

Application of Lipid Soluble Nutraceuticals in Foods

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Nutraceuticals

- Food or part of food that allegedly provides medicinal or health benefits, including the prevention and treatment of disease
- The term coined by Stephen DeFelice, founder and chairman of the Foundation for Innovation in Medicine, Cranford
- Derived from plants, animal, micro-organisms or marine source
- These can be lipid soluble or water soluble, depending on their solubility property

Why Lipid Nutraceuticals?

- Play an important role in nutrition and many biological functions
- Enhance organoleptic and texture properties of food products
- Play important roles in most of the biological processes as a source of essential fatty acids and as a source of energy via beta oxidation
- Absorbed well in small bowel using the same transport mechanisms as cholesterols and fats

Why Lipid Nutraceuticals?

- Play important roles such as metabolism control and human wellness
- Reduce risk of certain chronic diseases and helps healthy aging
- The market has responded by providing lipid foods in palatable and acceptable forms so that the benefits can be derived at large
- Efforts are oriented towards inclusion of these fatty acids into foods such as spreads, bread, cereals and dairy products to cater needs of variable age group customers

Importance of Lipid Soluble Nutraceuticals

- New findings related to health effects has resulted in increased interest and demand for lipid soluble nutraceuticals
- Because of fatty or oily nature, they impart desired flavor, texture and mouth feel to foods
- Beneficial health effects and essentiality of fat-soluble vitamins and carotenoids for eye health, cognitive health, skin health and for overall well-being have been recognized

A decorative graphic on the left side of the slide consists of several overlapping, semi-transparent circles in shades of blue and grey, with a small blue sphere at the top left.

Advantages of Lipid Soluble Nutraceuticals

- Acceptable in the body due to permeability through lipid layers of cells
- Sustained release of active ingredients due to slow absorption
- Exhibit desired stability under proper formulation and storage condition
- Significant therapeutic efficiency of properly formulated actives
- Impart many health benefits in palatable forms

Lipid Soluble Nutraceuticals Through Food

- Offer a comprehensive and effective approach for maintaining overall well-being
- Food products containing nutraceuticals are more cost-effective than supplements
- high doses of nutraceuticals in food are helpful for reversing and preventing deficiencies
- Important since the modern diet usually fails to provide sufficient quantities of many essential vitamins and minerals.
- Food grade ingredients and rigorous testing ensure only the safest and highest quality products

Lipid Soluble Nutraceuticals, Their classes & Sources

Class /Components	Sources
Fatty Acids	
Conjugated Linoleic acid	Milk
DHA, EPA	Fish oil, mustard, linseed
Polyphenols	
Anthocyanins	Fruits
Cathachins	tea, babul pods, mustard cake
Flavones	Fruits, vegetables, soya
Saponin	Soyabeans, chic pea
Carotenoids	
B-Carotene	Carrots, Vegetables, Fruits
Lutein,zeaxanthin	Vegetable, Eggs, corns
Lycopene	Tomato

Lipid Soluble Nutraceuticals, Their Classes & Sources

Class /Components	Sources
Curcuminoids	Turmeric
Zingiber officinale	Ginger
Flavonols	Onions, Apples, Tea
Capsicum	Chilli peppers
Probiotics/prebiotics/symbiotic	
Lactobacillus	Dahi, Yogurt
Fructo oligo saccharides	Whole Grains, Onions, Combination of pro & pre biotics
Phytosterogen	
Daidzein	Soyabean, flax, lentilseed
Zenistein	Maize
Lignans	Flax, rye, vegetable

Formulation challenges for Foods with Lipid Nutraceuticals

- Low water insolubility, poor absorption and bioavailability
- Subject to oxidative degradation.
- Oily in nature, difficult to handle and formulate
- Difficult to achieve Uniformity of contents
- Timely release in desired concentration for achieving benefit
- Need to achieve desired concentration, while formulating with other ingredients

Bioavailability Challenges for Lipid Soluble Nutraceuticals

Many physicochemical and physiological events present challenges for lipid soluble nutraceuticals during passage through GIT:

- (i) Restricted liberation from foods (Food matrix effect)
- (ii) Extensive metabolism or chemical transformation
- (iii) Low solubility in intestinal fluids
- (iv) Low permeation through the intestinal cell monolayer; and
- (v) Transporters in GIT

Formulating Foods having Lipid Nutraceuticals

- Formulation of a palatable product with desired attributes is task from a technological and food quality point of view
- Need to avoid adverse effect on sensorial properties of foods while formulating
- Bioavailability can be improved by designing the composition and structure of food matrices to control their liberation, transformation, solubilization, transport, absorption, and efflux in the GIT

Achieving Stability

Foods with lipid soluble Nutraceuticals should be evaluated for stability due to:

- Effect of Moisture
- Effect of Temperature
- Effect of Oxygen
- Effect of Ingredients/excipients

Incorporating Lipid Nutraceuticals in Food

- Careful selection and use of solubilizers, emulsifiers, wetting agents, absorption enhancers, taste masking agents, stabilizers are required
- Need to achieve uniform mixing, consistency, enhancing palatability and convenience of administration
- Techniques like emulsification, high shear mixing, encapsulation, taste masking, solubilization are to be selected as per requirement
- Incorporation into colloidal delivery system would help so that they become readily dispersible in aqueous- based products

Lipid Soluble Nutraceuticals in Foods

- Can be conveniently incorporated in food items so that these are acceptable to a large volume of population
- Food application is found to be of immense importance because of enhanced stability and palatability
- These foods are found to be convenient to administer and absorbed well by the body, thus exhibiting the desired benefits over a period of time
- Appear to be part of daily diet and found acceptable to pediatric and geriatric patients, without exhibiting any untoward side effects

Thank You

