ALGA DUNALIELLA

HISTORICAL BACKGROUND

About five years ago our factory began a project to growing Dunaliella salina microalga and recovering from it the valuable compound beta carotene. It had been known for twenty years that the Dunaliella salina algae contained a relatively high concentration of beta carotene. This had been reported by researchers in Australia, USSR, Israel and the USA. However, major technical difficulties prevented the harvesting of this microscopic algae. Now it has been developed a unique algal harvesting technique that is economically viable.

OPERATIONS

Our factory has started the project in Atacama Desert, in Northern Chile. The Atacama Desert is the most arid desert of the world, environmental conditions in this place require to living beings a special adaptation to support the extremes temperatures and solar irradiance. Dunaliella salina is a natural inhabitant in this place, due to its surprising physiological adaptations, it lives and grows producing betacarotene for protecting. They are growing this algae in shallow and circular ponds. Water is moved by paddlewheels constantly during day and after growing had finished the salt water bearing the rich betacarotene algae is pumped through the plant continuously, betacarotene is recovered and the water recycled to the ponds. This process is self-contained and has no adverse effects on the environment.

The plant uses physical means only to harvest the algae from salt water, then is washed and spray-dried to sell like an algal powder or converted in tablets for direct human consumption like a natural supplement of carotenoids (antioxidants). There are an increasing amount of scientific papers that indicate a therapeutic effect of beta carotene itself, independent of vitamin A activity. Findings published in journals such as American Journal of Clinical Nutrition, New England Journal of Medicine and The Lancet are subsequently appearing in the mainstream press such as USA Today, Los Angeles Times and the New York Times. The awareness of beta carotene in the general population has increased markedly in the past few years.

DUNALIELLA ALGAE

The microscopic algae named Dunaliella salina is the source of natural beta carotene. The algal cell functions just like an ordinary plant cell: it is photosynthetic, converting carbon dioxide from atmosphere into cell material and to provide energy. This is done by the green chlorophyll in the cell which is normally not visible as it is masked by the intense orange color of the beta
carotene. The beta carotene is produced in response to the harsh conditions of intense light, high salinity and temperatures. It protects the cell by preventing oxidation of cell components under the intense conditions. It is an antioxidant defense mechanism that is proposed to have protective affects in humans. In addition to the high concentrations of beta carotene, Dunaliella salina cell contains natural carotenoids alpha carotene, lutein, zeathantine and criphothazine. Every one of these carotenoids have specific antioxidant activities and assist to human body to a better health. This carotenoids are consumed normally in fruits and vegetables.

Natural beta carotene from the algae comprises an approximately equal mixture of cis- and trans- isomers with the cis- form of beta carotene more soluble in oil than synthetic trans beta carotene.

Synthetic beta carotene is derived from synthetic organic chemicals and is a crystalline form of beta carotene, primarily the trans- isomer. These crystals are difficult to dissolve in organic chemical solvents, implying that the human body would have similar, or greater, difficulties in assimilating the compound. Our natural beta carotene is soluble in oil to about 3.7 % or about ten times the solubility of synthetic oil suspensions. This indicates a higher degree of bio availability in the body. Is important to note that synthetic beta carotene based products have not other additional carotenoids like the natural beta carotene from Dunaliella.

**BETACAROTENE PROCESS**

After grow in shallow ponds, the alga is harvested by physical means, washed and spray-dried. The powder contains between 8 - 10% Carotenoids and is finally packed under nitrogen.

**WHAT BETACAROTENE IS ?**

Betacarotene is the most important naturally occurring pigment responsible for the yellow-red coloration of fruits, vegetables and flowers. The color of carrots, oranges, melons, peaches, apricots and other yellow-orange-red fruits and vegetables is due to the presence of carotene-like pigments-carotenoids. Recently published scientific data indicate that the most important function of B-carotene in our diet is its unique ability to increase the resistance of organisms to disease. Of special interest are the recent medical studies indicating that natural B-carotene may protects animals and humans against the development of various types of cancer. In fact, natural carotenoids may be the most important anti-cancer agents present in natural foods.
Since B-carotene is available in natural sources in very small quantities, it is very difficult and expensive to have it in concentrated forms. The chemical industry developed a synthetic pathway for B-carotene production. The synthetic product is being used at present by the food and pharmaceutical industry as a food coloring agent and a nutritional additive. However, while the synthetic product is composed of essentially only the crystalizable, low fat soluble all-trans B-carotene, the natural pigment, as it occurs in fruits, vegetables and algae, is a mixture of isomers, mostly 9-cis B-carotene, a highly fat soluble, non-crystalizable carotenoid. Beta carotene is an important ingredient in our diet. One molecule of all-trans betacarotene is converted within the human body to two molecules of vitamin A. Beta carotene is the preferred source of this vitamin since, contrary to vitamin A, it is non-toxic even when consumed in excessive amounts.

**ANTIOXIDANTS**

An increasing and important market for the use of beta carotene, which is provitamin A, is the dietary supplement market. Whereas vitamin A is toxic when consumed in high doses, beta carotene is readily metabolized by the body into vitamin A when required.