ERGOGENIC AIDS

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Wilf Paish is no stranger to these pages, and those who have followed the javelin remember his excellent BAAB booklet. In this piece, Paish discusses the latest trends in enhancing performance.

With the advent of better dope testing methods increasing the possibility of detection, athletes will constantly be searching for other substances that might enhance performance and which are legal or cannot be detected to date.

The situation isn't new. The ancient Greek athletes placed themselves on a diet of ram's testicles (probably to increase testosterone levels) prior to the Games. Way back in 1963, I experimented with creatine, carnitine, arginine, ornithine, glycine, inosine, adenosine triphosphate with cyanocobalamin (vitamin B-12), pangamic acid (vitamin B-15), pollen B, etc. in order to try to improve energy supply and to try to give athletes a legitimate advantage.

Whether I was successful or not is certainly open to debate, since it was not part of any controlled research experiment. But then, as now, I have been influenced by research on all of these preparations, together with many more that I have not included. Most of these substances have been subjected to experimental trials, and their use in sport can be supported by quite sound physiology.

I find it very interesting that ideas on ergogenic aids seem to come around in a cycle of about four years, probably influenced by the advent of an Olympic Games. The substances are all supported by new research which is closely followed by advertisments in the athletic press expounding on their value.

Hence we now find ourselves, yet again, involved in discussion of the merits, or otherwise, of creatine, carnitine and other products. If I can gaze into my crystal ball, I can forecast that the next product to be promoted will be ubiquonone (vitamin Q or Q 10).

So, what is the difference now, as opposed to the situation in which I found myself 30 years ago? Back in those distant days, most of the articles which appeared on nutrition came from either the health food trade magazines or publications for bodybuilders—both very lucrative markets. These articles were all supported by pseudo-scientific evidence, emanating from quite questionable research institutes.

Now, certainly in the U.K. the situation is very different. In the past, our hospitals were all geared to making the sick well and all of their research was geared toward this end. This is still very much the case, but a number of the preparations which were developed for treating the sick found possible use as enhancers of performances in sport. Indeed, the anabolic androgens came to us that way since they were initially used in post-operative recovery and for the treatment of anorexia.

However, on the legitimate side, we are now finding good evidence for the use of things such as glucose polymers and the other energy replacement drinks. Because these preparations have come to us from very ethical sources within the medical profession, the associated research papers are all valid. Hence the coaches of today have access to the works on creatine by Eric Hultman and Roger Harris, and on glycogen replacement by people such as Rod King. The hospitals, faced with ever-increasing costs, can see the "spinoff" associated with entering the sports market.

The question facing the sportsman is, "Can these products have any effect upon performance?" By translating some of the research material, originally intended for the medical profession, biochemists and the like, into layman's English, I hope to shed some light on it for coaches.

ATP

The vital fuel for muscle contraction is a substance called adenosine triphosphate (ATP). This is an energy-rich substance found in the muscles. When muscle contracts, ATP is used and energy is released in a cyclic chain to produce more ATP and other waste products. The amount of ATP used and the type of waste product produced depends upon the intensity and duration of muscular effort. ATP must always be present; therefore the body must continually produce this energy-providing substance. The body is capable of producing enough ATP as long as it has available the material resources for its production.

ATP is stored in the muscles, but after only a few seconds of intense exercise it is depleted. The body must then manufacture more by the oxidation of carbohydrates, through glycolysis or by converting the by-product of the first ATP reaction; that is turning adenosine diphosphate (ADP) back into ATP by giving it another phosphate. This it does by utilizing a substance known as creatine phosphate (phosphocreatine), which is also stored in the muscle.

CREATINE

R.E. Davies (1965) and Roger C. Harris, et al. (1992) stressed the importance of the creatine phosphagen system to muscular contraction and suggested that its depletion during intense exercise is "commonly associated with the onset of fatigue."

R.C. Harris and Hultman, et al. (1992) demonstrated a significant effect with a group of runners who trained over 4 x 300 meters. These runners were given an oral preparation of 20-30 grams of creatine monohydrate and were compared to a placebo group.

These researchers, using the same research methods, also found that the substance had a beneficial effect upon recovery.

From this it should be safe to assume that creatine can help in the production of energy and in the recovery process. Hence any wise or well-informed athlete would be foolish to ignore such valid information.

This introduces, however, the debate of the best method by which the athlete can increase levels of creatine. Of course, the simple answer could be direct supplementation. The body can manufacture creatine from the amino acids arginine and glycine; selective amino acid supplementation, therefore, might be the answer.

There is evidence to suggest that inosine supplementation can help the production of ATP at both mitochondrial and cytoplasmic levels. So perhaps this might be the answer?

Creatine, however, is found in abundance in red meat and including red meat in the diet can almost certainly meet the creatine demands of the athlete. Perhaps it might highlight the disadvantage which the vegetarian might experience?

What the research articles do not tell us is which is the most efficient way of making sure that enough creatine is available. Is supplementation of one form or another better than eating red meat? Presumably the former has to be influenced by absorption rates, gastric emptying, conversion losses and so on.

CARNITINE L

What of the next vogue supplement. . . carnitine L? Carnitine is found in the muscles and liver (presumably in storage for future use). It is related to the B group of vitamins and can be synthesized in the body depending upon the availability of vitamin C. Its function includes the transportation of fatty acids prior to their use in producing energy in the mitochondria. Hence in certain conditions fat can be used as a source of energy, fat being an extremely rich source of energy that provides about twice as much energy per molecule as a carbohydrate.

Research suggests that carnitine supplementation can provide energy for certain levels of exercise, thus saving carbohydrates, and that it can help in the recovery process. There might be a case, therefore, for its supplementation with distance runners. However, as has been asked concerning creatine, is supplementation better than producing it naturally in the body through a well-planned diet?

UBIQUONONE

Now to ubiquonone (vitamin Q). Again research indicates that this is an essential co-enzyme in the production of energy and in the ultimate availability of ATP. Should one supplement it in the form of CoQ 10, or via the amino acid phenylalanine, either taken naturally as part of the food intake or via supplementation? Or should one stimulate the body's natural production of the enzyme by a carefully planned diet that should include oily fish, beef, chicken, nuts and soya oil? Like all of the substances previously mentioned, the body can produce more than enough to meet the demands of the athlete, given the right conditions.

Finally, what about the energy replacement drinks now widely available on the market. Those with a high sugar content might not be the most suitable, since they could trigger the insulin response, producing the opposite effect to that intended.

However, the glucose polymers (basically complex starches) must have a place in high level sport.

The truth is the energy replacement process must start very soon after exercise is terminated. If the replacement time is much more than 10 minutes, then the total recovery time could be as long as 48 hours. During this time the elite distance runner will probably have trained an additional two or three times without totally recovering. The body could not take a meal of pasta that soon after exercise, as the effect of exercise is to reduce one's appetite rather than stimulate it. The sugary drinks could do more harm than good. Perhaps an apple or grapes, which are palatable when the athlete is in this state, might be the natural answer. However, there is a need to replace liquid so the glucose polymer drinks could "kill two birds with one stone."

As far as most of these situations are concerned, "You pays your money and you takes your chances."