Sports And Performance Nutrition

Prof: Geetha Ghaliyavar

Department Of Sports Nutrition

IIT Madras

Week-03

Lecture-16: Fat soluble vitamins

In this topic we are going to be discussing in detail of the fat-soluble vitamins. What is their role for an athlete? How can athletes choose food options and what happens if there is an inadequate and in case of inadequacy what can that manifest for athletic performance? There are 4 fat soluble vitamins A, D, E and K as the name suggests. You need good dietary fats to absorb these vitamins. If you recollect the first chapter where we talked about fats and how the fat that we eat from the food can have several important functions. So those athletes who are trying to cut weight please be very careful and don't totally avoid this food group. Fat soluble vitamins get stored in the body unlike the water soluble vitamins that are washed off in the urine daily and hence they need to be consumed in the daily diet.

Fat soluble vitamins on the other hand even when consumed on some days only can be stored in the liver and the body can pull it out of the body store for its requirement. It's something like having extra money in savings account. Vitamin D is a very crucial nutrient for an athlete. If you remember the chapter on minerals when we discussed calcium and its role for bone formation to remind you only consuming calcium rich food and not taking care of your vitamin D is not helpful.

Vitamin D has a direct role to play in higher bone mineral density. It is the vitamin D that helps calcium absorption. Other than the bone function vitamin D is also needed for the health of the muscle. An athlete needs strong bones and also strong muscles. So you can imagine the role of vitamin D for sports performance.

So in addition to the skeletal muscular function vitamin D has a very important role in improving the recovery after exercise. Other than the skeletal muscular function vitamin D can be very important even for those athletes who are recovering from an injury particularly a bone fracture. Vitamin D can also help maintain muscle mass and strength just like its important role in healing of bones even for those athletes with tissue injuries optimal vitamin D can hasten the process of recovery and most important of all vitamin D has an immune modulatory function and has a direct impact on immune function. So for athletes to optimize their performance from the bones to the muscles and immunity this vitamin is vital. We have innumerable research papers today that talk of how vitamin D can in fact can maintain blood sugars and also help in diabetes management and we also know that in those individuals who are trying to reduce body weight vitamin D can be an important intervention and not just the body.

Vitamin D is a hormone that can influence brain chemicals and that can really take care of how you feel in your head and keep upbeat. So the process of the body making vitamin D is very complicated and we know that sunlight is the source of vitamin D. When the naked skin is

exposed to sun rays the UVB rays that initiation process starts using cholesterol and there are a chain of reactions from the skin liver to the kidney to form the active form of Carceral however 125 dihydroxycholecalciferol is a very complicated process. Other than sunlight as a source for vitamin D there are far few foods that can give you vitamin D just very few and the oily or the marine fish can be the best source. For the ones who don't enjoy the egg yolk of course there's a very small amount of vitamin D in the yolk but please do ensure you consume the whole yolk because egg albumin is just 3.

5 grams of protein in the white and all the other important micronutrients is in the yolk including vitamin D. For the vegetarians sun grown mushrooms meaning those mushrooms that are exposed to the sun rays are the mushrooms that can give you the vitamin D but in a form which is vitamin D2. The body absorbs vitamin D3 and not vitamin D2. Now if you will wonder who is deficient in vitamin D and I think in my personal opinion the whole universe I know it sounds a bit off but in my practice majority of my clientele from as young as an 8 year old child all the way up to athletes even 55 to 60 who I work with are vitamin D deficient and you'll be surprised if you think only athletes who play indoor sports are at the risk of vitamin D deficiency. You'll be surprised a golfer and a tennis player who spends at least 4 to 5 hours right under the sun can also be very severely deficient.

Those individuals with the higher body mass index the height to weight waste ratio what we have already studied in the first chapter or the ones with higher fat mass which means that the more adipose tissue they have their vitamin D status is that compromised and of course if you live in an urban city as me the pollution of the automobile exhaust the carbon dioxide the carbon monoxide they deflect the UVB rays of the sun and since we don't have exposure to these UVB rays because these carbon particles deflect the UVB rays in urban cities it is very difficult to make the vitamin D or synthesize it in your own body. Of course if you are an athlete who is in a colder region or during the winter months when there is lesser exposure to the sun or perhaps even if you are in a place where the monsoons can be quite heavy or it is cloudy and rains consistently there is a risk of vitamin D deficiency. Typically as Indians because of a higher melanin content we can synthesize lesser vitamin D the darker the skin tone the longer do you take to make the vitamin D even on exposure to the sun because the melanin is meant to protect you from the harsh UV rays of the sun. So for all those individuals which I have just listed and to those athletes playing indoor and outdoor if your levels are low then supplementation is the best option and of course getting some sun rays can help. We don't know how much of the vitamin D synthesis that can initiate within our body but surely but the early morning sun rays can change brain chemicals improve the serotonin align the circadian rhythm of the day and night cycle improve sleep.

On that note the right time to get the sun rays if you are considering vitamin D synthesis is when the UVB rays are available and that is between 10 am and about 12 noon and of course you need to ensure that you are at least a couple of kilometres farther away from pollution or traffic and you don't have to bask in the sun forever even just 10 to 15 minutes maybe once or twice a week is enough and how can you know that you have got adequate vitamin D just when there is a slight burning or twitching of your skin is a good enough symptom to tell you you had enough sun rays. Also interestingly the body temperature or just the warmth of your skin can help the onset of vitamin D synthesis sooner. So do remember please do give some time for the skin to process the sun rays to initiate this vitamin D synthesis process. As vitamin D is a fat soluble vitamin it does get stored in the liver and interestingly one vitamin always

interacts with another in the body. So if you have excessive intake of vitamin D that can not only lower the function of another vitamin but it can also cause a over dosage and toxicity.

Vitamin D being so important from the bones to the muscle from immunity to your brain function it's superfluous for me to highlight how important it is to maintain optimal levels for an athlete. It is best for athletes to at least maintain a 50 Engie per ml of vitamin D and when you supplement vitamin D please do it under the guidance of a qualified sports nutritionist or sports dietitian. Large dose of vitamin D may not be necessary unless and until there is a severe deficiency and you want higher doses or sometimes even an injection under the supervision of a sports physician. Smaller doses of vitamin D can be absorbed optimally too. So if an athlete does not take care to optimize his serum vitamin D levels that can have other repercussions of the athlete falling ill frequently have a lot of body and bone pains and not just the weakness of muscle and poor recovery from exercise the athlete can also be at a very high risk of bone fracture.

As per the IOC consensus statement and the Australian Institute of sport vitamin D medicinal supplement comes under the evidence-based list of group A supplements. Do work with the sports physician or a sports nutritionist to look at the right dosage the duration and the protocol of supplements. Let us take a few more minutes and spend some time in understanding an athlete scenario. As we've been discussing of how important vitamin D is for the immune function of an athlete other than just the delayed onset muscle soreness and the pains and aches and classically you will hear deficient athletes complain of ankle pain around the calf muscles. Also another symptom that you will always hear in the interaction during the consultation is athletes catching a cold orphan.

Over respiratory tract infections are also not uncommon as we've discussed in the past athletes have a very high demand in the peak competition season in addition to several training sessions sometimes double or even triple inadequate sleep to top that and some of these athletes also do full-time school or college in the day and in the competition season they also have travel either outstation or sometimes even international events. With all of that it is but natural the immunity is suppressed and with low vitamin D these symptoms are amplified. On many occasions those athletes with repeated sinus infections or upper respiratory tract infections will also have to consume antibiotics and that can cause other side effects of gastric distress loose stool tiredness and the recovery period gets prolonged. So as dieticians we chalk out the meal plans with good source of vitamin D if they're pescatarian we add some oily fish and if they consume eggs then of course daily intake of eggs but do remember egg yolks only have 40 IU on an average even for healthy living 400 international units is recommended. So whereas a deficient athlete can need four or five times more the amount of vitamin D in daily supplement protocol.

So interestingly in spite of the vitamin D supplementation the blood parameters though transient can take a long period of time for the levels to go up. The serum vitamin D is very gradual to change and is a long haul process though the serum vitamin D is transient but patience is the key especially if you're working with smaller dosages. Over time as the levels of vitamin D improves in athletes over months you notice stronger immunity where the athlete complains less episodes of falling ill with lesser bouts of upper respiratory tract infection the athlete has the ability to train better recover better and most important of all you have a cheerful and a happy athlete. Coming to the next fat soluble vitamin, vitamin A a reflection of what we

discussed in the antioxidants chapter ace vitamins. Vitamin A as depicted in this photo as carrot and if you remember your mum always told you it's good for your eyes so please eat a carrot.

Vitamin A is available in the vegetarian foods as the red yellow and orange coloured fruit vegetables and in the animal source be the dairy or the red meats it's available as retinol. As an antioxidant when the free radicals are formed due to intense exercise vitamin A can help reduce oxidative stress and improve the recovery from the exercise training other than the eyes. Vitamin D also has a very important function in skin health and also in the basic covering of cells the mucosal membrane it is a strong scavenger and removes the pro oxidants and the free radicals. So as an antioxidant vitamin A is an absolute requirement in athletes daily diet. The next vitamin is vitamin K.

Vitamin K has a very important role in strengthening bones which improves the absorption of calcium and when you excessively take the vitamin D supplement vitamin K can intervene and ensure there is no side effect from over usage of vitamin D and vitamin K also has a function of blood clotting. Vitamin K can be easily got by consuming dark green leafy vegetables in daily diet. The last of the fat soluble vitamins is vitamin E. Vitamin E is also the last of the antioxidant cluster of ace vitamins. With its important function of lowering exercise induced inflammation particularly in its specific role to lower these peroxides vitamin E can improve recovery process for an athlete thereby vitamin E can uphold the immune function of those individuals in prolonged physical activity.

The deficiency of vitamin E is very rare. Vitamin E is found in sunflower oil though it's a omega-6 rich pro-inflammatory pufa oil. It's good for deep frying and perhaps occasionally it's okay to use sunflower oil. On that note we have discussed in detail of how we need to maintain the ratio of omega-3 to omega-6. So focus should always be on heart healthy oils as mu-fa and omega-3 rich foods.

So that leaves us with the other best option of almonds. Eat a handful of almonds even better soak them overnight peel them and that may be healthier which germ also contains vitamin E. So to summarize choose a variety of foods to ensure that you can get ace vitamins from the diet mainly the red yellow and orange coloured fruits vegetables the dark green leafy vegetables and just a handful of almonds a day and since vitamin D can be a challenge and by data and research we know that athletes are deficient in vitamin D athletes should take care to optimize their vitamin D levels and just because I have said vitamin D is important be judicious of the dosage and how you consume that please do that under the supervision of a qualified professional because overusing and assuming that excessive amounts is good can be dangerous because fat soluble vitamins are stored in the liver excess of one vitamin can lower the levels of other fat soluble vitamins. So do take care to stay within the stipulated recommended amounts and the sports dietitian can help you plan that. I hope you found this lecture insightful. Thank you for listening.