

## Functionality

# Amino acids

As part of this month's focus on functionality we take a look at the growing market for amino acid drinks in Japan and the opportunities for the European market.

The market for sports and energy drinks is one of the most dynamic beverage sectors worldwide and products that provide a functional benefit, either in terms of sporting performance or boosting energy levels, are becoming increasingly popular. Canadean reports that Asia accounts for almost half of the world's sales, with Japan accounting for 40% of this turnover and the highest per capita consumption at 15 litres. In Japan amino acid beverages have seen amazing levels of growth in recent years thanks to drinks which relieve fatigue or enhance health and beauty, as well as for improving sporting performance. According to Chemical Daily News the market for beverages supplemented with amino acids has grown from 9.6 billion yen (£768,000) in 1996 to over 70 billion yen (£5.6 million) in 2002 with a 240% increase over the last year alone.

One of the major brands in Japan is Ajinomoto's Amino Vital which is available in a range of formats from sachets and gel packs to fortified mineral waters. The different formats and presentations appeal to different age groups and activities but the resounding message is that amino acids provide 'energy for life'. Amino Vital sponsors some of Japan's most famous marathon athletes as well as the annual JAL Honolulu marathon in Hawaii. It is also the official sports drink of the Japanese Track and Field Association, the Professional Golf Association and the national tennis team.

Amino Supli from Kirin is another significant player in this sector. Kirin recently announced the launch of a hot version of Amino Supli with ginkgo leaves and vitamin C, which is positioned to appeal to those wanting a hot beverage in winter. In Japan Coca-Cola Acuaris contains arginine and branched chain amino acids (BCAA).

Significant brand building activity and phenomenal market growth means that awareness of amino acids and their health benefits is high in Japan. Research conducted for Ajinomoto reports that 60% of consumers associated amino acids with being 'good for health'. One of the reasons that the Japanese market for amino acid foods and drinks is so far advanced compared to Europe or the US, is likely to be because it is the home market for some of the companies at the forefront of amino acid research, including Ajinomoto Co Inc which is the world leader.

While the Japanese market is ahead in development of this sector of sports nutrition, a recent report from Frost and Sullivan suggests that the European market for sports nutrition products is going to see significant growth between now and 2009. The report suggests that this growth reflects the move away from sports nutrition products that cater for a niche market to products that are far more appealing to the mainstream consumer.

When it comes to products enhanced with amino acids in Europe there are a few front runners but the market is still relatively undeveloped. Feel-Fine energy drink is available in the UK and Sweden, both as a powder, which can be



added to water or juice, and as a canned beverage. It contains cysteine and glutamine and is positioned as a product to use "whenever the body needs a little help - after exercise, after work, after drinking." It also claims to help relieve "the symptoms of stress or PMT". Another example is Pripps Energy Double Impact Amino, a line extension of the established Pripps Energy drink, which is available in Sweden.



### So why use amino acids?

While the use of amino acids in foods and drinks is a relatively new concept, the nutritional function of individual amino acids have been well researched by pharmaceutical producers and they have long been used in enteral nutrition products, infusions and in supplements for specific nutritional uses. Because amino acids are involved in some of the many metabolic pathways that affect exercise metabolism, non-medical supplementation has, to date, been particularly associated with body-builders.

Advances in food technology, however, mean that it is now possible to develop food and drink products enhanced with amino acids, suitable for use by everyone from marathon runners and weekend warriors to the occasional gym user.

Amino acids are the building blocks of protein in the body. Over 50% of the body's dry weight is made up of proteins which play a vital role in making up the cells of the body's organs, muscles, hormones and enzymes. There are just 20 amino acids that are important for human health and combinations of these make up the 50,000 - 100,000 different proteins required for body structure and function. While the human body synthesises 11 of these amino acids, the other nine must be provided by the diet. These are termed 'essential' and foods that contain all of the essential amino acids include poultry, eggs, milk, cheese, meat, yoghurt and fish.

Essential amino acids (Provided by the diet)	Non-essential amino acids (Synthesised by the body)
Methionine	Glycine
Threonine	Alanine
Valine	Arginine
Tryptophan	Aspartic acid
Phenylalanine	Glutamic acid
Leucine	Asparagine
Isoleucine	Glutamine
Lysine	Cysteine
Histidine	Tyrosine
	Proline
	Serine

When foods containing protein are eaten and digested, they break down into individual amino acids before being absorbed into the bloodstream. This process takes approximately two hours. Once the protein has broken down individual amino acids are absorbed and delivered to the various parts of the body by the bloodstream and used in cells as sources for protein synthesis and energy.

Most people are not short of amino acids provided they are eating a balanced diet. However, there are certain stages of life, particularly childhood and old age, or circumstances such as during sporting activity, when the level of some amino acids in the body is not optimum. In these situations, supplementation with individual amino acids can be beneficial, as it can facilitate recovery or the re-establishing of the

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## AMINO ACIDS - continued

optimal amino acid level for metabolism. In situations where some amino acids are rapidly depleted, for example in intense sporting activity, there is a benefit in consuming beverages containing the individual amino acids (for example, branched chain amino acids valine, leucine and isoleucine) rather than more complex proteins. This is because the amino acids can be more rapidly absorbed than proteins (which have to be digested) and therefore contribute to a faster return to resting state amino acid levels.

### Arginine

Arginine is one of several amino acids of increasing interest to developers of sports and energy drinks. It is classified as a non-essential amino acid because it can be produced by the body. However, because arginine has an important role in the release of growth hormone, it is essential to a child's diet as it is necessary to maintain a normal rate of growth and development.

In sports nutrition arginine is used to enhance recovery rates. When you stop exercising and your body starts to rest, the body produces growth hormone to aid recovery and arginine can be important in this situation. If you already have sufficient arginine in the body, the process works faster meaning that you feel better sooner. Research also indicates that, post-exercise, arginine helps to stimulate the pancreas to release insulin, increasing glucose uptake, which is important for muscle recovery.

### Glutamine

Glutamine is the most abundant free amino acid in muscle, cerebro-spinal fluid, and in circulation. It makes up about 61% of the amino acid pool in skeletal muscle. Muscles store the greatest amount of glutamine and can release it into the bloodstream when levels are low or other tissues need it. Glutamine works by giving muscles the fuel they need to do their job - it provides the nitrogen required by the body to renew muscle protein in everyday life. When this nitrogen source is depleted, for example, during sporting activity, the body starts to break down skeletal muscle to compensate. Supplementation with glutamine may help to produce the nitrogen needed for the body to maintain optimum on-going muscle performance.

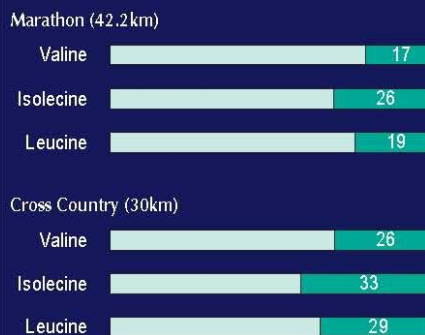
Glutamine's ability to preserve skeletal muscle mass in times of stress is probably what this amino acid is best known for. After surgical trauma, for example, glutamine supplementation as part of total parenteral nutrition, reduces the loss of free amino acids from muscles. Glutamine levels can also be reduced following injury, infection or surgery, and after intense exercise. Such depletion may impact the blood immune-cell balance which lowers immunity. It has been found that glutamine aids the growth of the white blood cells and a depletion of glutamine may be one reason why athletes who 'over-train' are prone to infection and colds. Research by sports scientists indicates that glutamine supplementation may decrease the incidence of respiratory infection in athletes and may reduce exercise induced tissue damage aiding recovery from training. There is also some evidence that glutamine may help athletes avoid infection and sickness during altitude training<sup>3</sup>.

### Branched-chain amino acids

Research suggests that physical performance may be enhanced by the increasing intake of branched-chain amino acids, leucine, isoleucine and valine, all of which are in any case essential and must be obtained from the diet.

The muscles hold a store of BCAA which is broken down to produce energy. Some sports health researchers believe that a fall in the plasma concentration of branched-chain amino acids contributes to fatigue in endurance events and research is ongoing to confirm this. Figure 1<sup>4</sup> shows how the

Figure 1: Percentages of amino acids in the muscles after exercise when the amount before is 100%.



Source: E. Blomstrand, P. Hassmén, B. Ekblom, E. A. Newsholme<sup>4</sup>

percentage of amino acids in the muscles decreases after strenuous exercise.

When BCAA stores become depleted this contributes to muscles becoming sore and fatigued. Replacing levels of BCAA may help to maintain the athlete's performance. Research to date indicates that performances could be enhanced in marathons or endurance sports, in particular.

Those of us who want to stay fit and take exercise regularly are sometimes put off by the aches and pains we suffer and the physical exhaustion that is the result of a vigorous workout. The research in this area suggests that amino acids may be able to help reduce the symptoms of fatigue and improve endurance which may encourage us to exercise more regularly!

In Europe sports and energy drinks are the fastest growing sector in the soft drinks market and already lines are becoming increasingly blurred between products specifically for serious athletes and consumer mainstream food and drinks. In this environment, amino acid drinks that offer tangible benefits to those looking for a physical boost, either during sporting activity or just to help them throughout the day, offer an exciting and potentially valuable opportunity. ■

## REFERENCES

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