

# Pharmaceutical and Cosmetic Uses of Palm and Lauric Products

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## ABSTRACT

The pharmaceutical and cosmetic industries are large and still growing. New products, astute marketing and sophisticated advertising have been very effective in these industries. They are more and more exacting and highly complex in their requirements. They require specification products with specific performance characteristics.

The cosmetic industry and drug or pharmaceutical industries are defined. Information is given about the unique composition of palm and lauric oils which make them suitable raw materials for use in these applications.

These two base oils are used in the form of triglycerides, whole fatty acids, fractionated fatty acids or fatty chemical derivatives. Information is given about these various ingredients, their use in specific cosmetic and pharmaceutical products and reasons for their use.

Particular use is made of palmitic, stearic, myristic and short-chain fatty acids. The derivatives would include glycerine esters, monostearates, other monoglycerides, propylene glycol esters, polyglycerol esters, sorbitans and sorbitan ethylene oxide products, isopropyl palmitic and myristate. Specific powdered stearins and cocoa butter substitutes are used in various formulations.

The production and marketing of ingredients for this industry are natural growths of the developing fatty acid industry in Malaysia and nearby countries of southeast Asia.

## INDUSTRY REQUIREMENTS

The pharmaceutical and cosmetic industries are very demanding and exacting. Their products must meet stringent criteria of performance and specifications. There must be practices of careful manufacturing and cleanliness in the preparation of their products. The raw materials and ingredients must comply with established standards of formulation and in many instances with regulatory standards and safety.

Although the science of pharmaceuticals and cosmetics is as old as recorded history and perhaps even older, it is also as new as current technology in this era of technological developments. Recorded literature of the science in these fields lags way behind the actual progress of research and development. Suppliers of these products have found it imperative to coordinate their many talents of expertise, product development, manufacture and marketing to develop their business. Considerable success has been attained by many companies with attendant growth and considerable profit increase.

## COSMETIC PRODUCTS

At the outset, it may be desirable to define "cosmetic." The United States Food, Drug and Cosmetic Act of 1938 defines it as "(1) articles intended to be rubbed, poured, sprinkled or sprayed on, introduced into, or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance, and (2) articles intended for use as a component of any such articles, excepting that the term shall not include soap."

## PHARMACEUTICAL PRODUCTS

For our purpose the terms "drugs" and "pharmaceuticals" are interchangeable. Thus pharmaceuticals may be defined as (1) articles recognized in the official United State Pharmacopeias, official Homoeopathic Pharmacopeias of the United States, or official National Formulary, or any supple-

ment to any of them; (2) articles intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease in man or other animals; (3) articles (other than food) intended to affect the structure of any function of the body of man or other animals; and (4) articles intended for use as a component of any articles previously specified in claim (1), (2), or (3) but does not include devices or their components, parts or accessories.

Thus many products conform to definitions of both drugs and cosmetics under the Act. Generally speaking, all countries either follow the above United States practices or have their own regulations which are very similar.

## EMOLLIENTS

The term "emollient" as used in this paper defines substances that help to maintain the desired smooth, soft and pliable texture of the normal human skin. By such means protection is provided against dryness and irritation.

## SCOPE, POTENTIAL AND REQUIREMENTS

For our purpose we will describe and elaborate on the use of palm and lauric products in pharmaceutical and cosmetic products as one broad category rather than listing each separately. Many other ingredients are used in these products, of course, which will not be described in this paper.

This industry is big. One estimate places the market for cosmetics and toiletries in the United States at over ten billion dollars per year. It is still growing at a rapid rate by virtue of many fine products and extensive advertising promotion and expert marketing. The final products produce good profits for producers and sellers. The best quality raw materials are used in the preparation of these products used by the industry. The ingredients used must comply with the buyers' specifications and applications. Such criteria are far more essential than the prices paid for these ingredients. Thus the profits are very good for the suppliers of these ingredients. Moreover, there is considerable reluctance to change suppliers once one is approved as a responsible and effective supplier.

## COMPOSITION OF PALM AND LAURIC OILS

It would be well to review a composition chart for fats and oils as shown in Table I. Special reference should be made to palm oil, which has a palmitic acid content of some 44%, the highest of the common oils and fats. The composition of beef tallow is shown as a comparison. Also note the 39% of oleic acid contained in palm oil, which is very desirable. Normal palm oil as well as fractionated palm oil products are used as such or as fatty acids in the products used for these ingredients. The palm oil stearins have higher palmitic acid contents and the oleins have higher oleic acid contents.

The lauric oils have unique compositions. The lauric acid contents are in the range of 48%. These oils contain 8-15% of short chain caprylic and capric acids. The lauric oils are further distinguished by their myristic acid content of 15.6 to 18%. Here again these oils are used as such or as fractionated. The fatty acids may be fractionated and used as such or more often as ingredients for further processing into fatty chemical derivatives.

**TABLE I**  
**Chemical and Physical Properties Composition of Selected Fats and Oils**

Predominant fatty acid	Common designation	Palm oil	Palm stearin	Palm olein	Beef tallow	Coconut oil	Palm kernel oil <sup>a</sup>
Caproic	C <sub>6</sub>					0.2	0.3
Caprylic	C <sub>8</sub>					8.0	4.4
Capric	C <sub>10</sub>					7.0	3.7
Lauric	C <sub>12</sub>	0.2	0.1- 0.6	0.1- 1.1		48.2	48.3
Myristic	C <sub>14</sub>	1.1	1.1- 1.9	0.9- 1.4	2.5	18.0	15.6
Palmitic	C <sub>16</sub>	44.0	47.2- 73.8	37.9- 41.7	26.6	8.5	7.8
Stearic	C18:0	4.5	4.4- 5.6	4.4- 4.8	21.8	2.3	2.0
Oleic	C18:1	39.2	15.6- 37.0	40.7- 43.9	42.8	5.7	15.1
Linoleic	C18:2	10.1	3.2- 9.8	10.4- 13.4	2.3	2.1	2.7
Other		0.8	0.2- 1.2	0.4- 1.5	4.0		0.1
Total		100.0			100.0	100.0	100.0
<b>Analyses</b>							
Iodine value		53.3	21.6- 49.4	56.1- 60.6		9.5	17.8
Saponification value		195.7	193 -206	194 -202		256	245
Wiley melting point (° F)						76	72
Slip melting point (° C)		95.7	44.5- 56.2	19.4- 23.5			27.3
Cloud point (° C)				6.6- 14.3			

<sup>a</sup>Source: PORIM.

### PALM OIL FATTY ACID UTILIZATION

It should be noted that the fractionated palm oil stearin has an even higher palmitic content as well as a lower price compared to normal palm oil. The raw material is hydrogenated to saturation, pressure split and fractionated to 90-95% palmitic acid. It is then processed further in a batch reactor into isopropyl palmitate. In this form it is used in bath oils, aerosol hair conditioners, fluid hair conditioners, hair grooming aids, hand creams, lotions and rouges. The ethylene glycol mono- and distearates as well as the glyceryl and propylene glycol palmitates and stearates are effective opacifiers in shampoo.

Palm oil fatty acids are an excellent source material for various stearic acids, especially where the triple pressed type of 55% palmitic and 45% stearic are required. These stearic acids are widely used in cosmetic formulations in antiperspirants, emollient creams and lotions, eye makeup, hair grooming aids and straighteners, nail whiteners, shampoos and shaving creams. These stearic acids are also processed into derivatives, such as butyl stearate, isobutyl stearate, glycerol monostearate and propylene glycol monostearate. They are used in face powders, hand creams, lotions, shampoos, lipstick, mascara, durable powder, foundations for heavy makeup and many similar products.

### USE OF GLYCERINE

Commercially pure glycerine is in wide-scale use in pharmaceutical and cosmetic products. Palm oil and the lauric oils are a major source of natural glycerine. Some uses would be in antiperspirants, baby preparations, emollient creams, eye lotions, hair grooming aids and lacquer, shaving creams, shampoos, and in similar products. Of course, glycerine is also used for preparation of chemical fatty derivatives such as glycerol monostearate, glycerine esters and polyglycerol esters.

### USE OF FATTY ACIDS FROM LAURIC OILS

The lauric oils, especially coconut and palm kernel oils, are unique and more versatile than palm oil and have many uses in pharmaceuticals and cosmetic formulations. One large field would be shampoos, in which it is usually the principal fat. Shaving creams usually contain some lauric oils. Coconut fatty acids and methyl esters are used in alkanolamides

and superamides for use in shampoo and similar products. The fractionated short-chain free coconut fatty acids find use in nonirritating and good lathering shaving soaps. Coconut oil or a fraction of the acids derived therefrom are necessary in shaving cream. Coconut fatty acids can be used in cuticle removers. The amine condensation products of lauric acid make excellent bases for the formulation of bubble bath products. Diethylene glycol monolaurate can be used as a solvent and lubricant. In conjunction with small amounts of soap, it acts as an excellent emulsifier for the manufacture of hand lotions and similar cosmetic products.

Myristic acid is fractionally distilled from crude coconut oil fatty acids and then used to produce isopropyl myristate. Of course, methyl myristate can be produced from methyl esters and also can be used as a starting material here. Isopropyl myristate is a common ingredient in such products as hair conditioners, bath preparations, eye makeup, hair grooming aids, lipstick, shampoo and similar products.

### MONOSTEARATES

More should be said about glycerol monostearate since it is used in so many cosmetic and pharmaceutical products. The fatty acid is usually of triple-pressed composition. This emulsifier can be available in higher monoglyceride contents, and the distilled form may be as high as 90%. It is usually the self-emulsifying type. It is available in flakes or the more preferred form of fine bead or powder. It imparts solvency, body and emolliency, and prevents separation of the formulations. It finds use in silicone-containing cosmetics and pharmaceutical products. Most antiperspirant creams, deodorant creams, shaving creams, and many other creams contain glycerol monostearate.

### REQUIREMENTS FOR VARIOUS INGREDIENTS

Fats, oils, glycerine, fatty acids or chemical derivatives are very seldom single chemical substances in these formulated products, but rather mixtures of the predominant constituents and lesser amounts of the related compounds. Of major significance is the capability and reputation of the supplier as assurance of uniformity of product. Oxidative stability of an ingredient is very important. In some products low bacteria certification is desired.

## 2-ETHYL HEXYL PALMITATE

Still another interesting fatty derivative is 2-ethyl hexyl palmitate. This is a colorless liquid with iodine value less than 1.0 and with high stability. It finds use in cosmetics where good emolliency, low odor and solubility are desired. It is soluble in ethanol, isopropanol and mineral oil, but not in water, propylene glycerol or glycerine. It is used in skin creams, lotions, bath oil, antiperspirants, deodorants and skin and eye makeup.

## SORBITOL ESTERS, ETHYLENE OXIDE PRODUCTS, GLYCOL ESTERS AND POLYGLYCEROL ESTERS

Other emulsifiers are available for emulsifying and solubilizing functions. Various properties of hydrophilic and lipophilic can be attained as required. The sorbitol esters of monostearate, tristearate and monopalmitate are examples. In addition there are the companion products of the ethylene oxide reaction products. The PEG 400 monolaurates, dilaurates, monostearates and distearates are other emulsifiers that are available. Of more recent availability are a host of polyglycerol esters which are available using various fatty acid formulations and specific polyglycerols of varying molecular weights. It is obvious that there can be a lot of interchangeability in these ingredients to get the desired finished cosmetic and drug products. Some of the uses for these ingredients would be fine creams, lotions, germicides, perfume oils, antibiotics, hormones, vitamins, ointments and suppositories. Other uses would be lipsticks, hair conditioners and skin cleansers.

## SHORT-CHAIN GLYCERINE PRODUCTS

The short-chain caprylic-capric glycerine esters are available for use in these products. They are emollient oils which are safe, and have excellent stability and fine lubricity. They have low skin irritation and excellent skin absorbance. One of these products is alcohol-soluble and is a very fluid oil. This ester is completely saturated and is tasteless and odorless. This product can be a carrier oil for cosmetic and pharmaceuticals including vitamins. These oils can be sterilized for injectables at a much lower temperature than ordinary carrier oils. This base fatty acid can also be reacted to produce a propylene glycol dicaprylate/dicapriate, finding use as a high-quality emollient oil. It is soluble in alcohol containing up to 20% water, has low viscosity, has a smooth nonoily feel and imparts excellent deposition on the skin. Various other variations of these esters are available, such as monoglycerides. These products are used in body oils, bath oils, emollient creams and lotions, lipsticks, glossers, makeup bases, suntan oils, toothpaste, mouth washes, pre- and aftershave lotions, flavor and fragrance carriers and extenders, vehicles for vitamins, antibiotics and medicinals and even for dietary supplements.

## ISOSTEARIC ACID AND COMPOUNDS

Another interesting fatty acid that can be derived from the olein fraction in the fatty acid fractionation of palm oil and similar fats and oils is isostearic acid. It is a liquid isomer of stearic acid consisting of a complex mixture of saturated branched chain C<sub>18</sub> fatty acid isomers. The cosmetic-grade fatty acids are water white in color, the iodine value is about 3.0 or less, and the titer is 6 C. It is a very stable

product. This fatty acid has low skin irritative potential, nonirritative eye application and low toxicity. It finds use as an emollient in cosmetic products. The isopropyl isostearate and isocetyl alcohol are also available. Claims are made for the "soft skin feel" of certain cosmetics along with improved emolliency, lubricity and moisturizing properties. It finds use in spreading bath oils, cleansing creams, hand lotions, shampoos and preshave lotions.

## POWDERED STEARINS

Fine particle-size powders are available from food-grade fully hydrogenated palm oil. These products have virtually no metal contamination, are low in acid value and are almost odorless. This type of product is used as a tablet lubricant in the pharmaceutical industry. It is generally added during granulation. The high palmitic content in this product is deemed to be desirable. It is also suggested that a tripalmitin produced from high purity palmitic acid could find effective use in this industry. This product too would be in the spray beaded form. Both of these products have the very stable beta prime crystalline structure.

## COCOA BUTTER SUBSTITUTES

Cocoa butter had found many uses in the past in cosmetic and pharmaceutical products. Currently many so-called "hard butters" or cocoa butter substitute products have found wide use as replacements for cocoa butter in this field. These products are available with various narrow melting characteristics deemed essential for these applications. These products crystallize in a stable form that is not brittle. The basic fat is palm kernel oil. These fats may be fractionated, hydrogenated or modified as desired. The products are very light in color and are bland and neutral. The physical form may be in flakes or beads. A large use is for suppository bases. Another use is as a vehicle for a candy-coated laxative. These fats are also used in various facial creams, among other functions. They find use in lipsticks, solid perfumes and stick cosmetics.

## FATTY ALCOHOLS

Small amounts of fatty alcohols and fatty alcohol ethoxylates derived from palm and lauric oils are used in quite a few cosmetic creams and lotions as lustering and stabilizing agents. By this means the viscosity is increased and the desired lubricating sensation is imparted to the skin. Another use would be to enhance lubricity of the cosmetic formulation.

## OPPORTUNITIES FOR INDUSTRY DEVELOPMENT

There has been a recent and growing development of the fatty acid industry in Malaysia, Taiwan, Philippines, Korea, India and other nearby countries. However, the processing of fatty derivatives is still very limited. Obviously there are many opportunities for expansion of the fatty acid industry into these products. Products for cosmetic and pharmaceutical uses derived from palm and lauric oils are only a small part of this industry. Raw materials from other sources are used and the endproducts are used in many different industries such as foods, textiles, paper chemicals, petroleum industry, chemicals and detergents.