18th May 2008

Spinach does build muscle!

Popeye, the sailor man knew it all along, says S.Ananthanarayanan.

Scientists in Rutgers University, New Jersey have found a component in leafy green vegetables (read spinach) that significantly propels the synthesis of muscle tissue. Laboratory tests have shown that this remarkable substance promotes the growth of human muscle by a whole 20%.

Steroids

This is a group of molecules found in living things, which act mainly by helping in metabolism, or the building up of substances from components. Well known steroids are estrogen, progesterone and testosterone, the agents that control the development of sexual characteristics and enable the process of reproduction. Another group is the corticosteroids, which control many aspects of metabolism and also the immune function. And then, there are the notorious anabolic steroids, or the substances that help build muscle and bone tissue.

Basically, the action of steroids is by helping amino acids, the building blocks of proteins, actually string together into different proteins. This is evidently a vital body function and natural or synthetic steroids have played important roles in medicine. The use for performance enhancement and promoting masculine qualities is of great antiquity and forms part of many traditional medical systems. Even before the synthesis of steroids in the 1930s, scientists had experimented with steroids and there was a body of knowledge about their effects on the body. The legitimate use now is largely in inducing bone growth, appetite, in wasting diseases like cancer or AIDS and in treating allergic conditions.

But there is also widespread misuse for performance enhancement in sport and even among students and young people for the enhancement in stamina and well being that anabolic steroids can produce. Apart from being banned in competitive sports, prolonged use of anabolic steroids has side effects like liver tumors, fluid retention, imbalance in cholesterol levels, and gender specific effects. The ‘miracle cures’ that some preparations are able to produce often rely on steroids and where one lands up with their use may be unpredictable.

Phytoecdysteroids

These are plant derived steroids of a class that found mainly in insects and acts to induce moulting, or the breakdown of the inelastic skin or skeletal part of the growing insect's body, a process known as ***ecdysis***. Plants synthesise these steroids mainly as a defense against insect predators. When insects eat plants that contain these substances, they may prematurely moult, lose weight or suffer such changes that reduce their numbers or alter their preferences of feeding.

This kind of synthesis of specific protective agents in plants is an aspect of adaptation to select among predators and is matched by adaptation on the part of the predators, for the balance of the ecosystem. About 250 of such ecdysteroids have been identified and it is believed that there may be about a thousand of them in all. Plants are also suspected of being able to switch the synthesis of these substances 'on or off', depending on stress, danger or other stimuli.

The steroid in spinach

Ecdysteroids, which have the same structure as the hormones that induce moulting in insects, are also found to produce a range of effects in mammals, including growth and increased stamina. A paper of the American Chemical Society, published on 30th April 2008, describes the investigation of the Rutgers group into the mechanism of ecdysteroid action. They prepared a culture of strands of partly formed muscle tissue of species of rat as well as human tissue and exposed the samples to phytoecdysteroids, extracted from spinach. It was found that the formation of muscle tissue increased by 20%. When living rats were given synthetic ecdysteroids, their grip strength increased. Plant extracts that contained ecdysteroids had the same effect.

The scientists were also able to isolate extraneous agents that seemed to inhibit the synthesis promoting effect of ecdysteroids, as a step towards harnessing the substances for use in medical practice.

But the immediate reaction to the publication by the scientists has been awakening of the child in countless adults who have grown up on Popeye, the comic strip character who gained immense strength, to fight the Sea Hag and her minions, by munching a can of spinach. Popeye alone is credited with having induced whole generations of children into healthy eating habits. Now it turns out the sailor man had hard science backing him up!