

5 September 2008

Lecithin: Natural Emulsifier and Health Food

Lecithin is the popular commercial name for a naturally occurring mixture of phospholipids found in vegetables, egg yolk and animals.

While the most common form of lecithin is derived from soy beans, lecithin was first isolated from egg yolk by the French Scientist Nicolas Théodore Gobley in 1846. Gobley named it after the Greek term *lekithos*, meaning “egg yolk” and described it as “a soft viscous orange coloured substance which made an emulsion with water”. Gobley later found similar substances in the brains of various animals.

The presence of lecithin in soy beans was reported in 1889, by Swiss scientists Schulze and Steiger. However it was not until the growth of the crushing and soy oil refining industries in the early 20th century that lecithin offered any real commercial opportunities for both the food manufacturing and health food applications.

Lecithin is described as being a “multi functional surface active agent”. It has a lipophilic component (oil tending) and a hydrophilic component (water tending) which allows it to assist in the formation of emulsions. Due to its higher percentage of lipophilic portions, lecithin will generally disperse better in oil than in water. It is commonly used in water-in-oil (W/O) emulsions such as margarines, and patents on the manufacture and use of lecithin date back to 1923.

Lecithin Manufacture

Lecithin is manufactured during the degumming step in soy oil manufacture. Crude soy oil contains around 1.8% lecithin which is removed by adding water to the oil, then separating out the lecithin/water sludge formed. This material can then be bleached with a small amount of hydrogen peroxide, which lightens the colour and significantly lowers microbial levels. The lecithin is then heated to evaporate off the hydrogen peroxide and dried to less than 1% moisture.

Liquid soy lecithin contains 62–65% phospholipids (the active emulsifier component), plus some soy oil and free fatty acids. Liquid lecithin is difficult to handle and will not readily dissolve in water. Clean-up usually requires lots of hot water and industrial strength detergent. However, liquid lecithin will readily dissolve in oil, so it is commonly used in W/O emulsions.

Chemically modified lecithin is also common overseas, particularly in the USA, but the use of such Lecithins is usually restricted by legislation and increasing customer demands for ‘all-natural’ products.

Standard liquid lecithin can be ‘de-oiled’ using solvents such as acetone or ethanol, producing a powdered or granular product with at least 90% phospholipids.

In the last 20 years the de-oiling process has been further improved to extract the phospholipids without the use of acetone. The result is a much cleaner tasting product with a higher natural Lutein content. Lutein is a natural antioxidant that has been linked to the prevention of age related macular (retina) degeneration. With the oil and free fatty acids removed, these de-oiled lecithin products are much easier to handle, and are commonly used in products such as bakery mixes, snack bars and cereals.



Health Aspects

While food scientists studied the functional properties of this natural emulsifier, medical professionals were also researching its medical properties. In 1931 and 1932 three studies were published in the American Journal of Physiology reporting on the effects of lecithin on pancreas and liver function in dogs. In 1941 German Scientist Rudolf Kunze published a 166 page book titled Lecithin, summarising the therapeutic use of lecithin in the prevention or treatment of various neurochemical and cardiovascular disorders.

Despite increased concern over cholesterol and heart disease, interest in the health benefits of lecithin waned somewhat, until the publication in the USA of Adelle Davis' book Lets Eat Right to Keep Fit in 1954. Many scientific studies continued to show promising results. By the early 1980's many papers had been published on the therapeutic benefits of lecithin, with some contradictory findings.

Using some of the more positive health research, some lecithin manufacturers started promoting de-oiled lecithin products to health-conscious customers. In the early 1980's one major American manufacturer offered a granular lecithin specifically for the health and natural food trade. This was later offered with fruit and nut ingredients to make the product more appetising. Lecithin continues to enjoy consistent demand in health food shops, especially in New Zealand.

Lecithin Applications

The three main applications for lecithin continue to be in margarine, chocolate and improving the dispersibility of powders, although several other specialised applications have been found.

Lecithin is a common emulsifier in standard margarines, where liquid lecithin is pre-blended with the oil stream to help form the emulsion. Liquid lecithin can often be used *solus* in full fat margarine systems, but usually needs to be used in conjunction with other emulsifiers such as unsaturated distilled monoglycerides as the fat level drops.

Lecithin is an important emulsifier in chocolate manufacture, especially during the conching process. Conching results in a finer chocolate particles, flavour development and the reduction in moisture content, which reduces the yield value. To allow the chocolate to flow without binding excessive moisture a small amount of lecithin is added at the start of the conching process. More lecithin is usually added at the end of the conching process to adjust the flow properties of the chocolate.

Many food powders such as cocoa powder and whole milk powder have poor dispersibility when added to water. Many cocoa powders are available with 15% lecithin to assist with dispersibility, especially in applications such as instant cold drinks. The process of milk powder lecithination has also developed over the last 20 years with milk powder manufacturers able to use various lecithins to achieve short wetting times. Manufacturers in the USA commonly add approximately 1% to the agglomerate water and added during spray drying. Alternatively a blend of liquid lecithin and low viscosity diluent (such as vegetable oil or anhydrous milk fat) can be added to milk powder during the final stages of drying to obtain the desired wetting times for whole milk powder. Typical dose rates are 0.2% to 1.0%.

Due to the high degree of lipophilic components lecithin is also frequently used as a tin- or mould-release agent in bakery and confectionery applications, or in formulations where some degree of lubrication is required. Lecithin has also been shown to form complexes with starch and can improve crumb softness and shelf life in bread.

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This article was first published in the August / September 2008 edition of Food New Zealand, the official journal of the NZ institute of Food Science and Technology.