FINAL REPORT OF THE SAFETY ASSESSMENT FOR CAPRYLIC/CAPRIC TRIGLYCERIDE

Caprylic/Capric Triglyceride, an oily mixed ester preparation predominantly composed of caprylic and capric fatty acids derived from coconut oil, has been used extensively in cosmetics, foods, and pharmaceuticals. When absorbed from the digestive tract, it is hydrolyzed, and the fatty acids are catabolized to C_2 fragments which may be further metabolized either to CO_2 or to form long-chain fatty acids.

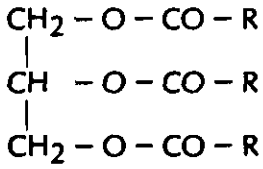
It has a very low toxicity to man and animals as shown by tests involving oral ingestion, intraperitoneal and intramuscular injection, skin and eye irritation tests, skin sensitization, percutaneous toxicity and finally, by two generation feeding studies.

The data reviewed support the conclusion that Caprylic/Capric Triglyceride is safe when incorporated in amounts similar to those presently marketed in cosmetic products.

CHEMICAL AND PHYSICAL PROPERTIES

STRUCTURE

Caprylic/Capric Triglyceride is a medium-chain triglyceride with the following structural formula (CTFA, 1978)[1]:



R represents the alkyl moieties primarily of C_8, caprylic (octanoic) and C_{10}, capric (decanoic) acids.

This mixed ester is manufactured by hydrolyzing coconut oil, removing the free glycerine, and separating the medium chain length fatty acids by fractional distillation. The acids are then blended in the proper ratio and re-esterified with glycerine. The resulting oil is soluble in ethanol to about 20% by weight (CTFA, 1978, Babayan, 1968, 1974).

[1]Available upon request. Administrator, Cosmetic Ingredient Review, Suite 212, 1133 15th St., NW, Washington, DC 20005.

PROPERTIES

The data in Table 1 characterizes this ingredient as it is currently manufactured:

TABLE 1. Chemical and Physical Properties (CTFA, 1978)[1]

Test	Range (% W/W or other basis)	Methodology
Specific gravity at 25°/25°C	0.92 – 0.96	USP
Refractive index at 20°C	1.4480 – 1.4510	USP
Saponification value	300 – 360	AOCS cd 3-25
Hydroxyl value	5.0 maximum	PAP
Acid value	0.1 maximum	AOCS cd-3a-63
Iodine value	1.0 maximum	AOCS cd 1-25
Moisture	0.15% maximum	Fischer

REACTIVITY

These triglycerides can undergo hydrolysis by enzymatic or chemical means to produce free fatty acids, partial glycerides, and glycerol. The free fatty acids may, in turn, undergo enzymatic beta-oxidation. Beta-oxidation of caprylic acid forms beta-ketocaprylic acid and can be further oxidized to yield acetic acid and C_6-acid. However, it is possible that the beta-ketocaprylic may also be oxidized to form methyl-n-phenylketone by decarboxylation. In the case of capric acid, methyl-n-heptylketone may also be formed (Hilditch, 1940).

ANALYTICAL METHODS

Older analytical methods for this ingredient involve the use of its infrared spectrum and the distillation range of its hydrolyzed fatty acids as a means of identification. Today, this ingredient may be analyzed by gas-liquid chromatography (CTFA, 1974; Guillot et *al.*, 1977).

IMPURITIES

The only known impurities are approximately 300 ppm free fatty acids and as much as 0.2% glycerol. The relatively low iodine number 5, which is determined in an arbitrary but standard method, indicates very little unsaturated material present (CTFA, 1978)[1].

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TABLE 2. Product Formulation Data (FDA, 1976)

Ingredient	Cosmetic Product Type	Concentration (%)	Number of Product Formulations
Caprylic/Capric Triglyceride	Bath oils, tablets, and salts	> 1 to 5	1
		> 0.1 to 1	1
	Other bath preparations	> 1 to 5	1
	Eye shadow	> 25 to 50	2
		> 10 to 25	2
		> 5 to 10	89
		> 1 to 5	2
		> 0.1 to 1	39
	Other eye makeup preparations	> 25 to 50	2
		> 10 to 25	1
		> 5 to 10	1
	Colognes and toilet water	> 0.1 to 1	4
	Perfumes	> 25 to 50	1
		> 5 to 10	38
	Other fragrance preparations	> 5 to 10	28
	Hair conditioners	> 1 to 5	1
	Hair sprays (aerosol fixatives)	> 1 to 5	1
	Shampoos (noncoloring)	> 0.1 to 1	1
	Tonics, dressings, and other hair grooming aids	> 1 to 5	1

TABLE 2. (Continued). Product Formulation Data (FDA, 1976)

Ingredient	Cosmetic Product Type	Concentration (5)	Number of Product Formulations
Caprylic/Capric Triglyceride	Blushers (all types)	> 50	3
		> 25 to 50	8
		> 10 to 25	5
		> 5 to 10	8
	Foundations	> 25 to 50	1
		> 5 to 10	10
		> 1 to 5	11
		> 0.1 to 1	1
	Lipstick	> 10 to 25	7
		> 5 to 10	140
		> 1 to 5	20
	Makeup bases	> 10 to 25	3
		> 5 to 10	1
	Rouges	> 5 to 10	8
	Makeup fixatives	> 25 to 50	1
	Nail creams and lotions	> 25 to 50	1
		> 5 to 10	1
	Deodorants (underarm)	> 0.1 to 1	2
	Aftershave lotions	> 1 to 5	2
	Shaving cream (aerosol, brushless and lather)	> 1 to 5	2
	Other shaving preparation products	> 1 to 5	1

TABLE 2. (Continued). Product Formulation Data (FD. ., 1976)

Ingredient	Cosmetic Product Type	Concentration (%)	Number of Product Formulations
Caprylic/Capric Triglyceride	Cleansing (cold creams,	> 10 to 25	1
	cleansing lotions, liquids	> 5 to 10	1
	and pads)	> 1 to 5	1
		> 0.1 to 1	1
	Face, body and hands	> 10 to 25	3
	(excluding shaving prepara-	> 5 to 10	8
	tions)	> 1 to 5	1
		> 0.1 to 1	2
	Moisturizing	> 5 to 10	1
		> 1 to 5	58
	Night	> 5 to 10	1
		> 1 to 5	1
	Wrinkle smoothing (removers)	> 0.1 to 1	1
	Other skin care preparations	> 25 to 50	1
		> 1 to 5	2
	Suntan gels, creams and	> 10 to 25	2
	liquids	> 5 to 10	1
		> 1 to 5	8
		> 0.1 to 1	1
	Other suntan preparations	> 10 to 25	1
		> 5 to 10	1
		> 0.1 to 1	1

USE

PURPOSE AND EXTENT OF USE IN COSMETICS

The desirability of this ingredient is based on its stability, solubility, lack of odor, color, and its blandness. It provides lubricity, promotes pigment dispersion and modifies the viscosity or hardness of finished formulation.

Caprylic/Capric Triglyceride is present in over 500 varieties of cosmetic formulations in concentrations from >0.1 – >50% as shown in Table 2 (FDA, 1976). The ingredient functions as a vehicle for pigment dispersions, as noted above. It is compatible with oleophilic ingredients and can be emulsified in water.

It presence in bath oils, hair sprays, and lipsticks provides contact with, and opportunity for absorption through, most body surfaces including skin, mucous membrane, and respiratory tract. The use of Caprylic/Capric Triglyceride in lipsticks provides an opportunity for frequent daily contact for a duration of perhaps 16 to 18 hours. When used in other products such as hair sprays, frequency of application may be once or twice a day with the ingredient remaining in contact for a few days.

NON-COSMETIC USES

Letters issued by the Food and Drug Administration have attested to the safety of Caprylic/Capric Triglyceride when used as a food additive. Its status as a Generally Recognized As Safe (GRAS) food additive is under review as are all GRAS materials (FDA, 1962, 1963, 1972).

In addition, it has also been marketed for consumption since 1962 as a nutritional supplement and blood lipid lowering agent. It has also been suggested for use in enteric drugs and rectal suppositories and as a vehicle for topically applied pharmaceuticals (Mead, 1977[1]; Kalser, 1971; Franz, 1976; Regdon, 1977; Dowrick, 1977).

BIOLOGICAL PROPERTIES

GENERAL EFFECTS, ABSORPTION, AND METABOLISM

There are no published data available concerning absorption and metabolism of Caprylic/Capric Triglyceride when topically applied to the skin. It is not known if the oil is absorbed through the skin. If absorbed, the liver would likely be the organ primarily involved in its metabolism.

Most of the data available deal with the absorption and metabolic behavior of ingested Caprylic/Capric Triglyceride (Greenberger and Skillman, 1969). The substance is rapidly absorbed from the intestine and predominantly catabolized in the liver to C_2 fragments. The C_2 fragments are further converted to CO_2 or used to synthesize longer chain fatty acids. Very little of the ingredient, if any, is said to be stored in adipose tissues. The development of cholesterolemia and atheromatous lesions in rabbits by dietary cholesterol

differs when Caprylic/Capric Triglyceride is fed as the vehicle as compared to when corn oil is offered as the vehicle. Medium-chain triglycerides are absorbed readily when fed to cirrhotic patients with poor fat absorption. Caprylic and Capric triglycerides greatly reduce the fecal fat content of patients with liver cirrhosis and steatorrhea. Long-chain fatty acids appear to be collected into the thoracic duct lymph as chylomicrons of triglycerides, whereas medium-chain fatty acids may be absorbed directly into the portal system as albumin-bound free fatty acids. Puromycin, which inhibits the absorption of oleic acid triglycerides has no effect on the absorption of ^{14}C labeled trioctanoin (caprylic triglyceride) in rats. Medium-chain triglycerides stimulate pancreatic enzymes in rats less effectively than long-chain triglycerides (Kalser, 1971; Kritchevsky and Tepper, 1965; Linscheer *et al.*, 1966; Feres *et al.*, 1967; Kayden and Midick, 1969; Leveille *et al.*, 1967).

ANIMAL TOXICOLOGY

General Studies

Acute Toxicity

Oral: Single doses of several preparations of Caprylic/Capric Triglyceride have been administered orally to mice or rats in a number of different laboratories. The results are summarized in Table 3.

TABLE 3. Acute Oral Toxicity of Caprylic/ Capric Triglyceride

Dose/kg	Species (no./group, sex)	Mortality (%)	LD50/kg	Reference
25.0 ml	Mouse (10F)	0	> 25 ml	(Consultox, 1977)[1]
12.5 ml	Mouse (10F)	0		
20.0 ml	Mouse (10F)	20	> 25 ml	(Consultox, 1977)[1]
25.0 ml	Mouse (10F)	10		
4.5 ml	Rat (10M)*	0		
9.0 ml	Rat (10M)*	0	> 36 ml	(Rheinischen, 1971)[1]
18.0 ml	Rat (10M)*	0		
36.0 ml	Rat (10M)*	0		
5.0 g	Rat (5M, 5F)	0	> 5 g	(Henkel, 1977)[1]
5.0g	Rat (5M, 5F)	0	> 5 g	(Henkel, A1835)[1]
5.0g	Rat (5M, 5F)	0	> 5 g	(PVO, 1976a)[1]
5.0 g**	Rat (5M, 5F)	0	> 5 g	(PVO, 1976b)[1]

* Fasted rats.

**Approximately 50% Caprylic/Capric Triglyceride in coconut oil.

In one test on mice, lethargy and ataxia occurred within ten minutes after the administration of 25 ml/kg and dyspnea was noted in some animals within one hour. All animals appeared asymptomatic at the end of the first day and no deaths were reported. In the second mouse test, ataxia, lethargy, dyspnea, and diuresis occurred within 15 minutes, and in several animals complete loss of activity was observed within two hours. Following the two highest doses, three deaths occurred in 24 to 48 hours. All symptoms disappeared in the survivors by the end of the third day. No necropsy observations were reported from either test. From the results of these tests it may be concluded that the acute oral LD50 in female mice is higher than 25 ml/kg (Conxultox, 1977)[1].

In the test on fasted male rats, no mortality resulted from any dose up to 36 ml/kg. At the two highest dose levels of 18 and 36 ml/kg, the rats consumed less food and excreted softer feces in the first two days. Otherwise, no notable symptoms were observed. At necropsy on the eleventh day, there were no striking findings. From the results of this study, it may be concluded that the acute oral LD50 of this ingredient in male rats is greater than 36 ml/kg (Rheinischen, 1971)[1].

Table 3 shows that 5 g/kg of four other samples of Caprylic/Capric Triglyceride produced no mortality in male or female rats. These animals, all observed for 14 days, showed no changes in appearance or behavior and presented no abnormalities at necropsy (Henkel, 1977; Henkel A1835; PVO 1976a, 1976b)[1].

Intraperitoneal: Six groups of five male rats each were injected intraperitoneally with single doses of Caprylic/Capric Triglyceride ranging from 1 to 24 ml/kg. There were no deaths. After doses of 8 ml/kg and higher, the rats showed a lack of appetite and decreased mobility during the first two days. Subsequently, the animals became normal in these respects. Necropsy after 14 days revealed some unabsorbed test material in the stomach area and "slight vascular complications." No histological observations were described. Though no LD50 could be calculated, this test shows that the intraperitoneal LD50 of this product in the rat is greater than 24 ml/kg (Rheinischen, 1971)[1].

Inhalation: Male rats and guinea pigs in groups of ten each were exposed for six hours in a 40-liter chamber containing an aerosol of Caprylic/Capric Triglyceride at a nominal concentration of 28.1 μl/l of air. The fraction of the aerosol with particles small enough to be inhaled into the lung, *i.e.*, with a diameter of 5 μm or less, represented 1.97 μl/1 of the test substance. Three controls of each species were sham exposed.

Observation during the exposure and for 14 days thereafter revealed no symptoms, abnormal behavior, or effects on body weight. One hour after the exposure, three animals and one control of each species were sacrificed for pathological examination, and the remaining test animals were sacrificed at 14 days. No gross or microscopic defects attributable to the substance were

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reported. Examination of the respiratory tract for adverse effects, including the detection of accumulated oil droplets, gave negative results (INBIFO, 1977)[1].

Intramuscular: Four rabbits received a single injection of 0.5 ml Caprylic /Capric Triglyceride in both thigh muscles. Two were sacrificed after 5 days and two after 14 days. Four other rabbits were treated in the same way with olive oil and sacrificed on the same schedule. Local tolerance to both test substances was good, with no effect on muscle function. Microscopic examination showed somewhat more mesenchymal reaction to this ingredient than to the olive oil. The latter was possibly absorbed more slowly, but pulmonary fatty embolism was more pronounced with the olive oil after both five- and 14-day sacrifice periods. However, the differences between the findings resulting from the injection of the experimental material and those of olive oil were so minor that the two materials were judged equally acceptable in regard to absorption and local tolerance (Hamburg Univ., 1963)[1].

Skin Irritation: The results of primary skin irritation tests of nine different lots or preparations of Caprylic/Capric Triglyceride are shown in Table 4. Tests of three lots performed by an official French method (Journal Official de la Republique Francaise) showed irritation indices of 0.21, 0.21, and 0.46, from which it was concluded that the material was nonirritating (Guillot *et al.*, 1977). One test on the hair-covered backs of rabbits showed the material to be nonirritating under this condition, though no irritation index was given (Henkel, Inc. 1977; Henkel, Inc. A 1838; PVO Int'l. Inc., 1976a; PVO Int'l Inc. 1976b; Warf Inst., 1975)[1]. All other tests shown in Table 4 were done by the Draize method with irritation indices above zero in only two cases:0.25 (Henkel A 1838)[1] and 0.05 (PVO, 1976b)[1]. These scores reflected "mild irritation potential" and "no irritation," respectively.

Skin Sensitization: Two samples of Caprylic/Capric Triglyceride were tested for skin sensitization potential in six male albino guinea pigs. A 4% solution in ethanol was applied to closely clipped areas on the backs and flanks of the test animals every other day for priming purposes until ten such applications had been made. Twenty-four hours after each priming treatment, erythema and edema readings were zero in all cases. Challenge applications made two weeks after the last priming dose also resulted in zero readings, thus showing no evidence of a sensitization potential for these materials in the guinea pig under the conditions of the test (Consultox, 1972)[1].

Eye Irritation: The design and results of eye irritation tests of seven different preparations of Caprylic/Capric Triglyceride are shown in Table 5. All applications of test materials were made in one eye of each rabbit, with the other eye, as a control, left untreated. According to the time schedules shown in the table, observations were made of the cornea for opacity and area involved, of the iris, and of the conjunctiva for redness, chemosis and discharge. The severity of ocular lesions was graded by the Draize method to

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TABLE 4. Primary Skin Irritation - Rabbits

No. and Sex of Rabbits	Concentration	Method	PII[1]	Conclusion	Reference
Unspecified	Undiluted 15%[2]	Occlusive patches "Neodermotest"[4]	0.21 0.08	Non-irrit. "	Guillot *et al.*, 1977
Unspecified	Undiluted 15%[2]	"	0.21 0.00	"	Guillot *et al.*, 1977
Unspecified	Undiluted 15%[2]	"	0.46 0.04	"	Guillot *et al.*, 1977
3M	Undiluted	Occluded soaked pad 2.5 cm^2 on hair-covered back for 24, 48 and 72 hrs.	—	"	(Rheinischen, 1971)[1]
3M, 3F	*Full strength*	*Draize et al.*, 0.5 ml, abraded and non-abraded skin, occluded patch; observed at 24 and 72 hours	0.00	"	(Henkel, 1977)[1]
6 (sex unspec.)	Full strength	Draize *et al.*, *same as above.*	0.25	Mild irrit. *potential*	(Henkel A1838)[1]
3M, 3F	Full strength	"	0.00	Non-irrit.	(PVO, 1976a)[1]
3M, 3F	Full strength[3]	"	0.05	Non-irrit.	(PVO, 1976b)[1]
6 (sex unspec.)	Full strength	Draize *et al.*,	0.92	Mild irrit.	(Warf, 1975)[1]

[1]PII - Primary irritation index.

[2]Also contains 3% polyoxyethylene sorbitan stearate (emulsifier), 0.2% preservative (not specified) and water to 100%.

[3]Approximately 50% Caprylic/Capric Triglyceride in coconut oil.

[4]J. official de la Republique, 1971[1].

arrive at the scores tabulated; the maximum score by the grading system used is 110. Only one of the six tests involving the single application of the test substance resulted in a very mild irritation: it yielded a score of 0.7 on the first day, 0.3 on the second and third days, and 0 thereafter. In this study only the conjunctiva was affected (PVO, 1976a)[1].

In one test the material was administered by pipette daily for six days "into the tear duct" of the left eye and the eye was held closed for five minutes.

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TABLE 5. Acute Eye Irritation

No. of Rabbits	Method, Dose and Concentration	Times of Observation Days / Hours	Score	Conclusion	Reference
3	0.05 ml	10	...	No tear duct infection or change in cornea	FDA, 1972
6	0.1 ml single dose full strength	1 2 3	0 0 0	No. irrit.	Henkel, 1977[2]
6	0.1 ml single dose full strength	24 48 96 108	0 8 0 0	No irrit.	Henkel, A1838[2]
6	0.1 ml single dose	1 2 3 4	0.7 0.3 0.3 0	Very mild, transient, conjuctival, redness and discharge	PVO, 1976a[1]
6	0.1 ml single dose full strength of approx. 50% Caprylic/Capric Triglyceride in coconut oil	1 2 3	0 0 0	Non-irrit.	PVO, 1976b[1]
6	0.1 ml single dose, undiluted	24 48 72	0 0 0	Non-irrit.	Warf, 1975[2]

Observation after ten days revealed no effect; however, this report did not indicate whether there was evidence of irritation at any earlier time (Rheinischen, 1971)[1].

The above studies indicate that Caprylic/Capric Triglyceride is at most only a very mild, transient irritant to the eye of the rabbit.

Subchronic Toxicity

Oral: Two groups of ten male white rats weighing 120 to 150 g were given undiluted Caprylic/Capric Triglyceride by throat probe daily for 30 days. Each rat of one group received 1.0 ml daily, equivalent to an average dose of 7.6 ml/kg, while each rat of the other group received 3 ml daily, equivalent to an average dose of 21.3 ml/kg. Weight gains of these two groups and of a 10-rat control group did not differ significantly. The group receiving the lower dose showed no abnormal appearance or behavior and no urinary changes throughout the test. Although no histopathology studies were reported, there were no

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gross pathologic findings at necropsy. The group receiving 3 ml per day exhibited a decrease in appetite, fatty feces and a shaggy coat in the first five to seven days, but thereafter, these effects disappeared. Also, there were no abnormal urinary findings in this group and no notable macroscopic abnormalities at necropsy (Rheinischen, 1971)[1].

Groups of 20 male white rats received 1 and 5% Caprylic/Capric Triglyceride in their diet for three months. Urine analysis and blood counts were done in the middle and at the end of the feeding period, and serum GOT and GPT transaminases and free and esterified fatty acids were measured when the animals were sacrificed. In none of these respects did the experimentals differ significantly from the controls. No effects of the test diets were reported for behavior, food intake, weight gain, organ:body weight ratios, or on the histological picture. Specific data on the organs selected for histological evaluation were not available (Rheinischen, 1971)[1].

Intramuscular: Five rabbits received, intramuscularly in both thighs, 0.5 ml of Caprylic/Capric triglyceride twice a week for 90 days. Blood samples taken before treatment started and before its termination showed no effects on total lipids or cholesterol levels, nor on hemoglobin, red and white cell counts and the differential blood picture, as compared with the findings in control animals. From histological examination of the thigh muscles, it was concluded that the test substance was absorbed without any reaction except for slight changes due to the injection itself and the depot of the injected material. There were no indications of pathological effects in the large parenchymatous organs and no fatty degeneration or pulmonary fatty embolism (Univ. of Hamburg, 1963)[1].

Dermal: Caprylic/Capric Triglyceride has been tested for toxicity and skin irritation in two formulations. A perfumed skin softener formulation containing 4% Caprylic/Capric Triglyceride was applied to the shaved skin of 15 female rats at a dose of 2 ml/kg five days per week for 13 weeks. This treatment had no effect on body weight, appearance or behavior. All blood-cell and serum chemistry parameters measured one week before termination of the study were within normal limits and comparable to those seen in an equal group at controls. At necropsy, organ weights and gross finding revealed no effects of the test substance, and no histopathological changes were observed. There were no localized effects on the skin. An additional study with a tanning butter formulation containing 22% Caprylic/Capric Triglyceride was applied to the clipped backs of three male and three female New Zealand strain albino rabbits at a dose of 2 g/kg five times per week for four weeks. At weekly intervals the backs of three of these animals and of three controls were abraded through the stratum corneum, leaving the dermis intact. The backs of the other three test rabbits and of six controls were not abraded. Throughout the test, no effects attributable to the treatment were noted on body weight, physical appearance

and behavior. Blood samples taken 23 days after initiation of the test showed no effects on hematocrit, hemoglobin concentration, cell counts, urea nitrogen, alkaline phosphatase or glutamic pyruvic transaminase activities, or glucose concentration. At the end of the test, no systemic, gross or histopathologic changes referable to the test material were observed. On the treated area of the skin there was slight to moderate erythema and slight peeling and cracking regardless of whether the skin was abraded or left intact (CTFA, 1976; CTFA, 1974)[1].

The oral tests and the two skin tests described above indicate the lack of systemic effects. Observations for local effects on the skin were only incidental and are not considered pertinent in the latter test because of the relative resistance of the rat skin to irritation.

Chronic Toxicity

Groups of 15 male and 15 female rats were fed a diet containing 19.6% of a medium-chain triglyceride composed of about 75% caprylic acid and 25% capric acid for 47 weeks. This diet supported normal growth and development, though growth rate was slightly less than that of rats fed conventional dietary fats. At autopsy, the carcass protein, ash levels and organ weights of test rats were similar to those of control rats but there was less carcass fat and smaller epididymal fat pads in the test group. Histological study revealed no abnormalities in intestine and liver (Harkins and Sarett, 1968)[1].

An earlier study showed that male rats fed medium-chain triglycerides at a level of 20% in their diet for a year weighed significantly less than rats fed a lard diet and had higher caloric requirements to maintain weight. Fertility and organ weight relationships remained normal (Kaunitz *et. al.*, 1958).

The above studies showed nutritional effects of long-term consumption of this ingredient in the diet of rats, but no effects were interpreted as adverse or toxic.

No conclusive studies on the mutagenic, or carcinogenic effects of Caprylic/Capric Triglycerides have been reported. Tricaprylin, however, has been widely used as a vehicle for the bioassay of suspected carcinogens (Lawely, 1976), because it does not induce tumors within the life span for experimental animals (Miller and Miller, 1960).

Special Studies

In a reproduction study, young adult male and female rats were fed a balanced diet containing 19.6% of a triglyceride of 75% caprylic and 25% capric acid for three weeks before mating. Litter size and birth weight of the test animals were similar to those of rats on conventional or low fat diets, but mortality during lactation was somewhat higher, and there was less weight gain due to a smaller volume of milk secreted. After weaning, the F_1 generation was fed as the F_0 generation had been and showed a weight gain comparable to that of control rats on an oleo oil diet (Harkins and Sorett, 1968).

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CLINICAL ASSESSMENT OF SAFETY

In France, 100 patients of a dermatology clinic who "constituted all of the dermatological allergies" (presumably patients having a wide spectrum of allergic dermatologic diagnoses) were tested with patches (1 cm^2) of tissue paper saturated with Caprylic/Capric Triglyceride for 48 hours. No positive reactions occurred (Degos, 1968)[1].

In another study, forty subjects were patch tested to undiluted Caprylic /Capric Triglyceride (patch test technique not described). Three readings were made (times not stated). "No skin irritation" was noted (Ippen, 1970)[1].

Caprylic/Capric Triglyceride (10, 20, and 50% solutions) dissolved in paraffin liquid DAB 6 was dropped into one eye each of two test persons at four- to six-day intervals. An additional five male subjects were tested with the undiluted material. No "incompatibility reactions" were perceived (Henkel, 1971)[1].

One hundred and twenty-eight adult males and females were tested with Caprylic/Capric Triglyceride using a modification of the Draize repeated insult patch test. All subjects had little or no irritation and none was sensitized. One subject had barely perceptible erythema at the first reading immediately following the removal of the first patch which had been applied for 48 hours (Hilltop, 1975a)[1].

Twelve women (age and race not stated) were tested with 0.4 ml of Caprylic/Capric Triglyceride on each patch. Patches were applied daily to the same site for 21 consecutive days. They were removed 23 hours after application and read at 24 hours. One subject had a score of 1.0 on a scale of 0 to 3 on day 16. The investigators reported that all other scores were negative and were given a 0 score. This ingredient was considered essentially nonirritating in the amount used (Hilltop, 1975b)[1].

When four human volunteers who had fasted overnight were fed 1 g/kg body weight of a medium-chain length triglyceride (71% caprylic, 25% capric, 3% lauric), their serum free fatty acids showed a high proportion of octanoic acid and a low proportion of long-chain acids for four hours (Tamir *et al.*, 1968).

Of ten human volunteers who ingested 100 ml of synthetic fat (a triglyceride of 74% lauric, 17% capric, 5% caprylic, 3% myristic, and a trace of caproic) eight had no chylomicrons in their sera, and none developed diarrhea or had fat in their feces; all had increased free fatty acids in their sera (Metais *et al.*, 1966).

SUMMARY

Caprylic/Capric Triglyceride, an oily mixed ester predominantly composed of caprylic and capric fatty acids derived from coconut oil, has been used extensively in cosmetics, foods, and pharmaceuticals. When absorbed from the digestive tract, it is hydrolyzed, and the fatty acids are catabolized to

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C_2 fragments which may be further metabolized either to CO_2 or to form long-chain fatty acids.

It has a very low toxicity to man and animals as shown by tests involving oral ingestion, intraperitoneal and intramuscular injection, skin and eye irritation tests, skin sensitization, percutaneous toxicity and finally, by two generation feeding studies.

The safety assessment of this ingredient rests on the information at hand and on the considerable usage at various concentrations in a variety of cosmetic and other consumer products. Additional biological assessment might reasonably be recommended to include studies on photosensitization.

CONCLUSIONS

It is the opinion of the Expert Panel, based on the evidence at hand which it believes to be relevant and accumulated in a reasonable manner, that the cosmetic product, Caprylic/Capric Triglyceride, is safe when incorporated in amounts similar to those presently marketed.

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