It is also best to choose brands that offer batch tested supplements. For an athlete using an adulterated product can be the downfall of his sporting career. There are several brands that offer batch tested products where every single supplement is screened for dope free substances, banned substance controller group, consumer labs, informed choice for sports, NSF certified sport and USP which can be a third party testing for quality ingredients used.

These are some of the standards that ensure the supplement product is of repute. An athlete must also take into account the benefits versus the risk and other factors that is involved while using supplements. As a priority for an athlete who participates in competitive sports he or she must steer clear from all the banned substances which is listed by the vada and nada from diuretics to herbal concoction to testosterone boosters to growth hormone releases. An athlete must be well educated to steer clear and avoid any ingredients that can be used in products. Athletes must also keep in mind batch tested products are superior quality and comes at a very high cost.

So taking them unnecessarily can be a burden and acts to the budget. And an athlete also needs to reason logically if the supplement is evidence based, is it proven to give benefits and enhance performance or is it a placebo which just gives you a complacency of having used a supplement and psychologically you feel good that you are going to perform better and in many scenarios that may be the case. Very important to also stick to the stipulated timelines of the recommended supplement use. A nutritional supplement overused for prolonged period of time can lead to over dosages and toxicity and in the body there is always a fine balance and homeostasis. One excessive nutrient can always lower the absorption of another nutrient and this is not desirable.

An ad hoc or over abuse of supplement also leads to other unnecessary risks. If you recollect in the protein supplement chapter when I discussed if the athlete already consumes high amount of non-vegetarian food, adding extra protein supplements from either the whey isolate or the casein can be an unnecessary burden on the kidney and that can lead to high levels of blood urea nitrogen, uric acid, creatinine and this can also be unnecessary for the athlete. And these high levels of biomarker or blood parameters have their own increased risk of other health concerns. Also not all supplements are guaranteed to use the best of raw materials or ingredients.

There is always a risk of adulteration. Elite athletes especially must take care to use superior quality products especially if they will be subjected to dope test and most importantly please

don't use self-supplementation protocol. It is always important to be discreet. Use the right guidance from professionals and support staff such as the sports dietitian or nutritionist and the doctor as sports physician. So to summarize please choose the right food and fluid options and supplements in addition to the food first approach only. Nutritional supplements can bridge deficiencies, ergogenic aids can enhance athletic performance.

Do remember to periodize and follow a scientific supplement protocol for the prescribed duration only. Please check for the academic credentials of the individuals you work with qualified sports dietitians and sports physicians can help you improve your health and performance and guide you with the right protocol for the nutritional or performance supplement use. I hope this lecture was insightful for you and thank you for listening. As I say the timing of the supplement to be taken or how much it has to be taken and when it has to be taken. And the specifications that is needed to be toned for my program and for my routine had to be really understood by me which was guided by Geeta Ma and I've been able to understand how the importance of not just taking the supplement or the performance enhancing supplement or nutritional supplement is important.

It is also important to time it right and take the right dosage and to the right period. For example let's say two weeks of a certain thing and she mentions it to not take, we don't take it or I don't take it. This has given me a different or it has opened a different understanding towards the science of nutrition and this has also helped me improve my performances in the water during the training and even my recovery period from my injury. This understanding of the science of nutrition is a mandatory thing which all the athletes should understand and take and I'm really happy with all the performances I'm doing in the pool and I'm hoping for the racing season next year. Hello, my name is Zeenia Samar and I'm the team leader for the sports science in Olympic Old West and also a senior sports physio.

I'm also a doping control officer with IDTM which is the International Drug Testing and Management Systems. Today we'll be talking about a very important topic which is anti-doping and supplements. Why is anti-doping an important subject in sports? It is to build a clean sports team. Clean sports means the athletes compete on a level playing field, are rewarded for their hard work, talent, skills and value the spirit of sports. As we all know, WADA is World Anti-Doping Agency whose primary role is to develop, harmonize and coordinate anti-doping rules and policies across all sports and countries.

WADA code is a document that harmonizes these regulations regarding anti-doping across all sports in all countries. You may find WADA code on the WADA website. Now the question is, what is doping? Doping is the use of banned substances which are performance enhancing drugs in competitive sports. There is a prohibited list which is released by WADA every year which is also found on the WADA website. Now to catch the cheaters, doping control testing is one of the tools that anti-doping organization use to level the playing field and protect clean sports.

And this testing is usually done in two ways, one is blood test and one is urine test. WADA has told that any athlete can be tested anytime, anywhere. There is no advance notice for the testing. One of the important questions is that whether the Ayurveda herbal supplements are prohibited in sports or not. Generally, organic, herbal, Ayurveda, these words are considered to be safe which is also a very big misconception.

Everyone use Ayurveda herbal supplements for an injury treatment or maybe a health supplement and there are a lot of dangers associated with these kind of supplements. The first one is they are not declared on the WADA prohibited list and they are not regulated. They can be performance boosters and which is also believed to be safe but it might contain a prohibited substance which is not declared on the box. There are high chances of unintentional doping associated with Ayurveda herbal organic supplements. The most safest option is to always consult your sports nutritionist or a dietitian to use any kind of herbal Ayurveda supplements.

Now coming to another important topic which is unintentional doping. We all know that doping can be either intentional but a lot of times in India the doping is unintentional due to lack of awareness. Unintentional doping can be because of many reasons. Number one is sabotage.

Someone has sabotaged your drinks, food, supplements, anything. Number two again is Ayurveda supplements has one of the major reasons of unintentional doping. Suggestions from the coach or a staff or parents or family member can have high chances of unintentional doping because they would obviously not know the prohibited substances in that particular medicine or a supplement. Post workout drinks, supplements, boosters, over the counter medications all have high chances of unintentional doping. It's always advisable to check with your sports doctor or a sports dietitian in case of supplements to have any kind of supplements or medicines. I would also like to reiterate on the fact that not all ingredients are declared on the label of the supplement and not all medicines are safe especially the ones which are for the cough or cold they have high chances of unintentional doping.

Now why are supplements required? In a survey top reasons athletes give for using supplements are increase energy, prevent a nutritional deficiency, any health issues, recovery from a workout or just a general appearance, medical conditions etc. And athletes who are taking too many supplements can have higher than the recommended daily intake of vitamins and minerals which is also very harmful for the health. So apart from doping issues one also have high chances of having a health issue by the use of unnecessary supplements or medicines. There are a lot of side effects of performance enhancing drugs which are all of these right from headaches, blood clots, nausea, liver damage etc. It's a range of harmful effects which supplements or medicines can cause.

Ultimately doping can result in sanctions. There was a study done from 2008-2016 which has concluded that the testing which is done for doping has increased in the span of years and hence the probability of catching the cheaters has also increased. Sanctions can range from disqualification, ineligible or a provisional suspension ranging from 4 months to even 4 years of ban. Always buy supplements which are informed sports certified. Informed sports is a global testing and supplement certification program which provides assurance to athletes that products carrying the informed sports mark have been tested or prohibited substances and manufactured to high quality standards.

And with this we come to the conclusion of our presentation. The key takeaways are you should never buy a supplement from unauthorized stores or brands. Always check with your nutritionist. Always check the supplement on informed sports and do not use Ayurveda or organic products because they are not regulated. Thank you for listening.