
Safety Assessment of Polyglyceryl Fatty Acid Esters as Used in Cosmetics

Status: Draft Final Report for Panel Review
Release Date: September 2, 2016
Panel Meeting Date: September 26-27, 2016

The 2016 Cosmetic Ingredient Review Expert Panel members are: Chairman, Wilma F. Bergfeld, M.D., F.A.C.P.; Donald V. Belsito, M.D.; Ronald A. Hill, Ph.D.; Curtis D. Klaassen, Ph.D.; Daniel C. Liebler, Ph.D.; James G. Marks, Jr., M.D., Ronald C. Shank, Ph.D.; Thomas J. Slaga, Ph.D.; and Paul W. Snyder, D.V.M., Ph.D. The CIR Director is Lillian J. Gill, D.P.A. This safety assessment was prepared by Monice M. Fiume, Assistant Director/Senior Scientific Analyst/Writer and Bart Heldreth, Ph.D., Chemist.

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Memorandum

To: CIR Expert Panel Members and Liaisons
 From: Monice M. Fiume *MMF*
 Assistant Director/Senior Scientific Analyst
 Date: September 2, 2016
 Subject: Safety Assessment of Polyglyceryl Fatty Acid Esters as Used in Cosmetics

Enclosed is the Draft Final Report of the Safety Assessment of Polyglyceryl Fatty Acid Esters as Used in Cosmetics (*PGlyFE092016rep*). At the March/April meeting, the Panel concluded that this family of 274 ingredients, which comprises ingredients that are esterification products of polyglycerin chains and fatty acids that vary in numbers of glycerin and fatty-acid equivalents and lengths of the fatty acids, are **safe as used in cosmetics when formulated to be non-irritating**.

A large submission of unpublished data was received, and the data have been incorporated into the report (indicated using green highlighting). The results of these new studies are consistent with the existing data. Because of the size of the submission, the following data are included in a supplement to the main report package:

1. Information on Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters (*PGlyFE092016data_1*)
 - a. 6 studies: dermal irritation in rabbits; clinical patch test; ocular irritation in rabbits; guinea pig maximization test; acute oral toxicity; Ames test
2. Information on Macadamia Seed Oil Polyglyceryl-6 Esters Behenate (*PGlyFE092016data_2*)
 - a. 6 studies: acute oral toxicity; Ames test; clinical patch test; dermal irritation in rabbits; guinea pig maximization test; ocular irritation in rabbits
3. Information on Polyglyceryl-8 Decabehenate/Caprates (*PGlyFE092016data_3*)
 - a. 6 studies: Ames test; dermal irritation in rabbits; clinical irritation study; ocular irritation in rabbits; guinea pig maximization test; acute oral toxicity
4. Information on Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate (*PGlyFE092016data_4*)
 - a. 5 studies: dermal irritation in rabbits; guinea pig maximization test; ocular irritation in rabbits; acute oral toxicity; Ames test
5. Information on Polyglyceryl-10 Decaethylhexanoate (*PGlyFE092016data_5*)
 - a. 5 studies: bacterial reverse mutation assay; in vitro ocular irritation; clinical patch test; in vitro skin irritation; clinical sensitization test
6. Information on Polyglyceryl-10 Pentaisostearate (*PGlyFE092016data_6*)
 - a. 5 studies: bacterial reverse mutation assay; in vitro ocular irritation; clinical patch test; in vitro skin irritation; clinical sensitization test
7. Information on Polyglyceryl-10 Nonaisostearate (*PGlyFE092016data_7*; *PGlyFE092016data_8*)
 - a. 9 studies: ocular irritation in rabbits; acute oral toxicity; dermal irritation in rabbits; clinical irritation study; photosensitization in guinea pigs; dermal irritation in guinea pigs; LLNA; Ames test; phototoxicity in guinea pigs.

Additionally, the VCRP data have been updated to now include 2016 data (*PGlyFE032016FDA*). There were no significant changes in frequency or types of use.

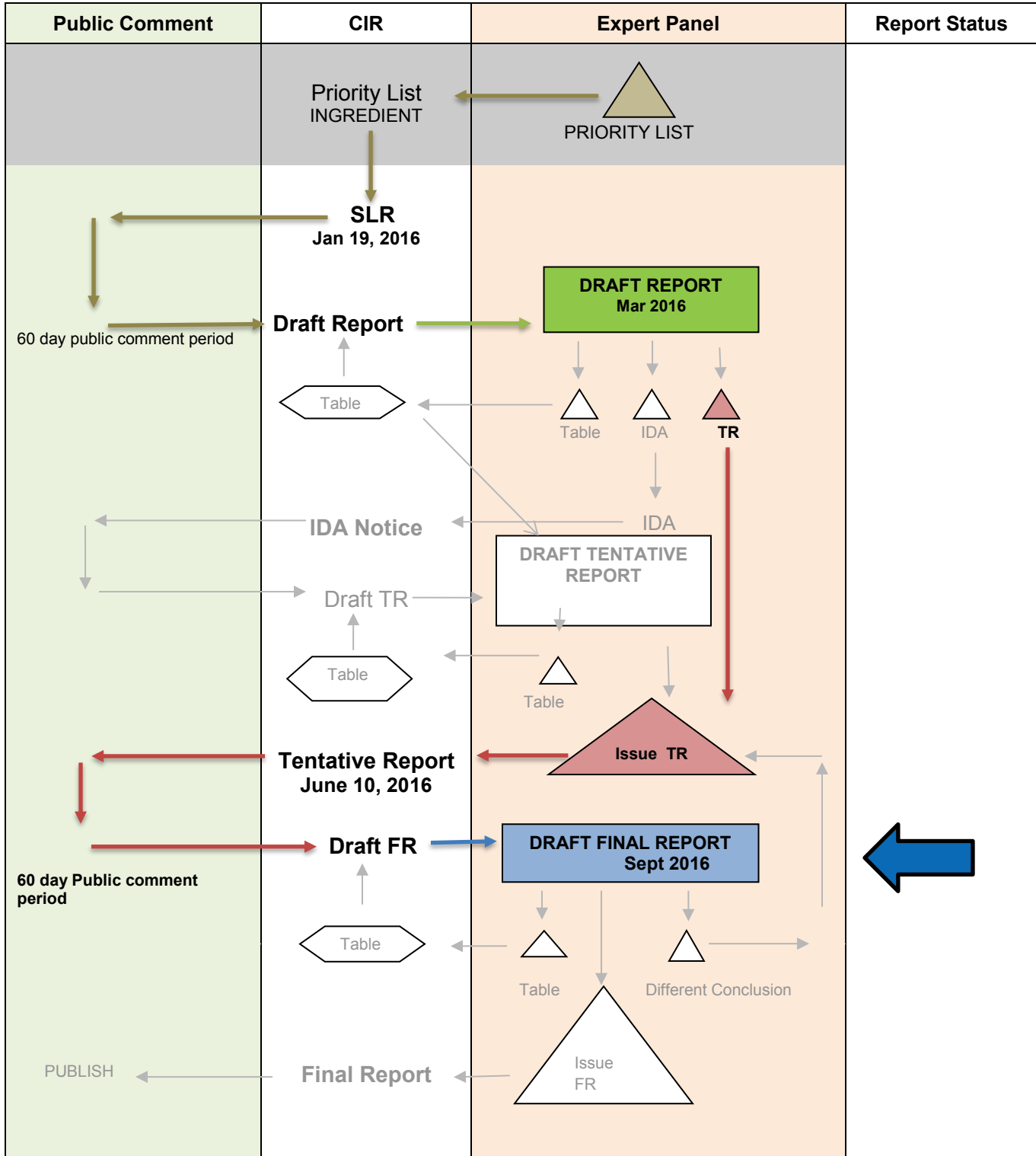
Comments on the draft report (*PGlyFE092016pcc_1*) and tentative report (*PGlyFE092016pcc_2*) were received from the Council and have been addressed.

Please review the Discussion to ensure that it captures the rationale for the report conclusion. The Panel should be prepared to issue a Final Report.

SAFETY ASSESSMENT FLOW CHART

INGREDIENT/FAMILY Polyglyceryl Fatty Acid Esters

MEETING Sept 2016



POLYGLYCERYL FATTY ACID ESTERS

March 31 – April 1, 2016: Draft Report

The Panel issued a tentative report for public comment with the conclusion that the following 274 polyglyceryl fatty acid esters are safe as used in cosmetics when formulated to be non-irritating. Acacia Decurrens/Jojoba/Sunflower Seed Wax Polyglyceryl-3 Esters was removed from the report because the Panel previously found the data insufficient to support the safety of Acacia Decurrens Extract in cosmetic formulations.

September 26-27, 2016: draft Final Report

The following unpublished data were received and added to the report:

1. Information on Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters
 - a. 6 studies: dermal irritation in rabbits; clinical patch test; ocular irritation in rabbits; guinea pig maximization test; acute oral toxicity; Ames test
2. Information on Macadamia Seed Oil Polyglyceryl-6 Esters Behenate
 - a. 6 studies: acute oral toxicity; Ames test; clinical patch test; dermal irritation in rabbits; guinea pig maximization test; ocular irritation in rabbits
3. Information on Polyglyceryl-8 Decabehenate/Caprates
 - a. 6 studies: Ames test; dermal irritation in rabbits; clinical irritation study; ocular irritation in rabbits; guinea pig maximization test; acute oral toxicity
4. Information on Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate
 - a. 5 studies: dermal irritation in rabbits; guinea pig maximization test; ocular irritation in rabbits; acute oral toxicity; Ames test
5. Information on Polyglyceryl-10 Decaethylhexanoate
 - a. 5 studies: bacterial reverse mutation assay; in vitro ocular irritation; clinical patch test; in vitro skin irritation; clinical sensitization test
6. Information on Polyglyceryl-10 Pentaisostearate
 - a. 5 studies: bacterial reverse mutation assay; in vitro ocular irritation; clinical patch test; in vitro skin irritation; clinical sensitization test
7. Information on Polyglyceryl-10 Nonaisostearate
 - a. 9 studies: ocular irritation in rabbits; acute oral toxicity; dermal irritation in rabbits; clinical irritation study; photosensitization in guinea pigs; dermal irritation in guinea pigs; LLNA; Ames test; phototoxicity in guinea pigs.

VCRP data were been updated to now include 2016 data.

Polyglyceryl Fatty Acid Esters

	CAS #	Use#	InfoBase#	PubMed#	SciFinder#	ChemID#	NTIS#	FDA#	ECHA#	HPV#	IUCLID/ SIDS#	WHO/ JEFC#	EU#	NICNAS#	Web#
Generic terms, Polyglyceryl Fatty Acid Esters, etc				X	X		---	CFR		---		X			
Acacia Decurrens/Jojoba/ Sunflower Seed Wax Polyglyceryl 3 Esters	---		---					---	---	---	---		no r		X
Adansonia Digitata Seed Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Almond Oil/Polyglyceryl-10 Esters	---		---										no r		---
Apricot Kernel Oil Polyglyceryl-10 Esters	---		---					---	---	---	---		no r	---	X
Apricot Kernel Oil Polyglyceryl-3 Esters	---		---					---	---	---	---		no r	---	---
Apricot Kernel Oil Polyglyceryl-4 Esters (Dub Aprilose +)	---		---		---	---	---	---	---	---	---		no r	---	---
Apricot Kernel Oil Polyglyceryl-5 Esters	---		---					---	---	---	---		no r	---	---
Apricot Kernel Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Argan Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Astrocaryum Vulgare Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	---
Avocado Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	---
Babassu Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---	---	---		no r	---	X
Babassu Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Borage Seed Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---	---	---		no r	---	---
Borage Seed Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Candelilla/Jojoba/Rice Bran Polyglyceryl-3 Esters	---		---					---	---	---	---		no r	---	---
Caprylic/Capric Glycerides Polyglyceryl-10 Esters (---		---										no r		X
Carapa Guaianensis Oil Polyglyceryl-6 Esters (---		---					---	---	---	---		no r	---	---
Castor Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Cocoa Butter Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	X
Coconut Oil Polyglyceryl-6 Esters	---		---										no r		X
Coffee Seed Oil Polyglyceryl-6 Esters	---		---					---	---	---	---		no r	---	---
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	187547-43-9 ¹		---										no r		X
Glyceryl/Polyglyceryl-6 Isostearate/ Behenate Esters	---		---		---	---	---	---	---	---	---		no r	---	---
Hazelnut Seed Oil Polyglyceryl-6 Esters	---		---										no r		X
Linseed Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---	---	---		no r	---	---
Macadamia Seed Oil Polyglyceryl 6 Esters	85711-62-2 ²		---		---	---	---	---	---	---	---		no r	---	X

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Macadamia Seed Oil Polyglyceryl 6 Esters Behenate	---		---										no r		---
Mauritia Flexuosa Seed Oil Polyglyceryl-6 Esters	---		---		---	---	---	---	---		---	---	no r	---	---
Olive Oil Polyglyceryl-3 Esters	---		---										no r		---
Olive Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---		---	---	no r	---	X
Olive Oil Polyglyceryl-6 Esters	---		---										no r		X
Palm Kernel Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---		---	---	no r	---	---
Palm Oil Polyglyceryl-3 Esters	---		---										no r		---
Palm Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---		---	---	no r	---	---
Palm Oil Polyglyceryl-5 Esters	---		---					---	---	---	---	---	no r	---	---
Palm Oil Polyglyceryl-6 Esters	---		---		---	---	---	---	---		---	---	no r	---	---
Parinari Curatellifolia Oil Polyglyceryl-6 Esters	---		---		---	---	---	---	---		---		no r	---	---
Pinus Sibirica Seed Oil Polyglyceryl-6 Esters	---		---		---	---	---	---	---		---		no r	---	---
Polyglyceryl-10 Apricot Kernelate	---		---		---	---	---	CFR	---		---		no r	---	X
Polyglyceryl-10 Behenate/Eicosadioate	457632-32-5 ³		---		---	---	---	---	---		---		no r	---	X
Polyglyceryl-10 Caprate	---		---		---	---	---	---	---		---		no r	---	---
Polyglyceryl-10 Caprylate	51033-41-1		---		---	---	---	---	---		---		no r	---	---
Polyglyceryl-10 Caprylate/Caprate	---		---		---	---	---	---	---		---		no r	---	X
Polyglyceryl-10 Cocoate	---		---		---	---	---	---	---		---		no r	---	---
Polyglyceryl-10 Decaethylhexanoate	---		---										no r		---
Polyglyceryl-10 Decahydroxystearate	---		---										no r		X
Polyglyceryl-10 Decaisostearate	95461-48-6 ⁴		---										no r		X
Polyglyceryl-10 Decalinoleate	68900-96-9		---										no r		---
Polyglyceryl-10 Decamacamiate	---		---							X			no r		---
Polyglyceryl-10 Decaoleate	11094-60-3 ³		---						X	preR			no r		X
Polyglyceryl-10 Decastearate	39529-26-5		---						X				no r		---
Polyglyceryl-10 Dicocoate	---		---						X				no r		---
Polyglyceryl-10 Didecanoate	182015-59-4		---										no r		---
Polyglyceryl-10 Diisostearate	102033-55-6; 63705-03-3 (generic)		---							X			no r		X
Polyglyceryl-10 Dilaurate													no r		---
Polyglyceryl-10 Dimyristate													no r		---
Polyglyceryl-10 Dioleate	33940-99-7		---						X				no r		X
Polyglyceryl-10 Dipalmitate	---		---						X				no r		X
Polyglyceryl-10 Distearate	12764-60-2		---						X				no r		X
Polyglyceryl-10 Dodecabeheate													no r		---
Polyglyceryl-10 Dodecacaprate													no r		---

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Polyglyceryl-10 Dodecapyrylate													no r		---
Polyglyceryl-10 Dodeca-Caprylate/Caprates													no r		---
Polyglyceryl-10 Eicosanedioate/ Tetradecanedioate	---		---		---	---		---	---		---	---	no r	---	X
Polyglyceryl-10 Hepta(Behenate/Stearate)													no r		---
Polyglyceryl-10 Heptahydroxystearate													no r		---
Polyglyceryl-10 Heptaoleate	9007-48-1		---					X					no r		---
Polyglyceryl-10 Heptastearate	99126-54-2 ⁶		---					X					no r		X
Polyglyceryl-10 Hexaerucate													no r		---
Polyglyceryl-10 Hexaisostearate													no r		---
Polyglyceryl-10 Hexaoleate	65573-03-7 ⁷		---					X					no r		---
Polyglyceryl-10 Hydroxystearate/ Stearate/Eicosadioate	---		---		---	---		---	---		---	---	no r	---	---
Polyglyceryl-10 Isostearate	133738-23-5		---		---	---		---	---		---	---	no r	---	---
Polyglyceryl-10 Laurate	34406-66-1 74504-64-6 (generic)		---		---	X		X	---		---	---	no r	---	X
Polyglyceryl-10 Linoleate	---		---		---	---		---	---		---	---	no r	---	---
Polyglyceryl-10 Mono/Dioleate													no r		X
Polyglyceryl-10 Myristate	87390-32-7												no r		X
Polyglyceryl-10 Nonaerucate	155808-79-0		---										no r		---
Polyglyceryl-10 Nonaisostearate													no r		
Polyglyceryl-10 Oleate	79665-93-3; 9007-48-1 (generic)		---		---	---		X	preR		---	---	no r	---	X
Polyglyceryl-10 Palmate	---		---		---	---		---	---		---	---	no r	---	X
Polyglyceryl-10 Palmitate	79777-31-4		---		---	---		---	---		---	---	no r	---	---
Polyglyceryl-10 Pentacaprylate	---		---					---	---		---	---	no r	---	---
Polyglyceryl-10 Pentahydroxystearate	144747-22-8 ⁸		---		X	---		---	---		---	---	no r	---	X
Polyglyceryl-10 Pentaisostearate	---		---					---	---		---	---	no r	---	---
Polyglyceryl-10 Pentalaurate	---		---					X					no r		
Polyglyceryl-10 Pentalinoleate													no r		
Polyglyceryl-10 Pentaoleate	86637-84-5		---					X					no r		
Polyglyceryl-10 Pentaricinoleate													no r		
Polyglyceryl-10 Pentastearate	94561-64-6												no r		
Polyglyceryl-10 Sesquisteate													no r		
Polyglyceryl-10 Stearate	79777-30-3		---		---	X		X	preR		---	---	no r	---	X
Polyglyceryl-10 Tetradecanedioate													no r		
Polyglyceryl-10 Tetralaurate													no r		
Polyglyceryl-10 Tetraoleate	34424-98-1		---					X	preR	---	---		no r	---	X

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Polyglyceryl-10 Tricocoate	---		---					X					no r		
Polyglyceryl-10 Tridecanoate	217782-56-4												no r		
Polyglyceryl-10 Trierucate													no r		
Polyglyceryl-10 Triisostearate													no r		
Polyglyceryl-10 Trilaurate													no r		
Polyglyceryl-10 Trioleate	102051-00-3		---					X					no r		
Polyglyceryl-10 Tristearate	12709-64-7		---					X					no r		
Polyglyceryl-10 Undecylenate	---		---		---	---		---	---		---	---	no r	---	---
Polyglyceryl-15 Diisostearate													no r		
Polyglyceryl-2 Caprate	156153-06-9		---						PreR	---	---		no r		X
Polyglyceryl-2 Caprylate	---		---				---		---	---	---		no r		---
Polyglyceryl-2 Diisostearate	67938-21-0; 63705-03-3 (generic)		---			X		---	X				no r	---	X
Polyglyceryl-2 Dioleate	67965-56-4; 60219-68-3		---					---	preR		---	---	no r	---	---
Polyglyceryl-2 Distearate	9009-32-9		---					---	preR		---	---	no r	---	---
Polyglyceryl-2 Isopalmitate	---		---					---	---	---	---		no r	---	---
Polyglyceryl-2 Isopalmitate/Sebacate	---		---					---	---	---	---		no r	---	X
Polyglyceryl-2 Isostearate	73296-86-3 81752-33-2		---						PreR	---	---		no r	---	X
Polyglyceryl-2 Laurate	96499-68-2; 74504-64-6 (generic)		---						PreR	---	---		no r	---	X
Polyglyceryl-2 Myristate	---		---						---	---	---		no r	---	
Polyglyceryl-2 Oleate	9007-48-1 (generic); 49553-76-6								X	---	---		no r	---	X
Polyglyceryl-2 Palmitate	---		---					---	---	---	---		no r	---	---
Polyglyceryl-2 Sesquicaprylate	---		---					---	---	---	---		no r	---	
Polyglyceryl-2 Sesquiisostearate (Hostacerin® DGI)	170211-20-8		---					---	---	---	---		no r	---	X
Polyglyceryl-2 Sesquioleate													no r		
Polyglyceryl-2 Sesquisteate	9009-32-9		---					---	---	---	---		no r	---	---
Polyglyceryl-2 Stearate	12694-22-3 9009-32-9 (generic)								preR	---	---		no r	---	X
Polyglyceryl-2 Tetrabehenate/ Macadamiate/Sebacate													no r		
Polyglyceryl-2 Tetraisostearate	121440-30-0		---					---	---	---	---		no r	---	X
Polyglyceryl-2 Tetraoleate													no r		
Polyglyceryl-2 Tetrastearate	72347-89-8		---			---		---	preR		---	---	no r	---	X
Polyglyceryl-2 Triisostearate	120486-24-0		---			---		---	preR		---	---	no r	---	---

	CAS #	Use#	InfoBase#	PubMed#	SciFinder#	ChemID#	NTIS#	FDA#	ECHA#	HPV#	IUCLID/ SIDS#	WHO/# JECA#	EU#	NICNAS#	Web#
Polyglyceryl-20 Docosabehenate/ Isostearate													no r		---
Polyglyceryl-20 Docosabehenate/Laurate													no r		---
Polyglyceryl-20 Docosabehenate/Oleate													no r		---
Polyglyceryl-20 Heptacaprylate													no r		---
Polyglyceryl-20 Heptadecabehenate/ Laurate													no r		
Polyglyceryl-20 Hexacaprylate													no r		
Polyglyceryl-20 Octadecabehenate/Laurate													no r		
Polyglyceryl-20 Octaisiononanoate													no r		
Polyglyceryl-3 Beeswax	136097-93-3		---										no r		X
Polyglyceryl-3 Behenate	1207543-50-7 ⁹		---										no r		X
Polyglyceryl-3 Caprate	133654-02-1; 51033-30-8; 74504-65-7		---						PreR	---	---		no r	---	X
Polyglyceryl-3 Caprylate	108777-93-1		---						---	---	---		no r	---	X
Polyglyceryl-3 Cocoate	223706-47-6		---					X	---				no r		---
Polyglyceryl-3 Di Hydroxystearate													no r		X
Polyglyceryl-3 Dicaprate													no r		---
Polyglyceryl-3 Dicitrate/Stearate													no r		---
Polyglyceryl-3 Dicoate	223706-47-6		---					X					no r		---
Polyglyceryl-3 Diisostearate	66082-42-6; 63705-03-3 (generic)		---						X				no r		X
Polyglyceryl-3 Dioleate	33940-99-7 ¹⁰ 79665-94-4		---			X		X	preR	---	---		no r	---	X
Polyglyceryl-3 Distearate	9009-32-9 94423-19-5		---					X					no R		
Polyglyceryl-3 Isostearate	127512-63-4		---					---	---				no R		---
Polyglyceryl-3 Laurate	51033-31-9 ¹¹		---					X	---	---	---		no R	---	X
Polyglyceryl-3 Myristate	---		---					X	---	---	---		no R	---	---
Polyglyceryl-3 Oleate	33940-98-6; 9007-48-1 (generic)							X	PreR	---	---		no R	---	X
Polyglyceryl-3 Palmitate	143701-24-1							X	---	---	---		no R		X
Polyglyceryl-3 Pentacaprylate/Caprate	---												no R		
Polyglyceryl-3 Pentaoliveate													no R		X
Polyglyceryl-3 Pentaricinoleate	221354-73-0												no R		
Polyglyceryl-3 Rice Branate	1166833-04- 0 ¹² 1166833-52-8		---						---	---	---		no R	---	X

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Polyglyceryl-3 Ricinoleate	29894-35-7		---					---	PreR				no R		X
Polyglyceryl-3 Soyate/Shea Butterate	---		---					---	***	---	---		no R	---	X
Polyglyceryl-3 Stearate	26855-43-6; 27231-72-8; 37349-34-1 (generic)		---					X	preR	---	---		no R	---	X
Polyglyceryl-3 Stearate SE													no R		
Polyglyceryl-3 Triisostearate	66082-43-7												no R		
Polyglyceryl-3 Triolivate													no R		
Polyglyceryl-4 Almondate/Shea Butterate	---		---		---	---	---	---	---				no R	---	---
Polyglyceryl-4 Caprate	160391-93-5; 74504-65-7		---					---	PreR	---	---	---	no R	---	X
Polyglyceryl-4 Caprylate								---	---	---	---	---	no R	---	---
Polyglyceryl-4 Caprylate/Caprate	---		---										no R		---
Polyglyceryl-4 Cocoate	---		---		---	---	---	X	---				no R	---	X
Polyglyceryl-4 Dilaurate													no R		
Polyglyceryl-4 Distearate													no R		
Polyglyceryl-4 Hazelnutseedate	---		---		---	---	---	---	---				no R	---	---
Polyglyceryl-4 Isostearate	63705-03-3; 91824-88-3		---					---	X	---	---	---	no R	---	X
Polyglyceryl-4 Isostearate/Laurate													no R		
Polyglyceryl-4 Laurate	75798-42-4; 74504-64-6 (generic)		---					---	---	---	---	---	no R	X	X
Polyglyceryl-4 Oleate	71012-10-7 9007-48-1		---			X	---	---	---	---	---	---	no R	---	---
Polyglyceryl-4 Pentaoleate	103230-29-1		---					X					no R		
Polyglyceryl-4 Pentapalmitate/Stearate													no R		
Polyglyceryl-4 Pentastearate	99570-00-0												no R		
Polyglyceryl-4 Punicate	---		---		---	---	---	---	---				no R	---	---
Polyglyceryl-4 Stearate	26855-44-7; 68004-11-5; 37349-34-1 (generic)		---			X	---	---	pre-R	---	---	---	no R	---	---
Polyglyceryl-4 Sweet Almondate													no R		
Polyglyceryl-4 Tristearate	99734-29-9		---					X					no R		
Polyglyceryl-5 Caprate	---		---					---	---	---	---	---	no R		---
Polyglyceryl-5 Dicaprylate	108777-93-1												no R		
Polyglyceryl-5 Dilaurate													no R		
Polyglyceryl-5 Dioleate	---		---					X					no R		X
Polyglyceryl-5 Hexastearate	---		---					X					no R		

	CAS #	Use#	InfoBase#	PubMed#	SciFinder#	ChemID#	NTIS#	FDA#	ECHA#	HPV#	IUCLID/ SIDS#	WHO/ JECA#	EU#	NICNAS#	Web#
Polyglyceryl-5 Isostearate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-5 Laurate	128738-83-0; 74504-64-6 (generic)		---					X	---	---	---	---	no R	---	X
Polyglyceryl-5 Myristate	---		---					X	---	---	---	---	no R	---	---
Polyglyceryl-5 Oleate	86529-98-8		---					X	preR	---	---	---	no R	---	X
Polyglyceryl-5 Pentamyrystate													no R		
Polyglyceryl-5 Ricinoleate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-5 Stearate	37349-34-1 (generic)		---					X	preR	---	---	---	no R	---	---
Polyglyceryl-5 Tribehenate													no R		
Polyglyceryl-5 Triisostearate													no R		
Polyglyceryl-5 Trimyrystate													no R		
Polyglyceryl-5 Trioleate	---		---					X					no R		
Polyglyceryl-5 Tristearate	9009-32-9 (generic)												no R		
Polyglyceryl-6 Adansonia Digitata Seedate	---		---										no r		---
Polyglyceryl-6 Apricot Kernelate													no r		X
Polyglyceryl-6 Argan Kernelate			---										no r		X
Polyglyceryl-6 Behenate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Caprate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Caprylate	---		---					---	---	---	---	---	no R	---	X
Polyglyceryl-6 Caprylate/Caprate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Citrullus Lanatus Seedate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Dicaprate													no r		
Polyglyceryl-6 Diisostearate													no r		
Polyglyceryl-6 Dioleate	76009-37-5		---					X					no r		
Polyglyceryl-6 Dipalmitate	---		---					X					no r		
Polyglyceryl-6 Distearate	34424-97-0		---					X					no r		X
Polyglyceryl-6 Heptacaprylate													no r		
Polyglyceryl-6 Hexaoleate	95482-05-6		---					X					no r		
Polyglyceryl-6 Hexastearate	---		---					X					no r		
Polyglyceryl-6 Isostearate	126928-07-2		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Laurate	51033-38-6		---					X	---	---	---	---	no R	---	---
Polyglyceryl-6 Myristate	---		---					X	---	---	---	---	no R	---	---
Polyglyceryl-6 Octacaprylate													no r		
Polyglyceryl-6 Octastearate													no r		X
Polyglyceryl-6 Oleate	9007-48-1; 79665-92-2		---					X	preR	---	---	---	no R	---	---
Polyglyceryl-6 Palmitate	99734-31-3		---					X	---	---	---	---	no R	---	---
Polyglyceryl-6 Palmitate/Succinate													no R		

	CAS #	Use#	InfoBase#	PubMed#	SciFinder#	ChemID#	NTIS#	FDA#	ECHA#	HPV#	IUCLID/ SIDS#	WHO/# JECA#	EU#	NICNAS#	Web#
Polyglyceryl-6 Pentacaprylate													no r		
Polyglyceryl-6 Pentaoleate	104934-17-0		---					X					no r		
Polyglyceryl-6 Pentaricinoleate													no r		
Polyglyceryl-6 Pentastearate	99734-30-2												no r		
Polyglyceryl-6 Ricinoleate	107615-51-0		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Schinziophyton Rautanenii Kernelate	---		---			---		---	---		---	---	no r	---	---
Polyglyceryl-6 Sclerocarya Birrea Seedate	---		---			---		---	---		---	---	no r	---	---
Polyglyceryl-6 Sesquicaprylate	108777-93-1; 946492-22-4; 946492-23-5												no r		
Polyglyceryl-6 Sesquisostearate	9009-32-9												no r		
Polyglyceryl-6 Sesquisteate	112939-69-2												no r		
Polyglyceryl-6 Stearate	95461-65-7		---					X	---	---	---	---	no R	---	---
Polyglyceryl-6 Tetrabehenate													no r		
Polyglyceryl-6 Tetracaprylate													no r		
Polyglyceryl-6 Tetraoleate	9007-48-1		---					X					no r		
Polyglyceryl-6 Tricaprylate													no r		
Polyglyceryl-6 Trichilia Emetica Seedate	---		---			---		---	---		---	---	no r	---	---
Polyglyceryl-6 Tristearate	71185-87-0		---					X					no r		
Polyglyceryl-6 Undecylenate	---		---					---	---	---	---	---	no R	---	---
Polyglyceryl-6 Ximenia Americana Seedate	---		---			---		---	---		---	---	no r	---	---
Polyglyceryl-8 C12-20 Acid Ester													no r		
Polyglyceryl-8 Decabehenate/Caprata													no r		
Polyglyceryl-8 Decaerucate/Decaiso- stearate/ Decaricinoleate													no r		
Polyglyceryl-8 Oleate	9007-48-1; 75719-56-1		---					X					no r		
Polyglyceryl-8 Stearate	37349-34-1; 75719-57-2							X					no r		---
Pumpkin Seed Oil Polyglyceryl-4 Esters (Ecobond PKO)	---		---										no r		---
Pumpkin Seed Oil Polyglyceryl-4 Esters Succinate													no r		
Rice Bran Oil Polyglyceryl-3 Esters (Prolix RO)	---		---										no r		---
Rosa Rubiginosa Seed Oil Polyglyceryl-6 Esters (Viatenza Rose PO6)	---		---										no r		---
Safflower Seed Oil Polyglyceryl-6 Esters (Viatenza Safflower PO6)	85711-62-2		---										no r		X

	CAS ##	Use#	InfoBase#	PubMed#	SciFinder#	ChemID#	NTIS#	FDA#	ECHA#	HPV#	IUCLID/ SIDS#	WHO/# JECCA#	EU#	NICNAS#	Web#
Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters (Viatenza Mongongo PO6)	85711-62-2		---										no r		X
Sclerocarya Birrea Seed Oil Polyglyceryl-10 Esters	85711-62-2		---										no r		X
Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters	---		---										no r		---
Sesame Oil Polyglyceryl-6 Esters	---		---										no r		X
Shea Butter Polyglyceryl-3 Esters	--		---										no r		---
Shea Butter Polyglyceryl-4 Esters	---		---		---	---	---	---	---		---	---	not listed	---	---
Shea Butter Polyglyceryl-6 Esters	85711-62-2		---										no r		X
Soybean Oil Polyglyceryl-6 Esters	85711-62-2		---										no r		X
Sunflower Seed Oil Polyglyceryl-10 Esters	85711-62-2		---										no r		X
Sunflower Seed Oil Polyglyceryl-3 Esters	---		---										no r		---
Sunflower Seed Oil Polyglyceryl-4 Esters	---		---		---	---	---	---	---		---	---	no r	---	---
Sunflower Seed Oil Polyglyceryl-5 Esters	---		---					---	---	---	---	---	no r	---	---
Sunflower Seed Oil Polyglyceryl-6 Esters	85711-62-2		---										no r		X
Sweet Almond Oil Polyglyceryl-4 Esters	1072006-19-9		---		---	---	---	---	---		---	---	no r	---	---
Sweet Almond Oil Polyglyceryl-6 Esters	85711-62-2		---										no r		X
Theobroma Grandiflorum Seed Butter Polyglyceryl-6 Esters	---		---										no r		---
Trichilia Emetica Seed Oil Polyglyceryl-6 Esters	85711-62-2		---										no r		X
Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate	368869-33-4 ¹³		---										no r		X
Watermelon Seed Oil Polyglyceryl 10 Esters)	---		---										no r		---
Watermelon Seed Oil Polyglyceryl 6 Esters	---		---										no r		X
Ximenia Americana Seed Oil Polyglyceryl-6 Esters	---		---										no r		X

SciFinder – :

Polyglyceryl – 199 hits/4 useful

Esterification products of glycerin and fatty acids – 456 hits

9007-48-1	63705-03-3	85711-62-2	126928-07-2
9009-32-9	65573-03-7	86529-98-8	127512-63-4
11094-60-3	66082-42-6	86637-84-5	128738-83-0
12694-22-3	66082-43-7	87390-32-7	128774-95-8
12709-64-7	67938-21-0	91824-88-3	133654-02-1
12764-60-2	67965-56-4	94423-19-5	133738-23-5
26855-43-6	68004-11-5	95461-48-6	136097-93-3
26855-44-7	68900-96-9	95461-64-6	148618-57-9
27321-72-8	71012-10-7	95461-65-7	155808-79-0
29894-35-7	72347-89-8	95482-05-6	156153-06-9
33940-98-6	73296-86-3	99126-54-2	160391-93-5
33940-99-7	74504-64-6	99570-00-0	182015-59-4
34406-66-1	74504-65-7	99734-29-9	187547-43-9
34424-97-0	75719-56-1	99734-30-2	217782-56-4
34424-98-1	75719-57-2	102033-55-6	368869-33-4
37349-34-1	75798-42-4	102051-00-3	457632-32-5
39529-26-5	76009-37-5	103175-09-3	946492-22-4
49553-76-6	71185-87-0	103230-29-1	946492-23-5
51033-30-8	79665-92-2	104934-17-0	1072006-19-9
51033-31-9	79665-93-3	108777-93-1	1166833-04-0
51033-38-6	79665-94-4	112939-69-2	1207543-50-7
51033-41-1	79777-30-3	120486-24-0	
60219-68-3	81752-33-2	121440-30-0	

CAS # AND polyglycerol esters AND polyglycerin esters AND glycerol esters, without polyglyceryl – 1256 hits

Refine so only English – 895 hits

PubMed –: Polyglyceryl – 31 hits/2 useful

Polyglycerol and ester# - 84 hits

(glycerol AND ((fatty AND acid) OR ester)) AND (toxic# OR dermal OR sensitiz# OR sensitiS# OR irita# OR carcinogen# OR mutagen# OR genotoxic# OR teratogen#) – 508 HITS

9007-48-1 [EC/RN Number] OR 9009-32-9 [EC/RN Number] OR 11094-60-3 [EC/RN Number] OR 12694-22-3 [EC/RN Number] OR 12709-64-7 [EC/RN Number] OR 12764-60-2 [EC/RN Number] OR 26855-43-6 [EC/RN Number] OR 26855-44-7 [EC/RN Number] OR 27321-72-8 [EC/RN Number] OR 29894-35-7 [EC/RN Number] OR 33940-98-6 [EC/RN Number] OR 33940-99-7 [EC/RN Number] OR 34406-66-1 [EC/RN Number] OR 34424-97-0 [EC/RN Number] OR 34424-98-1 [EC/RN Number] OR 37349-34-1 [EC/RN Number] OR 39529-26-5 [EC/RN Number] OR 49553-76-6 [EC/RN Number] OR 51033-30-8 [EC/RN Number] OR 51033-31-9 [EC/RN Number] OR 51033-38-6 [EC/RN Number] OR 51033-41-1 [EC/RN Number] OR 60219-68-3 [EC/RN Number] OR 63705-03-3 [EC/RN Number] OR 65573-03-7 [EC/RN Number] OR 66082-42-6 [EC/RN Number] OR 66082-43-7 [EC/RN Number] OR 67938-21-0 [EC/RN Number] OR 67965-56-4 [EC/RN Number] OR 68004-11-5 [EC/RN Number] OR 68900-96-9 [EC/RN Number] OR 71012-10-7 [EC/RN Number] OR 72347-89-8 [EC/RN Number] OR 73296-86-3 [EC/RN Number] OR 74504-64-6 [EC/RN Number] OR 74504-65-7 [EC/RN Number] OR 75719-56-1 [EC/RN Number] OR 75719-57-2 [EC/RN Number] OR 75798-42-4 [EC/RN Number] OR 76009-37-5 [EC/RN Number] OR 71185-87-0 [EC/RN Number] OR 79665-92-2 [EC/RN Number] OR 79665-93-3 [EC/RN Number] OR 79665-94-4 [EC/RN Number] OR 79777-30-3 [EC/RN Number] OR 81752-33-2 [EC/RN Number] OR 85711-62-2 [EC/RN Number] OR 86529-98-8 [EC/RN Number] OR 86637-84-5 [EC/RN Number] OR 87390-32-7 [EC/RN Number] OR 91824-88-3 [EC/RN Number] OR 94423-19-5 [EC/RN Number] OR 95461-48-6 [EC/RN Number] OR 95461-64-6 [EC/RN Number] OR 95461-65-7 [EC/RN Number] OR 95482-05-6 [EC/RN Number] OR 99126-54-2 [EC/RN Number] OR 99570-00-0 [EC/RN Number] OR 99734-29-9 [EC/RN Number] OR 99734-30-2 [EC/RN Number] OR 102033-55-6 [EC/RN Number] OR 102051-00-3 [EC/RN Number] OR 103175-09-3 [EC/RN Number] OR 103230-29-1 [EC/RN Number] OR 104934-17-0 [EC/RN Number] OR 108777-93-1 [EC/RN Number] OR 112939-69-2 [EC/RN Number] OR 120486-24-0 [EC/RN Number] OR 121440-30-0 [EC/RN Number] OR 126928-07-2 [EC/RN Number] OR 127512-63-4 [EC/RN Number] OR 128738-83-0 [EC/RN Number] OR 128774-95-8 [EC/RN Number] OR 133654-02-1 [EC/RN Number] OR 133738-23-5 [EC/RN Number] OR 136097-93-3 [EC/RN Number] OR 148618-57-9 [EC/RN Number] OR 155808-79-0 [EC/RN Number] OR 156153-06-9 [EC/RN Number] OR 160391-93-5 [EC/RN Number] OR 182015-59-4 [EC/RN Number] OR 187547-43-9 [EC/RN Number] OR 217782-56-4 [EC/RN Number] OR 368869-33-4 [EC/RN Number] OR 457632-32-5 [EC/RN Number] OR 946492-22-4 [EC/RN Number] OR 946492-23-5 [EC/RN Number] OR 1072006-19-9 [EC/RN Number] OR 1166833-04-0 [EC/RN Number] OR 1207543-50-7 [EC/RN Number] – 0 hits

POLYGLYCERYL FATTY ACID ESTERS – TRANSCRIPTS

Full Panel – April 1, 2016

DR. BERGFELD: All of them. All right, moving on to the next ingredient in this report advancing, polyglyceryl fatty acids, Dr. Belsito.

DR. BELSITO: So this is the first time we are looking at this report of 275 ingredients. We are notified that of the 275, unfortunately acacia decurrens has been found to be insufficient previously by the panel so we felt that we could go ahead and rule that all 274, except for acacia decurrens jojoba sunflower seed wax polyglycerol-3 esters were safe as used when formulated to be non-irritating and in that in our discussion we would have penetration enhancement in the respiratory boiler plate.

DR. MARKS: Second.

DR. BERGFELD: Would you also include the exclusion of your one ingredient --

DR. BELSITO: Yes, that is insufficient and it was insufficient based upon composition.

DR. BERGFELD: Right, so is that going to be in the discussion or the conclusion?

DR. BELSITO: Well we could eliminate it just from the list and then have no comment on it.

DR. BERGFELD: Okay, is that your preference?

DR. BELSITO: Yes.

DR. BERGFELD: Okay.

DR. MARKS: Agree.

DR. BERGFELD: Agree. Any other comments regarding this movement of going safe? Seeing none, I'll call for the question; all those in favor? Opposed? Abstaining?

(Motion passed unanimously)

DR. HILL: Yeah I just -- we had talked yesterday about we had some plant derived fatty acids that we didn't have the acid composition for and then I was bothered by the idea of reading across without that information so I think we had come up with a list of about eight or nine that fell under that category.

DR. BERGFELD: So we can make an informal request for that? For the composition of some of these that are undefined?

DR. HILL: I would have preferred to leave those insufficient until we got --

DR. BERGFELD: Well the vote has gone forward though so --

DR. HILL: I am aware of that. Yes, I am sorry; I tried to jump in but --

DR. BERGFELD: Well Carol, you heard us so in case we can an informal.

Belsito Team – March 31, 2016 (1st review)

DR. BELSITO: The next one is polyglyceryl fatty acid esters. So this is the first time we're looking at these 275 ingredients and they function as skin conditioning ingredients. A lot of the data came out of the ECHA website and the question we're being asked is is this sufficient and if not what do we need. So my first question always goes to Dan and I guess Bart is not here so is the grouping appropriate?

DR. LIEBLER: Yes. It is big but yes. I didn't have any exclusions.

DR. BELSITO: There is one of these and I believe it is acacia decurrens jojoba is that the one where the flour wax was insufficient? I can't tell where my where my comment is whether it is acacia or adensonia. But one of the flour waxes that is part of this group was insufficient which bring us up to the issue we've always had with the arachidonic acid and then do we want to include it.

MS. FIUME: It was acacia decurrens flower wax.

DR. BELSITO: So now we have acacia decurrens sunflower seed wax polyglyceryl three acids. Does that bother anyone that the flower wax of acacia decurrens was insufficient and we're including it in this grouping.

DR. LIEBLER: Do we know why it was insufficient?

DR. SNYDER: I'm guessing composition and impurities.

DR. LIEBLER: So we just don't know what the fatty acid profile is basically? So you're worried about possibly having a significant amount of arachidonic acid? That would be the thing he would like to verify that it doesn't.

DR. BELSITO: From my emails I've been away for the past week so I got through this but I didn't look as to why it was insufficient.

DR. LIEBLER: That's what I would be looking for I think and I realize we don't necessarily have in the report here fatty acid profiles for all the plant derived ingredients. Table 5 has some of them.

DR. BELSITO: So in going through the report we have 260 uses in lipsticks to 39 per cent. But were told the diisostearyl polyglyceryl-3 was okayed for food use so I'm assuming no one has problems with the ingestion from all of those lipstick products?

DR. SNYDER: No.

DR. BELSITO: It is a penetration enhancer so we have to put that into the discussion. So there was this thing in the (inaudible) studies about an impact on light dark cycle disturbance and they thought that is what caused some issues in those (inaudible) I'm assuming we just leave that off?

DR. SNYDER: Yes.

DR. BELSITO: So under irritation and sensitization more than adequately covered. I think there were some issues where occasionally there was irritation. I wasn't overwhelmed by it but if we wanted to be safe we could go on formulated to be non irritating to cover that aspect. I wonder if any of you had any comments.

DR. SNYDER: Your memo said there were 275 ingredients but the report said 273.

MS. FIUME: I'm sorry I tried to catch it in most places. There were two ingredients that we found at the very end so it was actually 275. I know the introduction has 275.

DR. SNYDER: Okay thank you.

DR. LIEBLER: So Monice handed me the report and it does look like simply that it was insufficient for the composition. That had appeared to be it. It just didn't have the fatty acid profile.

DR. SNYDER: Would it be advantageous if we had a boiler plate for what we consider data needs and issues for nail applications like we do for inhalation and other things?

DR. BELSITO: I think creating a boiler plate may be a little difficult because some components in the nail product is going to be volatile and then we talk about the fact that the amount in the breathing zone is small or below the threshold of toxicologic concern. There are many different options.

DR. LIEBLER: Well I was think of that very issue when we do that with oxidized and non oxidized because our data needs are different for those.

DR. SNYDER: I don't think it is the answer to my problem. My issue is very simple is you've got to define what the chemical substance is and if we ask for impurities give impurities. Just because it goes on the nail doesn't change the fact that you haven't defined the impurities. You have to define the chemical nature of the substance so I don't think a boiler plate is going to take care of that.

DR. BELSITO: Going back to the polyglyceryl fatty acids Monice on page 32 of the PDF under case reports it talks about an 80 year old female with a rash and she was patch tested and it says to go on this is the third line and the irritation caused by this substance.

MS. FIUME: I believe it was [inaudible].

DR. BELSITO: I understand but is that the author's words because it is not irritation if it persisted it is sensitization.

MS. FIUME: It was probably the author's words but I can change it too.

DR. BELSITO: Well if it's the author's words I would put it in quotation marks and put sic because that is not an appropriate description that patch test was positive. I thought overall these were all safe as used when formulated to be non irritating just to cover that small little bit of irritant data and then the only question I had is are you okay with including that one flower wax?

DR. LIEBLER: Not today. But I agree with you this is a large but straightforward family of ingredients and you mentioned the penetration enhancement needs to be covered in the discussion. These are extensively metabolized to common nutrients and physiologic intermediates. I see no issue with that.

DR. BELSITO: -- Monice on page 33 the paragraph with apricot kernel oil down towards the bottom. So I would add here and rechallenge the responses were seen in both the control and the experimental group because that's one really fluky sensitization study where it looks like they're actually sensitized the (inaudible) or something else in the mixture because you're getting positive reactions in both control and experimental group. So I thought I didn't really have a lot of issues with that. Then I had a list of some of the discussion. We need penetration enhancement, respiratory boiler plate. A lot of these are derived from plant substances so do we need the botanical boiler plate? So we need the botanical boiler plate and I don't

even know if we want to discuss that fluky repro study with the day night issue where the fluky (inaudible) study do those even require I mean I think that is putting too much emphasis on studies that are obviously flawed.

DR. LIEBLER: I agree.

DR. BELSITO: So really just penetration, respiratory, botanical and a conclusion of safe when formulated to be non irritating.

MS. FIUME: With the pesticide and heavy metal boiler plate as well?

DR. BELSITO: Yes. And then we will be eliminating the flower wax.

MS. FIUME: Dr. Belsito can I ask for a clarification on the botanical boiler plate because we have the information now that says it is not a constituent of concern language that we've been using in the pure botanicals it is just the heavy metals?

DR. BELSITO: Yes I'm not concerned about the constituents of concern. There's nothing that pops up at me at the levels these are used it is more just the pesticides heavy metals.

MS. FIUME: Just for your information so when it comes back just earlier this week I did receive more information on probably at least 10 to 12 of these ingredients and it was mostly acute talks and irritation sensitization and one or two photo contact studies and they were all negative. So just agreed with what was already there.

DR. BELSITO: Now in my discussion of my last point do we want to say anything about the mucosal exposure in lipstick products and that that product was considered for food as long as it was (inaudible) free or we don't need to discuss that?

DR. SNYDER: I think it is a non issue.

DR. LIEBLER: I agree.

DR. BELSITO: Okay anything else with this group? So we're going to say discussion penetration enhancement, respiratory boiler plate, botanical boiler plate not about constituents but about heavy metals and pesticides, eliminate the acacia jojoba flower wax and safe as used when formulated for being non irritating.

DR. LIEBLER: Sounds good.

Marks Team – April 1, 2016 (1st review)

DR. MARKS: Next -- Polyglyceryl fatty acid esters. This is a draft report, so it's the first time we've seen these. A small list of ingredients, only 275, so we previously reviewed components of these ingredients and found them safe. That's on page 68, so I guess going back, is there, in this long, laundry list of ingredients of these polyglyceryl fatty acid esters, anything we should remove? This is going to be a first if we can look at 275 ingredients and say they all look good in this grouping. Where's Bart?

MS. FIUME: He had to go over and do --

DR. MARKS: Yeah, no, that's fine. I'm only teasing here. So Ron, you say it looks fine. Tom, looks fine, the 275 and Ron Shank are you fine with the 275?

DR. SHANK: I split it in two, the simple polyglyceryl fatty acids, I found were okay. But I needed help from the chemists on the multi-esters.

DR. HILL: Are you talking about, for example, the ones derived from plant? Plant derived fatty acid mixtures, is that what you're --

DR. SHANK: Let's see --

DR. MARKS: Multi-ester, you refer to it.

DR. SHANK: They are referred to here as multi- esters.

MS. FIUME: PDF page 38.

DR. SHANK: 38? Thank you.

DR. MARKS: And the help you needed, Ron, in terms of, from the chemists, that's why Bart, actually I was teasing Bart, but it would be good to have Bart here in terms of clearing up the chemistry.

DR. HILL: Well, I get your point. It's kind of a level -- this is sort of like monoglyceride, monoacylglycerols and diacylglycerols, the way that these are made; I think you can't divorce the groups, because you get mixtures. That's my take on it.

DR. SHANK: And I have here that we have the data for simple polyglyceryl fatty acids. Can we use those stated to cover all of the multi-esters? I also have a question, I'm not sure why these compounds absorb UV light, somewhere in the report.

DR. MARKS: I don't see any phototox data at all.

DR. SHANK: Right.

DR. HILL: I wouldn't predict that we'd need it, unless there's some highly conjugated unsaturated fatty acid that I'm missing here. But I was going to bring up that we have a few plant derived fatty acids that are used for the esterification that, to my memory, and I didn't go back and go through the 400 and some oils that we had in the oil report, to my memory, we didn't previously review it. And I want to say fatty acid composition whenever we actually do the safety assessment. I'm missing information right now, I guess is the best way to put it.

MS. FIUME: I brought the fatty acid composition that was available from the oils report into this report.

DR. HILL: Right. So there are some plants that weren't in the oils report that are fatty acids that are used for these, I'm confident. I didn't count them.

MS. FIUME: And I did look for fatty acid composition on typical data sheets, so whatever I did find, there is additional in here that was not in the oils. But whatever I could find is in here.

DR. HILL: Okay. So that means there's still some missing ones I guess is -- but that doesn't mean we remove the ingredients. It only means we need some information.

MS. FIUME: Dr. Shank, while you're looking, if I could just --

DR. SHANK: Sure.

MS. FIUME: -- add some information. So we had already received a lot of information from industry and then last week, because it was still within the 60-day comment period, we did receive another large submission. Most of the information was acute, oral tox, ocular irritation and skin sensitization and genotox on a number of ingredients. It was all negative. But we also received some phototoxicity data on polyglyceryl-10 nonaisostearate, and it was not phototoxic, so we have two studies in guinea pigs for that compound.

DR. SHANK: Thank you.

DR. MARKS: So it's at wave three, Monice.

MS. FIUME: It is.

DR. MARKS: That's good to know. I mean that's very helpful.

MS. FIUME: And I've actually, if anyone, I only have one copy, but I've marked in red on the data profile, if anyone would like to see it, what the additional data we received is. Different than what's in the report.

DR. MARKS: That'll -- you'll actually, when we get the next rendition of this report, you'll -- that'll be highlighted, this is new.

MS. FIUME: It'll all be highlighted. It's just there was a lot of information. I kind of like to make sure I knew what we did receive.

DR. MARKS: So Bart is back here, Ron Shank. Did you want to ask him about the chemistry? And you were saying, can we use the data from the simple esters to cover the multi- esters?

DR. SHANK: Correct.

DR. MARKS: And how do you think the chemists can answer that? Meaning, is this something that you say structurally this is similar, so we can read across? Or do you think that's something we actually -- now you got more data. I don't know if that covered some of the multi-esters or not.

MS. FIUME: It did.

DR. MARKS: Oh it did. Okay.

DR. HILL: So again, my answer was, that the way that these things are made, you're going to get mixtures and so even if it says it's the mono-ester, it's a mixture of mono-esters and -- undoubtedly contaminated with some di and tri.

DR. MARKS: Okay.

DR. HILL: And so if it's marketed as the di, it's going to have some mono and a collection of di and so that I think, my sense is at least, that they're all mixtures based on the way that they're made. And that really taking them apart would compromise any read across.

DR. MARKS: So, Ron Shank, is that reassuring?

DR. SHANK: Yes.

DR. MARKS: So we can say now all the 275 ingredients are okay in the report? Okay, good, that's -- any data needs from -- and I know we have wave three there. But any data needs at this point? No. And irritation, sensitization was good?

DR. HILL: Just the fatty acid compositions on the plants that weren't part of the vegetable oil report earlier.

DR. MARKS: But would that prohibit us from issuing a tentative report with a safe conclusion?

DR. HILL: Yes.

DR. SHANK: I would like to say insufficient on those.

DR. BERGFELD: I thought that you said you had some plant readings.

DR. HILL: Some.

DR. BERGFELD: Oh, not enough for you? I mean, we haven't seen these.

MS. FIUME: It was in the report.

DR. BERGFELD: Oh was it? Okay. I thought you said it was new.

DR. HILL: Well that -- my point is that's what enables read across or lack thereof.

DR. BERGFELD: I think this deserves a big discussion, in the discussion. All this 200 plus, plus read across and --

DR. HILL: What I was surprised to see is that these polyglyceryls are biotransformed as if they were monoglycerides because, liking that, I was wondering how we even, you have your monoglycerol, and I apologize, I'll probably go in and erase my comment but it was sort of, I can't fathom how you'd think that what we did on the monoacylglycerols has any relationship whatsoever to these. Because polyglyceryls are not physiological, but at least it seems like we can cleave freely and, yeah, we generate polyglyceryls, but no toxicology I can suspect. But nowhere, nothing in evidence.

DR. MARKS: So I still haven't, from the team, got a consensus moved. I'll be seconding a motion. Is it going to be safe or tentative or insufficient data on those. Safe?

DR. SHANK: Safe.

DR. MARKS: Ron Shank, safe.

DR. HILL: Dissent.

DR. MARKS: Dissent, okay.

DR. HILL: But I don't have a list, I should get the list. Actually, I don't have the benefit of wave three. So --

MS. FIUME: Oh, wave three doesn't have fatty acid composition.

DR. HILL: Okay.

MS. FIUME: I just was -- we need to say that there were additional fatty acid composition in here, in addition to what was in the oil report.

DR. HILL: Okay. So I just need to go through and look and see what's missing.

DR. MARKS: Fatty acid composition of plant.

DR. HILL: There are certain, where it's esterified with a plant-derived fatty acid, plant oil derived fatty acid and there are some plants that appeared in here that were not in our oils report. But I didn't compile a list of those, there are not many.

DR. MARKS: Okay, well, I'll go ahead and presumably second the motion to end the report with a safe conclusion. And then I'll let you, Ron Hill, obviously, uh, conclusion.

DR. HILL: Okay.

DR. MARKS: And then. Ron, you can go ahead and mention if you want, the need for fatty acid composition of plant oil derived ingredients. Okay. Any other comments?

DR. HILL: Any chance you could (inaudible) and I keep getting from her? I'll have to stay up half the night finding out which ones -- no I can find it.

DR. EISENMANN: I want to look for one that I didn't find any data on.

MS. FIUME: Okay. All right.

MS. FIUME: Dr. Marks? Before we move on, can you give me some discussion items for the polyglyceryl fatty acid esters? What you would like to see in there.

DR. SLAGA: Well, since you have all the related data it would be nice to have that discussed in the discussion since they're all safe, and then I think that's a great policy to avoid discussion. I didn't see anything negative to put in the discussion.

DR. BERGFELD: I don't think you have to put what's negative. You have to put what to do with the read across, what -- all these ingredients.

DR. SLAGA: Well, that would be, I guess, part of the discussion too.

MR. BEST: It certainly seems mysterious to a layperson. I mean (laughter) the read across, right. I know that's gone before us or maybe hallucinating kind of what that means and entails why it's okay (inaudible) certainly.

DR. HILL: So except for the ones that we don't know about, the fatty acids that are esterified onto the polyglyceryls are in common with both the vegetable oil ingredients that we reviewed before and also the acyl glycerols that we've reviewed before. So the difference is that we have polyglyceryl core instead of simple glycerol core.

It appears that in terms of bio-handling -- I know Dr. Liebler doesn't like that word but it's real -- in terms of bio-handling that we are able to freely remove the fatty acids from the polyglyceryls and our indication from Toxicokinetics is that we are able to metabolize these to fatty acids in polyglyceryls. The polyglyceryls are very hydrophilic and effectively cleared from the body rapidly, and there's no evidence from the data that we do have that the polyglyceryls generated the way that in terms of systemic availability cause any toxicological affects, and I believe we have very high doses given orally, and in that particular case we would expect absorption and the toxicology should be relevant to anything dermal that I can envision. Does that help at all?

DR. MARKS: Monice?

MS. FIUME: Yes, but if I could get something -- some additional wording written in case it's in a capture. Just even a note of some terms and I can go with it from there. Thank you.

DR. MARKS: Ron Shank, did you want to add anything more in terms of the discussion?

DR. SHANK: No.

DR. HILL: Are you hoping for that tomorrow morning, or can you email me and I'll email back what I just said?
(laughter)

DR. SHANK: Yes.

MS. FIUME: Yes, I just need to be able to have it to be -- if it goes out as tentative to be able to release it next week.

DR. HILL: Okay, hopefully it got captured somewhere here.

MS. FIUME: I'm hoping the --

DR. MARKS: Well, it'll be in the recorded minutes. So, actually it will all be there. Okay, any other comments?

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Safety Assessment of Polyglyceryl Fatty Acid Esters as Used in Cosmetics

Status: Draft Final Report for Panel Review
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The 2016 Cosmetic Ingredient Review Expert Panel members are: Chairman, Wilma F. Bergfeld, M.D., F.A.C.P.; Donald V. Belsito, M.D.; Ronald A. Hill, Ph.D.; Curtis D. Klaassen, Ph.D.; Daniel C. Liebler, Ph.D.; James G. Marks, Jr., M.D., Ronald C. Shank, Ph.D.; Thomas J. Slaga, Ph.D.; and Paul W. Snyder, D.V.M., Ph.D. The CIR Director is Lillian J. Gill, D.P.A. This safety assessment was prepared by Monice M. Fiume, Assistant Director/Senior Scientific Analyst/Writer and Bart Heldreth, Ph.D., Chemist.

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ABSTRACT

The Cosmetic Ingredient Review (CIR) Expert Panel (Panel) assessed the safety of 274 polyglyceryl fatty acid esters. Each of the esters in this group is a polyether comprising 2 to 20 glyceryl residues, end-capped by esterification with simple carboxylic acids, such as fatty acids. Most of these ingredients are reported to function in cosmetics as skin-conditioning agents and/or surfactants. The Panel reviewed the available data and considered conclusions from relevant previous CIR reports, and determined that these ingredients are safe in cosmetics in the present practices of use and concentration described in this safety assessment when formulated to be non-irritating.

INTRODUCTION

This is a safety assessment of the polyglyceryl fatty acid esters as used in cosmetic formulations. Each of the esters in this group is a polyether comprising 2 to 20 glyceryl residues, end-capped by esterification with simple carboxylic acids, such as fatty acids. The 274 ingredients included in this report are listed alphabetically in Table 1. Table 2 and Table 3 present these ingredients based initially by increasing polyglyceryl chain length and second by increasing alkyl chain length; however, when there is a mixture of fatty acid constituents, those ingredients are presented by chain length for the polyglyceryl moiety and alphabetically based on the fatty acid component. Test data are presented based on increasing chain length (i.e., the order provided in Table 2 and Table 3).

According to the *International Cosmetic Ingredient Dictionary and Handbook*, most of these ingredients are reported to function in cosmetics as skin-conditioning agents and/or surfactants¹ (Table 3). Additional functions have also been reported.

In 2011, the Cosmetic Ingredient Review (CIR) Expert Panel (Panel) published a safety assessment of a family of ingredients that included Polyglyceryl-20 Octaisnonanoate; the Panel concluded that all of the ingredients named in that report are safe in the present practices of use and concentration identified in that assessment.² Because Polyglyceryl-20 Octaisnonanoate is a polyglyceryl fatty acid ester and is structurally related to the ingredients in this report, it is being included in this safety assessment.

The Panel has recently reviewed the safety of monoglyceryl monoesters, and concluded that the monoglyceryl monoesters are safe in cosmetics in the present practices of use and concentration described in that safety assessment.³ Monoglyceryl monoesters and the polyglyceryl fatty acid esters both consist of the same starting materials, and they have the same potential metabolites. The difference between these two families of ingredients is that monoglyceryl monoesters are structurally constituted of the esterification products of only one equivalent of glycerin and one equivalent of a carboxylic acid, as opposed to the varying number of equivalents of glycerin and fatty acids in the polyglyceryl esters.

The Panel has previously reviewed the safety of ingredients that represent some of the starting materials of the polyglyceryl fatty acid esters that may persist as residual impurities in the polyglyceryl esters products, or may represent potential metabolites (e.g., from the action of esterases in the skin), such as glycerin and free fatty acids. A list of relevant ingredients that have been reviewed and the associated conclusions are provided in Table 4. (The full reports can be found on the CIR website: <http://www.cir-safety.org/ingredients>). Other ingredients, such as dipropylene glycol and polypropylene glycols (PPGs), have also been reviewed and are also included in Table 4 because they have similar properties and functions.

Much of the toxicity data included in this safety assessment were found on the European Chemicals Agency (ECHA) website.⁴ The ECHA website provides summaries of information generated by industry, and it is the summary data that are reported in this safety assessment when ECHA is cited. Also, when deemed appropriate, read-across data from ECHA are included in this report. In some ECHA dossiers, such as in 1,2,3-propanetriol, homopolymer, diisooctadecanoate, the number of polyglyceryl chains is not defined. Because the number of polyglyceryl chains is not defined, and it therefore is unclear what specific ingredient is being studied, the data are presented as potential read-across data.

Several studies that are summarized in this safety assessment examined the toxicity of a “polyglyceryl ester”. The exact composition of the test material was not identified in many of the studies and, generally, very few details were provided. However, this information is included in this safety assessment for completeness.

CHEMISTRY

Definition and Structure

The ingredients in this report are each structurally constituted of the esterification products of polyglycerin chains and fatty acids. These ingredients vary in the number of equivalents of glycerin and fatty acids, and the length of those fatty acids (Figures 1 and 2). The definitions and idealized structures of the polyglyceryl fatty acid esters are provided in Table 3.

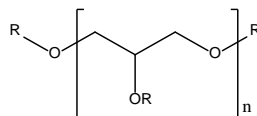


Figure 1. Generic structure of polyglyceryl esters, wherein R represents hydrogen or the residue of certain fatty acids, and n varies from 2 to 20

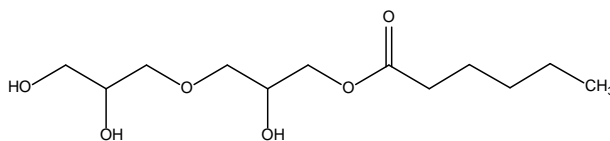


Figure 2. Polyglyceryl-2 caprate (wherein R, in the general structure in Figure 1, is hydrogen in 3 instances and caprate in 1 instance; and n is 2)

The polymerization process used to produce polyglycerol yields a distribution of different oligomers that have a primarily linear structure.⁵ In addition to the linear configuration, a significant part of the polyglycerol is of the branched types, e.g., originating from 1,2- and 2,2-*O*-ether linkages.

Polyglyceryl esters of fatty acids have a hydrophilic polyglycerol group that consists of a finite number of hydroxyethers of glycerol and a hydrophobic fatty acid chain within the same compound.⁶ These ingredients are non-ionic compounds, and a range of polarities is possible because of the variation of the degree of polymerization and number of fatty acids per head-group.

Physical and Chemical Properties

The physical properties and appearance of polyglyceryl esters of fatty acids mainly depends on their molecular structure. Typically, the physical form of those with a higher degree of polymerization and shorter or unsaturated fatty acid chains ranges from viscous liquids to plastic pastes, and the polyglyceryl esters with a lower degree of polymerization and longer, saturated fatty acid chains are generally powders, flakes or small beads.⁶ The color of the esters is dependent on the source of the fatty acids, but the polyglycerol will contribute to the color.⁵ The solubility of polyglyceryl esters in organic solvents depends on the nature of the solvent and the polarity of the ester but, generally, the esters will show best solubility in protic and polar aprotic solvents, such as lower alcohols and dimethyl sulfoxide (DMSO).

Polyglyceryl esters of fatty acids are polar or amphiphilic lipids, and the amphiphilic properties in water exhibit mesomorphic activities forming lyotropic liquid crystals.⁶ The polyglyceryl ester as a polar emulsifier will form aggregated bodies, such as micelles, at low concentrations in water. Polyglyceryl esters of fatty acids become unstable with water and high temperatures, and the instability is enhanced in the presence of alkaline substances. The presence of an alkali or acid results in the partial hydrolysis of fatty acids and the formation of free polyglycerol.

Polyglyceryl esters are comparable to monoglycerides with respect to hydrolysis. In enzymatic systems, lipases will hydrolyze the polyglyceryl ester, as seen in the case of other glycerides.⁵

The average fatty acid compositions (when available) are described in Table 5, and the physical and chemical properties of many of the ingredients included in this safety assessment are presented in Table 6.

Method of Manufacture

The synthesis of polyglyceryl esters of fatty acids is achieved by the polymerization of a hydrophilic headgroup, and then esterification of the headgroup with the hydrophobic tails.⁶ Polyglycerols are generally prepared from an alkaline condensation of glycerol molecules at elevated temperature, with the removal of water. Because one glycerol molecule possesses 3 reactive sites (1 secondary alcohol (center position) and 2 primary alcohols (terminal positions)), several kinds of diglycerol molecules can be formed. If the polymerization proceeds to tri-, tetra-, or higher glycerols, then the number of possible linear or branched isomers increases exponentially. Moreover, once a dimer is formed, cyclic products can result from intramolecular ring-closure reactions (Figure 3).

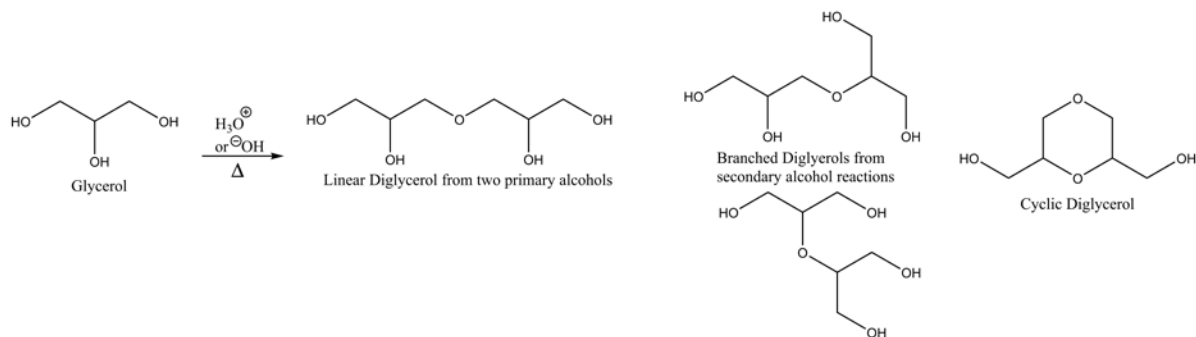


Figure 3. Polymerization of glycerol⁷

Polyglycerols can be used as produced, or they may be stripped of excess glycerol and cyclic glycerols by steam distillation at reduced pressure.⁷ Alternatively, stripping processes have been developed using mesoporous and zeolite catalysts under milder conditions.

Other possible processes for production of a polyglycerol use reactive petrochemical substances such as epichlorohydrin (1-chloro-2,3-dihydroxypropane), which is allowed to react with glycerol in an etherification process. However, epichlorohydrin is a hazardous material, and the purification of the polyglycerol complicates the process.⁵ Glycidol is also used for the production of polyglycerol, and the oxirane group easily reacts with glycerol or epichlorohydrin, depending on the conditions of the reaction and the type of polyglycerol required. However, these processes use chemicals that make the process non-competitive in relation to a glycerol based process.

According to the World Health Organization (WHO) Food and Agriculture Organization (FAO), polyglyceryl esters of fatty acids (as used in foods) are formed by reacting polymerized glycerols with edible fats, oils (edible fats and oils are primarily triglycerides), or fatty acids.⁸ The degree of polymerization varies, and is specified by a number (such as tri-) that is related to the average number of glycerol residues per polyglycerol molecule.

Polyglyceryl esters of fatty acids also can be prepared by direct esterification between polyolethers and fatty acids at elevated temperatures ($T > 200^\circ\text{C}$) with the removal of water.^{5,6} The esterification is normally carried out under alkaline conditions and can be stopped by simply adding an acid and lowering the reaction temperature. To obtain a large amount of mono- and diesters, the synthesis is generally carried out with an excess of polyglycerol. Some unreacted polyglycerol can be removed by simple gravimetric settling, and the remaining fraction by extraction with water combined with salts in a charge-wise separation process. Alternatively, polyglyceryl esters can be prepared by an inter-esterification (or transesterification) between polyglycerols and triglycerides; this is a reaction carried out at a high temperature and under conditions similar to direct esterification, but the degree of polymerization is not as high as obtained with direct esterification. Transesterification between polyglycerol and alcohol esters of fatty acids is another possible method of synthesis; using this process, methanol is continuously removed from the reactor, and the process includes a second step to reduce the remaining unreacted oxirane oxygen.

Composition and Impurities

Joint FAO/WHO Expert Committee on Food Additives (JECFA) specifications for polyglyceryl esters of fatty acids used in foods state “the polyglycerol moiety shall be composed of not less than 70% of di-, tri- and tetraglycerols and shall contain not more than 10% of polyglycerols equal to or higher than heptaglycerol”; that acids other than fatty acids shall not be detectable; and that not more than 2 mg/kg lead is detectable.⁸ Minor amounts of mono-, di-, and triglycerides, free glycerol and polyglycerols, free fatty acids, and sodium salts of fatty acids may be present.

Trace amounts of unreacted glycerol and fatty acid soaps can be found in polyglyceryl esters of fatty acids.⁶ Specifications, impurities or constituents of some of the ingredients included in this report are provided in Table 7.

USE

Cosmetic

The safety of the cosmetic ingredients included in this safety assessment is evaluated based on data received from the U.S. Food and Drug Administration (FDA) and the cosmetics industry on the expected use of these ingredients in cosmetics. Use frequencies of individual ingredients in cosmetics are collected from manufacturers and reported by cosmetic product category in FDA’s Voluntary Cosmetic Registration Program (VCRP) database. Use concentration data are submitted by Industry in response to surveys, conducted by the Personal Care Products Council (Council), of maximum reported use concentrations by product category.

Based on 20156 VCRP data and the results of the Council surveys, 77 of the 274 ingredients included in this report are reported to be in use. According to 2016 VCRP registration data, Polyglyceryl-3 Diisostearate has the most reported uses of

the ingredients included in this report; of the 371 reported uses, 363 are in leave-on formulations, 216 of which are in lipsticks⁹ (Table 8). Polyglyceryl-4 Isostearate has the second highest number of reported uses; of the 280 uses, all but one is in leave-on products. The results of the concentration of use surveys conducted by the Council indicate Polyglyceryl-2 Triisostearate and Polyglyceryl-3 Diisostearate have the highest concentration of use in a leave-on formulation; these ingredients are used at 40% and 39% in lipsticks, respectively¹⁰⁻¹⁴ (Table 8). Additionally, supplier-recommended use concentrations are provided; most of the recommended use levels are $\leq 10\%$ (Table 9).

Use concentrations were reported for several ingredients that were not reported as used in the VCRP; it should be presumed there is at least one use in every category for which a concentration is reported. Additionally, several ingredients have uses reported in the VCRP, but concentration of use data were not received. The 197 ingredients with no reported uses in both the VCRP and industry survey are listed in Table 10.

Many of these polyglyceryl fatty acid esters are used in products applied to the eye area, products that can result in incidental ingestion, or products that come into contact with mucous membranes. The highest reported concentrations of use for these types of exposures are 24.1% Polyglyceryl-4 Isostearate in "other" eye make-up preparations and 40% Polyglyceryl-2 Triisostearate in lipstick formulations (resulting in incidental ingestion and mucous membrane exposure).¹¹ A few of the polyglyceryl fatty acid esters are reported to be used in baby products; Polyglyceryl-3 Diisostearate has the highest reported use in a baby product, i.e., 2% in baby lotions, oils, and creams.

Additionally, some of the polyglyceryl fatty acid esters are used in cosmetic sprays and could possibly be inhaled; for example, Polyglyceryl-3 Distearate is reported to be used at 3% in spray body and hand creams. In practice, 95% to 99% of the droplets/particles released from cosmetic sprays have aerodynamic equivalent diameters $>10 \mu\text{m}$, with propellant sprays yielding a greater fraction of droplets/particles $<10 \mu\text{m}$ compared with pump sprays.^{15,16} Therefore, most droplets/particles incidentally inhaled from cosmetic sprays would be deposited in the nasopharyngeal and thoracic regions of the respiratory tract and would not be respirable (i.e., they would not enter the lungs) to any appreciable amount.^{17,18}

All of the polyglyceryl fatty acids named in this report are listed in the European Union inventory of cosmetic ingredients, and none of the listed ingredients are restricted from use in any way under the rules governing cosmetic products in the European Union.¹⁹ In Australia, according to a National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Polyglyceryl-10 Laurate (~60% pure, with ~40% polyglycerin-10 and ~2% sodium laurate) is not considered to pose an unreasonable risk to public health when used in the proposed manner (i.e., $\leq 3\%$ in skin lotions), and cannot be classified according to the *Globally Harmonised System for the Classification and Labelling of Chemicals* or the *Approved Criteria for Classifying Hazardous Substances*.²⁰

Non-Cosmetic

Polyglyceryl esters of fatty acids, up to and including the decaglycerol esters, are permitted as multipurpose direct food additives when (1) they are prepared from corn oil, cottonseed oil, lard, palm oil from fruit, peanut oil, safflower oil, sesame oil, soybean oil, and tallow and the fatty acids derived from these substances (hydrogenated and non-hydrogenated) and/or oleic acid derived from tall oil fatty acids; (2) they are used as emulsifiers in food, in amounts not greater than that required to produce the intended physical or technical effect; (3) polyglyceryl esters of a mixture of stearic, oleic, and coconut fatty acids are used as a cloud inhibitor in vegetable and salad oils when use is not precluded by standards of identity, and oleic acid derived from tall oil fatty acids may be used as a substitute for, or together with, the oleic acid; and (4) polyglyceryl esters of butter oil fatty acids are used as emulsifiers in combination with other approved emulsifiers in dry, whipped topping base, when used at a level not in excess of the amount required to perform their emulsifying effect. [21CFR172.854]

JECFA established an acceptable daily intake (ADI) of 0-25 mg/kg bw for polyglyceryl esters of fatty acids having an average chain length of up to 3 glycerol units,²¹ and an ADI of 0-7.5 mg/kg bw for polyglyceryl esters of interesterified ricinoleic acid.²² In the EU, the esters are listed as food additives at concentrations between 5000 and 10,000 mg/kg in certain foods, and up to 7% free glycerol/polyglycerol is allowed (i.e., 700 mg/kg).²³ Polyglyceryl-10 Caprylate/Caprates²⁴ and Polyglyceryl-10 Oleate²⁵ are polysorbate replacers, dispersing agents, and emulsifiers in foods.

Several polyglyceryl oleates are allowed for use as inactive ingredients in approved drug products.²⁶ Polyglyceryl-3 Oleate is approved as an inactive ingredient in topical, oral, and vaginal drug products. In oral products, maximum potency is 0.87 mg in gelatin-coated capsules, 330.7 mg in soft gelatin capsules, and 310 mg/ml in oral solutions; in vaginal products maximum potency is 2.7% in regular and sustained-release emulsions and creams. Approved dermal use is in topical sustained release creams; a maximum potency was not specified. Polyglyceryl-4 Oleate is approved as an inactive ingredient in vaginal emulsions and creams at a maximum potency of 2.71%. Polyglyceryl-10 Oleate is approved for use in oral soft gelatin capsules and in oral solutions; maximum potency is 199.9 mg and 190 mg/ml, respectively.

Polyglyceryl-10 Oleate is used as an internal lubricant for polyvinyl chloride (PVC) sheet and film and as an anti-fog agent in plasticized PVC film formulations.²⁵

TOXICOKINETICS**Penetration Enhancement****Polyglyceryl-3 Diisostearate**

Polyglyceryl-3 Diisostearate was not a penetration enhancer in a study that evaluated the skin penetration enhancing effects of several excipients on the hydrophilic drug 5-fluorouracil.²⁷

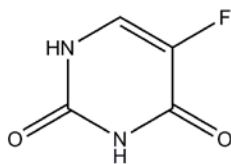


Figure 4. 5-Fluorouracil

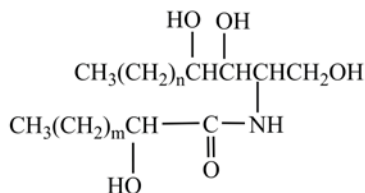
The ability to enhance skin penetration was determined *in vitro* by measuring skin permeability coefficients for human abdominal skin samples.

Polyglyceryl-3 Dioleate

Polyglyceryl-3 Dioleate is reported to be a water-in-oil surfactant/solubilizer associated with enhanced drug penetration.²⁸

Polyglyceryl-4 Laurate and Polyglyceryl-4 Oleate

The effect of 2 microemulsions on the rate and extent of release and penetration of ceramide AP was evaluated using an *in vitro*, multi-layer, membrane model with 4 layers of circular 40-mm membrane films arranged one over the other.²⁹



wherein m has a value ranging from 13 to 27 and n has a value ranging from 12 to 20.

Figure 5. Ceramide AP

One test microemulsion, an *o/w* emulsion, contained 15% Polyglyceryl-4 Laurate, 15% Polyglyceryl-4 Oleate, and 60% water-1,2 pentanediol (1:9); the other, a *w/o* emulsion, contained 30% Polyglyceryl-4 Laurate, 15% isopropyl palmitate/linoleic acid (5:2), and 55% water-1,2 pentanediol (1.5-8.5). Both test formulations contained 0.4% ceramide AP. A non-ionic hydrophilic cream containing 0.5% ceramide AP was used as a reference formulation. Each test substance, in an amount that contained 50 µg ceramide AP, was spread evenly over a 4 cm² area. The formulation was left in place for 15-180 min; the unabsorbed test material was then removed and the ceramide was extracted from the membranes. When compared to the reference cream, the microemulsions increased the rate and extent of penetration of ceramide AP. Within 15 min, a higher percentage of ceramide AP was released from the microemulsions and penetrated into the deeper membrane layers; ceramide AP was not detected in the 3rd and 4th layers when the reference cream was used. Also, the amount that penetrated into each layer at each time point was greater with the microemulsions than with the cream. The total percent ceramide AP released and penetrated was 93.4% with the microemulsion containing 15% Polyglyceryl-4 Laurate and 15% Polyglyceryl-4 Oleate, 84.2% for the second test formulation, and 73.3% with the reference formulation.

The effect of similar microemulsions and microemulsion gels on the permeation of ceramide NP was evaluated in human thigh skin samples using Franz diffusion cells.³⁰ Several microemulsions were evaluated; the formulations were composed of 30 or 35% Polyglyceryl-4 Laurate/Polyglyceryl-4 Oleate (1:1), 10-15% isopropyl palmitate/linoleic acid (9:12), 50-60% water/1,2 pentanediol (1.5:8.5), 0.2% ceramide AP, and 0.1% deuterated ceramide NP. The gels were prepared by dispersing 2.5% Carbopol[®] 940 into the microemulsion. Some of the formulations were *o/w*, and some were bicontinuous. A hydrophilic cream containing 0.2% deuterated ceramide NP was used as a reference formulation. Twenty mg of each formulation was applied to the skin surface (3.1416 cm²) and allowed to permeate for 300 min. After 300 min, the skin surface was wiped and the stratum corneum layer was removed with 10 tape strips over a 2.016 cm² area. Subsequently, 3 skin punches were taken and the epidermal layer was removed. Permeation was deeper from the microemulsions, as compared to the cream and the microemulsion gels; additionally, penetration was deeper with the *o/w* formulations compared to the bicontinuous formulations. Deuterated ceramide NP in the cream did not permeate into the deeper layers of the stratum corneum and other skin layers. Permeation from the gel was shallow due to its high viscosity.

Polyglyceryl-10 Trioleate

The effect of Polyglyceryl-10 Trioleate on the permeation of tenoxicam (a non-steroidal anti-inflammatory drug) in a propylene glycol solution was examined *in vitro* using dorsal skin from male Hartley strain guinea pigs.³¹

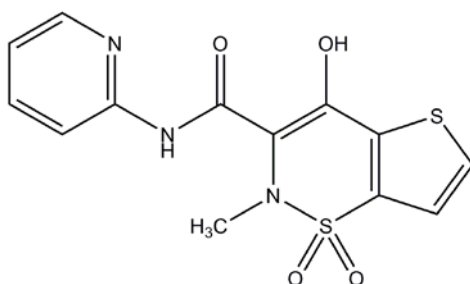


Figure 6. Tenoxicam

The test solution was prepared by suspending 0.3 g tenoxicam in a mixed solution of 3.0 g propylene glycol and 1.5 g Polyglyceryl-10 Trioleate, and the suspension was adjusted to a pH of 6.0. Using a Franz-type diffusion chamber, 1 g of the resulting suspension, which contained 1% tenoxicam, 10% propylene glycol, and 5% Polyglyceryl-10 Trioleate, was applied to the donor skin, and 1.0 ml of the receptor solution was sampled every 3 h for 48 h. The flux of tenoxicam was statistically significantly enhanced by the inclusion of Polyglyceryl-10 Trioleate, from $8.11 \times 10^{-5} \mu\text{g/s}\cdot\text{cm}^2$ to $28.48 \mu\text{g/s}\cdot\text{cm}^2$.

Absorption, Distribution, Metabolism, and Excretion (ADME)

Oral

Metabolic studies of polyglyceryl esters indicated that these esters are hydrolyzed in the gastrointestinal (GI) tract, and utilization and digestibility studies supported the assumption that the fatty acid moiety is metabolized in the normal manner.³² Analytical studies have produced no evidence of accumulation of the polyglycerol moiety in body tissues.

Albino Wistar rats were fed a diet containing 5% or 10% polyglyceryl ester; the exact composition of the ester was not provided, but it was stated that the ester was mostly prepared with stearic and oleic acids.³³ Control animals were given untreated feed. The number of animals per group and duration of dosing also was not specified, however some animals were fed the test diet for up to 14 mos, and some were maintained through 3 generations. Feed consumption was determined for 2 males and 2 females per group, and feces were collected for these animals for 24 days. Fecal lipids were increased in the test groups when compared to the controls; however, the researchers stated that at least 95-98% of the polyglyceryl esters were digested.

Similarly, groups of Wistar rats were fed a diet containing 5% polyglyceryl ester prepared with oleic acid or with linseed oil, and feed consumption was measured and feces collected for 2 males and 2 females per group for 24 days.³³ The polyglyceryl esters were almost completely utilized.

Groups of 8 male Sherman rats were fed a restricted diet consisting of 1 g of a polyglyceryl ester in 5 g basic diet/day for 3 wks, followed by 8 wks feeding, *ad libitum*, of a diet containing 8% of the test material.³⁴ The esters used in the study ranged in size from 2 to 30 glyceryl radicals, with hydrogenated cottonseed oil or peanut oil. Fecal fat excretion, calculated as total lipid extract, absorption, and digestibility values, were determined during the restricted and *ad libitum* feeding periods. The fecal lipids from rats fed the polyglyceryl hydrogenated cottonseed oil esters were higher in palmitic, stearic, and oleic acids, and lower in linoleic acid, than those the fed the polyglyceryl peanut oil esters. Gas-liquid chromatography (GLC) analysis of the fatty acids of the extracted lipids from the epididymal fat pads determined that only triglycerides were present and no appreciable amounts of polyglycerols were deposited.

A study was conducted in which rats were fed a polyglyceryl ester with a high melting point for 8 mos.³⁵ No residues were detected in depot fat, or in fat of muscle, liver, kidney or spleen. (Details were not provided.)

Polyglyceryl Oleates and Decaoleate

The metabolism of Polyglyceryl-3 Oleate, Polyglyceryl-10 Oleate, and Polyglyceryl-10 Decaoleate was investigated in male Sprague-Dawley rats.³⁶ Groups of 4 rats were dosed with 1% Polyglyceryl-3 [¹⁴C]Oleate, Polyglyceryl-10 [¹⁴C]Oleate, [¹⁴C]Polyglyceryl-10 Oleate, Polyglyceryl-10 [¹⁴C]Decaoleate, and [¹⁴C]Polyglyceryl-10 Decaoleate by stomach tube in a liquid diet; the diet contained 7-14 μCi of ¹⁴C. The study also included 2 polyglyceryl esters that are not cosmetic ingredients, but are similar to ingredients reviewed in this report: triglycerol [¹⁴C]tetraoleate and polyglycerin-10 [¹⁴C]monoeicosanoate. Catabolism studies were conducted by administering the test diet, collecting expired CO₂, feces, and urine with the use of metabolism chambers, and collecting GI tract contents and examining the carcass of each animal after 51 h. In additional groups of 4 animals, simultaneous catabolism-absorption studies were conducted by inserting a thoracic duct cannula in each animal, dosing the animals, and then using a metabolism chamber for the collection of lymph, respiratory CO₂, feces, and

urine (each as a single fraction) for 51 h. Lipids were extracted from the lymph of animals dosed with fatty-acid labelled esters, and the distribution of radioactivity among the various lipid constituents of lymph was obtained to determine whether any intact polyglyceryl esters were present in the lymph lipids. The metabolism of the esters was also compared to glycerol-1,3- ^{14}C , ^{14}C polyglycerin-3, and ^{14}C polyglycerin-10.

The disposition of radioactivity following administration of each compound is presented in Table 11. In the catabolism studies, total recovery of the radioactivity ranged from 88-98% of the dose. The distribution of the absorbed ^{14}C Polyglyceryl-10 Oleate and ^{14}C Polyglyceryl-10 Decaoleate was considerably different from that of glycerol. The absorbed polyglyceryls were excreted primarily in the urine (33.5-37%) with less than 4% of the ^{14}C appearing in the respiratory CO_2 and less than 5.5% in the carcass; ~44.5-46.5% was found in the GI contents. Only small amounts of radioactivity from the ^{14}C oleic acid moiety were recovered in feces (~0.1-0.9%) and GI content (~2.8-4.0%), and the fatty acid appeared to be equally well-absorbed as the polyglyceryl-3 and the polyglyceryl-10 ester. Radioactivity from labeled oleic acid moieties of the esters appeared in expired CO_2 at close to the same rates as that from glycerol; however, recovery of labeled polyglycerin-3 and polyglycerin-10 in expired CO_2 was less than 4% of the dose, with unpolymerized glycerol accounting for most of what was recovered. Radioactivity from the eicosanoic acid-labeled ester was excreted in CO_2 at a lower rate (55.5%) than that for the oleic acid-labeled compounds.

In the catabolism-absorption studies, 83-102% of the radioactivity was recovered. No more than 5% of the radioactivity from glycerol-labeled esters were absorbed via the lymphatic system; however, ~67.5-78.5% of the radioactivity from the oleic acid-labeled polyglyceryl esters was recovered in the lymph, and ~54% was recovered in the lymph of animals given the eicosanoate-labeled polyglyceryl ester. Lipids from the oleate- (and eicosanoate-) labeled compounds contained 97-99% of the total lymph radioactivity.

In vitro hydrolysis studies confirmed that the oleic acid ester bond in the polyglyceryl-3 and polyglyceryl-10 esters was readily cleaved. Additionally, it was shown that the eicosanoate bond was cleaved more slowly than the oleate bond. The researchers concluded that the polyglycerols were not catabolized, the ether linkages are inert to normal enzymatic hydrolysis, and the polyglycerols were absorbed and rapidly excreted in the urine without being catabolized.

Groups of 10 male and 10 female Sprague-Dawley rats were fed a diet containing 2.5, 5.0, or 10.0% Polyglyceryl-10 Decaoleate for 90 days, and the control group was fed a diet containing soybean oil as the dietary fat.³⁷ The percentage of dietary fatty acids absorbed decreased as the levels of Polyglyceryl-10 Decaoleate in the diet increased. Fat absorption by males and females of the 5 and 10% test groups was statistically significantly less than controls at wks 4 and 10, and was statistically significantly decreased in females of the 2.5% group at wk 4 and males of the 2.5% group at wk 10. GLC analysis of fecal fatty acids revealed excretion of oleic acid increased in a dose-related manner; the increased excretion of fatty acids in general, and oleic acid in particular, indicated that the absorption of dietary Polyglyceryl-10 Decaoleate was not complete. The researchers stated that fecal oleic acid may have resulted from excretion of intact Polyglyceryl-10 Decaoleate or from hydrolyzed or partially hydrolyzed but unabsorbed material.

In Vitro

Polyglyceryl-2 Diisostearate

The metabolism of Polyglyceryl-2 Diisostearate was evaluated using a lipase assay; olive oil was used as a reference substance.³⁸ Both Polyglyceryl- Diisostearate and olive oil increased the fatty acid concentration in all reaction vials in a time dependent manner, and the speed of fatty acid formation was comparable for both substrates. The *in vitro* experimental results support the hypothesis that accumulation of Polyglyceryl-2 Diisostearate in the gut is unlikely.

TOXICOLOGICAL STUDIES

Acute Toxicity

Acute toxicity studies are summarized in Table 12.^{32,38-54}

In an acute dermal toxicity study in rats, the LD_{50} of 1,2,3-propanetriol, homopolymer, diisooctadecanoate was >5 g/kg. Low toxicity was reported in acute oral studies. In rats, the LD_{50} >2 g/kg for Polyglyceryl-3 Caprate, Polyglyceryl-3 Caprylate, Polyglyceryl-4 Caprate, Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate, and Polyglyceryl-8 Decabehenate/Caprate, the LD_{50} was estimated to be >2.5 g/kg for Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate, and Polyglyceryl-10 Nonaisostearate, and the LD_{50} was >5 g/kg for Polyglyceryl-3 Isostearate, Polyglyceryl-3 Oleate, Polyglyceryl-2 Diisostearate and Polyglyceryl-3 Diisostearate.

Short-Term Toxicity

Animal

Oral

Polyglyceryl Esters - general

In rats, repeated oral dosing with 10 g/kg bw polyglyceryl ester daily over 5 days caused no deaths.³² (No details were provided.)

The feeding of a restricted diet consisting of 1 g of a polyglyceryl ester in 5 g basic diet/day for 3 wks to Sherman rats, followed by 8 wks feeding, *ad libitum*, of a diet containing 8% of the test material (8 males/group; study described in the ADME section) did not result in any microscopic abnormalities in the liver, kidneys, or ileum.³⁴

Polyglyceryl Stearate

Two groups of 4 male albino rats were administered a suspension of 1 g/kg bw/day of polyglyceryl stearate (glyceryl chain length not stated) in an aqueous solution of 0.5% carboxymethylcellulose (CMC) and 0.1% Tween 80 for 10 wks; one group was fed a basic diet, and the other a diet supplemented with 5% hydrogenated fat.⁵⁵ Two untreated control groups, one fed a basal diet and one the fat-supplemented diet, were used. Polyglyceryl stearate was not toxic, and it did not have an effect on red blood cell count, white blood cell count, or hemoglobin values.

Polyglyceryl-2 Diisostearate

In a dietary study, 5 male and 5 female rats per group were given feed containing 0, 0.012, 0.12, or 1.2% Polyglyceryl-2 Diisostearate (for a targeted dose of 0, 10, 100, or 1000 mg/kg/day, respectively) for 28 days, and a control group was given untreated feed.³⁸ There were no mortalities, clinical signs of toxicity, effects on body weight, clinical pathology, or gross or histopathology alterations that were considered related to the dietary administration of the test substance and/or considered to be of toxicological significance. The no observed adverse effect level (NOAEL) was 845 mg/kg/day in males and 922 mg/kg/day in females, corresponding to the highest dietary concentration tested.

Human

Oral

Polyglyceryl Esters - general

For 3 wks, 37 subjects were fed 2-20 g/day polyglyceryl ester in their diet.³² No abnormalities were detected in the hematology or clinical chemistry values or urinary or fecal parameters that were examined.

Subchronic Toxicity Studies

Animal

Oral

Polyglyceryl-10 Decaoleate

Groups of 10 male and 10 female Sprague-Dawley rats were fed a diet containing 2.5, 5.0, or 10.0% Polyglyceryl-10 Decaoleate for 90 days, and the control group was fed a diet containing soybean oil as the dietary fat.³⁷ Urine was collected from each group during wks 3 and 9, total fatty acid absorption was determined in feces collected during wks 4 and 10, and hematological studies were conducted during wks 5 and 11, and at study termination. No test article-related signs of toxicity were observed. Gross and microscopic examination of the testes and ovaries and other organs did not reveal any signs of toxicity or microscopic lesions, and relative and absolute organ weights were unremarkable.

Chronic Toxicity Studies

Animal

Oral

Polyglyceryl Esters - general

Groups of 25 male and 25 female mice were fed a diet with 5% polyglyceryl ester for 80 wks.³² No adverse effects on body weight, feed consumption, hematology values, or survival rate were noted. Carcass fat of the test group showed no polyglycerol residues. The levels of free fatty acids, unsaponifiable material, and the fatty acid composition of carcass fat were the same for the test group compared to a control group fed 5% ground nut oil in the diet. The only differences noted in organ weights were for the liver and kidneys of female mice, which were significantly higher. Microscopic examination of all major organs showed nothing remarkable.

In a 2-yr study, 28 male and 28 female rats were fed 5% polyglyceryl ester in the diet.³² No adverse effects on body weight, feed consumption, hematology values, or survival rate were noted. Organ weights were similar in control and test groups. Liver function tests and renal function tests performed at 59 and 104 wks of the study were comparable between the test group and a control group fed 5% ground nut oil. The carcass fat contained no polyglycerol, and the levels of free fatty acid, unsaponifiable residue and fatty acid composition of carcass fat were not different from the controls. A complete histological examination of major organs showed nothing remarkable.

In the ADME study described previously, in which Wistar rats (number of animals per group not specified) were fed a diet containing 5 or 10% polyglyceryl ester (prepared mostly with stearic and oleic acid; duration of dosing not specified, however some animals were fed the test diet for up to 14 mos, and some were maintained through 3 generations), no abnormalities were observed upon microscopic examination of tissues (details not provided).³³

DEVELOPMENTAL AND REPRODUCTIVE TOXICITY STUDIES

Oral

Polyglyceryl Esters - general

A test group of 22 rats was fed a diet containing 1.5% polyglyceryl ester for 3 generations.³² A group of 28 rats was used as a control. The animals were kept for over 1 year without significant variation in fertility or reproductive performance. Gross and microscopic examination of the third generation revealed no consistent abnormality attributable to the test substance. No details were provided.

Polyglyceryl-3 Diisostearate

A combined repeated dose oral toxicity study with a reproduction/developmental toxicity screening test (OECD Guideline 422) was conducted in Wistar rats.³⁹ The animals were dosed once daily by gavage with 0, 100, 300, or 1000 mg/kg bw/day 1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined; this substance is most likely Polyglyceryl-3 Diisostearate) in corn oil. Initially, the groups consisted of 12 males and 12 females. However, because a disturbance of the light/dark cycle was believed to cause a reduction in mating rate of the females of the first delivery, additional male and female rats were added in a second delivery for breeding to meet guideline requirements for the number of gravid females per group. All (1st and 2nd delivery) animals were subjected to the same conditions of the study, with the exception that the males of the second delivery were necropsied on day 24 after mating, not on day 16 of mating. Therefore, Polyglyceryl-3 Diisostearate was administered to male rats for up to 28 days (first delivery) and up to 41 days (second delivery) and to female rats for 14 days prior to mating, through the mating and gestation periods, and until the F₁ generation reached day 4 post-partum.

Because an impact caused by the light/dark cycle disturbance could not be excluded (i.e., a prolonged duration of gestation and an increased post-implantation loss at the high dose), the study was repeated with a third delivery with control and high-dose groups under proper light conditions. The test article was administered to 12 male rats/group for 33 days and to 12 female rats/group for 14 days prior to mating, through mating and gestation, and until day 4 post-partum.

Five males and 5 females/group killed at the end of the study were selected for hematology and clinical chemistry examinations, and some additional organs were weighed. The NOEL and NOAEL for systemic effects were ≥ 300 mg/kg bw/day and ≥ 1000 mg/kg bw/day 1,2,3-propanetriol, homopolymer, diisooctadecanoate, respectively, in both males and females. No adverse effects on body weights and body weight gains, feed consumption, hematology, clinical chemistry, neurobehavior, or gross or microscopic lesions were observed. Statistically significant increases in absolute and relative liver and kidney weights in males and females of the 1000 mg/kg bw/day were not considered to be adverse effects because there was no evidence for an impairment of organ function by clinical pathology and histopathology. Additionally, increases in the absolute and relative heart weights in high-dose females were without histopathological correlation and considered to be incidental.

GENOTOXICITY STUDIES

Genotoxicity studies are summarized in Table 13.^{20,38-44,46,48,56-65}

Generally, negative results were obtained in genotoxicity tests. Polyglyceryl-2 Oleate, Polyglyceryl-2 Diisostearate, and 1,2,3-propanetriol, homopolymer, diisooctadecanoate were not genotoxic in the Ames test, mammalian cell gene mutation assay, or chromosomal aberration assay, with or without metabolic activation. Polyglyceryl-3 Caprate, Polyglyceryl-3 Caprylate, Polyglyceryl-3 Laurate, Polyglyceryl-3 Isostearate, Polyglyceryl-4 Caprate, Polyglyceryl-4 Isostearate, Polyglyceryl-4 Laurate/Succinate, Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decabehenate/Caprate, Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate, Polyglyceryl-6 Decaethylhexanoate, Polyglyceryl-10 Pentaisostearate, and Polyglyceryl-10 Nonaisostearate were negative in the Ames test. Polyglyceryl-6 Caprylate/Caprate Polyglyceryl-10 Laurate (~60% pure) gave equivocal results in the absence and positive results in the presence of metabolic activation when tested at concentrations up to 125 and 2250 $\mu\text{g/ml}$, respectively, in a chromosomal aberration assay using Chinese hamster V79 cells, but was not clastogenic in a chromosomal aberration assay in human peripheral lymphocytes, with or without activation.

According to the European Food Safety Authority (EFSA) Panel, the impurities of polyglyceryl fatty acid esters, i.e. free fatty acids and their esters, have no structural alerts for genotoxicity.²³

CARCINOGENICITY STUDIES

Oral

In a 2-yr study (summarized previously in "Chronic Toxicity"), 28 male and 28 female rats were fed 5% polyglyceryl ester in the diet.³² Tumor incidence and tumor distribution were similar in control and test groups.

DERMAL IRRITATION AND SENSITIZATION STUDIES

Dermal irritation and sensitization studies are summarized in Table 14.^{38,40-44,46-48,56,66-71,71-74,74-97}

Apricot Kernel Oil Polyglyceryl-4 Esters and Palm Oil Polyglyceryl-4 Esters were classified as non-irritant in the Skin-Ethic™ irritation test, Polyglyceryl-4 Laurate/Sebacate, Polyglyceryl-4 Laurate/Succinate, and Polyglyceryl-6 Caprylate/Caprates were considered to be non-irritant in the EpiSkin™ model for skin irritation, and Polyglyceryl-10 Decaethylhexanoate. Polyglyceryl-10 Pentaisostearate were considered non-irritating using the EpiDerm™ model for skin irritation.

In rabbits, Polyglyceryl-3 Caprate, a polyglyceryl mono/diester of capric acid (read-across for Polyglyceryl-3 Caprylate), Polyglyceryl-4 Caprate, Polyglyceryl-3 Diisostearate, 1,2,3-propanetriol, homopolymer, diisooctadecanoate, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decabehenate/Caprates, and Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate were not irritating to the skin. Polyglyceryl-2 Isostearate, Glyceryl/Polyglyceryl-6 Isostearate, and Polyglyceryl-10 Nonaisostearate were mildly irritating, Polyglyceryl-2 Diisostearate was slightly irritating, and Polyglyceryl-3 Isostearate and Polyglyceryl-3 Oleate were moderate irritants in rabbit skin. Polyglyceryl-3 Caprate, Polyglyceryl-3 Caprylate, Polyglyceryl-3 Isostearate, Polyglyceryl-4 Caprate, Polyglyceryl-4 Isostearate, Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Polyglyceryl-2 Diisostearate, Polyglyceryl-4 Diisostearate/Polyhydroxystearate/Sebacate (read-across for Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate), Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decabehenate/Caprates, and Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate were not sensitizers in guinea pig studies; Polyglyceryl-10 Nonaisostearate was not a sensitizer in a local lymph node assay. Polyglyceryl-3 Diisostearate was not a sensitizer in guinea pigs in one sensitization study (50% at induction and challenge; 25% at rechallenge), but results were inconclusive in a guinea pig maximization test (0.1% or 0.2% at intradermal induction; 40% at epicutaneous induction; 10 and 15% at challenge; 8 and 4% at rechallenge).

In a clinical studies, 7% Polyglyceryl-2 Isostearate elicited slight irritation, and erythema was observed in 24-h occlusive patches tests of undiluted Polyglyceryl-10 Decaethylhexanoate (3/43 subjects and 3 controls) and Polyglyceryl-10 Pentaisostearate (1/43 subjects). Undiluted Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, 5% Polyglyceryl-10 Laurate, 10% Polyglyceryl-10 Myristate, 5% Polyglyceryl-10 Isostearate, 5% Polyglyceryl-10 Oleate, 10% Polyglyceryl-10 Stearate, a mixture containing 60% Polyglyceryl-10 Eicosanedioate/Tetradecanedioate/40% glycerin, undiluted Polyglyceryl-2 Sesquiosostearate, 20% active 1,2,3-propanetriol, homopolymer, diisooctadecanoate, undiluted Macadamia See Oil Polyglyceryl-6 Esters Behenate, undiluted Polyglyceryl-8 Decabehenate/Caprates, 5% Polyglyceryl-10 Diisostearate, 50% Polyglyceryl-10 Pentaisostearate, and Polyglyceryl-10 Decaoleate (concentration not given) were not skin irritants. Undiluted Polyglyceryl-3 Laurate, Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate, Polyglyceryl-10 Decaethylhexanoate, and Polyglyceryl-10 Pentaisostearate were not irritants or sensitizers.

Photosensitization/Phototoxicity

Animal

Polyglyceryl-10 Nonaisostearate

The phototoxicity and photosensitization potentials of Polyglyceryl-10 Nonaisostearate were evaluated in female albino Dunkin-Hartley guinea pigs. In the phototoxicity study, 0.5 ml undiluted Polyglyceryl-10 Nonaisostearate was^{39,47} applied to the right flank of 10 guinea pigs.⁸² The animals were exposed to the maximal non-erythematous dose of ultraviolet (UV) radiation, and exposure was first to 150 mJ/cm² UVB and then to 7000 mJ/cm² UVA (source: Biotronic, Vilbert Lourmat). A non-irradiated test site served as a negative control, and 8-methoxypsoralen was used as the positive control. Reactions were scored 24 and 48 h after irradiation. No cutaneous reactions were observed; Polyglyceryl-10 Nonaisostearate was not phototoxic in guinea pigs.

In the photosensitization study, 3 induction applications were made, with 2 day intervals between applications, of 0.5 ml undiluted Polyglyceryl-10 Nonaisostearate (determined to be the maximal non-irritant concentration in a preliminary test) to a 25 cm² area of interscapular skin of 11 animals, and the test sites were exposed to 7000 mJ/cm² UVA irradiation 30 min after application.⁹⁸ Prior to application, 2 pair of intradermal injections were made with 50% Freund's Complete Adjuvant/physiological saline solution. Six control animals were treated in a similar manner using liquid paraffin. After a 16-day non-treatment period, the challenge was performed by applying 0.5 ml of undiluted Polyglyceryl-10 Nonaisostearate to a 50 cm² area on one flank of the test and control animals; 30 min after application, the treated site and an untreated site on the opposite flank were exposed to 7 J/cm² UVA irradiation. Cutaneous reactions were evaluated 24 and 48 h after challenge. No cutaneous reactions were observed during induction or challenge. Polyglyceryl-10 Nonaisostearate was not a photosensitizer.

OCULAR IRRITATION STUDIES

Ocular irritation studies are summarized in Table 15.^{20,30,38-44,47,86,99-112}

Polyglyceryl-3 Laurate, a mixture containing 60% Polyglyceryl-10 Eicosanedioate/Tetradecanedioate, Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate (10% in corn oil), undiluted Polyglyceryl-10 Decaethylhexanoate, and undiluted Polyglyceryl-10 Pentaisostearate were classified as non-irritating using an EpiOcular™ tissue model. In the hen's egg test chorioallantoic membrane (HET-CAM) assay, microemulsions containing 30% or 40% Polyglyceryl-4 Laurate, Apricot Kernel Oil Polyglyceryl-4 Esters, Palm Oil Polyglyceryl-4 Esters, and Polyglyceryl-2 Dioleate were classified as non-irritant, and Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate produced minor irritation. Polyglyceryl-4 Laurate/Sebacate, Polyglyceryl-4 Laurate/Succinate, and Polyglyceryl-6 Caprylate/Caprates were considered non-irritant in the SkinEthic™ reconstituted human corneal epithelium model, and Polyglyceryl-10 Laurate, Polyglyceryl-10 Myristate, and Polyglyceryl-10 Isostearate were considered unlikely to cause irritation when evaluated in the rabbit enucleated eye test (REET). Polyglyceryl-10 Myristate, Polyglyceryl-10 Stearate, and Polyglyceryl-10 Diisostearate were non-irritating using the SIRC-neutral red (NR) method.

In rabbit eyes, Polyglyceryl-3 Caprate, a polyglyceryl mono/diester of capric acid (read-across for Polyglyceryl-3 Caprylate), Polyglyceryl-4 Caprate, Polyglyceryl-2 Diisostearate, Polyglyceryl-2 Dioleate, Polyglyceryl-3 Diisostearate, and 1,2,3-propanetriol, homopolymer, diisooctadecanoate were not irritating, and Polyglyceryl-3 Isostearate and Polyglyceryl-3 Oleate were slightly irritating. Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Polyglyceryl-10 Laurate, Polyglyceryl-10 Myristate, Polyglyceryl-10 Isostearate, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, and Polyglyceryl-8 Decabehenate Caprate caused minimal irritation in rabbit eyes, and Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate and Polyglyceryl-10 Nonaisostearate were mild irritants. Polyglyceryl-10 Laurate (~60% pure) was possibly slightly irritating to the eyes of humans.

CLINICAL REPORTS

Case Reports

A case report described the incidence of recurring pruritic erythema over a 3-mo period in an 80-yr old female.¹¹³ A 48-h closed patch test with the subject's cosmetics was positive (++) . Subsequent testing with the individual ingredients was positive (+) with 0.5% aqueous (aq.) Polyglyceryl-10 Laurate, and the positive reaction caused by this substance was still present in this patient 7 days after exposure. Positive reactions (+) were reported at all concentrations with additional testing of 0.05-1% aq. Polyglyceryl-10 Laurate. After 6 mos, patch tests with 0.1-1% Polyglyceryl-10 Laurate (obtained from several suppliers), and 0.5-1% Polyglyceryl-4 Laurate and Polyglyceryl-6 Laurate, were positive. No reactions were reported with 0.1-1% aq. Polyglyceryl-10 Myristate, Polyglyceryl-10 Isostearate, Polyglyceryl-10 Stearate, and Polyglyceryl-10 Oleate, or with the control test materials.

SUMMARY

This assessment reviews the safety of 274 polyglyceryl fatty acid esters as used in cosmetics. Each of the esters in this group is a polyether comprising 2 to 20 glyceryl residues, end-capped by esterification with simple carboxylic acids, such as fatty acids. Most of these ingredients are reported to function in cosmetics as skin-conditioning agents and/or surfactants.

Seventy-seven of the 274 ingredients included in this report are reported to be in use. Polyglyceryl-3 Diisostearate has the most reported uses (371, 216 of which are in lipsticks), and Polyglyceryl-4 Isostearate has the second highest number of reported uses (280). Polyglyceryl-2 Triisostearate and Polyglyceryl-3 Diisostearate have the highest concentration of use in a leave-on formulation; these ingredients are used at 40% and 39%, respectively. Many of these polyglyceryl fatty acid esters are used in products applied to the eye area, products that can result in incidental ingestion, or products that come into contact with mucous membranes, and a few of the polyglyceryl fatty acid esters are reported to be used in baby products. Additionally, some of the polyglyceryl fatty acid esters are used in cosmetic sprays and could possibly be inhaled.

Polyglyceryl esters of fatty acids, up to and including the decaglycerol esters, are permitted as multipurpose direct food additives. JECFA established an ADI of 0-25 mg/kg bw for polyglyceryl esters of fatty acids having an average chain length of up to 3 glycerol units, and an ADI of 0-7.5 mg/kg bw for polyglyceryl esters of interesterified ricinoleic acid. In the EU, the esters are listed as food additives at levels between 5000 and 10,000 mg/kg in certain foods, and up to 7% free glycerol/polyglycerol is allowed (i.e., 700 mg/kg).

Polyglyceryl esters are hydrolyzed in the GI tract, and the fatty acid moiety is metabolized in a normal manner. Analytical studies have produced no evidence of accumulation of the polyglycerol moiety in body tissues.

The ability to enhance skin penetration was examined for several of the polyglyceryl fatty acid esters. Polyglyceryl-3 Dioleate is reported to be a water-in-oil surfactant/solubilizer associated with enhanced drug penetration. Polyglyceryl-10 Trioleate enhanced the flux of tenoxicam in an *in vitro* study. Microemulsions containing Polyglyceryl-4 Laurate and Polyglyceryl-4 Oleate increased ceramide permeation into skin.

In an acute dermal toxicity study in rats, the LD₅₀ of 1,2,3-propanetriol, homopolymer, diisooctadecanoate was >5 g/kg. Low toxicity was reported in acute oral studies. In rats, the LD₅₀ >2 g/kg for Polyglyceryl-3 Caprate, Polyglyceryl-3 Caprylate, Polyglyceryl-4 Caprate, Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate, and Polyglyceryl-8 Decabehenate/Caprate, the LD₅₀ was estimated to be >2.5 g/kg for Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate, and Polyglyceryl-10 Nonaisostearate, and the LD₅₀ was >5 g/kg for Polyglyceryl-3 Isostearate, Polyglyceryl-3 Oleate, Polyglyceryl-2 Diisostearate and Polyglyceryl-3 Diisostearate.

Dietary studies with polyglyceryl ester, polyglyceryl stearate, Polyglyceryl-2 Diisostearate, and Polyglyceryl-10 Decaoleate did not produce any remarkable effects. No test-article related adverse effects were observed in multi-generational studies with polyglyceryl esters or 1,2,3-propanetriol, homopolymer, diisooctadecanoate.

Generally, negative results were obtained in genotoxicity tests. Polyglyceryl-2 Oleate, Polyglyceryl-2 Diisostearate, and 1,2,3-propanetriol, homopolymer, diisooctadecanoate were not genotoxic in the Ames test, mammalian cell gene mutation assay, or chromosomal aberration assay, with or without metabolic activation. Polyglyceryl-3 Caprate, Polyglyceryl-3 Caprylate, Polyglyceryl-3 Laurate, Polyglyceryl-3 Isostearate, Polyglyceryl-4 Caprate, Polyglyceryl-4 Isostearate, Polyglyceryl-4 Laurate/Succinate, Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decabehenate/Caprate, Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate, Polyglyceryl-6 Decaethylhexanoate, Polyglyceryl-10 Pentaisostearate, and Polyglyceryl-10 Nonaisostearate were negative in the Ames test. Polyglyceryl-6 Caprylate/Caprate and Polyglyceryl-10 Laurate (~60% pure) gave equivocal results in the absence and positive results in the presence of metabolic activation when tested at concentrations up to 125 and 2250 µg/ml, respectively, in a chromosomal aberration assay using Chinese hamster V79 cells, but were not clastogenic in a chromosomal aberration assay in human peripheral lymphocytes, with or without activation. The impurities of polyglyceryl fatty acid esters, i.e. free fatty acids and their esters, have no structural alerts for genotoxicity.

In a 2-yr dietary study in rats, 5% polyglyceryl ester was not carcinogenic and did not produce any adverse effects.

Apricot Kernel Oil Polyglyceryl-4 Esters and Palm Oil Polyglyceryl-4 Esters were classified as non-irritant in the Skin-Ethic™ irritation test, Polyglyceryl-4 Laurate/Sebacate, Polyglyceryl-4 Laurate/Succinate, and Polyglyceryl-6 Caprylate/Caprate were considered to be non-irritant in the EpiSkin™ model for skin irritation, and Polyglyceryl-10 Decaethylhexanoate. Polyglyceryl-10 Pentaisostearate was considered non-irritating using the EpiDerm™ model for skin irritation.

In rabbits, Polyglyceryl-3 Caprate, a polyglyceryl mono/diester of capric acid (read-across for Polyglyceryl-3 Caprylate), Polyglyceryl-4 Caprate, Polyglyceryl-3 Diisostearate, 1,2,3-propanetriol, homopolymer, diisooctadecanoate, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decabehenate/Caprate, and Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate were not irritating to the skin. Polyglyceryl-2 Isostearate, Glyceryl/Polyglyceryl-6 Isostearate, and Polyglyceryl-10 Nonaisostearate were mildly irritating, Polyglyceryl-2 Diisostearate was slightly irritating, and Polyglyceryl-3 Isostearate and Polyglyceryl-3 Oleate were moderate irritants in rabbit skin. Polyglyceryl-3 Caprate, Polyglyceryl-3 Caprylate, Polyglyceryl-3 Isostearate, Polyglyceryl-4 Caprate, Polyglyceryl-4 Isostearate, Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Polyglyceryl-2 Diisostearate, Polyglyceryl-4 Diisostearate/Polyhydroxystearate/Sebacate (read-across for Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate), Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, Polyglyceryl-8 Decabehenate/Caprate, and Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate were not sensitizers in guinea pig studies; Polyglyceryl-10 Nonaisostearate was not a sensitizer in a local lymph node assay. Polyglyceryl-3 Diisostearate was not a sensitizer in guinea pigs in one sensitization study (50% at induction and challenge; 25% at rechallenge), but results were inconclusive in a guinea pig maximization test (0.1% or 0.2% at intradermal induction; 40% at epicutaneous induction; 10 and 15% at challenge; 8 and 4% at rechallenge).

In clinical studies, 7% Polyglyceryl-2 Isostearate elicited slight irritation, and erythema was observed in 24-h occlusive patches tests of undiluted Polyglyceryl-10 Decaethylhexanoate (3/43 subjects and 3 controls) and Polyglyceryl-10 Pentaisostearate (1/43 subjects). Undiluted Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, 5% Polyglyceryl-10 Laurate, 10% Polyglyceryl-10 Myristate, 5% Polyglyceryl-10 Isostearate, 5% Polyglyceryl-10 Oleate, 10% Polyglyceryl-10 Stearate, a mixture containing 60% Polyglyceryl-10 Eicosanedioate/Tetradecanedioate/40% glycerin, undiluted Polyglyceryl-2 Sesquiosostearate, 20% active 1,2,3-propanetriol, homopolymer, diisooctadecanoate, undiluted Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, undiluted Polyglyceryl-8 Decabehenate/Caprate, 5% Polyglyceryl-10 Diisostearate, 50% Polyglyceryl-10 Pentaisostearate, and Polyglyceryl-10 Decaoleate (concentration not given) were not skin irritants. Undiluted Polyglyceryl-3 Laurate, Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate, Polyglyceryl-10 Decaethylhexanoate, and Polyglyceryl-10 Pentaisostearate were not irritants or sensitizers.

Undiluted Polyglyceryl-10 Nonaisostearate was not phototoxic or a photosensitizer in guinea pigs.

Polyglyceryl-3 Laurate, a mixture containing 60% Polyglyceryl-10 Eicosanedioate/Tetradecanedioate, Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate (10% in corn oil), undiluted Polyglyceryl-10 Decaethylhexanoate, and undiluted Polyglyceryl-10 Pentaisostearate were classified as non-irritating using an EpiOcular™ tissue model. In the HET-CAM assay, microemulsions containing 30% or 40% Polyglyceryl-4 Laurate, Apricot Kernel Oil Polyglyceryl-4 Esters, Palm Oil Polyglyceryl-4

Esters, and Polyglyceryl-2 Dioleate were classified as non-irritant, and Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate produced minor irritation. Polyglyceryl-4 Laurate/Sebacate, Polyglyceryl-4 Laurate/Succinate, and Polyglyceryl-6 Caprylate/Caprates were considered non-irritant in the SkinEthic™ reconstituted human corneal epithelium model, and Polyglyceryl-10 Laurate, Polyglyceryl-10 Myristate, and Polyglyceryl-10 Isostearate were considered unlikely to cause irritation when evaluated in the REET. Polyglyceryl-10 Myristate, Polyglyceryl-10 Stearate, and Polyglyceryl-10 Diisostearate were non-irritating using the SIRC-NR method.

In rabbit eyes, Polyglyceryl-3 Caprate, a polyglyceryl mono/diester of capric acid (read-across for Polyglyceryl-3 Caprylate), Polyglyceryl-4 Caprate, Polyglyceryl-2 Diisostearate, Polyglyceryl-2 Dioleate, Polyglyceryl-3 Diisostearate, and 1,2,3-propanetriol, homopolymer, diisooctadecanoate were not irritating, and Polyglyceryl-3 Isostearate and Polyglyceryl-3 Oleate were slightly irritating. Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters, Polyglyceryl-10 Laurate, Polyglyceryl-10 Myristate, Polyglyceryl-10 Isostearate, Macadamia Seed Oil Polyglyceryl-6 Esters Behenate, and Polyglyceryl-8 Decabehenate Caprate caused minimal irritation in rabbit eyes, and Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate and Polyglyceryl-10 Nonaisostearate were mild irritants.

Polyglyceryl-10 Laurate (~60% pure) was possibly slightly irritating to the eyes of humans.

DISCUSSION

The ingredients in this report are esterification products of polyglycerin chains and fatty acids that vary in numbers of glycerin and fatty-acid equivalents and lengths of the fatty acids. The polymerization process used to produce polyglycerol yields a distribution of oligomers with primarily linear structures. In addition to linear configurations, branched polyglycerol configurations, originating from 1,2- and 2,2-O-ether linkages, are also possible.

The Panel acknowledged this is a very large group of ingredients; however these ingredients are extensively metabolized to common nutrients and physiologic intermediates, therefore the Panel was satisfied that the data included in the report could be used to assess the safety of all the ingredients. Furthermore, the Panel has reviewed previously the safety of numerous ingredients that serve as starting materials for the synthesis of polyglyceryl fatty acid esters. These previously-reviewed ingredients, which can be residual impurities in the polyglyceryl esters products or potential metabolites (e.g., glycerin and free fatty acids released by the action of esterases in the skin), were found safe as used (or safe when formulated to be non-irritating) in cosmetic formulations.

Some of these ingredients can enhance the penetration of other ingredients through the skin. The Panel cautioned that care should be taken in formulating cosmetic products that may contain these ingredients in combination with any ingredients whose safety was based on their lack of dermal absorption data, or when dermal absorption was a concern.

It was noted that some of these ingredients are derived from plants. The Panel expressed concern about pesticide residues and heavy metals that may be present in botanical ingredients, and stressed that the cosmetics industry should continue to use the necessary procedures to limit these impurities in the ingredient before blending into cosmetic formulations.

The Panel was concerned that the potential exists for dermal irritation with the use of products formulated using some of the polyglyceryl fatty acid esters. The Panel specified that products containing these ingredients must be formulated to be non-irritating.

Additionally, the Panel discussed the issue of incidental inhalation exposure, as some of the polyglyceryl fatty acid esters are used in cosmetic sprays and could possibly be inhaled. For example, Polyglyceryl-3 Distearate is reported to be used at 3% in spray body and hand creams. The Panel noted that droplets/particles from spray cosmetic products would not be respirable to any appreciable amount. Furthermore, droplets/particles deposited in the nasopharyngeal or bronchial regions of the respiratory tract present no toxicological concerns based on the chemical and biological properties of these ingredients. Coupled with the small actual exposure in the breathing zone and the concentrations at which the ingredients are used, the available information indicates that incidental inhalation would not be a significant route of exposure that might lead to local respiratory or systemic effects. A detailed discussion and summary of the Panel's approach to evaluating incidental inhalation exposures to ingredients in cosmetic products is available at <http://www.cir-safety.org/cir-findings>.

CONCLUSION

The CIR Expert Panel concluded that the 274 polyglyceryl fatty acid esters listed below are safe in cosmetics in the present practices of use and concentration described in this safety assessment when formulated to be non-irritating:

Adansonia Digitata Seed Oil Polyglyceryl-6 Esters*
Almond Oil/Polyglyceryl-10 Esters*
Apricot Kernel Oil Polyglyceryl-3 Esters*
Apricot Kernel Oil Polyglyceryl-4 Esters*
Apricot Kernel Oil Polyglyceryl-5 Esters*
Apricot Kernel Oil Polyglyceryl-6 Esters*

Apricot Kernel Oil Polyglyceryl-10 Esters*
Argan Oil Polyglyceryl-6 Esters*
Astrocaryum Vulgare Oil Polyglyceryl-6 Esters*
Avocado Oil Polyglyceryl-6 Esters*
Babassu Oil Polyglyceryl-4 Esters
Babassu Oil Polyglyceryl-6 Esters

Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters*
 Borage Seed Oil Polyglyceryl-4 Esters*
 Borage Seed Oil Polyglyceryl-6 Esters*
 Candellilla/Jojoba/Rice Bran Polyglyceryl-3 Esters
 Caprylic/Capric Glycerides Polyglyceryl-10 Esters
 Carapa Guianensis Oil Polyglyceryl-6 Esters*
 Castor Oil Polyglyceryl-6 Esters*
 Cocoa Butter Polyglyceryl-6 Esters*
 Coconut Oil Polyglyceryl-6 Esters
 Coffee Seed Oil Polyglyceryl-6 Esters*
 Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate
 Glycerol/Polyglyceryl-6 Isostearate/Behenate Esters
 Hazelnut Seed Oil Polyglyceryl-6 Esters*
 Linseed Oil Polyglyceryl-4 Esters*
 Macadamia Seed Oil Polyglyceryl 6 Esters*
 Macadamia Seed Oil Polyglyceryl 6 Esters Behenate
 Mauritia Flexuosa Seed Oil Polyglyceryl-6 Esters*
 Olive Oil Polyglyceryl-3 Esters*
 Olive Oil Polyglyceryl-4 Esters*
 Olive Oil Polyglyceryl-6 Esters*
 Palm Kernel Oil Polyglyceryl-4 Esters*
 Palm Oil Polyglyceryl-3 Esters*
 Palm Oil Polyglyceryl-4 Esters
 Palm Oil Polyglyceryl-5 Esters*
 Palm Oil Polyglyceryl-6 Esters*
 Parinari Curatellifolia Oil Polyglyceryl-6 Esters*
 Pinus Sibirica Seed Oil Polyglyceryl-6 Esters*
 Polyglyceryl-2 Caprate
 Polyglyceryl-2 Caprylate*
 Polyglyceryl-2 Diisostearate
 Polyglyceryl-2 Dioleate*
 Polyglyceryl-2 Distearate*
 Polyglyceryl-2 Isopalmitate
 Polyglyceryl-2 Isopalmitate/Sebacate*
 Polyglyceryl-2 Isostearate
 Polyglyceryl-2 Laurate
 Polyglyceryl-2 Myristate*
 Polyglyceryl-2 Oleate
 Polyglyceryl-2 Palmitate*
 Polyglyceryl-2 Sesquicaprylate*
 Polyglyceryl-2 Sesquiosostearate
 Polyglyceryl-2 Sesquioleate*
 Polyglyceryl-2 Sesquistearate
 Polyglyceryl-2 Stearate
 Polyglyceryl-2 Tetrabehenate/ Macadamiate/Sebacate*
 Polyglyceryl-2 Tetraisostearate
 Polyglyceryl-2 Tetraoleate*
 Polyglyceryl-2 Tetrastearate*
 Polyglyceryl-2 Triisostearate
 Polyglyceryl-3 Beeswax
 Polyglyceryl-3 Behenate*
 Polyglyceryl-3 Caprate
 Polyglyceryl-3 Caprylate
 Polyglyceryl-3 Cocoate*
 Polyglyceryl-3 Dicaprate*
 Polyglyceryl-3 Dicitrate/Stearate
 Polyglyceryl-3 Dicocoate*
 Polyglyceryl-3 Di Hydroxystearate*
 Polyglyceryl-3 Diisostearate
 Polyglyceryl-3 Dioleate*
 Polyglyceryl-3 Distearate
 Polyglyceryl-3 Isostearate
 Polyglyceryl-3 Laurate
 Polyglyceryl-3 Myristate*
 Polyglyceryl-3 Oleate
 Polyglyceryl-3 Palmitate
 Polyglyceryl-3 Pentacaprylate/Caprate*
 Polyglyceryl-3 Pentaoliveate*
 Polyglyceryl-3 Pentaricinoleate
 Polyglyceryl-3 Rice Branate*
 Polyglyceryl-3 Ricinoleate
 Polyglyceryl-3 Soyate/Shea Butterate*
 Polyglyceryl-3 Stearate
 Polyglyceryl-3 Stearate SE*
 Polyglyceryl-3 Triisostearate*
 Polyglyceryl-3 Trioliveate*
 Polyglyceryl-4 Almondate/Shea Butterate*
 Polyglyceryl-4 Caprate
 Polyglyceryl-4 Caprylate*
 Polyglyceryl-4 Caprylate/Caprate*
 Polyglyceryl-4 Cocoate
 Polyglyceryl-4 Dilaurate*
 Polyglyceryl-4 Distearate*
 Polyglyceryl-4 Hazelnutseedate*
 Polyglyceryl-4 Isostearate
 Polyglyceryl-4 Isostearate/Laurate*
 Polyglyceryl-4 Laurate
 Polyglyceryl-4 Laurate/Sebacate*
 Polyglyceryl-4 Laurate/Succinate*
 Polyglyceryl-4 Oleate
 Polyglyceryl-4 Pentaoleate*
 Polyglyceryl-4 Pentapalmitate/Stearate*
 Polyglyceryl-4 Pentastearate*
 Polyglyceryl-4 Punicate*
 Polyglyceryl-4 Stearate*
 Polyglyceryl-4 Sweet Almondate*
 Polyglyceryl-4 Tristearate*
 Polyglyceryl-5 Caprate*
 Polyglyceryl-5 Dicaprylate*
 Polyglyceryl-5 Dilaurate*
 Polyglyceryl-5 Dioleate
 Polyglyceryl-5 Hexastearate*
 Polyglyceryl-5 Isostearate
 Polyglyceryl-5 Laurate
 Polyglyceryl-5 Myristate*
 Polyglyceryl-5 Oleate
 Polyglyceryl-5 Pentamyristate*
 Polyglyceryl-5 Ricinoleate*
 Polyglyceryl-5 Stearate
 Polyglyceryl-5 Tribehenate*
 Polyglyceryl-5 Triisostearate
 Polyglyceryl-5 Trimyristate*
 Polyglyceryl-5 Trioleate
 Polyglyceryl-5 Tristearate*
 Polyglyceryl-6 Adansonia Digitata Seedate*
 Polyglyceryl-6 Apricot Kernelate*
 Polyglyceryl-6 Argan Kernelate*
 Polyglyceryl-6 Behenate*

Polyglyceryl-6 Caprate*
 Polyglyceryl-6 Caprylate*
 Polyglyceryl-6 Caprylate/Caprato
 Polyglyceryl-6 Citrullus Lanatus Seedate*
 Polyglyceryl-6 Dicaprate*
 Polyglyceryl-6 Diisostearate*
 Polyglyceryl-6 Dioleate
 Polyglyceryl-6 Dipalmitate*
 Polyglyceryl-6 Distearate
 Polyglyceryl-6 Heptacaprylate*
 Polyglyceryl-6 Hexaoleate*
 Polyglyceryl-6 Hexastearate*
 Polyglyceryl-6 Isostearate
 Polyglyceryl-6 Laurate*
 Polyglyceryl-6 Myristate*
 Polyglyceryl-6 Octacaprylate*
 Polyglyceryl-6 Octastearate
 Polyglyceryl-6 Oleate
 Polyglyceryl-6 Palmitate*
 Polyglyceryl-6 Palmitate/Succinate*
 Polyglyceryl-6 Pentacaprylate*
 Polyglyceryl-6 Pentaoleate*
 Polyglyceryl-6 Pentaricinoleate*
 Polyglyceryl-6 Pentastearate
 Polyglyceryl-6 Ricinoleate
 Polyglyceryl-6 Schinziophyton Rautanenii Kernelate*
 Polyglyceryl-6 Sclerocarya Birrea Seedate*
 Polyglyceryl-6 Sesquicaprylate*
 Polyglyceryl-6 Sesquiosostearate*
 Polyglyceryl-6 Sesquisteate*
 Polyglyceryl-6 Stearate*
 Polyglyceryl-6 Tetrabeheenate*
 Polyglyceryl-6 Tetracaprylate*
 Polyglyceryl-6 Tetraoleate*
 Polyglyceryl-6 Tricaprylate
 Polyglyceryl-6 Trichilia Emetica Seedate*
 Polyglyceryl-6 Tristearate*
 Polyglyceryl-6 Undecylenate*
 Polyglyceryl-6 Ximenia Americana Seedate*
 Polyglyceryl-8 C12-20 Acid Ester*
 Polyglyceryl-8 Decabeheenate/Caprato
 Polyglyceryl-8 Decaerucate/Decaisostearate/ Decaricinoleate
 Polyglyceryl-8 Oleate*
 Polyglyceryl-8 Stearate*
 Polyglyceryl-10 Apricot Kernelate*
 Polyglyceryl-10 Behenate/Eicosadioate
 Polyglyceryl-10 Caprate*
 Polyglyceryl-10 Caprylate*
 Polyglyceryl-10 Caprylate/Caprato
 Polyglyceryl-10 Cooate*
 Polyglyceryl-10 Decaethylhexanoate*
 Polyglyceryl-10 Decahydroxystearate*
 Polyglyceryl-10 Decaisostearate
 Polyglyceryl-10 Decalinoleate*
 Polyglyceryl-10 Decamacadamiate*
 Polyglyceryl-10 Decaoleate
 Polyglyceryl-10 Decastearate*
 Polyglyceryl-10 Dicooate*
 Polyglyceryl-10 Didecanoate*
 Polyglyceryl-10 Diisostearate
 Polyglyceryl-10 Dilaurate*
 Polyglyceryl-10 Dimyristate*
 Polyglyceryl-10 Dioleate
 Polyglyceryl-10 Dipalmitate
 Polyglyceryl-10 Distearate
 Polyglyceryl-10 Dodecabeheenate*
 Polyglyceryl-10 Dodecacaprato*
 Polyglyceryl-10 Dodecacaprylate*
 Polyglyceryl-10 Dodeca-Caprylate/ Caprate*
 Polyglyceryl-10 Eicosanedioate/Tetradecanedioate*
 Polyglyceryl-10 Hepta(Behenate/Stearate)*
 Polyglyceryl-10 Heptahydroxystearate
 Polyglyceryl-10 Heptaoleate*
 Polyglyceryl-10 Heptastearate*
 Polyglyceryl-10 Hexaerucate*
 Polyglyceryl-10 Hexaisostearate*
 Polyglyceryl-10 Hexaoleate*
 Polyglyceryl-10 Hydroxystearate/Stearate/Eicosadioate
 Polyglyceryl-10 Isostearate
 Polyglyceryl-10 Laurate
 Polyglyceryl-10 Linoleate*
 Polyglyceryl-10 Mono/Dioleate*
 Polyglyceryl-10 Myristate
 Polyglyceryl-10 Nonaerucate*
 Polyglyceryl-10 Nonaisostearate
 Polyglyceryl-10 Oleate
 Polyglyceryl-10 Palmate*
 Polyglyceryl-10 Palmitate*
 Polyglyceryl-10 Pentacaprylate*
 Polyglyceryl-10 Pentahydroxystearate
 Polyglyceryl-10 Pentaisostearate
 Polyglyceryl-10 Pentalaurate*
 Polyglyceryl-10 Pentalinoleate*
 Polyglyceryl-10 Pentaoleate
 Polyglyceryl-10 Pentaricinoleate*
 Polyglyceryl-10 Pentastearate
 Polyglyceryl-10 Sesquisteate*
 Polyglyceryl-10 Stearate
 Polyglyceryl-10 Tetradecanedioate*
 Polyglyceryl-10 Tetralaurate*
 Polyglyceryl-10 Tetraoleate*
 Polyglyceryl-10 Tricoate*
 Polyglyceryl-10 Tridecanoate*
 Polyglyceryl-10 Trierucate*
 Polyglyceryl-10 Triisostearate*
 Polyglyceryl-10 Trilaurate*
 Polyglyceryl-10 Trioleate*
 Polyglyceryl-10 Tristearate
 Polyglyceryl-10 Undecylenate*
 Polyglyceryl-15 Diisostearate*
 Polyglyceryl-20 Docosabeheenate/Isostearate*
 Polyglyceryl-20 Docosabeheenate/Laurate*
 Polyglyceryl-20 Docosabeheenate/Oleate*
 Polyglyceryl-20 Heptacaprylate*
 Polyglyceryl-20 Heptadecabeheenate/Laurate*
 Polyglyceryl-20 Hexacaprylate*
 Polyglyceryl-20 Octadecabeheenate/Laurate*
 Polyglyceryl-20 Octaisnonanoate*

Pumpkin Seed Oil Polyglyceryl-4 Esters*	Sunflower Seed Oil Polyglyceryl 3 Esters*
Pumpkin Seed Oil Polyglyceryl-4 Esters Succinate*	Sunflower Seed Oil Polyglyceryl-4 Esters*
Rice Bran Oil Polyglyceryl-3 Esters*	Sunflower Seed Oil Polyglyceryl-5 Esters*
Rosa Rubiginosa Seed Oil Polyglyceryl-6 Esters*	Sunflower Seed Oil Polyglyceryl 6 Esters*
Safflower Seed Oil Polyglyceryl-6 Esters*	Sunflower Seed Oil Polyglyceryl 10 Esters*
Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters*	Sweet Almond Oil Polyglyceryl-4 Esters*
Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters*	Sweet Almond Oil Polyglyceryl-6 Esters*
Sclerocarya Birrea Seed Oil Polyglyceryl-10 Esters*	Theobroma Grandiflorum Seed Butter Polyglyceryl-6 Esters*
Sesame Oil Polyglyceryl-6 Esters*	Trichilia Emetica Seed Oil Polyglyceryl-6 Esters*
Shea Butter Polyglyceryl-3 Esters*	Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate
Shea Butter Polyglyceryl-4 Esters*	Watermelon Seed Oil Polyglyceryl-6 Esters *
Shea Butter Polyglyceryl-6 Esters*	Watermelon Seed Oil Polyglyceryl-10 Esters*
Soybean Oil Polyglyceryl-6 Esters*	Ximenia Americana Seed Oil Polyglyceryl-6 Esters*

*Not reported to be in current use. Were ingredients in this group not in current use to be used in the future, the expectation is that they would be used in product categories and at concentrations comparable to others in this group.

TABLES**Table 1. Polyglyceryl Fatty Acid Esters – presented alphabetically**

Adansonia Digitata Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Di-Hydroxystearate
Almond Oil/Polyglyceryl-10 Esters	Polyglyceryl-3 Diisostearate
Apricot Kernel Oil Polyglyceryl-3 Esters	Polyglyceryl-3 Dioleate
Apricot Kernel Oil Polyglyceryl-4 Esters	Polyglyceryl-3 Distearate
Apricot Kernel Oil Polyglyceryl-5 Esters	Polyglyceryl-3 Isostearate
Apricot Kernel Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Laurate
Apricot Kernel Oil Polyglyceryl-10 Esters	Polyglyceryl-3 Myristate
Argan Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Oleate
Astrocaryum Vulgare Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Palmitate
Avocado Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Pentacaprylate/Caprates
Babassu Oil Polyglyceryl-4 Esters	Polyglyceryl-3 Pentaoliveate
Babassu Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Pentaricinoleate
Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Rice Branate
Borage Seed Oil Polyglyceryl-4 Esters	Polyglyceryl-3 Ricinoleate
Borage Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Soyate/Shea Butterate
Candelilla/Jojoba/Rice Bran Polyglyceryl-3 Esters	Polyglyceryl-3 Stearate
Caprylic/Capric Glycerides Polyglyceryl-10 Esters	Polyglyceryl-3 Stearate SE
Carapa Guaianensis Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Triisostearate
Castor Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Trioliveate
Cocoa Butter Polyglyceryl-6 Esters	Polyglyceryl-4 Almond/Shea Butterate
Coconut Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Caprate
Coffee Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Caprylate
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	Polyglyceryl-4 Caprylate/Caprates
Glycerol/Polyglyceryl-6 Isostearate/Behenate Esters	Polyglyceryl-4 Cocoate
Hazelnut Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Dilaurate
Linseed Oil Polyglyceryl-4 Esters	Polyglyceryl-4 Distearate
Macadamia Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Hazelnutseedate
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	Polyglyceryl-4 Isostearate
Mauritia Flexuosa Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Isostearate/Laurate
Olive Oil Polyglyceryl-3 Esters	Polyglyceryl-4 Laurate
Olive Oil Polyglyceryl-4 Esters	Polyglyceryl-4 Laurate/Sebacate
Olive Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Laurate/Succinate
Palm Kernel Oil Polyglyceryl-4 Esters	Polyglyceryl-4 Oleate
Palm Oil Polyglyceryl-3 Esters	Polyglyceryl-4 Pentaoleate
Palm Oil Polyglyceryl-4 Esters	Polyglyceryl-4 Pentapalmitate/Stearate
Palm Oil Polyglyceryl-5 Esters	Polyglyceryl-4 Pentastearate
Palm Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Punicate
Parinari Curatellifolia Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Stearate
Pinus Sibirica Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Sweet Almond
Polyglyceryl-2 Caprate	Polyglyceryl-4 Tristearate
Polyglyceryl-2 Caprylate	Polyglyceryl-5 Caprate
Polyglyceryl-2 Diisostearate	Polyglyceryl-5 Dicaprylate
Polyglyceryl-2 Dioleate	Polyglyceryl-5 Dilaurate
Polyglyceryl-2 Distearate	Polyglyceryl-5 Dioleate
Polyglyceryl-2 Isopalmitate	Polyglyceryl-5 Hexastearate
Polyglyceryl-2 Isopalmitate/Sebacate	Polyglyceryl-5 Isostearate
Polyglyceryl-2 Isostearate	Polyglyceryl-5 Laurate
Polyglyceryl-2 Laurate	Polyglyceryl-5 Myristate
Polyglyceryl-2 Myristate	Polyglyceryl-5 Oleate
Polyglyceryl-2 Oleate	Polyglyceryl-5 Pentamyristate
Polyglyceryl-2 Palmitate	Polyglyceryl-5 Ricinoleate
Polyglyceryl-2 Sesquicaprylate	Polyglyceryl-5 Stearate
Polyglyceryl-2 Sesquiisostearate	Polyglyceryl-5 Tribehenate
Polyglyceryl-2 Sesquioleate	Polyglyceryl-5 Triisostearate
Polyglyceryl-2 Sesquisteate	Polyglyceryl-5 Trimyristate
Polyglyceryl-2 Stearate	Polyglyceryl-5 Trioleate
Polyglyceryl-2 Tetrabehenate/ Macadamiate/Sebacate	Polyglyceryl-5 Tristearate
Polyglyceryl-2 Tetraisostearate	Polyglyceryl-6 Adansonia Digitata Seedate
Polyglyceryl-2 Tetraoleate	Polyglyceryl-6 Apricot Kernelate
Polyglyceryl-2 Tetrastearate	Polyglyceryl-6 Argan Kernelate
Polyglyceryl-2 Triisostearate	Polyglyceryl-6 Behenate
Polyglyceryl-3 Beeswax	Polyglyceryl-6 Caprate
Polyglyceryl-3 Behenate	Polyglyceryl-6 Caprylate
Polyglyceryl-3 Caprate	Polyglyceryl-6 Caprylate/Caprates
Polyglyceryl-3 Caprylate	Polyglyceryl-6 Citrullus Lanatus Seedate
Polyglyceryl-3 Cocoate	Polyglyceryl-6 Dicaprate
Polyglyceryl-3 Dicaprate	Polyglyceryl-6 Diisostearate
Polyglyceryl-3 Dicitrate/Stearate	Polyglyceryl-6 Dioleate
Polyglyceryl-3 Dicocoate	Polyglyceryl-6 Dipalmitate

Polyglyceryl-6 Distearate	Polyglyceryl-10 Hexaoleate
Polyglyceryl-6 Heptacaprylate	Polyglyceryl-10 Hydroxystearate/Stearate/Eicosadioate
Polyglyceryl-6 Hexaoleate	Polyglyceryl-10 Isostearate
Polyglyceryl-6 Hexastearate	Polyglyceryl-10 Laurate
Polyglyceryl-6 Isostearate	Polyglyceryl-10 Linoleate
Polyglyceryl-6 Laurate	Polyglyceryl-10 Mono/Dioleate
Polyglyceryl-6 Myristate	Polyglyceryl-10 Myristate
Polyglyceryl-6 Octacaprylate	Polyglyceryl-10 Nonaerucate
Polyglyceryl-6 Octastearate	Polyglyceryl-10 Nonaisostearate
Polyglyceryl-6 Oleate	Polyglyceryl-10 Oleate
Polyglyceryl-6 Palmitate	Polyglyceryl-10 Palmate
Polyglyceryl-6 Palmitate/Succinate	Polyglyceryl-10 Palmitate
Polyglyceryl-6 Pentacaprylate	Polyglyceryl-10 Pentacaprylate
Polyglyceryl-6 Pentaoleate	Polyglyceryl-10 Pentahydroxystearate
Polyglyceryl-6 Pentaricinoleate	Polyglyceryl-10 Pentaisostearate
Polyglyceryl-6 Pentastearate	Polyglyceryl-10 Pentalaurate
Polyglyceryl-6 Ricinoleate	Polyglyceryl-10 Pentalinoleate
Polyglyceryl-6 Schinziophyton Rautanenii Kernelate	Polyglyceryl-10 Pentaoleate
Polyglyceryl-6 Sclerocarya Birrea Seedate	Polyglyceryl-10 Pentaricinoleate
Polyglyceryl-6 Sesquicaprylate	Polyglyceryl-10 Pentastearate
Polyglyceryl-6 Sesquiosostearate	Polyglyceryl-10 Sesquistearate
Polyglyceryl-6 Sesquistearate	Polyglyceryl-10 Stearate
Polyglyceryl-6 Stearate	Polyglyceryl-10 Tetradecanedioate
Polyglyceryl-6 Tetrabehenate	Polyglyceryl-10 Tetralaurate
Polyglyceryl-6 Tetracaprylate	Polyglyceryl-10 Tetraoleate
Polyglyceryl-6 Tetraoleate	Polyglyceryl-10 Tricocoate
Polyglyceryl-6 Tricaprylate	Polyglyceryl-10 Tridecanoate
Polyglyceryl-6 Trichilia Emetica Seedate	Polyglyceryl-10 Trierucate
Polyglyceryl-6 Tristearate	Polyglyceryl-10 Triisostearate
Polyglyceryl-6 Undecylenate	Polyglyceryl-10 Trilaurate
Polyglyceryl-6 Ximenia Americana Seedate	Polyglyceryl-10 Trioleate
Polyglyceryl-8 C12-20 Acid Ester	Polyglyceryl-10 Tristearate
Polyglyceryl-8 Decabehenate/Capratae	Polyglyceryl-10 Undecylenate
Polyglyceryl-8 Decaerucate/Decaisostearate/ Decaricinoleate	Polyglyceryl-15 Diisostearate
Polyglyceryl-8 Oleate	Polyglyceryl-20 Docosabehenate/Isostearate
Polyglyceryl-8 Stearate	Polyglyceryl-20 Docosabehenate/Laurate
Polyglyceryl-10 Apricot Kernelate	Polyglyceryl-20 Docosabehenate/Oleate
Polyglyceryl-10 Behenate/Eicosadioate	Polyglyceryl-20 Heptacaprylate
Polyglyceryl-10 Caprate	Polyglyceryl-20 Heptadecabehenate/Laurate
Polyglyceryl-10 Caprylate	Polyglyceryl-20 Hexacaprylate
Polyglyceryl-10 Caprylate/Capratae	Polyglyceryl-20 Octadecabehenate/Laurate
Polyglyceryl-10 Cocoate	Polyglyceryl-20 Octaisnonanoate
Polyglyceryl-10 Decaethylhexanoate	Pumpkin Seed Oil Polyglyceryl-4 Esters
Polyglyceryl-10 Decahydroxystearate	Pumpkin Seed Oil Polyglyceryl-4 Esters Succinate
Polyglyceryl-10 Decaisostearate	Rice Bran Oil Polyglyceryl-3 Esters
Polyglyceryl-10 Decalinoleate	Rosa Rubiginosa Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Decamacadamiate	Safflower Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Decaoleate	Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Decastearate	Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Dicoate	Sclerocarya Birrea Seed Oil Polyglyceryl-10 Esters
Polyglyceryl-10 Didecanoate	Sesame Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Diisostearate	Shea Butter Polyglyceryl-3 Esters
Polyglyceryl-10 Dilaurate	Shea Butter Polyglyceryl-4 Esters
Polyglyceryl-10 Dimyristate	Shea Butter Polyglyceryl-6 Esters
Polyglyceryl-10 Dioleate	Soybean Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Dipalmitate	Sunflower Seed Oil Polyglyceryl-3 Esters
Polyglyceryl-10 Distearate	Sunflower Seed Oil Polyglyceryl-4 Esters
Polyglyceryl-10 Dodecabehenate	Sunflower Seed Oil Polyglyceryl-5 Esters
Polyglyceryl-10 Dodecacapratae	Sunflower Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Dodecacaprylate	Sunflower Seed Oil Polyglyceryl-10 Esters
Polyglyceryl-10 Dodeca-Caprylate/ Caprate	Sweet Almond Oil Polyglyceryl-4 Esters
Polyglyceryl-10 Eicosanedioate/Tetradecanedioate	Sweet Almond Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Hepta(Behenate/Stearate)	Theobroma Grandiflorum Seed Butter Polyglyceryl-6 Esters
Polyglyceryl-10 Heptahydroxystearate	Trichilia Emetica Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Heptaoleate	Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate
Polyglyceryl-10 Heptastearate	Watermelon Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-10 Hexaerucate	Watermelon Seed Oil Polyglyceryl-10 Esters
Polyglyceryl-10 Hexaisostearate	Ximenia Americana Seed Oil Polyglyceryl-6 Esters

Table 2. Polyglyceryl Fatty Acid Esters – arranged by polyglyceryl chain length

Polyglyceryl Monoesters		
<u><i>Polyglyceryl-2 discrete esters</i></u> Polyglyceryl-2 Caprate Polyglyceryl-2 Caprylate Polyglyceryl-2 Laurate Polyglyceryl-2 Myristate Polyglyceryl-2 Isopalmitate Polyglyceryl-2 Palmitate Polyglyceryl-2 Isostearate Polyglyceryl-2 Oleate Polyglyceryl-2 Stearate	<u><i>Polyglyceryl-5 discrete esters</i></u> Polyglyceryl-5 Caprate Polyglyceryl-5 Laurate Polyglyceryl-5 Myristate Polyglyceryl-5 Isostearate Polyglyceryl-5 Oleate Polyglyceryl-5 Stearate Polyglyceryl-5 Ricinoleate <u><i>Polyglyceryl-5 mixed esters</i></u> Apricot Kernel Oil Polyglyceryl-5 Esters Palm Oil Polyglyceryl-5 Esters Sunflower Seed Oil Polyglyceryl-5 Esters	<u><i>Polyglyceryl-6 mixed esters (con't)</i></u> Soybean Oil Polyglyceryl-6 Esters Sunflower Seed Oil Polyglyceryl-6 Esters Sweet Almond Oil Polyglyceryl-6 Esters Theobroma Grandiflorum Seed Butter Polyglyceryl-6 Esters Trichilia Emetica Seed Oil Polyglyceryl-6 Esters Watermelon Seed Oil Polyglyceryl-6 Esters Ximenia Americana Seed Oil Polyglyceryl-6 Esters
<u><i>Polyglyceryl-2 mixed esters</i></u> Polyglyceryl-2 Isopalmitate/Sebacate		<u><i>Polyglyceryl-8 discrete esters</i></u> Polyglyceryl-8 Oleate Polyglyceryl-8 Stearate
<u><i>Polyglyceryl-3 discrete esters</i></u> Polyglyceryl-3 Caprate Polyglyceryl-3 Caprylate Polyglyceryl-3 Laurate Polyglyceryl-3 Myristate Polyglyceryl-3 Palmitate Polyglyceryl-3 Isostearate Polyglyceryl-3 Oleate Polyglyceryl-3 Stearate Polyglyceryl-3 Stearate SE Polyglyceryl-3 Ricinoleate Polyglyceryl-3 Behenate	<u><i>Polyglyceryl-6 discrete esters</i></u> Polyglyceryl-6 Caprate Polyglyceryl-6 Caprylate Polyglyceryl-6 Undecylenate Polyglyceryl-6 Laurate Polyglyceryl-6 Myristate Polyglyceryl-6 Palmitate Polyglyceryl-6 Isostearate Polyglyceryl-6 Oleate Polyglyceryl-6 Stearate Polyglyceryl-6 Ricinoleate Polyglyceryl-6 Behenate	<u><i>Polyglyceryl-8 mixed esters</i></u> Polyglyceryl-8 C12-20 Acid Ester
<u><i>Polyglyceryl-3 mixed esters</i></u> Apricot Kernel Oil Polyglyceryl-3 Esters Candelilla/Jojoba/Rice Bran Polyglyceryl-3 Esters Olive Oil Polyglyceryl-3 Esters Palm Oil Polyglyceryl-3 Esters Polyglyceryl-3 Beeswax Polyglyceryl-3 Cocoate Polyglyceryl-3 Rice Branate Polyglyceryl-3 Soyate/Shea Butterate Rice Bran Oil Polyglyceryl-3 Esters Shea Butter Polyglyceryl-3 Esters Sunflower Seed Oil Polyglyceryl-3 Esters	<u><i>Polyglyceryl-6 mixed esters</i></u> Adansonia Digitata Seed Oil Polyglyceryl-6 Esters Apricot Kernel Oil Polyglyceryl-6 Esters Argan Oil Polyglyceryl-6 Esters Astrocaryum Vulgare Oil Polyglyceryl-6 Esters Avocado Oil Polyglyceryl-6 Esters Babassu Oil Polyglyceryl-6 Esters Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters Borage Seed Oil Polyglyceryl-6 Esters Carapa Guaianensis Oil Polyglyceryl-6 Esters Castor Oil Polyglyceryl-6 Esters Cocoa Butter Polyglyceryl-6 Esters Coconut Oil Polyglyceryl-6 Esters Coffee Seed Oil Polyglyceryl-6 Esters Glycerol/Polyglyceryl-6 Isostearate/Behenate Esters Hazelnut Seed Oil Polyglyceryl-6 Esters Macadamia Seed Oil Polyglyceryl-6 Esters Mauritia Flexuosa Seed Oil Polyglyceryl-6 Esters Olive Oil Polyglyceryl-6 Esters Palm Oil Polyglyceryl-6 Esters Parinari Curatellifolia Oil Polyglyceryl-6 Esters Pinus Sibirica Seed Oil Polyglyceryl-6 Esters Polyglyceryl-6 Adansonia Digitata Seedate Polyglyceryl-6 Apricot Kernelate Polyglyceryl-6 Argan Kernelate Polyglyceryl-6 Caprylate/Caprate Polyglyceryl-6 Citrullus Lanatus Seedate Polyglyceryl-6 Palmitate/Succinate Polyglyceryl-6 Schinziophyton Rautanenii Kernelate Polyglyceryl-6 Sclerocarya Birrea Seedate Polyglyceryl-6 Trichilia Emetica Seedate Polyglyceryl-6 Ximenia Americana Seedate Rosa Rubiginosa Seed Oil Polyglyceryl-6 Esters Safflower Seed Oil Polyglyceryl-6 Esters Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters Sesame Oil Polyglyceryl-6 Esters Shea Butter Polyglyceryl-6 Esters	<u><i>Polyglyceryl-10 discrete esters</i></u> Polyglyceryl-10 Caprate Polyglyceryl-10 Caprylate Polyglyceryl-10 Undecylenate Polyglyceryl-10 Laurate Polyglyceryl-10 Myristate Polyglyceryl-10 Palmitate Polyglyceryl-10 Isostearate Polyglyceryl-10 Linoleate Polyglyceryl-10 Oleate Polyglyceryl-10 Stearate
<u><i>Polyglyceryl-4 discrete esters</i></u> Polyglyceryl-4 Caprate Polyglyceryl-4 Caprylate Polyglyceryl-4 Laurate Polyglyceryl-4 Isostearate Polyglyceryl-4 Oleate Polyglyceryl-4 Stearate		<u><i>Polyglyceryl-10 mixed esters</i></u> Almond Oil/Polyglyceryl-10 Esters Apricot Kernel Oil Polyglyceryl-10 Esters Caprylic/Capric Glycerides Polyglyceryl-10 Esters Polyglyceryl-10 Apricot Kernelate Polyglyceryl-10 Behenate/Eicosadioate Polyglyceryl-10 Caprylate/Caprate Polyglyceryl-10 Cocoate Polyglyceryl-10 Eicosanedioate/Tetradecanedioate Polyglyceryl-10 Hydroxystearate/Stearate/ Eicosadioate Polyglyceryl-10 Palmate Sclerocarya Birrea Seed Oil Polyglyceryl-10 Esters Sunflower Seed Oil Polyglyceryl-10 Esters Watermelon Seed Oil Polyglyceryl-10 Esters
<u><i>Polyglyceryl-4 mixed esters</i></u> Apricot Kernel Oil Polyglyceryl-4 Esters Babassu Oil Polyglyceryl-4 Esters Borage Seed Oil Polyglyceryl-4 Esters Linseed Oil Polyglyceryl-4 Esters Olive Oil Polyglyceryl-4 Esters Palm Kernel Oil Polyglyceryl-4 Esters Palm Oil Polyglyceryl-4 Esters Polyglyceryl-4 Almond/Shea Butterate Polyglyceryl-4 Caprylate/Caprate Polyglyceryl-4 Cocoate Polyglyceryl-4 Hazelnutseedate Polyglyceryl-4 Isostearate/Laurate Polyglyceryl-4 Laurate/Sebacate Polyglyceryl-4 Laurate/Succinate Polyglyceryl-4 Punicate Polyglyceryl-4 Sweet Almond/Shea Butter Polyglyceryl-4 Esters Sunflower Seed Oil Polyglyceryl-4 Esters Sweet Almond Oil Polyglyceryl-4 Esters		

Table 2. Polyglyceryl Fatty Acid Esters – arranged by polyglyceryl chain length

Polyglyceryl Multi-esters (i.e., not mono-esters and not “polyesters”)		
<u><i>Polyglyceryl-2 discrete multi-esters</i></u>	<u><i>Polyglyceryl-6 discrete multi-esters</i></u>	<u><i>Polyglyceryl-10 discrete multi-esters (con't)</i></u>
Polyglyceryl-2 Sesquicaprylate	Polyglyceryl-6 Sesquicaprylate	Polyglyceryl-10 Pentaricinoleate
Polyglyceryl-2 Sesquiosostearate	Polyglyceryl-6 Dicaprate	Polyglyceryl-10 Hexaoleate
Polyglyceryl-2 Diisostearate	Polyglyceryl-6 Tricaprylate	Polyglyceryl-10 Heptaoleate
Polyglyceryl-2 Triisostearate	Polyglyceryl-6 Tetracaprylate	Polyglyceryl-10 Decaoleate
Polyglyceryl-2 Tetraisostearate	Polyglyceryl-6 Pentacaprylate	Polyglyceryl-10 Distearate
Polyglyceryl-2 Dioleate	Polyglyceryl-6 Heptacaprylate	Polyglyceryl-10 Tristearate
Polyglyceryl-2 Sesquioleate	Polyglyceryl-6 Octacaprylate	Polyglyceryl-10 Pentastearate
Polyglyceryl-2 Tetraoleate	Polyglyceryl-6 Dipalmitate	Polyglyceryl-10 Pentahydroxystearate
Polyglyceryl-2 Sesquisteate	Polyglyceryl-6 Sesquiosostearate	Polyglyceryl-10 Heptahydroxystearate
Polyglyceryl-2 Distearate	Polyglyceryl-6 Diisostearate	Polyglyceryl-10 Heptastearate
Polyglyceryl-2 Tetrastearate	Polyglyceryl-6 Dioleate	Polyglyceryl-10 Decahydroxystearate
	Polyglyceryl-6 Tetraoleate	Polyglyceryl-10 Decastearate
<u><i>Polyglyceryl-2 mixed multi-esters</i></u>	Polyglyceryl-6 Pentaoleate	Polyglyceryl-10 Dodecabenenate
Polyglyceryl-2 Tetrabenenate/ Macadamiate/Sebacate	Polyglyceryl-6 Hexaoleate	Polyglyceryl-10 Trierucate
	Polyglyceryl-6 Sesquisteate	Polyglyceryl-10 Hexaerucate
	Polyglyceryl-6 Distearate	Polyglyceryl-10 Nonaerucate
	Polyglyceryl-6 Tristearate	
<u><i>Polyglyceryl-3 discrete multi-esters</i></u>	Polyglyceryl-6 Pentastearate	<u><i>Polyglyceryl-10 mixed multi-esters</i></u>
Polyglyceryl-3 Dicaprate	Polyglyceryl-6 Hexastearate	Polyglyceryl-10 Decamacadamiate
Polyglyceryl-3 Diisostearate	Polyglyceryl-6 Octastearate	Polyglyceryl-10 Dicoate
Polyglyceryl-3 Triisostearate	Polyglyceryl-6 Pentaricinoleate	Polyglyceryl-10 Didecanoate
Polyglyceryl-3 Dioleate	Polyglyceryl-6 Tetrabenenate	Polyglyceryl-10 Dodeca-Caprylate/ Caprate
Polyglyceryl-3 Distearate		Polyglyceryl-10 Hepta(Behenate/Stearate)
Polyglyceryl-3 Di-Hydroxystearate	<u><i>Polyglyceryl-6 mixed multi-ester</i></u>	Polyglyceryl-10 Mono/Dioleate
Polyglyceryl-3 Pentaricinoleate	Macadamia Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-10 Sesquisteate
	Behenate	Polyglyceryl-10 Tetradecanedioate
<u><i>Polyglyceryl-3 mixed multi-esters</i></u>		Polyglyceryl-10 Tricocoate
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	<u><i>Polyglyceryl-8 mixed multi-esters</i></u>	
Polyglyceryl-3 Dicitrate/Stearate	Polyglyceryl-8 Decabenenate/Caprate	<u><i>Polyglyceryl-15 discrete multi-ester</i></u>
Polyglyceryl-3 Dicoate	Polyglyceryl-8 Decaerucate/Decaisostearate/ Decaricinoleate	Polyglyceryl-15 Diisostearate
Polyglyceryl-3 Pentacaprylate/Caprate		
Polyglyceryl-3 Pentaolive	<u><i>Polyglyceryl-10 discrete multi-esters</i></u>	<u><i>Polyglyceryl-20 discrete multi-esters</i></u>
Polyglyceryl-3 Triolive	Polyglyceryl-10 Decaethylhexanoate	Polyglyceryl-20 Hexacaprylate
Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate	Polyglyceryl-10 Dodecacaprate	Polyglyceryl-20 Heptacaprylate
	Polyglyceryl-10 Pentacaprylate	Polyglyceryl-20 Octaisnonanoate
<u><i>Polyglyceryl-4 discrete multi-esters</i></u>	Polyglyceryl-10 Dodecacaprylate	
Polyglyceryl-4 Dilaurate	Polyglyceryl-10 Tridecanoate	<u><i>Polyglyceryl-20 mixed multi-esters</i></u>
Polyglyceryl-4 Pentaoleate	Polyglyceryl-10 Dilaurate	Polyglyceryl-20 Docosabenenate/Isostearate
Polyglyceryl-4 Distearate	Polyglyceryl-10 Trilaurate	Polyglyceryl-20 Docosabenenate/Laurate
Polyglyceryl-4 Tristearate	Polyglyceryl-10 Tetralaurate	Polyglyceryl-20 Docosabenenate/Oleate
Polyglyceryl-4 Pentastearate	Polyglyceryl-10 Pentalaurate	Polyglyceryl-20 Heptadecabenenate/Laurate
	Polyglyceryl-10 Dimyristate	Polyglyceryl-20 Octadecabenenate/Laurate
<u><i>Polyglyceryl-4 mixed multi-esters</i></u>	Polyglyceryl-10 Dipalmitate	
Polyglyceryl-4 Pentapalmitate/Stearate	Polyglyceryl-10 Diisostearate	
Pumpkin Seed Oil Polyglyceryl-4 Esters	Polyglyceryl-10 Triisostearate	
Pumpkin Seed Oil Polyglyceryl-4 Esters Succinate	Polyglyceryl-10 Pentaisostearate	
	Polyglyceryl-10 Hexaisostearate	
<u><i>Polyglyceryl-5 discrete multi-esters</i></u>	Polyglyceryl-10 Nonaisostearate	
Polyglyceryl-5 Dicaprylate	Polyglyceryl-10 Decaisostearate	
Polyglyceryl-5 Dilaurate	Polyglyceryl-10 Pentalinoleate	
Polyglyceryl-5 Trimyristate	Polyglyceryl-10 Decalinoleate	
Polyglyceryl-5 Pentamyristate	Polyglyceryl-10 Dioleate	
Polyglyceryl-5 Triisostearate	Polyglyceryl-10 Trioleate	
Polyglyceryl-5 Dioleate	Polyglyceryl-10 Tetraoleate	
Polyglyceryl-5 Trioleate	Polyglyceryl-10 Pentaoleate	
Polyglyceryl-5 Tristearate		
Polyglyceryl-5 Hexastearate		
Polyglyceryl-5 Tribenenate		

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

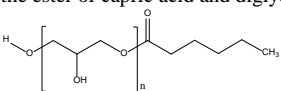
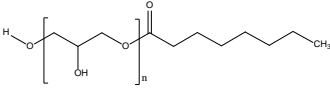
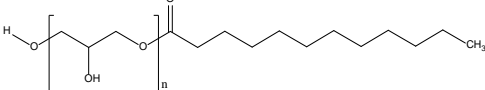
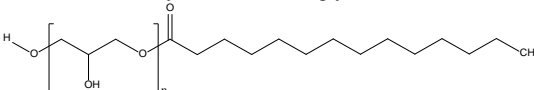
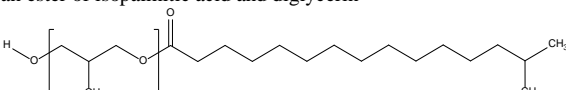
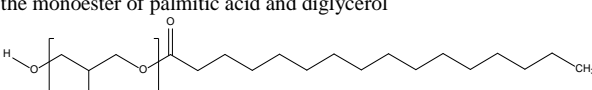
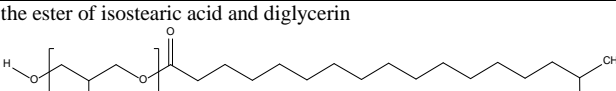
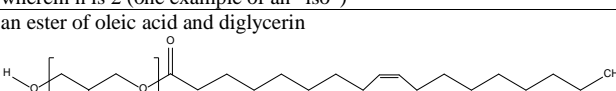
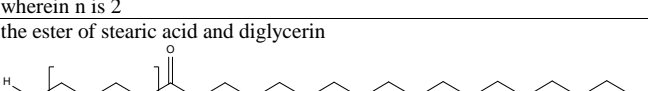
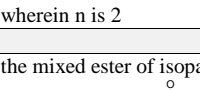
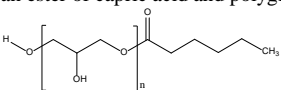
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl Monoesters		
<i>Polyglyceryl-2 discrete esters</i>		
Polyglyceryl-2 Caprate 156153-06-9	the ester of capric acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Caprylate	the ester of caprylic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Laurate 96499-68-2	the ester of lauric acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Myristate	the monoester of myristic acid and diglycerol 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Isopalmitate	an ester of isopalmitic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Palmitate	the monoester of palmitic acid and diglycerol 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Isostearate 73296-86-3 81752-33-2	the ester of isostearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Oleate 49553-76-6 9007-48-1 (generic)	an ester of oleic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Stearate 12694-22-3 9009-32-9 (generic)	the ester of stearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-2 mixed esters</i>		
Polyglyceryl-2 Isopalmitate/Sebacate	the mixed ester of isopalmitic acid, sebacic acid and diglycerin 	surfactant - emulsifying agent
wherein RC(O)- represents the residue of isopalmitic or sebacic acid, and n is 2		
<i>Polyglyceryl-3 discrete esters</i>		
Polyglyceryl-3 Caprate 133654-02-1 51033-30-8 74504-65-7	an ester of capric acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
wherein n is 3		

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

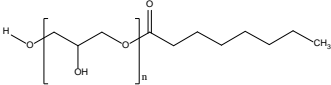
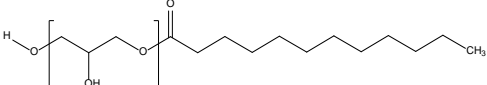
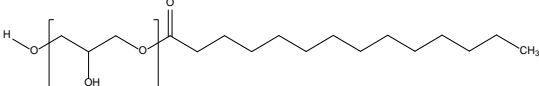
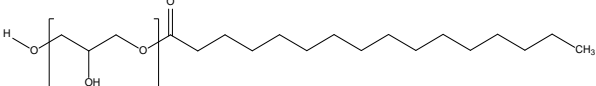
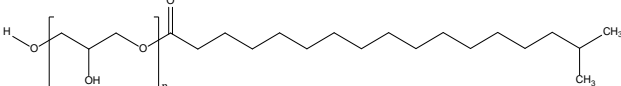
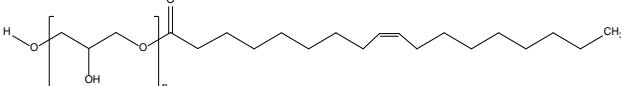
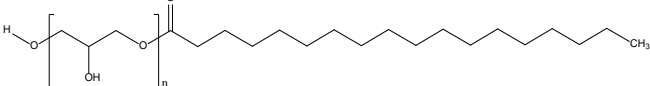
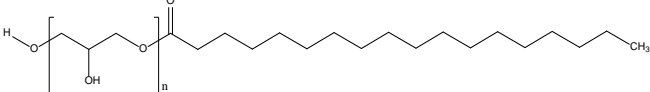
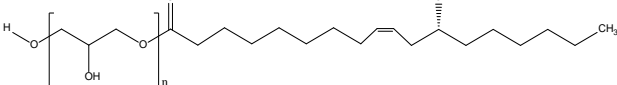
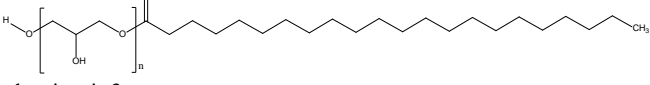
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-3 Caprylate 108777-93-1	the ester of caprylic acid and polyglycerin-3 	deodorant agent; surfactants - emulsifying agent
Polyglyceryl-3 Laurate 51033-31-9	the ester of lauric acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Myristate	the ester of myristic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Palmitate	an ester of palmitic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Isostearate 127512-63-4	the ester of isostearic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Oleate 33940-98-6 9007-48-1 (generic)	an ester of oleic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Stearate 26855-43-6 27321-72-8 37349-34-1 (generic)	an ester of stearic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Stearate SE	a self-emulsifying grade of polyglyceryl-3 stearate that contains some sodium and/or potassium stearate 	surfactant - emulsifying agent
Polyglyceryl-3 Ricinoleate 29894-35-7 (generic)	an ester of ricinoleic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Behenate	the ester of behenic acid and polyglycerin-3 	emulsion stabilizer; slip modifier; surface modifier

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-3 mixed esters Apricot Kernel Oil Polyglyceryl-3 Esters	the product obtained by the transesterification of prunus armeniaca (apricot) kernel oil and polyglycerin-3	skin-conditioning agent - emollient; surfactant - emulsifying agent
Candelilla/Joboba/Rice Bran Polyglyceryl-3 Esters	a product obtained by the transesterification of polyglycerin-3 and euphorbia cerifera (candelilla) wax, and simmondsia chinensis (jojoba) seed wax and oryza sativa (rice) bran wax	emulsion stabilizer; surfactant - emulsifying agent
Olive Oil Polyglyceryl-3 Esters	the product obtained by the transesterification of polyglycerin-3 and olea europaea (olive) fruit oil	surfactant – emulsifying agent
Palm Oil Polyglyceryl-3 Esters	the product obtained by the transesterification of polyglycerin-3 and elaeis guineensis (palm) oil	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Beeswax 136097-93-3	an ester of beeswax fatty acids and polyglycerin-3	surfactant – emulsifying agent
Polyglyceryl-3 Cocoate	the ester of coconut acid and polyglycerin-3	surfactant – emulsifying agent
Polyglyceryl-3 Rice Branate	the monoester of polyglycerin-3 and rice bran acid	surfactant – emulsifying agent
Polyglyceryl-3 Soyate/Shea Butterate	an ester of a mixture of fatty acids derived from glycine soja (soybean) oil and butyrospermum parkii (shea) butter with polyglycerin-3	surfactant – emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

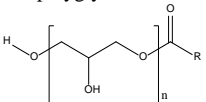
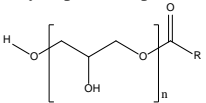
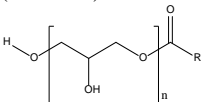
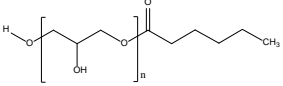
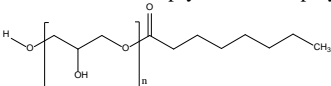
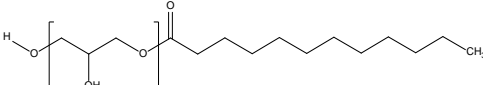
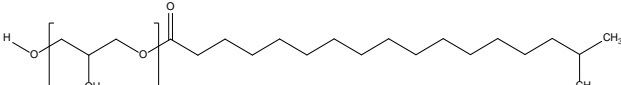
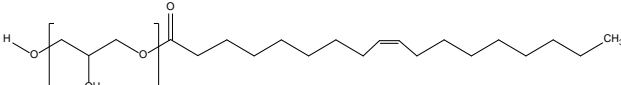
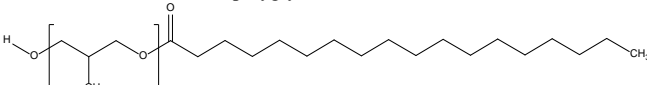
Ingredient CAS No.	Definition & Structure	Function(s)
Rice Bran Oil Polyglyceryl-3 Esters	<p>the product obtained by the transesterification of oryza sativa (rice) bran oil and polyglycerin-3</p> 	surfactants - emulsifying agent
Shea Butter Polyglyceryl-3 Esters	<p>the product obtained by the transesterification of polyglycerin-3 and butyrospermum parkii (shea) butter</p> 	emulsion stabilizer; hair conditioning agent; skin-conditioning agent – miscellaneous; surfactant - emulsifying agent; viscosity increasing agent - aqueous
Sunflower Seed Oil Polyglyceryl-3 Esters	<p>the product obtained by the transesterification of helianthus annuus (sunflower) seed oil and polyglycerin-3</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-4 discrete esters</i>		
Polyglyceryl-4 Caprate 160391-93-5 74504-65-7	<p>the ester of capric acid and polyglycerin-4</p>  <p>wherein n is 4</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Caprylate	<p>the monoester of caprylic acid and polyglycerin-4</p>  <p>wherein n is 4</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Laurate 75798-42-4; 74504-64-6 (generic);	<p>the ester of lauric acid and polyglycerin-4</p>  <p>wherein n is 4</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Isostearate 63705-03-3 91824-88-3	<p>an ester of isostearic acid and polyglycerin-4</p>  <p>wherein n is 4 (one example of an “iso”)</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Oleate 71012-10-7 9007-48-1 (generic)	<p>an ester of oleic acid and polyglycerin-4</p>  <p>wherein n is 4</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Stearate 26855-44-7 37349-34-1 (generic) 68004-11-5	<p>an ester of stearic acid and polyglycerin-4</p>  <p>wherein n is 4</p>	surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

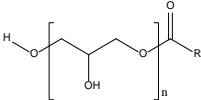
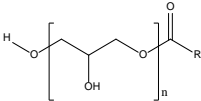
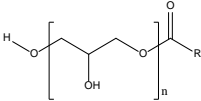
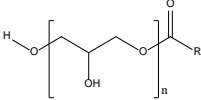
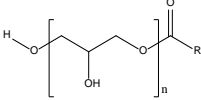
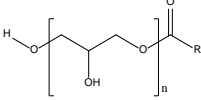
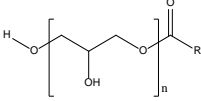
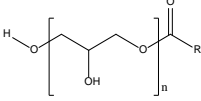
Ingredient CAS No.	Definition & Structure	Function(s)
<p><i>Polyglyceryl-4 mixed esters</i> Apricot Kernel Oil Polyglyceryl-4 Esters</p>	<p>the product obtained by the transesterification of prunus armeniaca (apricot) kernel oil and polyglycerin-4</p>	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from prunus armeniaca (apricot) kernel oil, and n is 4</p>	
Babassu Oil Polyglyceryl-4 Esters	<p>the product obtained by the transesterification of orbignya oleifera seed oil and polyglycerin-4</p>	<p>surfactant - solubilizing agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from orbignya oleifera seed oil, and n is 4</p>	
Borage Seed Oil Polyglyceryl-4 Esters	<p>the product obtained by the transesterification of borago officinalis seed oil and polyglycerin-4</p>	<p>opacifying agent; surfactant - emulsifying agent; surfactant - solubilizing agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from borago officinalis seed oil, and n is 4</p>	
Linseed Oil Polyglyceryl-4 Esters	<p>the product obtained by the transesterification of linum usitatissimum (linseed) seed oil and polyglycerin-4</p>	<p>opacifying agent; surfactant - emulsifying agent; surfactant - solubilizing agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from linum usitatissimum (linseed) seed oil, and n is 4</p>	
Olive Oil Polyglyceryl-4 Esters	<p>the product obtained by the transesterification of olea europaea (olive) fruit oil and polyglycerin-4</p>	<p>surfactant - solubilizing agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from olea europaea (olive) fruit oil, and n is 4</p>	
Palm Kernel Oil Polyglyceryl-4 Esters	<p>is the product obtained by the transesterification of elaeis guineensis (palm) kernel oil and polyglycerin-4</p>	<p>opacifying agent; surfactant - emulsifying agent; surfactant - solubilizing agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from elaeis guineensis (palm) kernel oil, and n is 4</p>	
Palm Oil Polyglyceryl-4 Esters	<p>the product obtained by the transesterification of polyglycerin-4 and elaeis guineensis (palm) oil</p>	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from elaeis guineensis (palm) oil, and n is 4</p>	
Polyglyceryl-4 Almond/Shea Butterate	<p>an ester of a mixture of fatty acids derived from almond oil and butyrospermum parkii (shea) butter with polyglycerin-4</p>	<p>surfactant - emulsifying agent</p>
	<p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from butyrospermum parkii (shea) butter, and n is 4</p>	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

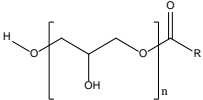
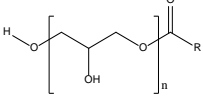
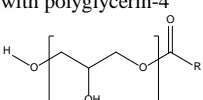
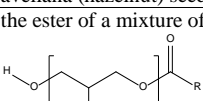
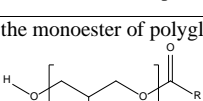
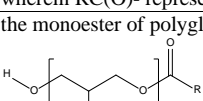
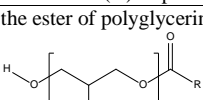
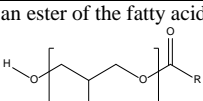
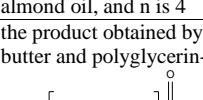
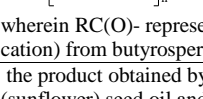
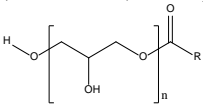
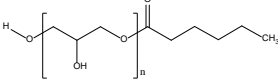
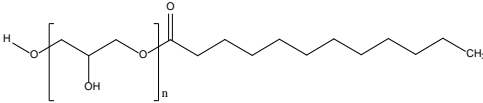
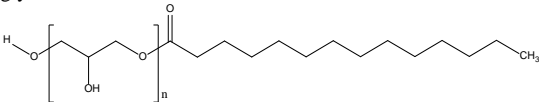
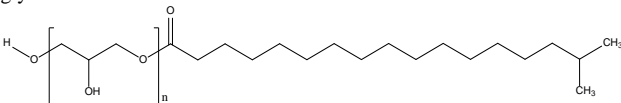
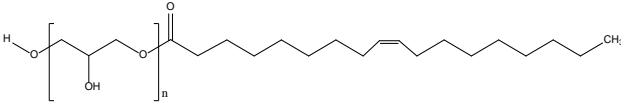
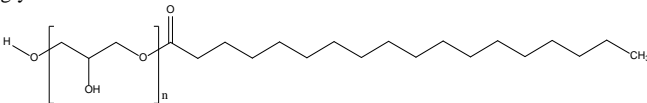
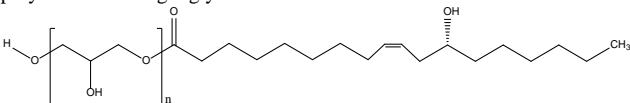
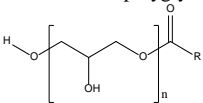
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-4 Caprylate/Caprate	the monoester of polyglycerin-4 and a mixture of caprylic and capric acids 	surfactant – hydro-trope; surfactant – solubilizing agent
Polyglyceryl-4 Cocoate	wherein RC(O)- represents the residue of capric or caprylic acid, and n is 4 an ester of coconut acid and polyglycerin-4 	surfactant - emulsifying agent
Polyglyceryl-4 Hazelnutseedate	wherein RC(O)- represents the residue of coconut acid, and n is 4 an ester of the fatty acids derived from corylus avellana (hazelnut) seed oil with polyglycerin-4 	surfactant - emulsifying agent
Polyglyceryl-4 Isostearate/Laurate	wherein RC(O)- represents the residue of the fatty acids derived from corylus avellana (hazelnut) seed oil, and n is 4 the ester of a mixture of isostearic and lauric acids with polyglycerin-4 	dispersing agent - nonsurfactant; emulsion stabilizer; surfactant - emulsifying agent; surfactant - foam booster
Polyglyceryl-4 Laurate/Sebacate	wherein RC(O)- represents the residue of isostearic or lauric acid, and n is 4 the monoester of polyglycerin-4 and a mixture of lauric and sebacic acids 	surfactant – hydrotrope; surfactant – solubilizing agent
Polyglyceryl-4 Laurate/Succinate	wherein RC(O)- represents the residue of lauric or sebacic acid, and n is 4 the monoester of polyglycerin-4 and a mixture of lauric and succinic acids 	surfactant - emulsifying agent
Polyglyceryl-4 Punicate	wherein RC(O)- represents the residue of lauric or succinic acid, and n is 4 the ester of polyglycerin-4 and punicic acid 	surfactant - emulsifying agent
Polyglyceryl-4 Sweet Almondate	wherein RC(O)- represents the residue of punicic acid, and n is 4 an ester of the fatty acids derived from sweet almond oil and polyglycerin-4 	skin-conditioning agent - misc; surfactant - emulsifying agent
Shea Butter Polyglyceryl-4 Esters	wherein RC(O)- represents the residue of the fatty acids obtained from sweet almond oil, and n is 4 the product obtained by the transesterification of butyrospermum parkii (shea) butter and polyglycerin-4 	emulsion stabilizer; skin-conditioning agent – emollient
Sunflower Seed Oil Polyglyceryl-4 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from butyrospermum parkii (shea) butter, and n is 4 the product obtained by the transesterification of helianthus annuus (sunflower) seed oil and polyglycerin-4 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from helianthus annuus (sunflower) seed oil, and n is 4	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

Ingredient CAS No.	Definition & Structure	Function(s)
Sweet Almond Oil Polyglyceryl-4 Esters 1072006-19-9 (generic)	the product obtained by the transesterification of prunus amygdalus dulcis (sweet almond) oil and polyglycerin-4 	surfactants - solubilizing agent
<i>Polyglyceryl-5 discrete esters</i>		
Polyglyceryl-5 Caprate	the monoester of capric acid and polyglycerin-5 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Laurate 128738-83-0; 74504-64-6 (generic)	the ester of lauric acid and a glycerin polymer containing an average of 5 glycerin units 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Myristate	the monoester of myristic acid and a glycerin polymer containing 5 units of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Isostearate	the ester of isostearic acid and a glycerin polymer containing an average of 5 glycerin units 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Oleate 86529-98-8 9007-48-1 (generic)	the ester of oleic acid and a glycerin polymer containing an average of 5 glycerin units 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Stearate 37349-34-1 (generic)	the monoester of stearic acid and a glycerin polymer containing 5 units of glycerin 	surfactant - emulsifying agent
Polyglyceryl-5 Ricinoleate	is the product obtained by the reaction of ricinoleic acid with a glycerin polymer containing 5 glycerin units 	surfactant - emulsifying agent
<i>Polyglyceryl-5 mixed esters</i>		
Apricot Kernel Oil Polyglyceryl-5 Esters	the product obtained by the transesterification of prunus armeniaca (apricot) kernel oil and polyglycerin-5 	skin-conditioning agent - emollient; surfactant - emulsifying agent

wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from prunus armeniaca (apricot) kernel oil, and n is 5

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

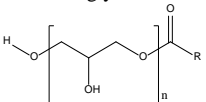
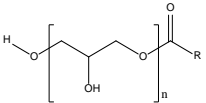
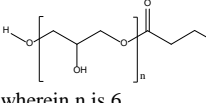
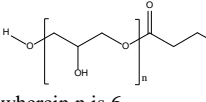
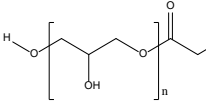
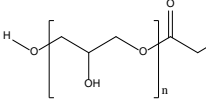
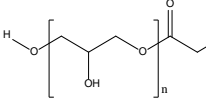
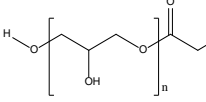
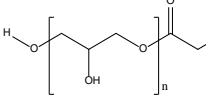
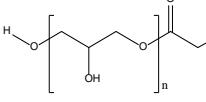
Ingredient CAS No.	Definition & Structure	Function(s)
Palm Oil Polyglyceryl-5 Esters	<p>the product obtained by the transesterification of a glycerin polymer containing 5 units of glycerin and elaeis guineensis (palm) oil</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Sunflower Seed Oil Polyglyceryl-5 Esters	<p>the product obtained by the transesterification of helianthus annuus (sunflower) seed oil and a glycerin polymer containing 5 units of glycerin</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-6 discrete esters</i>		
Polyglyceryl-6 Caprate	<p>the monoester of capric acid and polyglycerin-6</p>  <p>wherein n is 6</p>	surfactant - cleansing agent; surfactant - emulsifying agent
Polyglyceryl-6 Caprylate	<p>the monoester of caprylic acid and polyglycerin-6</p>  <p>wherein n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Undecylenate	<p>an ester of undecylenic acid and polyglycerin-6</p>  <p>wherein n is 6</p>	surfactant - emulsifying agent
Polyglyceryl-6 Laurate 51033-38-6; 74504-64-6 (generic)	<p>the ester of lauric acid and polyglycerin-6</p>  <p>wherein n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Myristate	<p>the monoester of myristic acid and polyglycerin-6</p>  <p>wherein n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Palmitate 99734-31-3	<p>the ester of palmitic acid and polyglycerin-6</p>  <p>wherein n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Isostearate 126928-07-2	<p>the ester of isostearic acid and polyglycerin-6</p>  <p>wherein n is 6 (one example of an "iso")</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Oleate 79665-92-2 9007-48-1 (generic)	<p>the ester of oleic acid and polyglycerin-6</p>  <p>wherein n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

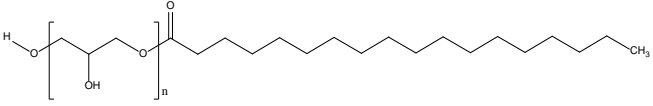
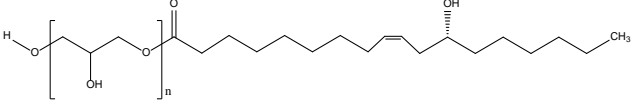
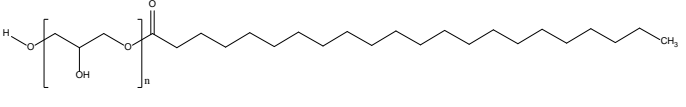
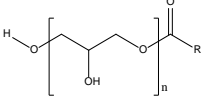
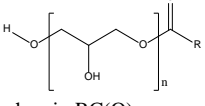
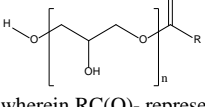
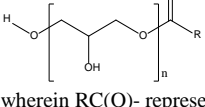
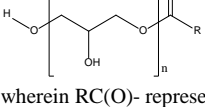
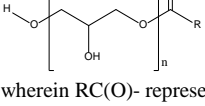
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-6 Stearate 95461-65-7	the ester of stearic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Ricinoleate 107615-51-0	wherein n is 6 the ester of polyglycerin-6 and ricinoleic acid 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Behenate	wherein n is 6 the monoester of behenic acid and polyglycerin-6 	emulsion stabilizer; slip modifier; surface modifier
<i>Polyglyceryl-6 mixed esters</i>		
Adansonia Digitata Seed Oil Polyglyceryl-6 Esters	the product obtained by the transesterification of adansonia digitata seed oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Apricot Kernel Oil Polyglyceryl-6 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from adansonia digitata seed oil, and n is 6 the product obtained by the transesterification of prunus armeniaca (apricot) kernel oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Argan Oil Polyglyceryl-6 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from prunus armeniaca (apricot) kernel oil, and n is 6 the product obtained by the transesterification of argania spinosa kernel oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Astrocaryum Vulgare Oil Polyglyceryl-6 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from argania spinosa kernel oil, and n is 6 the product obtained by the transesterification of astrocaryum vulgare kernel oil and polyglycerin-6 	skin-conditioning agent - misc; surfactant - emulsifying agent
Avocado Oil Polyglyceryl-6 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from astrocaryum vulgare kernel oil, and n is 6 the product obtained by the transesterification of persea gratissima (avocado) oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Babassu Oil Polyglyceryl-6 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from persea gratissima (avocado) oil, and n is 6 the product obtained by the transesterification of orbignya oleifera seed oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from orbignya oleifera seed oil, and n is 6	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

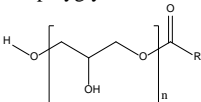
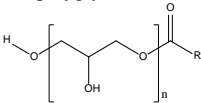
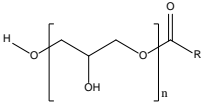
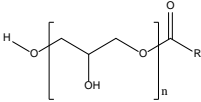
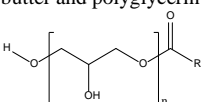
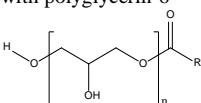
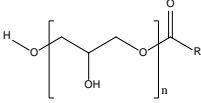
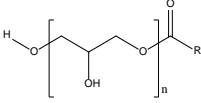
Ingredient CAS No.	Definition & Structure	Function(s)
Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of bertholletia excelsa seed oil and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from bertholletia excelsa seed oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Borage Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of borage officinalis seed oil and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from borage officinalis seed oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Carapa Guaianensis Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of carapa guaianensis seed oil and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from carapa guaianensis seed oil, and n is 6</p>	skin-conditioning agent - emollient
Castor Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of ricinus communis (castor) seed oil and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from ricinus communis (castor) seed oil, and n is 6</p>	skin-conditioning agent - emollient; skin conditioning agent - misc; surfactant - emulsifying agent
Cocoa Butter Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of theobroma cacao (cocoa) seed butter and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from theobroma cacao (cocoa) seed butter, and n is 6</p>	skin-conditioning agent - emollient
Coconut Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of cocos nucifera (coconut) oil with polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from cocos nucifera (coconut) oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Coffee Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of polyglycerin-6 and coffea arabica (coffee) seed oil</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from coffea arabica (coffee) seed oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	<p>the mixture of esters formed by the reaction of glycerin and polyglycerin-6 with isostearic acid and behenic acid</p>  <p>wherein RC(O)- represents the residue of isostearic or behenic acid, and n is 1 or 6</p>	skin-conditioning agent - emollient

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

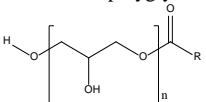
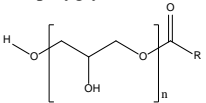
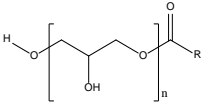
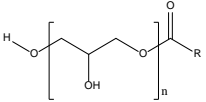
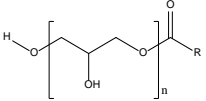
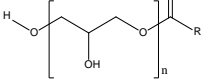
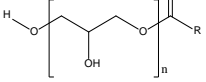
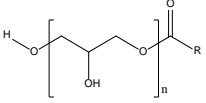
Ingredient CAS No.	Definition & Structure	Function(s)
Hazelnut Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of corylus avellana (hazelnut) seed oil and polyglycerin-6</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Macadamia Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of macadamia ternifolia seed oil and polyglycerin-6</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Mauritia Flexuosa Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of the oil obtained from the seeds of <i>Mauritia flexuosa</i> and polyglycerin-6</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Olive Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of olea europaea (olive) fruit oil and polyglycerin-6</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Palm Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of polyglycerin-6 and elaeis guineensis (palm) oil</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Parinari Curatellifolia Oil Polyglyceryl-6 Esters	<p>the product of the transesterification of the oil obtained from the seeds of <i>Parinari curatellifolia</i> and polyglycerin-6</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Pinus Sibirica Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of pinus sibirica seed oil and polyglycerin-6</p> 	surfactant - emulsifying agent
Polyglyceryl-6 Adansonia Digitata Seedate	<p>the ester of the fatty acids obtained from adansonia digitata seed oil and polyglycerin-6</p> 	skin-conditioning agent - emollient; surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

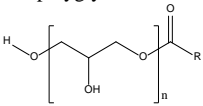
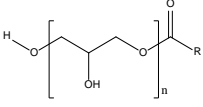
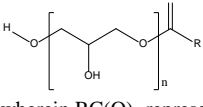
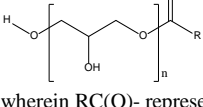
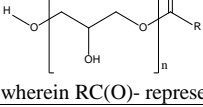
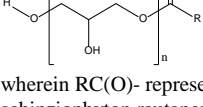
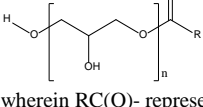
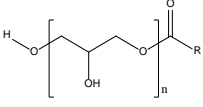
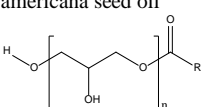
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-6 Apricot Kernelate	<p>the ester of the fatty acids derived from prunus armeniaca (apricot) kernel oil and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from prunus armeniaca (apricot) kernel oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Argan Kernelate	<p>the ester of polyglycerin-6 and the fatty acids obtained from argania spinosa kernel oil</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from argania spinosa kernel oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Caprylate/Caprate	<p>the monoester of polyglycerin-6 and a mixture of caprylic and capric acids</p>  <p>wherein RC(O)- represents the residue of capric or caprylic acid, and n is 6</p>	surfactant - hydrotrope; surfactant - solubilizing agent
Polyglyceryl-6 Citrullus Lanatus Seedate	<p>the ester of the fatty acids derived from citrullus lanatus (watermelon) seed oil and polyglycerin-6</p>  <p>wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from citrullus lanatus (watermelon) seed oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Palmitate/Succinate	<p>the monoester of polyglycerin-6 and a mixture of palmitic and succinic acids</p>  <p>wherein RC(O)- represents the residue of palmitic or succinic acid, and n is 6</p>	surfactant - emulsifying agent
Polyglyceryl-6 Schinziophyton Rautanenii Kernelate	<p>the ester of polyglycerin-6 and the fatty acids obtained from schinziophyton rautanenii kernel oil</p>  <p>wherein RC(O)- represents the residue of the fatty acids obtained from schinziophyton rautanenii kernel oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Sclerocarya Birrea Seedate	<p>the ester of polyglycerin-6 and the fatty acids obtained sclerocarya birrea seed oil</p>  <p>wherein RC(O)- represents the residue of the fatty acids obtained from sclerocarya birrea seed oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Trichilia Emetica Seedate	<p>the ester of polyglycerin-6 and the fatty acids obtained from trichilia emetica seed butter</p>  <p>wherein RC(O)- represents the residue of the fatty acids obtained from trichilia emetica seed butter, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Ximenia Americana Seedate	<p>the ester of polyglycerin-6 and the fatty acids obtained from ximenia americana seed oil</p>  <p>wherein RC(O)- represents the residue of the fatty acids obtained from ximenia americana seed oil, and n is 6</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

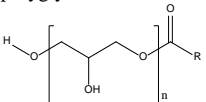
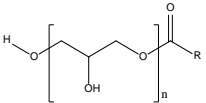
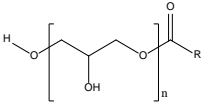
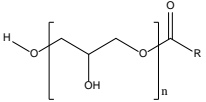
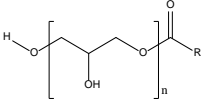
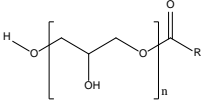
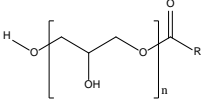
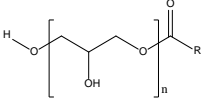
Ingredient CAS No.	Definition & Structure	Function(s)
Rosa Rubiginosa Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of rosa rubiginosa seed oil and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; skin-conditioning agent - miscellaneous; surfactant - emulsifying agent</p>
Safflower Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of carthamus tinctorius (safflower) seed oil and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters	<p>the product formed by the transesterification of schinziophyton rautanenii kernel oil and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of sclerocarya birrea seed oil with polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
Sesame Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of sesamum indicum (sesame) oil and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
Shea Butter Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of butyrospermum parkii (shea) butter and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
Soybean Oil Polyglyceryl-6 Esters	<p>the product of the transesterification of glycine soja (soybean) oil and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>
Sunflower Seed Oil Polyglyceryl-6 Esters	<p>the product obtained by the transesterification of helianthus annuus (sunflower) seed oil and polyglycerin-6</p> 	<p>skin-conditioning agent - emollient; surfactant - emulsifying agent</p>

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

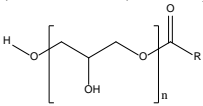
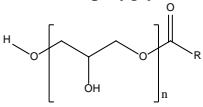
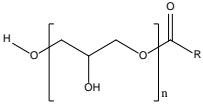
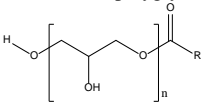
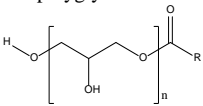
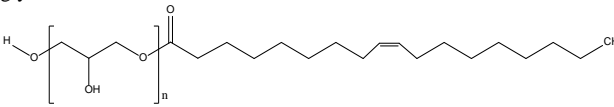
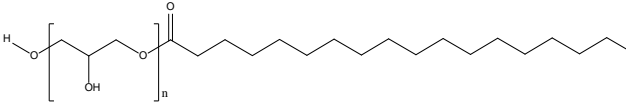
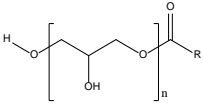
Ingredient CAS No.	Definition & Structure	Function(s)
Sweet Almond Oil Polyglyceryl-6 Esters	the product obtained by the transesterification of prunus amygdalus dulcis (sweet almond) oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Theobroma Grandiflorum Seed Butter Polyglyceryl-6 Esters	the product obtained by the transesterification of theobroma grandiflorum seed butter and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Trichilia Emetica Seed Oil Polyglyceryl-6 Esters	the product obtained by the transesterification of trichilia emetica seed butter and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Watermelon Seed Oil Polyglyceryl-6 Esters	the product obtained by the transesterification of citrullus lanatus (watermelon) seed oil with polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Ximenia Americana Seed Oil Polyglyceryl-6 Esters	the product obtained by the transesterification of ximenia americana seed oil and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-8 discrete esters</i>		
Polyglyceryl-8 Oleate 75719-56-1 9007-48-1 (generic)	an ester of oleic acid and a glycerin polymer containing an average of 8 glycerin units 	skin-conditioning agent - misc.; surfactant - emulsifying agent
Polyglyceryl-8 Stearate 37349-34-1 (generic) 75719-57-2	an ester of stearic acid and a glycerin polymer containing an average of 8 glycerin units 	surfactant - emulsifying agent
<i>Polyglyceryl-8 mixed esters</i>		
Polyglyceryl-8 C12-20 Acid Ester	the ester of a glycerin polymer containing 8 units of glycerin and a synthetic mixture of saturated acids containing 12 to 20 carbons in the alkyl chain 	surfactant - emulsifying agent
	wherein RC(O)- represents the residue of a fatty acid containing 12 to 20 carbons in the alkyl chain, and n is 8	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

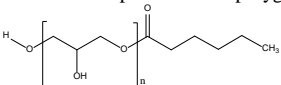
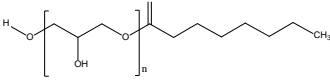
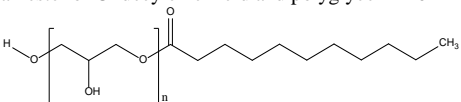
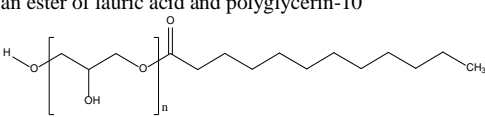
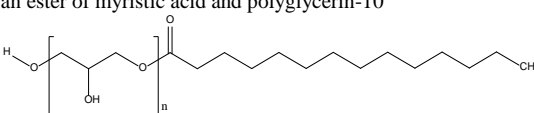
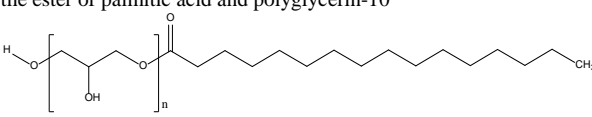
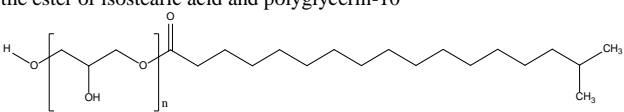
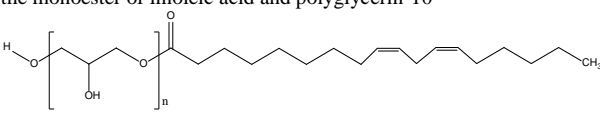
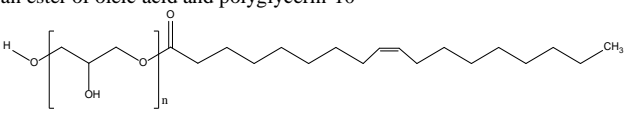
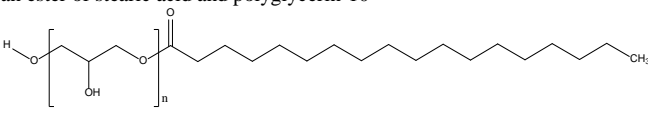
Ingredient CAS No.	Definition & Structure	Function(s)
<i>Polyglyceryl-10 discrete esters</i> Polyglyceryl-10 Caprate	the ester of capric acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Caprylate 51033-41-1	the monoester of caprylic acid and polyglycerin-10 	surfactant - emulsifying agent
Polyglyceryl-10 Undecylenate	an ester of Undecylenic Acid and polyglycerin-10 	surfactant - emulsifying agent
Polyglyceryl-10 Laurate 34406-66-1 74504-64-6 (generic)	an ester of lauric acid and polyglycerin-10 	skin-conditioning agent - misc; surfactant - emulsifying agent
Polyglyceryl-10 Myristate 87390-32-7	an ester of myristic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Palmitate 79777-31-4	the ester of palmitic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Isostearate 133738-23-5	the ester of isostearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Linoleate	the monoester of linoleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Oleate 79665-93-3 9007-48-1 (generic)	an ester of oleic acid and polyglycerin-10 	skin-conditioning agent - misc; surfactant - emulsifying agent
Polyglyceryl-10 Stearate 79777-30-3 9009-32-9 (generic)	an ester of stearic acid and polyglycerin-10 	skin-conditioning agent - misc; surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

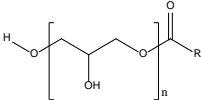
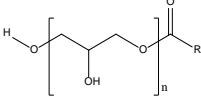
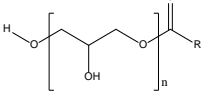
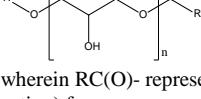
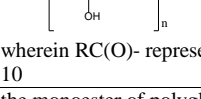
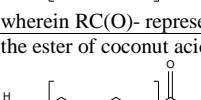
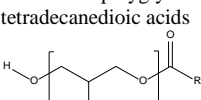
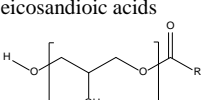

Ingredient CAS No.	Definition & Structure	Function(s)
<i>Polyglyceryl-10 mixed esters</i> Almond Oil/Polyglyceryl-10 Esters	the product obtained by the transesterification of prunus amygdalus dulcis (sweet almond) oil and polyglycerin-10 	surfactant - emulsifying agent
Apricot Kernel Oil Polyglyceryl-10 Esters	the product obtained by the transesterification of prunus armeniaca (apricot) kernel oil and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Caprylic/Capric Glycerides Polyglyceryl-10 Esters	the product obtained by the transesterification of caprylic/capric glycerides with polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent; surfactant - solubilizing agent
Polyglyceryl-10 Apricot Kernelate	the ester of the fatty acids derived from prunus armeniaca (apricot) kernel oil and polyglycerin-10 	skin-conditioning agent - emollient; skin-conditioning agent - miscellaneous; surfactant - emulsifying agent
Polyglyceryl-10 Behenate/Eicosadioate	the monoester of polyglycerin-10 and a blend of behenic and eicosadioic acids 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Caprylate/Caprinate	the monoester of polyglycerin-10 and a blend of caprylic and capric acids 	emulsion stabilizer; solvent; surfactant - emulsifying agent
Polyglyceryl-10 Cocoate	the ester of coconut acid and polyglycerin-10 	surfactant-cleansing agent; surfactant-emulsifying agent
Polyglyceryl-10 Eicosanedioate/Tetradanedioate	the ester of polyglycerin-10 with a mixture of eicosanedioic and tetradanedioic acids 	hair conditioning agent; skin conditioning agent - occlusive
Polyglyceryl-10 Hydroxystearate/Stearate/Eicosadioate	the monoester of polyglycerin-10 with a blend of hydroxystearic, stearic and eicosandioic acids 	skin-conditioning agent - emollient

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

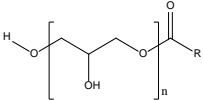
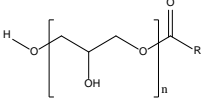
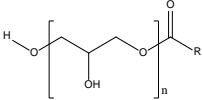
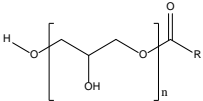
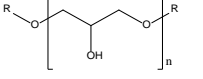
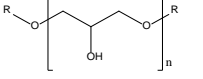
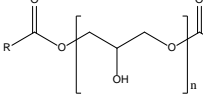
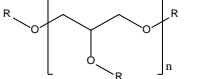
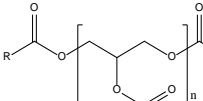
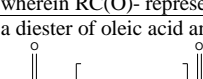
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-10 Palmate	the ester of palm acid and polyglycerin-10 	skin-conditioning agent - misc; surfactant - emulsifying agent
Sclerocarya Birrea Seed Oil Polyglyceryl-10 Esters	wherein RC(O)- represents the residue of palm acid, and n is 10 the product obtained by the transesterification of sclerocarya birrea seed oil with polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Sunflower Seed Oil Polyglyceryl-10 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from sclerocarya birrea seed oil, and n is 10 the product obtained by the transesterification of helianthus annuus (sunflower) seed oil and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Watermelon Seed Oil Polyglyceryl-10 Esters	wherein RC(O)- represents the residue of fatty acids derived (via transesterification) from helianthus annuus (sunflower) seed oil, and n is 10 the product obtained by the transesterification of citrullus lanatus (watermelon) seed oil with polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl Multi-esters (i.e., not mono-esters and not “polyesters”)		
<i>Polyglyceryl-2 discrete multi-esters</i>		
Polyglyceryl-2 Sesquicaprylate	a mixture of mono- and diesters of caprylic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Sesquiisostearate 170211-20-8	wherein R- represents hydrogen or the residue of caprylic acid, and n is 2 a mixture of mono and diesters of isostearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Diisostearate 63705-03-3 (generic) 67938-21-0	wherein R- represents hydrogen or the residue of isostearic acid, and n is 2 the diester of isostearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Triisostearate 120486-24-0	wherein RC(O)- represents the residue of isostearic acid, and n is 2 the triester of isostearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Tetraisostearate 121440-30-0	wherein R- represents hydrogen or the residue of isostearic acid, and n is 2 the tetraester of isostearic acid and a dimer of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-2 Dioleate 60219-68-3 67965-56-4	wherein RC(O)- represents the residue of isostearic acid, and n is 2 a diester of oleic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of oleic acid, and n is 2	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

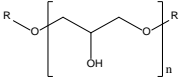
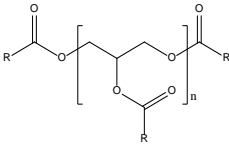
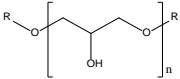
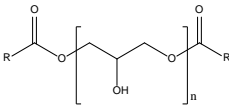
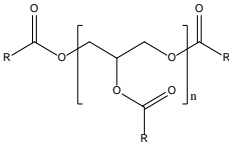
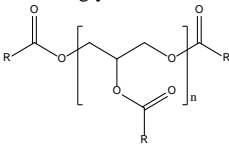
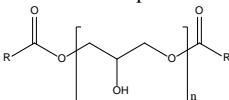
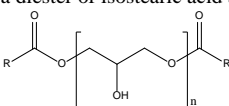
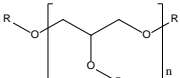
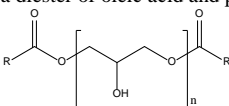
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-2 Sesquioleate	a mixture of mono and diesters of oleic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein R- represents hydrogen or the residue of oleic acid, and n is 2	
Polyglyceryl-2 Tetraoleate	the tetraester of oleic acid and diglycerin 	skin-conditioning agent - misc; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of oleic acid, and n is 2	
Polyglyceryl-2 Sesquistearate 9009-32-9 (generic)	a mixture of mono- and diesters of stearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein R- represents hydrogen or the residue of stearate acid, and n is 2	
Polyglyceryl-2 Distearate 61725-93-7 9009-32-9 (generic)	the diester of stearic acid and diglycerin 	surfactant - emulsifying agent
	wherein RC(O)- represents the residue of stearic acid, and n is 2	
Polyglyceryl-2 Tetrastearate 72347-89-8 9009-32-9 (generic)	the tetraester of stearic acid and diglycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of stearic acid, and n is 2	
<i>Polyglyceryl-2 mixed multi-esters</i>		
Polyglyceryl-2 Tetra behenate/ Macadamate/Sebacate	the tetraester of a mixture of behenic, sebacic and macadamia acids with a dimer of glycerin 	skin-conditioning agent - emollient
	wherein RC(O)- represents the residue of behenic, sebacic, or macadamia acid, and n is 2	
<i>Polyglyceryl-3 discrete multi-esters</i>		
Polyglyceryl-3 Dicaprate	the diester of capric acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of capric acid, and n is 3	
Polyglyceryl-3 Diisostearate 63705-03-3 (generic) 66082-42-6	a diester of isostearic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of isostearic acid, and n is 3	
Polyglyceryl-3 Triisostearate 66082-43-7	the triester of isostearic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein R- represents hydrogen or the residue of isostearic acid, and n is 3	
Polyglyceryl-3 Dioleate 79665-94-4	a diester of oleic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
	wherein RC(O)- represents the residue of oleic acid, and n is 3	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

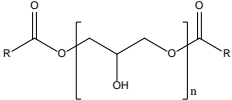
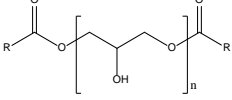
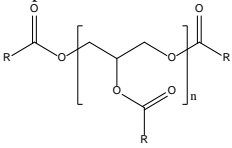
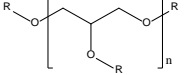
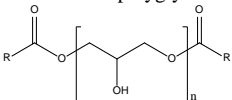
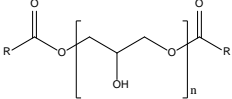
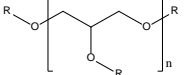
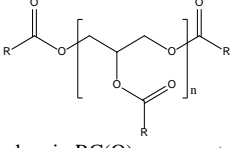
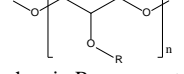
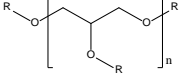
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-3 Distearate 94423-19-5 9009-32-9 (generic) 61725-93-7 (generic)	the diester of stearic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Di-Hydroxystearate	wherein RC(O)- represents the residue of stearic acid, and n is 3 the diester of hydroxystearic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Pentaricinoleate	wherein RC(O)- represents the residue of hydroxystearic acid, and n is 3 the pentaester of ricinoleic acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-3 mixed multi-esters</i>		
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	the diester of dilinoleic acid and Polyglyceryl-3 Diisostearate 	skin-conditioning agent - emollient
Polyglyceryl-3 Dicitrate/Stearate	wherein R- represents the residue of isostearic acid or dilinoleic acid, and n is 3 the diester of polyglycerin-3 with a mixture of citric acid and stearic acid 	surfactant - emulsifying agent
Polyglyceryl-3 Dicoate	wherein RC(O)- represents the residue of citric or stearic acid, and n is 3 the diester of coconut acid and polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Pentacaprylate/Caprate	wherein RC(O)- represents the residue of coconut acid, and n is 3 the pentaester of a mixture of caprylic acid and capric acid with polyglycerin-3 	skin-conditioning agent - emollient; surfactant - emulsifying agent; surfactant - solubilizing agent
Polyglyceryl-3 Pentaoliveate	wherein R- represents hydrogen or the residue of capric or caprylic acid, and n is 3 is the pentaester of polyglycerin-3 and olive acid 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-3 Trioliveate	wherein RC(O)- represents the residue of olive acid, and n is 3 the triester of polyglycerin-3 and olive acid 	surfactant - emulsifying agent
Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate	wherein R- represents hydrogen or the residue of olive acid, and n is 3 the diester of dilinoleic acid and polyglyceryl-3 triisostearate 	skin-conditioning agent - emollient
	wherein R- represents the residue of isostearic acid or dilinoleic acid, and n is 3	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

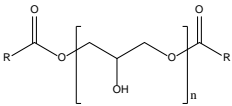
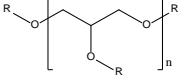
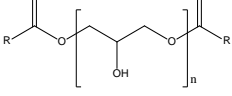
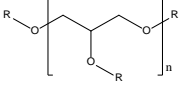
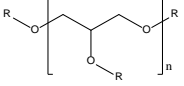
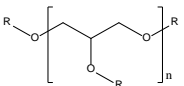
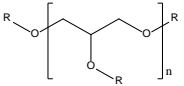
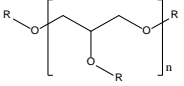
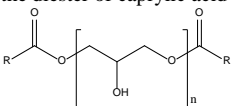
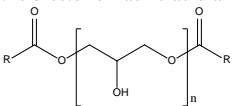
Ingredient CAS No.	Definition & Structure	Function(s)
<i>Polyglyceryl-4 discrete multi-esters</i>		
Polyglyceryl-4 Dilaurate	the diester of lauric acid and polyglycerin-4 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Pentaoleate 103230-29-1	wherein RC(O)- represents the residue of lauric acid, and n is 4 the pentaester of oleic acid and polyglycerin-4 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Distearate	wherein R- represents hydrogen or the residue of oleic acid, and n is 4 a diester of polyglycerin-4 with stearic acid 	surfactant - emulsifying agent
Polyglyceryl-4 Tristearate 99734-29-9	wherein RC(O)- represents the residue of stearic acid, and n is 4 the triester of stearic acid and polyglycerin-4 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-4 Pentastearate 99570-00-0	wherein R- represents hydrogen or the residue of stearic acid, and n is 4 the pentaester of stearic acid and polyglycerin-4 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-4 mixed multi-esters</i>		
Polyglyceryl-4 Pentapalmitate/Stearate	wherein R- represents hydrogen or the residue of stearic acid, and n is 4 the pentaester of a mixture of palmitic acid and stearic acid with polyglycerin-4 	surfactant - emulsifying agent
Pumpkin Seed Oil Polyglyceryl-4 Esters	wherein R- represents hydrogen or the residue of palmitic or stearic acid, and n is 4 the complex mixture of esters formed by the transesterification of cucurbita pepo (pumpkin) seed oil and polyglycerin-4 	emulsion stabilizer; surfactant - emulsifying agent
Pumpkin Seed Oil Polyglyceryl-4 Esters Succinate	wherein R- represents hydrogen or the residue of the fatty acids derived from cucurbita pepo (pumpkin) seed oil (via transesterification), and n is 4 the complex mixture of esters formed by the transesterification of cucurbita pepo (pumpkin) seed oil and polyglycerin-4 reacted with succinic acid 	emulsion stabilizer; surfactant - emulsifying agent
<i>Polyglyceryl-5 discrete multi-esters</i>		
Polyglyceryl-5 Dicaprylate 108777-93-1 (generic)	wherein R- represents hydrogen or the residue of succinic acid or the fatty acids derived from cucurbita pepo (pumpkin) seed oil (via transesterification), and n is 4 the diester of caprylic acid with a glycerin polymer containing 5 glycerin units 	skin-conditioning agent - emollient; surfactant - cleansing agent; surfactant - emulsifying agent
Polyglyceryl-5 Dilaurate	wherein RC(O)- represents the residue of caprylic acid, and n is 5 the diester of lauric acid and a glycerin polymer containing 5 units of glycerin 	surfactant - emulsifying agent
	wherein RC(O)- represents the residue of lauric acid, and n is 5	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

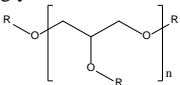
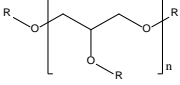
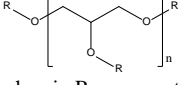
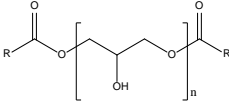
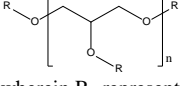
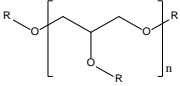
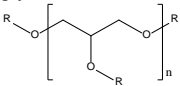
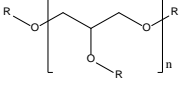
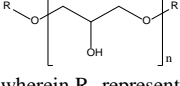
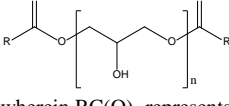
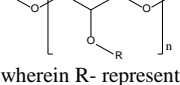
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-5 Trimyristate	the triester of myristic acid and a glycerin polymer containing 5 units of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Pentamyristate	wherein R- represents hydrogen or the residue of myristic acid, and n is 5 the pentaester of myristic acid and a glycerin polymer containing 5 units of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Triisostearate	wherein R- represents hydrogen or the residue of myristic acid, and n is 5 the triester of isostearic acid and a glycerin polymer containing 5 units of glycerin 	surfactant – cleansing agent; surfactant – dispersing agent; surfactant - emulsifying agent
Polyglyceryl-5 Dioleate	wherein R- represents hydrogen or the residue of isostearic acid, and n is 5 the diester of oleic acid and a glycerin polymer containing 5 units of glycerin 	surfactant - emulsifying agent
Polyglyceryl-5 Trioleate	wherein RC(O)- represents the residue of oleic acid, and n is 5 the triester of oleic acid and a glycerin polymer containing 5 units of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Tristearate 9009-32-9 (generic)	wherein R- represents hydrogen or the residue of oleic acid, and n is 5 the triester of stearic acid and a glycerin polymer containing 5 units of glycerin 	surfactant – cleansing agent; surfactant – dispersing agent; surfactant - emulsifying agent
Polyglyceryl-5 Hexastearate	wherein R- represents hydrogen or the residue of stearic acid, and n is 5 the hexaester of stearic acid and a glycerin polymer containing 5 units of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-5 Tribehenate	wherein R- represents hydrogen or the residue of stearic acid, and n is 5 the triester of behenic acid and a glycerin polymer containing 5 units of glycerin 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-6 discrete multi-esters</i>		
Polyglyceryl-6 Sesquicaprylate 108777-93-1 (generic) 946492-22-4 (generic) 946492-23-5 (generic)	a mixture of mono- and diesters of caprylic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant – cleansing agent; surfactant - emulsifying agent
Polyglyceryl-6 Dicaprate	wherein R- represents hydrogen or the residue of caprylic acid, and n is 6 the diester of capric acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Tricaprylate	wherein RC(O)- represents the residue of capric acid, and n is 6 the triester of caprylic acid and polyglycerin-6 	surfactant – cleansing agent
	wherein R- represents hydrogen or the residue of caprylic acid, and n is 6	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

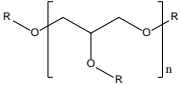
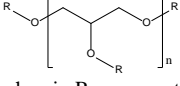
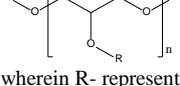
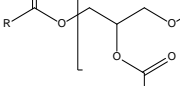
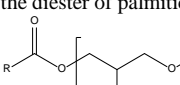
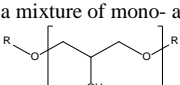
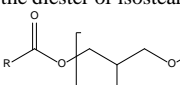
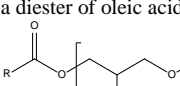
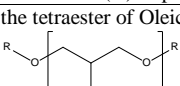
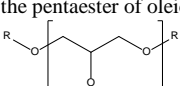
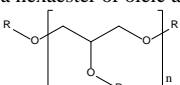
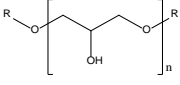
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-6 Tetracaprylate	the tetraester of caprylic acid and polyglycerin-6 	surfactant – cleansing agent
Polyglyceryl-6 Pentacaprylate	wherein R- represents hydrogen or the residue of caprylic acid, and n is 6 the pentaester of caprylic acid and polyglycerin-6 	surfactant – cleansing agent
Polyglyceryl-6 Heptacaprylate	wherein R- represents hydrogen or the residue of caprylic acid, and n is 6 the heptaester of caprylic acid and polyglycerin-6 	surfactant - emulsifying agent
Polyglyceryl-6 Octacaprylate	wherein R- represents hydrogen or the residue of caprylic acid, and n is 6 the octaester of polyglycerin-6 and caprylic acid 	skin-conditioning agent - emollient
Polyglyceryl-6 Dipalmitate	wherein RC(O)- represents the residue of caprylic acid, and n is 6 the diester of palmitic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Sesquiossearate	wherein RC(O)- represents the residue of palmitic acid, and n is 6 a mixture of mono- and diesters of isostearic acid and polyglycerin-6 	surfactant - emulsifying agent
Polyglyceryl-6 Diisostearate	wherein R- represents hydrogen or the residue of isostearic acid, and n is 6 the diester of isostearic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Dioleate 76009-37-5	wherein RC(O)- represents the residue of isostearic acid, and n is 6 a diester of oleic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Tetraoleate 128774-95-8	wherein RC(O)- represents the residue of oleic acid, and n is 6 the tetraester of Oleic Acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Pentaoleate 104934-17-0	wherein R- represents hydrogen or the residue of oleic acid, and n is 6 the pentaester of oleic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Hexaoleate 95482-05-6	wherein R- represents hydrogen or the residue of oleic acid, and n is 6 a hexaester of oleic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Sesquistearate 112939-69-2	wherein R- represents hydrogen or the residue of oleic acid, and n is 6 a mixture of mono- and diesters of stearic acid and polyglycerin-6 	surfactant - emulsifying agent
	wherein R- represents hydrogen or the residue of stearic acid, and n is 6	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

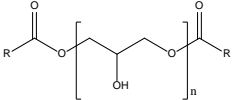
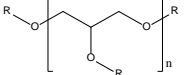
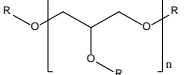
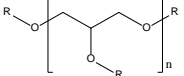
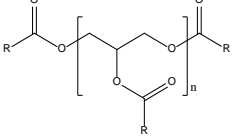
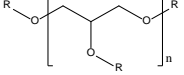
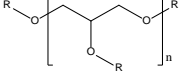
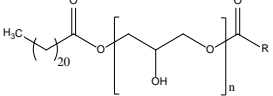
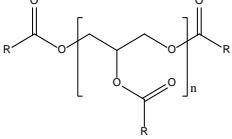
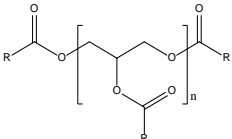
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-6 Distearate 34424-97-0 9009-32-9 (generic)	a diester of stearic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Tristearate 71185-87-0 9009-32-9 (generic)	wherein RC(O)- represents the residue of stearic acid, and n is 6 the triester of stearic acid and polyglycerin-6 	surfactant - emulsifying agent
Polyglyceryl-6 Pentastearate 9009-32-9 (generic) 99734-30-2	wherein R- represents hydrogen or the residue of stearic acid, and n is 6 the pentaester of stearic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Hexastearate	wherein R- represents hydrogen or the residue of stearic acid, and n is 6 the hexaester of stearic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Octastearate	wherein R- represents hydrogen or the residue of stearic acid, and n is 6 the octaester of stearic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Pentaricinoleate	wherein RC(O)- represents the residue of stearic acid, and n is 6 the pentaester of ricinoleic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-6 Tetrabehenate	wherein R- represents hydrogen or the residue of ricinoleic acid, and n is 6 the tetraester of behenic acid and polyglycerin-6 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-6 mixed multi-ester</i>		
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	the behenic acid ester of the product obtained by the transesterification of macadamia seed oil and polyglycerin-6 	skin-conditioning agent - emollient
<i>Polyglyceryl-8 mixed multi-esters</i>		
Polyglyceryl-8 Decabehenate/Caprates	the decaester of a mixture of behenic acid and capric acid with a glycerin polymer containing 8 units of glycerin 	viscosity increasing agent - nonaqueous
Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate	wherein RC(O)- represents the residue of capric or behenic acid, and n is 8 the decaester of a glycerin polymer containing 8 units of glycerin with a mixture of erucic acid, isostearic acid and ricinoleic acid 	skin-conditioning agent - emollient
	wherein RC(O)- represents the residue of erucic, isostearic, or ricinoleic acid, and n is 8	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

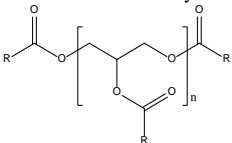
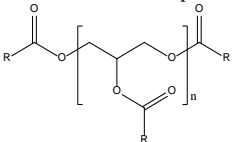
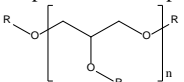
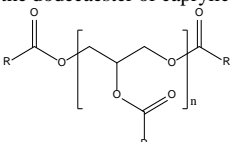
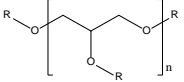
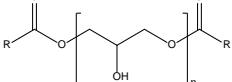
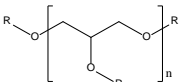
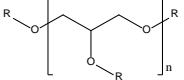
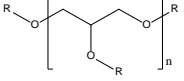
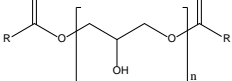
Ingredient CAS No.	Definition & Structure	Function(s)
<i>Polyglyceryl-10 discrete multi-esters</i> Polyglyceryl-10 Decaethylhexanoate	the decaester of 2-ethylhexanoic acid and polyglycerin-10 	skin conditioning agent - humectant
Polyglyceryl-10 Dodecacaprate	wherein RC(O)- represents the residue of 2-ethylhexanoic acid, and n is 10 the dodecaester of capric acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Pentacaprylate	wherein RC(O)- represents the residue of capric acid, and n is 10 the pentaester of caprylic acid and polyglycerin-10 	surfactant – cleansing agent; surfactant - emulsifying agent; surfactant – solubilizing agent
Polyglyceryl-10 Dodecaprylate	the dodecaester of caprylic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Tridecanoate 217782-56-4	wherein RC(O)- represents the residue of caprylic acid, and n is 10 the triester of decanoic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Dilaurate	wherein R- represents hydrogen or the residue of decanoic acid, and n is 10 the diester of lauric acid and polyglycerin-10 	surfactant – cleansing agent
Polyglyceryl-10 Trilaurate	wherein RC(O)- represents the residue of lauric acid, and n is 10 the triester of lauric acid and polyglycerin-10 	surfactant – cleansing agent
Polyglyceryl-10 Tetralaurate	wherein R- represents hydrogen or the residue of lauric acid, and n is 10 the tetraester of lauric acid and polyglycerin-10 	surfactant – cleansing agent
Polyglyceryl-10 Pentalaurate	wherein R- represents hydrogen or the residue of lauric acid, and n is 10 the pentaester of lauric acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Dimyristate	wherein R- represents hydrogen or the residue of lauric acid, and n is 10 the diester of myristic acid and polyglycerin-10 	surfactant - emulsifying agent
	wherein RC(O)- represents the residue of myristic acid, and n is 10	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

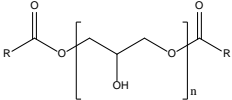
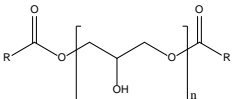
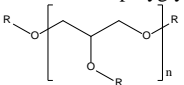
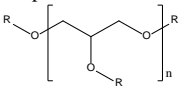
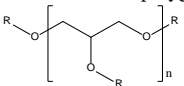
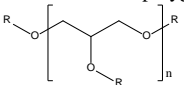
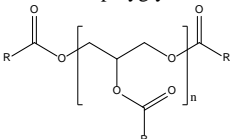
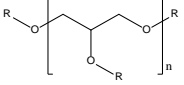
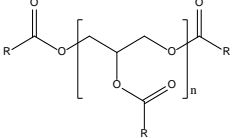
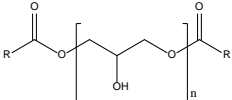
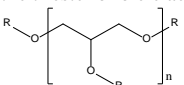
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-10 Dipalmitate	the diester of palmitic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Diisostearate 102033-55-6 63705-03-3 (generic)	wherein RC(O)- represents the residue of palmitic acid, and n is 10 a diester of isostearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Triisostearate	wherein RC(O)- represents the residue of isostearic acid, and n is 10 the triester of polyglycerin-10 and isostearic acid 	surfactant - emulsifying agent
Polyglyceryl-10 Pentaisostearate	wherein R- represents hydrogen or the residue of isostearic acid, and n is 10 the pentaester of isostearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Hexaisostearate	wherein R- represents hydrogen or the residue of isostearic acid, and n is 10 the hexaester of polyglycerin-10 and isostearic acid 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Nonaisostearate	wherein R- represents hydrogen or the residue of isostearic acid, and n is 10 the nonaester of polyglycerin-10 and isostearic acid 	skin-conditioning agent - emollient
Polyglyceryl-10 Decaisostearate	wherein R- represents hydrogen or the residue of isostearic acid, and n is 10 the ester of polyglycerin-10 and isostearic acid 	skin-conditioning agent - emollient
Polyglyceryl-10 Pentalinoleate	wherein RC(O)- represents the residue of isostearic acid, and n is 10 the pentaester of linoleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Decalinoleate 68900-96-9	wherein R- represents hydrogen or the residue of linoleic acid, and n is 10 a decaester of linoleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Dioleate 33940-99-7	wherein RC(O)- represents the residue of linoleic acid, and n is 10 a diester of oleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Trioleate 102051-00-3	wherein RC(O)- represents the residue of oleic acid, and n is 10 the triester of oleic acid and polyglycerin-10 	surfactant - emulsifying agent
	wherein R- represents hydrogen or the residue of oleic acid, and n is 10	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

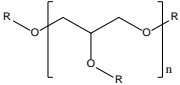
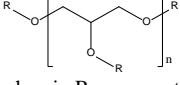
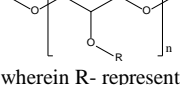
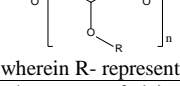
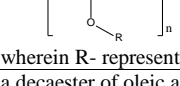
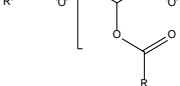
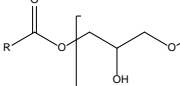
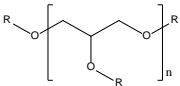
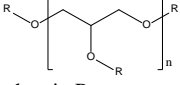
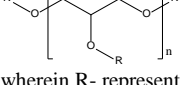
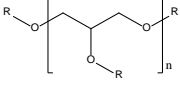
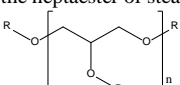
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-10 Tetraoleate 34424-98-1	a tetraester of oleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Pentaoleate 86637-84-5	the pentaester of oleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Pentarinoleate	the pentaester of ricinoleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Hexaoleate 65573-03-7	the hexaester of oleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Heptaoleate 103175-09-3	a heptaester of oleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Decaoleate 11094-60-3	a decaester of oleic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Distearate 12764-60-2 9009-32-9 (generic)	the diester of stearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Tristearate 12709-64-7 9009-32-9 (generic)	the triester of stearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Pentastearate 9009-32-9 (generic) 95461-64-6	a pentaester of stearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Pentahydroxystearate	the pentaester of hydroxystearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Heptahydroxystearate	a heptaester of hydroxystearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Heptastearate 99126-54-2 9009-32-9 (generic)	the heptaester of stearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

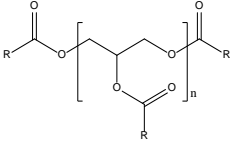
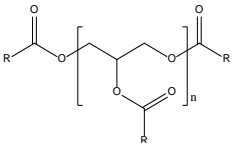
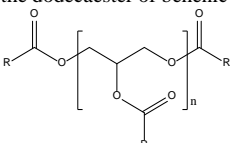
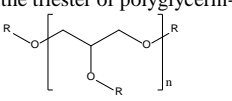
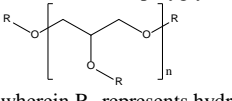
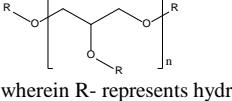
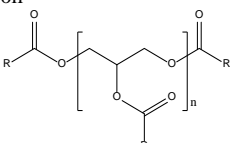
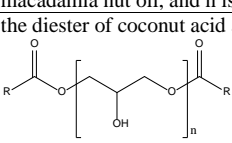
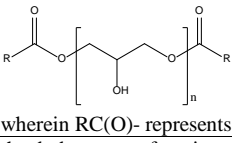
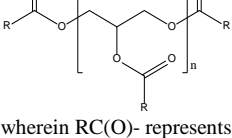
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-10 Decahydroxystearate	the decaester of hydroxystearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Decastearate 39529-26-5	wherein RC(O)- represents the residue of hydroxystearic acid, and n is 10 the decaester of stearic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Dodecabenenate	wherein RC(O)- represents the residue of stearic acid, and n is 10 the dodecaester of behenic acid and polyglycerin-10 	surfactant - emulsifying agent
Polyglyceryl-10 Trierucate	wherein RC(O)- represents the residue of behenic, and n is 10 the triester of polyglycerin-10 and erucic acid 	surfactant – dispersing agent; surfactant - emulsifying agent
Polyglyceryl-10 Hexaerucate	wherein R- represents hydrogen or the residue of erucic acid, and n is 10 the hexaester of polyglycerin-10 and erucic acid 	surfactant – dispersing agent; surfactant - emulsifying agent
Polyglyceryl-10 Nonaerucate 155808-79-0	wherein R- represents hydrogen or the residue of erucic acid, and n is 10 the nonaester of erucic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
<i>Polyglyceryl-10 mixed multi-esters</i>		
Polyglyceryl-10 Decamacadamiate	wherein R- represents hydrogen or the residue of erucic acid, and n is 10 a decaester of polyglycerin-10 and the fatty acids derived from macadamia nut oil 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Dicocoate	wherein RC(O)- represents the residue of the fatty acids derived from macadamia nut oil, and n is 10 the diester of coconut acid and polyglycerin-10 	surfactant – cleansing agent; surfactant - emulsifying agent
Polyglyceryl-10 Didecanoate 182015-59-4	wherein RC(O)- represents the residue of coconut acid, and n is 10 the diester of decanoic acid and polyglycerin-10 	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Dodeca-Caprylate/ Caprate	wherein RC(O)- represents the residue of decanoic acid, and n is 10 the dodecaester of a mixture of caprylic and capric acids with polyglycerin-10 	skin-conditioning agent - occlusive
	wherein RC(O)- represents the residue of capric or caprylic acid, and n is 10	

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

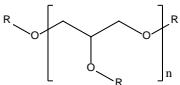
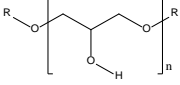
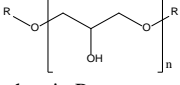
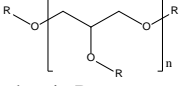
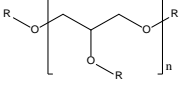
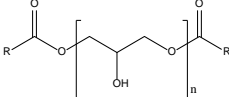
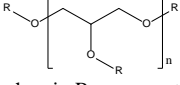
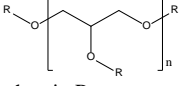
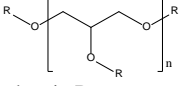
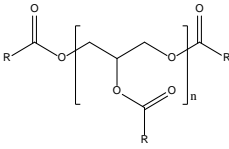
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-10 Hepta(Behenate/Stearate)	the heptaester of polyglycerin-10 with a mixture of behenic acid and stearic acid  wherein R- represents hydrogen or the residue of behenic acid and stearic acid, and n is 10	surfactant - emulsifying agent
Polyglyceryl-10 Mono/Dioleate	a mixture of mono- and diesters of oleic acid and polyglycerin-10  wherein R- represents hydrogen or the residue of oleic acid, and n is 10	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-10 Sesquistearate	a mixture of mono- and diesters of stearic acid and polyglycerin-10  wherein R- represents hydrogen or the residue of stearate acid, and n is 10	surfactant - emulsifying agent
Polyglyceryl-10 Tetradecanedioate	the ester of tetradecanedioic acid and polyglycerin-10  wherein R- represents hydrogen or the residue of tetradecanedioic acid, and n is 10	hair conditioning agent; skin conditioning agent - humectant
Polyglyceryl-10 Tricocoate	the triester of coconut acid and polyglycerin-10  wherein R- represents hydrogen or the residue of coconut acid, and n is 10	surfactant - cleansing agent; surfactant - emulsifying agent
<i>Polyglyceryl-15 discrete multi-ester</i>		
Polyglyceryl-15 Diisostearate	a diester of isostearic acid and a glycerin polymer containing 15 glycerin units  wherein RC(O)- represents the residue of isostearic acid, and n is 15	hair conditioning agent; surfactant - cleansing agent; surfactant - emulsifying agent
<i>Polyglyceryl-20 discrete multi-esters</i>		
Polyglyceryl-20 Hexacaprylate	the hexaester of caprylic acid and polyglycerin-20  wherein R- represents hydrogen or the residue of caprylic acid, and n is 20	surfactant - cleansing agent; surfactant - emulsifying agent; surfactant - solubilizing agent
Polyglyceryl-20 Heptacaprylate	the heptaester of caprylic acid and polyglycerin-20  wherein R- represents hydrogen or the residue of caprylic acid, and n is 20	surfactant - cleansing agent; surfactant - emulsifying agent; surfactant - solubilizing agent
Polyglyceryl-20 Octaisiononanoate	the octaester of isononanoic acid and polyglycerin-20  wherein R- represents hydrogen or the residue of isononanoic acid, and n is 20	surfactant - cleansing agent; surfactant - emulsifying agent; surfactant - solubilizing agent
<i>Polyglyceryl-20 mixed multi-esters</i>		
Polyglyceryl-20 Docosabehenate/Isostearate	the docosaester of polyglycerin-20 with a mixture of behenic and isostearic acids  wherein RC(O)- represents the residue of behenic or isostearic acid, and n is 20	skin-conditioning agent - emollient; surfactant - emulsifying agent

Table 3. Definitions, idealized structures, and function ¹ (CIR Staff)

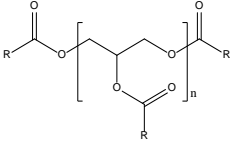
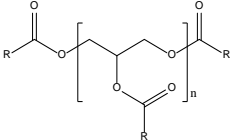
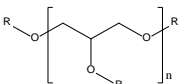
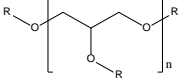
Ingredient CAS No.	Definition & Structure	Function(s)
Polyglyceryl-20 Docosabehenate/Laurate	<p>the docosaester of polyglycerin-20 with a mixture of behenic and lauric acids</p>  <p>wherein RC(O)- represents the residue of behenic or lauric acid, and n is 20</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-20 Docosabehenate/Oleate	<p>the docosaester of polyglycerin-20 with a mixture of behenic and oleic acids</p>  <p>wherein RC(O)- represents the residue of behenic or oleic acid, and n is 20</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-20 Heptadecabehenate/Laurate	<p>the heptadecaester of polyglycerin-20 with a mixture of behenic and lauric acids</p>  <p>wherein R- represents hydrogen or the residue of behenic or lauric acid, and n is 20</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent
Polyglyceryl-20 Octadecabehenate/Laurate	<p>the octadecaester of polyglycerin-20 and a mixture of behenic and lauric acids</p>  <p>wherein R- represents hydrogen or the residue of behenic or lauric acid, and n is 20</p>	skin-conditioning agent - emollient; surfactant - emulsifying agent

Table 4. Previously Reviewed Components and Related Ingredients

Component	Conclusion	Reference
Glycerin	safe in cosmetics in the present practices of use and concentration (was used in 15,654 formulations, 10,046 of which were leave-ons; the maximum use concentrations were 79.2% in leave-on products, 99.4% in rinse-off products, and 47.9% in products diluted for the bath	115
Dipropylene Glycol	safe as used	116,117
Tripropylene Glycol	safe in the present practices of use and concentration when formulated to be non-irritating	118
Polypropylene Glycols (and PPG \geq 3)	safe in the present practices of use and concentration when formulated to be non-irritating	118
Monoglyceryl Monoesters	safe in the present practices of use and concentration	3
Glyceryl Alginate	safe in the present practices of use and concentration	119
Glyceryl Isostearate/Myristate	safe in the present practices of use and concentration	120
Glyceryl Myristate		
Citric Acid	safe in the present practices of use and concentration	121
Coconut Acid	safe for use as a cosmetic ingredient	122
Hydroxystearic Acid	safe as a cosmetic ingredient in the present practices of use	123
Isostearic Acid	safe as a cosmetic ingredient in the present practices of use	124
Lauric Acid	safe in the present practices of use and concentration	125
Myristic Acid	safe in the present practices of use and concentration	120
Oleic Acid	safe in the present practices of use and concentration	125
Olive Acid	safe in the present practices of use and concentration	126
Palm Acid	safe in the present practices of use and concentration	126
Palmitic Acid	safe in the present practices of use and concentration	125
Rice Bran Acid	safe in the present practices of use and concentration	126
Ricinoleic Acid	safe in the present practices of use and concentration	127
Sebacic Acid	safe in the present practices of use and concentration	128
Stearic Acid	safe in the present practices of use and concentration	125
Potassium Stearate		129,130
Sodium Stearate		129,130
Adansonia Digitata Seed Oil	safe in the present practices of use and concentration	126
Argania Spinosa Kernel Oil	safe in the present practices of use and concentration	126
Beeswax	safe in the present practices of use and concentration	131,132
Bertholletia Excelsa Seed Oil	safe in the present practices of use and concentration	126
Borago Officinalis Seed Oil	safe in the present practices of use and concentration	126
Butyrospermum Parkii (Shea) Butter	safe in the present practices of use and concentration	126
Caprylic/Capric/Coco Glycerides	safe for use as a cosmetic ingredient	122
Carthamus Tinctorius (Safflower) Seed Oil	safe in the present practices of use and concentration	126
Citrullus Lanatus (Watermelon) Seed Oil	safe in the present practices of use and concentration	126
Cocos Nucifera (Coconut) Oil	safe for use as a cosmetic ingredient	122
Cocoglycerides		
Hydrogenated Coco-Glycerides		
Corylus Avellana (Hazelnut) Seed Oil	safe in the present practices of use and concentration	126
Cucurbita Pepo (Pumpkin) Seed Oil	safe in the present practices of use and concentration	126
Elaeis Guineensis (Palm) Oil	safe in the present practices of use and concentration	126
Elaeis Guineensis (Palm) Kernel Oil		
Euphorbia Cerifera (Candelilla) Wax	safe in the present practices of use and concentration	131,132
Glycine Soja (Soybean) Oil	safe in the present practices of use and concentration	126
Hydrogenated Soybean Oil		
Helianthus Annuus (Sunflower) Seed Oil	safe in the present practices of use and concentration	126
Helianthus Annuus (Sunflower) Seed Wax		
Linum Usitatissimum (Linseed) Seed Oil	safe in the present practices of use and concentration	126
Macadamia Integrifolia Seed Oil	safe in the present practices of use and concentration	126
Macadamia Ternifolia Seed Oil		
Olea Europaea (Olive) Fruit Oil	safe in the present practices of use and concentration	126
Orbignya Oleifera Seed Oil		
Oryza Sativa (Rice) Bran Oil	safe in the present practices of use and concentration	133
Oryza Sativa (Rice) Bran Wax		
Persea Gratissima (Avocado) Oil	safe in the present practices of use and concentration	126
Prunus Amygdalus Dulcis (Sweet Almond) Oil	safe in the present practices of use and concentration	126
Prunus Armeniaca (Apricot) Kernel Oil	safe in the present practices of use and concentration	126
Ricinus Communis (Castor) Seed Oil	safe in the present practices of use and concentration	127

Table 4. Previously Reviewed Components and Related Ingredients

Component	Conclusion	Reference
Hydrogenated Castor Oil		
Schinziophyton Rautanenii Kernel Oil	safe in the present practices of use and concentration	126
Sclerocarya Birrea Seed Oil	safe in the present practices of use and concentration	126
Simmondsia Chinensis (Jjoba) Seed Wax	safe in the present practices of use and concentration	134
Sesamum Indicum (Sesame) Seed Oil	safe in the present practices of use and concentration	126
Theobroma Cacao (Cocoa) Seed Butter	safe in the present practices of use and concentration	126
Theobroma Grandiflorum Seed Butter	safe in the present practices of use and concentration	126

Table 5. Average fatty acid composition of polyglyceryl fatty acid esters (%)

Fatty Acids	Adansonia Digitata Seed Oil Polyglyceryl- 6 Esters ¹³⁵	Apricot Kernel Oil Polyglyceryl-6 Esters ¹³⁶	Apricot Kernel Oil Polyglyceryl-10 Esters ¹³⁷	Argan Oil Polyglyceryl-6 Esters ^{138,138}	Babassu Oil Polyglyceryl-6 Esters ¹³⁹	Bertholletia Excelsa Seed Oil Polyglyceryl- 6 Esters ¹⁴⁰	Caprylic/Capric Glycerides Poly- glyceryl-10 Esters ¹⁴¹
Caproic (C6)							<2
Caprylic (C8)					2-8		50-65
Capric (C10)					1-8		30-50
Lauric (C12)*					35-55		<3
Myristic (C14)					10-30		<1
Myristoleic (C14:1)							
Palmitic (C16)	18-30	3.0-9.0	4.6-7.6	10-15	5-15	10-20	
Palmitoleic (C16:1)		<1.5					
Heptadecanoic (C17:0)							
Stearic (C18)	2-9	0.5-4.0	0.2-1.3	4-7	1-8	5-15	
Oleic (C18:1)	30-45	55.0-75.0	60-74	40-55	9-20	25-40	
Linoleic (C18:2)	20-40	20.0-35.0	20-34	25-40	1-7	30-55	
Linolenic (C18:3)	1-3			<0.5		<1	
Arachidic (C20)	< 2	<1.0		<1		<1	
Eicosenoic (C20:1)		<1.0		<1			
Behenic (C22)							
Erucic (C22:1)							
Lignoceric (C24)							
Others							

	Cocoa Butter Polyglyceryl-6 Esters ¹⁴²	Coconut oil Polyglyceryl-6 Esters ¹⁴³	Hazelnut Seed Oil Polyglyceryl-6 Esters ¹⁴⁴	Macadamia Seed Oil Polyglyceryl 6 Esters ¹⁴⁵	Olive Oil Polyglyceryl-6 Esters ¹⁴⁶	Polyglyceryl-10 Decaoleate ³⁷	Safflower Seed Oil Polyglyceryl-6 Esters ¹⁴⁷
Caproic (C6)		<1					
Caprylic (C8)		4-10					
Capric (C10)		4-11					
Lauric (C12)*		42-52				4.2	
Myristic (C14)		13-21				2.6	
Myristoleic (C14:1)							
Palmitic (C16)	20-35	6-12	4.5-9.	7-11	7.5-20	16.6	6-7
Palmitoleic (C16:1)	<1			16-30	<3.5		
Heptadecanoic (C17:0)							
Stearic (C18)	25-40	1-4	1-4	2-7	0.5-5	14.4	0.9-9.7
Oleic (C18:1)	25-40	3-12	66-86.2	50-67	55-85	5.3	10-20
Linoleic (C18:2)	2-5	0.5-4	8-10.4	1-5	3.5-20	55.8	68-83
Linolenic (C18:3)	<0.5		<0.6		<1.5		<0.2
Arachidic (C20)	0.5-2			1-4	<1		
Eicosenoic (C20:1)				1-3	<1		
Behenic (C22)							
Erucic (C22:1)							
Lignoceric (C24)							
Others						Total fatty acids are 83.1%	

Table 5. Average fatty acid composition of polyglyceryl fatty acid esters (%)

Fatty Acids	Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters ¹⁴⁸	Sclerocarya Birrea Seed Oil Polyglyceryl- 6 Esters ¹⁴⁹	Sesame Oil Polyglyceryl-6 Esters ¹⁵⁰	Shea Butter Polyglyceryl-6 Esters ¹⁵¹	Soybean Oil Polyglyceryl-6 Esters ¹⁵²	Sunflower Seed Oil Polyglyceryl-6 Esters (high oleic acid) ¹⁵³	Sunflower Seed Oil Polyglyceryl-10 Esters ¹⁵⁴
Caproic (C6)							
Caprylic (C8)							
Capric (C10)							
Lauric (C12)*							
Myristic (C14)		<0.2					
Myristoleic (C14:1)							
Palmitic (C16)	6-10	9-13	5-15	3-7	8-13	2-6	3-5.5
Palmitoleic (C16:1)		<0.2					
Heptadecanoic (C17:0)							
Stearic (C18)	4-8	4-8	2-8	35-47	2-7	1-5	2-5
Oleic (C18:1)	10-20	70-80	35-55	33-50	17-28.5	70-90	74-82
Linoleic (C18:2)	30-54	4-9	34-55	3-8	46-62	5-20	8-15.5
Linolenic (C18:3)	30-32	<0.7	<1.1	<2	4-10	<1	<0.2
Arachidic (C20)		<1	<1.2	<2.5		<1	
Eicosenoic (C20:1)				<0.5		<0.5	
Behenic (C22)						<1	
Erucic (C22:1)							
Lignoceric (C24)						<1	
Others							

Fatty Acids	Sweet Almond Oil Polyglyceryl-6 Esters ¹⁵⁵	Trichilia Emetica Seed Oil Polyglyceryl-6 Esters ¹⁵⁶
Caproic (C6)		
Caprylic (C8)		
Capric (C10)		
Lauric (C12)*		
Myristic (C14)		
Myristoleic (C14:1)		
Palmitic (C16)	4-9	30-40
Palmitoleic (C16:1)		
Heptadecanoic (C17:0)	<1	
Stearic (C18)	<3	1.5-4
Oleic (C18:1)	62-86	45-55
Linoleic (C18:2)		8-13
Linolenic (C18:3)	20-30	<1.5
Arachidic (C20)	<1	
Eicosenoic (C20:1)		
Behenic (C22)		
Erucic (C22:1)		
Lignoceric (C24)		
Others		

Table 6. Physical and Chemical Properties

	Adansonia Digitata Seed Oil Polyglyceryl-6 Esters¹³⁵	Apricot Kernel Oil Polyglyceryl-6 Esters¹³⁶	Apricot Kernel Oil Polyglyceryl-10 Esters¹³⁷	Argan Oil Polyglyceryl-6 Esters^{138,138}	Babassu Oil Polyglyceryl-6 Esters¹³⁹	Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters¹⁴⁰	Borage Seed Oil Polyglyceryl-6 Esters¹⁵⁷
Property							
physical characteristics	soft paste amber in color	amber liquid (20°C)	amber (physical state not specified)	amber liquid	soft paste with amber color	soft paste with amber color	oil
molecular wt							
solubility	water dispersible	water dispersible	water soluble	water dispersible	water dispersible	water dispersible	water dispersible
melting point (°C)							
density (g/ml)	<1	<1	>1		<1	<1	
specific gravity (g/ml)							
pH							
refractive index (20°C)	approx. 1.47	approx. 1.47	approx. 1.47	approx. 1.47	approx. 1.47	approx. 1.47	
saponification value	150 – 170	125-155		125-155	175-205	125-155	
acid value (mg KOH/g)	<5	<5	<5	<5	<5	<5	
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)	<10	<10	<10	<10	<10	<10	
iodine value (gI ₂ /100g)		75-90		75-90	10-25	75-90	
polarity	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic
HLB							
	Caprylic/Capric Glycerides Polyglyceryl-10 Esters¹⁴¹	Cocoa Butter Polyglyceryl-6 Esters¹⁴²	Coconut Oil Polyglyceryl-6 Esters¹⁴³	Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	Hazelnut Seed Oil Polyglyceryl-6 Esters¹⁴⁴	Macadamia Seed Oil Polyglyceryl-6 Esters¹⁴⁵
physical characteristics	amber in color	beige solid	soft paste, with amber color	viscous liquid ¹⁵⁸ yellow liquid ¹⁵⁹ ~6000	white waxy solid ⁴⁵	amber	amber liquid
molecular wt							
solubility		water dispersible	water dispersible			water dispersible	water dispersible
melting point (°C)		40-50	40-50				
density (g/ml)	>1	<1	<1			<1	<1
specific gravity (g/ml)							
pH							
refractive index (20°C)	approx. 1.47	approx. 1.47	approx. 1.47			approx.. 1.47	~1.47
saponification value		145-165	180-220	140-160 ¹⁵⁸			140-160
acid value (mg KOH/g)	<5	<5	<5	10.0 max ¹⁵⁸		<5	<5
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)	<10	<10	<10			<10	<10
iodine value (gI ₂ /100g)		20-35	3-10	10.0 max ¹⁵⁸			
polarity	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic			non-ionic, amphiphilic	non-ionic, amphiphilic
HLB				~5 ¹⁵⁹			

Table 6. Physical and Chemical Properties

	Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	Olive Oil Polyglyceryl- 6 Esters ¹⁴⁶	Palm Kernel Oil Poly- glyceryl-4 Esters ¹⁶⁰	Polyglyceryl-3 Beeswax ¹⁶¹	Polyglyceryl-2 Caprate ¹⁶²	Polyglyceryl-4 Caprate	Polyglyceryl-3 Caprylate ¹⁶³
physical characteristics	white waxy solid ⁵¹	amber liquid		white to off-white		transparent, pale, yellow liquid with faint odor ¹⁶⁴ colorless to yellow, clear to slightly turbid, viscous liquid ¹⁶⁵	high viscosity liquid
molecular wt					320.42		
solubility		water dispersible	water- and oil- soluble			soluble in water, ethanol, 1,2- propanediol, esters oil; insoluble in paraffin oi, isopropyl myristate, vegetable oil ¹⁶⁵	
melting point (°C)				63-73			
density (g/ml)		<1			1.083 g/cm ³		
specific gravity (g/ml)							
pH							
refractive index (20°C)		~1.47			1.481		
saponification value		125-155		80-94		50-70 ¹⁶⁴	
acid value (mg KOH/g)		<5		2 max		5 max ¹⁶⁴	
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)		<10					
iodine value (gI ₂ /100g)		60-75					
polarity		non-ionic, amphiphilic					
HLB						14.5 ¹⁶⁴ ; ~14 ¹⁶⁵	

Table 6. Physical and Chemical Properties

	Polyglyceryl-10 Caprylate/Caprates ^{24,166}	Polyglyceryl-8 Decabehenate/Caprates	Polyglyceryl-8 Decaerucate/Decaiso- stearate/Decaricin- oleate	Polyglyceryl-10 Decaethylhexanoate	Polyglyceryl-10 Decaisostearate ¹⁶⁷	Polyglyceryl-10 Decaoleate	Polyglyceryl-3 Di- Hydroxystearate
physical characteristics	amber, viscous liquid	pale yellow solid ¹⁶⁸	pale yellow viscous liquid ^{53,169}	pale yellow viscous liquid ¹⁷⁰	faint yellow liquid		solid
molecular wt							
solubility					insoluble in water		slightly soluble in water
melting point (°C)							
density (g/ml)							
specific gravity (g/ml)					0.956 (25°C)		
pH							
refractive index (20°C)							
saponification value	85-105	150.6 ¹⁶⁸	157 ¹⁶⁸			170.9 ³⁶ ; 177.5 ³⁷	
acid value (mg KOH/g)	7.0 max	3.9 ¹⁶⁸	1.3 ¹⁶⁹	0.1 ¹⁷⁰		14.0 ³⁶	
hydroxyl value (mg KOH/g)						23.0 ³⁷ ; 40.0 ³⁶	
peroxide value (meq of active oxygen/Kg)	5.0 max					3.4 ³⁷	
iodine value (gI ₂ /100g)	2.0 max					66.2 ³⁷	
polarity							
HLB	14						

Table 6. Physical and Chemical Properties

	Polyglyceryl-2 Diisostearate	Polyglyceryl-3 Diisostearate ²⁷	Polyglyceryl-6 Diisostearate ¹⁷¹	Polyglyceryl-3 Diolate ^{28,172}	Polyglyceryl-6 Diolate ¹⁷³	Polyglyceryl-10 Dipalmitate ^{174,174}	Polyglyceryl-3 Distearate ¹⁷⁵
physical characteristics	clear pale yellow, homogenous liquid ³⁸	slightly yellowish, viscous liquid	pale yellow liquid	viscous yellow liquid		beads or waxy solids	white or slightly yellowish powder
molecular wt				766.13 ¹⁷⁶	991.38		
solubility		< 0.15 mg/L (water)		dispersible in water; soluble in many organic solvents			at 20°C: forms liquid crystals in water, etha- nol, and glycerin; insol- uble in propylene gly- col; forms a solid wax with wheat germ, avoca- do, and paraffin oils, and squalene; at 65°C: dispersible in water, clearly soluble in ethanol, in wheat germ, avocado, and paraffin oils, and squalene; tur- bid solubility in glycer- in; insoluble in propyl- ene glycol
melting point (°C)	-10 ³⁸						
density (g/ml)	0.941 g/cm ³ ³⁸						
specific gravity (g/ml)				0.99			
pH							
refractive index (20°C)		8.129 (predicted)					
saponification value							140-180
acid value (mg KOH/g)							
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)							≤1.0
iodine value (gI ₂ /100g)							≤1.0
polarity							
HLB		1.4 (predicted)	8	3		11	

Table 6. Physical and Chemical Properties

	Polyglyceryl-6 Pentacaprylate ¹⁹⁴	Polyglyceryl-3 Penta- caprylate/Caprata ¹⁹⁵	Polyglyceryl-10 Pentaisostearate ²⁰²	Polyglyceryl-3 Pentaoleate ¹⁹⁶	Polyglyceryl-10 Pentaoleate ^{197,198}	Polyglyceryl-4 Pentastearate ¹⁹⁹	Polyglyceryl-6 Pentastearate ^{200,201}
physical characteristics	liquid	liquid	pale yellow liquid ²⁰²	amber viscous liquid	pale yellow to red-yellow viscous liquid	white to pale yellow pellet	pale yellow waxy solid
molecular wt							
solubility	slightly soluble in water						easy to soluble in oil and organic solvent, and disperse into hot water
melting point (°C)							53-60
density (g/ml)							
specific gravity (g/ml)							
pH							
refractive index (20°C)							
saponification value			143.1 ²⁰²	170-200			125-140
acid value (mg KOH/g)			0.07 ²⁰²	5.0 max			2.0
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)							
iodine value (gI ₂ /100g)							3.0
polarity				non-ionic ¹⁹⁶			
HLB		3.0			3.5		~7.0
	Polyglyceryl-10 Pentastearate ^{203,204}	Polyglyceryl-3 Rice Branate ²⁰⁵	Polyglyceryl-3 Ricinoleate ²⁰⁶	Polyglyceryl-2 Sesquicaprylate	Polyglyceryl-2 Sesquioleate ²⁰⁷	Polyglyceryl-3 Soyate/Shea Butterate ²⁰⁸	Polyglyceryl-3 Stearate ¹⁷⁴
physical characteristics	white to pale yellow solid	light ivory (waxy solid (flakes))		yellow, transparent liquid ²⁰⁹	highly viscous liquid	liquid	granules
molecular wt	2091.15						
solubility		dispersible in water; miscible in oils		insoluble in water, soluble in castor oil, ethanol, mineral oil ²⁰⁹		slightly soluble to soluble in water	
melting point (°C)							
density (g/ml)		>1 g/ml (25°C)					
specific gravity (g/ml)							0.89-0.92 (25°C)
pH							
refractive index (20°C)							
saponification value							
acid value (mg KOH/g)							
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)							
iodine value (gI ₂ /100g)							
polarity		non-ionic		hydrophobic; non-ionic ²⁰⁹			
HLB	3.5		4		~4		

Table 6. Physical and Chemical Properties

	Polyglyceryl-4 Stearate	Polyglyceryl-10 Stearate^{176,210}	Polyglyceryl-2 Tetraistearate²⁰⁹	Polyglyceryl-10 Tetraoleate²¹¹	Polyglyceryl-2 Tetrastearate²¹²	Polyglyceryl-10 Tricoate²¹³	Polyglyceryl-10 Tridecanoate²¹⁴
physical characteristics		pale yellow to light yellow liquid or solid	yellow liquid	viscous amber to brown liquid		pale yellow viscous liquid	liquid
molecular wt	580.79 ¹⁷⁶	432.64			1095.97		
solubility			soluble in low and high polar esters and in vegetable oil, castor oil, and mineral oil; insoluble in water and ethanol	insoluble in water		insoluble in water	slightly soluble in water
melting point (°C)							
density (g/ml)							
specific gravity (g/ml)			0.926	1.01			
pH							
refractive index (20°C)			1.466				
saponification value							
acid value (mg KOH/g)							
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)							
iodine value (gI ₂ /100g)							
polarity		hydrophilic					
HLB		12.0					
	Polyglyceryl-10 Triisostearate^{215,216}	Polyglyceryl-10 Trioleate²¹⁷	Polyglyceryl-10 Tristearate²¹⁸	Rice Brain Oil Polyglyceryl-3 Esters	Safflower Seed Oil Polyglyceryl-6 Esters¹⁴⁷	Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters¹⁴⁸	Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters¹⁴⁹
physical characteristics	pale yellow liquid	light yellow to red-yellow viscous liquid	white to pale yellow waxy substance	oily limpid liquid ²¹⁹ clear, oily, amber-colored liquid ²²⁰	amber (physical state not specified)	brown liquid	amber liquid
molecular wt							
solubility	insoluble in water			dispersible in water; miscible in oils ²¹⁹	water dispersible	water dispersible	water dispersible
melting point (°C)							
density (g/ml)				>1	<1	<1	<1
specific gravity (g/ml)							
pH							
refractive index (20°C)					approx. 1.47	approx. 1.47	approx. 1.47
saponification value						145-165	145-165
acid value (mg KOH/g)					<5	<5	<5
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)					<10	<10	<10
iodine value (gI ₂ /100g)						95-110	50-65
polarity				non-ionic		non-ionic, amphiphilic	non-ionic, amphiphilic
HLB	8	7.0	7.5				

Table 6. Physical and Chemical Properties

	Sesame Oil Polyglyceryl-6 Esters¹⁵⁰	Shea Butter Polyglyceryl-6 Esters¹⁵¹	Soybean Oil Polyglyceryl-6 Esters¹⁵²	Sunflower Seed Oil Polyglyceryl-10 Esters¹⁵⁴	Sweet Almond Oil Polyglyceryl-6 Esters¹⁵⁵	Trichilia Emetica Seed Oil Poly- glyceryl-6 Esters¹⁵⁶	Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate^{56,221,222}
physical characteristics	amber liquid	beige solid	dark orange liquid	amber viscous liquid	amber liquid	dark brown soft paste	hazy, viscous liquid
molecular wt							>1000
solubility	water dispersible	water dispersible	water dispersible	water dispersible	water dispersible	water dispersible	
melting point (°C)		35-45					
density (g/ml)	<1	<1	<1	>1	<1	<1	
specific gravity (g/ml)							
pH							
refractive index (20°C)	approx. 1.47	approx. 1.47	approx. 1.47	approx. 1.47	approx. 1.47	approx. 1.47	
saponification value	140-160	135-165	145-165	115-135	130-160	140-160	160-180
acid value (mg KOH/g)	<5	<5		< 5	<5	<5	≤10
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)	<10	<10		<10	<10	<10	
iodine value (gI ₂ /100g)	75-90	45-60	90-105	50-60	70-85	50-65	≤10
polarity	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	non-ionic, amphiphilic	
HLB							
Ximenia Americana Seed Oil Polyglyceryl- 6 Esters²²³							
physical characteristics	oil						
molecular wt							
solubility	hydrodispersible - water soluble						
melting point (°C)							
density (g/ml)							
specific gravity (g/ml)							
pH							
refractive index (20°C)							
saponification value							
acid value (mg KOH/g)							
hydroxyl value (mg KOH/g)							
peroxide value (meq of active oxygen/Kg)							
iodine value (gI ₂ /100g)							
polarity							
HLB							

Table 7. Specifications, Impurities, and/or Constituents

Ingredient	Specifications/Impurities/Constituents	Reference
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	PEG-free	159
Polyglyceryl-4 Caprate	PEG-free	164
Polyglyceryl-6 Distearate	100% vegetable-derived ; PEG-free	184,224
Polyglyceryl-10 Distearate	arsenic = 0.002; heavy metals = 0.005	177
Polyglyceryl-4 Laurate	PEG-free	187
Polyglyceryl-4 Oleate	100 ppm D,L-tocopherol; <1% volatiles	225
Polyglyceryl-10 Myristate	2 ppm arsenic; 20 ppm heavy metals	185

Abbreviations: PEG – polyethylene glycol

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
	Babassu Oil Polyglyceryl-4 Esters		Candelilla/Jojoba/Rice Bran Polyglyceryl-3 Esters		Caprylic/Capric Glycerides Polyglyceryl-10 Esters	
Totals*	18	2.3	20	0.5-2	6	NR
Duration of Use						
Leave-On	NR	NR	19	0.5-2	4	NR
Rinse-Off	18	2.3	1	NR	2	NR
Diluted for (Bath) Use	NR	NR	NR	NR	0	NR
Exposure Type						
Eye Area	NR	NR	8	NR	0	NR
Incidental Ingestion	NR	NR	1	NR	0	NR
Incidental Inhalation-Spray	NR	NR	5 ^a ; 3 ^b	NR	1 ^a ; 3 ^a	NR
Incidental Inhalation-Powder	NR	NR	3 ^b	NR	3 ^b	NR
Dermal Contact	1	2.3	19	0.5-2	6	NR
Deodorant (underarm)	NR	NR	NR	aerosol: 0.5	NR	NR
Hair - Non-Coloring	17	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	1	NR	NR	NR
Baby Products	NR	NR	1	1.5	NR	NR
	Coconut Oil Polyglyceryl-6 Esters		Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate		Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	
Totals*	2	NR	4	2-4	10	2
Duration of Use						
Leave-On	NR	NR	4	2-4	10	2
Rinse Off	2	NR	NR	NR	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	1	NR	2	NR
Incidental Ingestion	NR	NR	NR	NR	2	NR
Incidental Inhalation-Spray	NR	NR	3 ^a	NR	1 ^b	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	2 ^c
Dermal Contact	2	NR	4	2-4	8	2
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	1	NR	NR	NR	2	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
	Macadamia Seed Oil Polyglyceryl-6 Esters Behenate		Palm Oil Polyglyceryl-4 Esters		Polyglyceryl-2 Caprate	
	5	2-25	1	NR	6	NR
Duration of Use						
Leave-On	5	2-25	1	NR	6	NR
Rinse-Off	NR	NR	NR	NR	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	3	2-3	NR	NR	NR	NR
Incidental Ingestion	NR	25	NR	NR	NR	NR
Incidental Inhalation-Spray	1 ^a	NR	1 ^b	NR	1; 1 ^a ; 4 ^b	NR
Incidental Inhalation-Powder	NR	NR	1 ^b	NR	4 ^b	NR
Dermal Contact	4	2	1	NR	6	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	25	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	Polyglyceryl-2 Diisostearate		Polyglyceryl-2 Isopalmitate		Polyglyceryl-2 Isostearate	
Totals	86	0.1-18.8	9	NR	8	1-19.3
Duration of Use						
Leave-On	84	0.1-18.8	9	NR	7	1.6-19.3
Rinse Off	2	0.88-5	NR	NR	1	1
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	6	1.5-4	NR	NR	NR	NR
Incidental Ingestion	39	4-18.8	9	NR	1	2.3-19.3
Incidental Inhalation-Spray	7 ^a ; 14 ^b	0.25-0.5; 15 ^a	NR	NR	NR	NR
Incidental Inhalation-Powder	14 ^b	0.1; 0.14-2 ^c	NR	NR	2	2.1 ^c
Dermal Contact	45	0.1-5	NR	NR	7	1-2.5
Deodorant (underarm)	NR	0.1 (not spray)	NR	NR	NR	NR
Hair - Non-Coloring	NR	0.25-15	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	39	4-18.8	9	NR	2	2.3-19.3
Baby Products	NR	NR	NR	NR	NR	NR
	Polyglyceryl-2 Laurate		Polyglyceryl-2 Oleate		Polyglyceryl-2 Sesquiosostearate	
Totals*	9	2-4.6	4	0.09-2.4	11	1.1-7.6
Duration of Use						
Leave-On	6	2	4	0.09-2.4	9	2.1-7.6
Rinse-Off	3	4.6	NR	2.4	2	1.1
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	1	NR	NR	0.27-2.4	NR	2.1
Incidental Ingestion	NR	NR	NR	2.4	2	7.6
Incidental Inhalation-Spray	3 ^a ; 1 ^b	2 ^b	1 ^a ; 2 ^b	NR	2 ^a ; 2 ^b	NR
Incidental Inhalation-Powder	1 ^b	NR	2 ^b	0.09 ^c	2 ^b	4.4 ^c
Dermal Contact	8	NR	4	0.09-2.4	8	1.1-4.4
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	1	2-4.6	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	1	NR
Mucous Membrane	NR	NR	NR	2.4	2	7.6
Baby Products	NR	NR	NR	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
Totals*	Polyglyceryl-2 Sesquistearate		Polyglyceryl-2 Stearate		Polyglyceryl-2 Tetraistearate	
	NR	0.9	NR	0.16-2.2	30	0.5-7
Duration of Use						
Leave-On	NR	NR	NR	0.16-2.2	30	0.5-7
Rinse-Off	NR	0.9	NR	0.2	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	0.2-1	NR	NR
Incidental Ingestion	NR	NR	NR	0.2	27	7
Incidental Inhalation-Spray	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	2.2 ^c	NR	0.96
Dermal Contact	NR	0.9	NR	0.16-2.2	3	0.5-4.6
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	0.2	27	7
Baby Products	NR	NR	NR	NR	NR	NR
Totals	Polyglyceryl-2 Triisostearate		Polyglyceryl-3 Beeswax		Polyglyceryl-3 Caprate	
	165	0.12-40	111	0.5-5.8	12	NR
Duration of Use						
Leave-On	162	0.12-40	85	0.5-5.8	11	NR
Rinse Off	3	1-4	25	2.5	1	NR
Diluted for (Bath) Use	NR	NR	1	NR	NR	NR
Exposure Type						
Eye Area	22	0.12-20	11	0.8-3	NR	NR
Incidental Ingestion	89	4.1-40	9	3.8-5.8	NR	NR
Incidental Inhalation-Spray	6 ^a ; 3 ^b	NR	1; 32 ^a ; 15 ^c	NR	NR	NR
Incidental Inhalation-Powder	2; 3 ^b	0.49-2; 1-5 ^c	15 ^c	3.4; 4 ^c	NR	NR
Dermal Contact	75	0.12-20	99	0.5-3.4	12	NR
Deodorant (underarm)	NR	NR	NR	NR	11 ^a	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	3	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	90	4.1-40	18	3.8-5.8	1	NR
Baby Products	NR	NR	NR	NR	NR	NR
Totals*	Polyglyceryl-3 Caprylate		Polyglyceryl-3 Dicitrate/Stearate		Polyglyceryl-3 Diisostearate	
	8	0.05-1	13	2-4	371	0.0000015-39
Duration of Use						
Leave-On	5	0.05-1	13	2-4	363	0.0000015-39
Rinse-Off	3	0.6	NR	NR	7	0.000025-29.7
Diluted for (Bath) Use	NR	NR	NR	NR	1	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	37	0.006-12.2
Incidental Ingestion	NR	NR	NR	NR	216	7.8-39
Incidental Inhalation-Spray	1 ^b	0.05	6 ^a ; 7 ^b	NR	35 ^a ; 25 ^b	0.0000015-0.5
Incidental Inhalation-Powder	NR	0.05 ^c	7 ^b	2-4 ^c	25 ^b	0.25; 0.03-1 ^c
Dermal Contact	8	0.05-1	10	2-4	150	0.003-12.2
Deodorant (underarm)	3 ^a	not spray: 0.5-1; aerosol: 0.6	NR	NR	NR	0.003-0.3 (not spray)
Hair - Non-Coloring	NR	NR	3	2.2	NR	0.0000015-0.003
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	2	0.6	NR	NR	221	0.003-39
Baby Products	NR	NR	NR	NR	NR	2

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
Totals*	10	0.02-3	11	NR	192	0.6-6
Duration of Use						
Leave-On	7	0.02-3	9	NR	1	6
Rinse-Off	3	NR	2	NR	191	0.6-2
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	0.02-0.066	1	NR	NR	6
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	1; 6 ^a	3; 1 ^a	3 ^a ; 4 ^b	NR	1 ^b	NR
Incidental Inhalation-Powder	NR	0.29 ^c	4 ^b	NR	1 ^b	NR
Dermal Contact	4	0.29-3	11	NR	189	2-6
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	6	1	NR	NR	3	0.6-2
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	186	NR
Baby Products	NR	NR	NR	NR	NR	NR
Totals	14	1.2-1.5	1	NR	NR	0.15
Duration of Use						
Leave-On	11	1.2-1.5	NR	NR	NR	0.15
Rinse Off	3	NR	1	NR	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	2	1.5	NR	NR	NR	0.15
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	6 ^a ; 2 ^b	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	2 ^b	NR	NR	NR	NR	NR
Dermal Contact	14	1.5	1	NR	NR	0.15
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	1.2	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	1	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
Totals*	48	0.25-2	17	0.5-0.61	19	0.5-1.5
Duration of Use						
Leave-On	48	0.25-2	14	0.5-0.54	6	0.5-1.5
Rinse-Off	NR	NR	3	0.61	12	0.9-1.5
Diluted for (Bath) Use	NR	NR	NR	NR	1	NR
Exposure Type						
Eye Area	5	NR	NR	NR	2	NR
Incidental Ingestion	NR	NR	1	0.5	NR	NR
Incidental Inhalation-Spray	36 ^a ; 3 ^b	NR	4 ^a ; 8 ^b	NR	1 ^a ; 2 ^b	0.5 ^a
Incidental Inhalation-Powder	3 ^b	0.25 ^b	8 ^b	NR	2 ^b	0.72 ^c
Dermal Contact	46	0.25-2	16	0.54-0.61	18	0.72-1.5
Deodorant (underarm)	NR	NR	NR	NR	1 ^a	1.5 (not spray)
Hair - Non-Coloring	NR	NR	NR	NR	1	0.5-1.1
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	1	0.5	5	1-1.5
Baby Products	NR	NR	NR	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
Totals*	1	NR	280	0.067-24.1	12	0.47
Polyglyceryl-4 Cocoate						
Polyglyceryl-4 Isostearate						
Polyglyceryl-4 Laurate						
Duration of Use						
Leave-On	NR	NR	279	0.067-24.1	8	NR
Rinse-Off	1	NR	1	0.16-1.7	4	0.47
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	51	0.51-24.1	1	NR
Incidental Ingestion	NR	NR	44	0.067-10.9	NR	NR
Incidental Inhalation-Spray	NR	NR	20 ^a ; 7 ^b	0.26; 2.1 ^a	4 ^a	NR
Incidental Inhalation-Powder	NR	NR	47 ^b	0.17; 0.5-2.5 ^c	NR	NR
Dermal Contact	1	NR	229	0.067-24.1	12	0.47
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	2	2.1	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	1	NR	NR	NR
Mucous Membrane	1	NR	44	0.067-10.9	NR	NR
Baby Products	NR	NR	1	1	NR	NR
Totals	7	1.8	1	NR	2	NR
Polyglyceryl-4 Oleate						
Polyglyceryl-5 Dioleate						
Polyglyceryl-5 Isostearate						
Duration of Use						
Leave-On	7	1.8	NR	NR	2	NR
Rinse Off	NR	NR	1	NR	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	2	NR	NR	NR	1	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	3 ^a	1.8	NR	NR	1 ^b	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	1 ^b	NR
Dermal Contact	7	1.8	1	NR	2	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	1	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
Totals*	2	0.6	11	0.35	1	1
Polyglyceryl-5 Laurate						
Polyglyceryl-5 Oleate						
Polyglyceryl-5 Stearate						
Duration of Use						
Leave-On	NR	0.6	9	0.35	1	1
Rinse-Off	1	0.6	2	NR	NR	NR
Diluted for (Bath) Use	1	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	7 ^a	0.35 ^c	1 ^b	NR
Incidental Inhalation-Powder	NR	0.6 ^c	NR	NR	1 ^b	1 ^c
Dermal Contact	2	0.6	11	0.35	1	1
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	2	NR	1	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹ Max Conc of Use (%) ¹⁰⁻¹⁴		# of Uses ⁹ Max Conc of Use (%) ¹⁰⁻¹⁴		# of Uses ⁹ Max Conc of Use (%) ¹⁰⁻¹⁴	
	Polyglyceryl-5 Triisostearate		Polyglyceryl-5 Trioate		Polyglyceryl-6 Caprylate/Caprates	
Totals*	NR	1-5	7	2.8	NR	0.75
Duration of Use						
<i>Leave-On</i>	NR	1-5	6	NR	NR	NR
<i>Rinse-Off</i>	NR	NR	NR	2.8	NR	0.75
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	5	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	2 ^a ; 5 ^b	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	5 ^b	NR	NR	NR
Dermal Contact	NR	1	7	NR	NR	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	2.8	NR	0.75
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	5	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	Polyglyceryl-6 Dioleate		Polyglyceryl-6 Distearate		Polyglyceryl-6 Isostearate	
Totals	30	1.8-2.4	71	4-22.4	14	NR
Duration of Use						
<i>Leave-On</i>	23	2.4	52	4-22.4	14	NR
<i>Rinse Off</i>	7	1.8	18	NR	NR	NR
<i>Diluted for (Bath) Use</i>	NR	NR	1	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	7	4	NR	NR
Incidental Ingestion	2	NR	1	22.4	1	NR
Incidental Inhalation-Spray	12 ^b	NR	26 ^a ; 16 ^b	NR	4 ^a ; 8 ^b	NR
Incidental Inhalation-Powder	12 ^b	2.4 ^c	1; 16 ^b	NR	8 ^b	NR
Dermal Contact	22	2.4	67	4-10.5	13	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	6	1.8	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	5	NR	NR
Mucous Membrane	2	NR	11	22.4	1	NR
Baby Products	NR	NR	1	NR	NR	NR
	Polyglyceryl-6 Octastearate		Polyglyceryl-6 Oleate		Polyglyceryl-6 Pentastearate	
Totals*	1	NR	1	NR	NR	5
Duration of Use						
<i>Leave-On</i>	1	NR	1	NR	NR	5
<i>Rinse-Off</i>	NR	NR	NR	NR	NR	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	5
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	1 ^a	NR	1 ^b	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	1 ^b	NR	NR	NR
Dermal Contact	1	NR	1	NR	NR	5
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
Totals*	Polyglyceryl-6 Ricinoleate		Polyglyceryl-6 Tricaprylate		Polyglyceryl-8 Decabehenate/Caprato	
	2	NR	NR	3.6	NR	9
Duration of Use						
Leave-On	1	NR	NR	3.6	NR	9
Rinse-Off	1	NR	NR	NR	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	1	NR	NR	NR	NR	9
Incidental Inhalation-Spray	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	1	NR	NR	3.6	NR	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	2	NR	NR	NR	NR	9
Baby Products	NR	NR	NR	NR	JNR	NR
	Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate		Polyglyceryl-10 Behenate/Eicosadioate		Polyglyceryl-10 Caprylate/Caprato	
Totals	1	NR	2	2-5	1	NR
Duration of Use						
Leave-On	1	NR	1	2	NR	NR
Rinse Off	NR	NR	1	5	1	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	2	NR	NR
Incidental Inhalation-Spray	1 ^b	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	1 ^b	NR	NR	NR	NR	NR
Dermal Contact	1	NR	2	5	1	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	2	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
	Polyglyceryl-10 Decaisostearate		Polyglyceryl-10 Decaoleate		Polyglyceryl-10 Diisostearate	
Totals*	3	2.7	11	0.01-5	10	0.8-17
Duration of Use						
Leave-On	3	2.7	11	1-5	9	0.8-2
Rinse-Off	NR	NR	NR	0.01	1	1.6-17
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	3	2.7	NR	NR	NR	NR
Incidental Ingestion	NR	NR	3	0.01-5	NR	NR
Incidental Inhalation-Spray	NR	NR	5 ^a	NR	4 ^a ; 4 ^b	2 ^a
Incidental Inhalation-Powder	NR	NR	NR	NR	4 ^b	0.8 ^c
Dermal Contact	3	2.7	8	1-5	10	0.8-17
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	2
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	3	0.01-5	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴	# of Uses ⁹	Max Conc of Use (%) ¹⁰⁻¹⁴
Totals*	NR	3.9	17	2-10	10	NR
Polyglyceryl-10 Dioleate						
Polyglyceryl-10 Dipalmitate						
Polyglyceryl-10 Distearate						
Duration of Use						
Leave-On	NR	NR	3	10	9	NR
Rinse-Off	NR	NR	12	2	1	NR
Diluted for (Bath) Use	NR	NR	2	2	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	NR	1	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	1 ^b	NR	9 ^a	NR
Incidental Inhalation-Powder	NR	NR	1 ^b	10 ^c	NR	NR
Dermal Contact	NR	3.9	16	2-10	10	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	12	2	1	NR
Baby Products	NR	NR	NR	NR	NR	NR
Polyglyceryl-10 Heptahydroxystearate						
Polyglyceryl-10 Hydroxystearate/ Stearate/Eicosadioate						
Polyglyceryl-10 Isostearate						
Totals	1	1-2	2	0.62-1.8	6	0.6
Duration of Use						
Leave-On	1	1-2	1	0.62-1.2	6	0.6
Rinse Off	NR	NR	1	1.8	NR	NR
Diluted for (Bath) Use	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	NR	NR	NR	NR
Incidental Ingestion	NR	2	NR	0.62-1.2	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	5 ^a ; 1 ^b	0.6
Incidental Inhalation-Powder	NR	NR	NR	NR	1 ^b	NR
Dermal Contact	1	1	2	1.8	6	0.6
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	2	NR	0.62-1.2	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
Polyglyceryl-10 Laurate						
Polyglyceryl-10 Myristate						
Polyglyceryl-10 Nonaisostearate						
Totals*	52	0.0009-6.5	19	0.0003-1.2	45	0.5
Duration of Use						
Leave-On	43	0.0009-6.5	12	0.0003-1.2	45	NR
Rinse-Off	9	0.2-5	7	0.0003-0.04	NR	0.5
Diluted for (Bath) Use	NR	0.69-2	NR	NR	NR	NR
Exposure Type						
Eye Area	5	NR	2	NR	20	NR
Incidental Ingestion	NR	NR	NR	NR	16	NR
Incidental Inhalation-Spray	11 ^a ; 12 ^b	0.5; 6.5 ^a	5 ^a ; 4 ^b	NR	NR	NR
Incidental Inhalation-Powder	12 ^b	NR	4 ^b	0.8 ^c	NR	NR
Dermal Contact	46	0.0009-2	18	0.0003-1.2	29	0.5
Deodorant (underarm)	NR	NR	NR	not spray: 0.0003 aerosol: 0.1	NR	NR
Hair - Non-Coloring	6	0.4-6.5	1	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	0.69-2	NR	NR	16	NR
Baby Products	7	1	1	NR	NR	NR

Table 8. Frequency and concentration of use according to duration and type of exposure

	<i># of Uses⁹</i>	<i>Max Conc of Use (%)¹⁰⁻¹⁴</i>	<i># of Uses⁹</i>	<i>Max Conc of Use (%)¹⁰⁻¹⁴</i>	<i># of Uses⁹</i>	<i>Max Conc of Use (%)¹⁰⁻¹⁴</i>
Totals*	29	0.0000085-3	3	NR	NR	2-4.8
Duration of Use						
<i>Leave-On</i>	21	0.21-3	2	NR	NR	2-4.8
<i>Rinse-Off</i>	8	0.0000085	1	NR	NR	NR
<i>Diluted for (Bath) Use</i>	NR	2	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	0.63	1	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	4.8
Incidental Inhalation-Spray	9 ^a ; 10 ^b	1	1 ^a	NR	NR	NR
Incidental Inhalation-Powder	10 ^b	0.21-3 ^c	NR	NR	NR	2 ^c
Dermal Contact	23	0.0000085-3	NR	NR	NR	2
Deodorant (underarm)	NR	NR	2	NR	NR	NR
Hair - Non-Coloring	6	0.0000085	NR	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	2	NR	NR	NR	4.8
Baby Products	1	NR	NR	NR	NR	NR
Totals*	6	1-2.6	15	0.0003-2.2	99	0.13-2
Duration of Use						
<i>Leave-On</i>	6	1-2.6	13	0.0003-2.2	92	0.13-2
<i>Rinse-Off</i>	NR	NR	2	0.0003-0.1	7	1
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Exposure Type						
Eye Area	NR	NR	2	NR	13	0.41-1.8
Incidental Ingestion	1	2.6	NR	0.0003-2	NR	NR
Incidental Inhalation-Spray	3; 2 ^a	1 ^a	5 ^a ; 5 ^b	NR	33 ^a ; 34 ^b	0.25 ^a
Incidental Inhalation-Powder	NR	NR	5 ^b	1-2.2 ^c	34 ^b	0.13-2 ^c
Dermal Contact	1	NR	14	0.0003-2.2	98	0.13-2
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	4	1	1	NR	1	0.25
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	1	2.6	NR	0.0003-2	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR
Totals*	1	NR	20	1-11.2		
Duration of Use						
<i>Leave-On</i>	1	NR	20	1-11.2		
<i>Rinse-Off</i>	NR	NR	NR	NR		
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR		
Exposure Type						
Eye Area	1	NR	2	1-1.2		
Incidental Ingestion	NR	NR	17	9-11.2		
Incidental Inhalation-Spray	NR	NR	NR	NR		
Incidental Inhalation-Powder	NR	NR	NR	NR		
Dermal Contact	1	NR	3	1-1.2		
Deodorant (underarm)	NR	NR	NR	NR		
Hair - Non-Coloring	NR	NR	NR	NR		
Hair-Coloring	NR	NR	NR	NR		
Nail	NR	NR	NR	NR		
Mucous Membrane	NR	NR	17	9-11.2		
Baby Products	NR	NR	NR	NR		

*Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types may not equal the sum of total uses.

^a Includes products that can be sprays, but it is not known whether the reported uses are sprays

^b Not specified whether this product is a spray or a powder or neither, but it is possible it may be a spray or a powder, so this information is captured for both categories of incidental inhalation

^c Includes products that can be powders, but it is not known whether the reported uses are powders

NR – not reported

Table 9. Supplier Recommended Use Levels

Ingredient	Supplier-Recommended Concentration	Reference
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	3.0%	159
Polyglyceryl-4 Caprate	2-10%	164
Polyglyceryl-3 Caprylate	0.2-2%	163
Polyglyceryl-10 Caprylate/Caprato	1-7%	166
Polyglyceryl-4 Cocoate	1-5%	226
Polyglyceryl-6 Distearate	1-3%	184
	4-6	224
		227
Polyglyceryl-10 Eicosanedioate/Tetradecanedioate	1-10%	180
Polyglyceryl-4 Isostearate	2.5-4%	187
Polyglyceryl-4 Laurate (in o/w lotion wipes)	5.0 - 10.0 % in concentrates 0.5 - 1.0 % in impregnating liquids	
Polyglyceryl-10 Laurate (~60% pure, with ~40% polyglycerin-10 and ~2% sodium laurate)	≤3%	20
Polyglyceryl-3 Oleate	2.5-4%	190
Polyglyceryl-10 Oleate	1-7%	193
Polyglyceryl-3 Ricinoleate	3.5-4% (w/o emulsions); 5-25% (anhydrous products)	206
Polyglyceryl-2 Sesquioleate	2-3%	207

Table 10. Ingredients Not Reported to be Used ⁹⁻¹⁴

Adansonia Digitata Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-3 Soyate/Shea Butterate	Polyglyceryl-6 Sclerocarya Birrea Seedate	Polyglyceryl-10 Tricocoate
Almond Oil/Polyglyceryl-10 Esters	Polyglyceryl-3 Stearate SE	Polyglyceryl-6 Sesquicaprylate	Polyglyceryl-10 Tridecanoate
Apricot Kernel Oil Polyglyceryl-3 Esters	Polyglyceryl-3 Triisostearate	Polyglyceryl-6 Sesquiosostearate	Polyglyceryl-10 Trierucate
Apricot Kernel Oil Polyglyceryl-4 Esters	Polyglyceryl-3 Trioliolate	Polyglyceryl-6 Sesquisteate	Polyglyceryl-10 Triisostearate
Apricot Kernel Oil Polyglyceryl-5 Esters	Polyglyceryl-4 Almondate/Shea Butterate	Polyglyceryl-6 Stearate	Polyglyceryl-10 Trilaurate
Apricot Kernel Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Caprylate	Polyglyceryl-6 Tetrabehenate	Polyglyceryl-10 Trioleate
Apricot Kernel Oil Polyglyceryl-10 Esters	Polyglyceryl-4 Caprylate/Caprata	Polyglyceryl-6 Tetracaprylate	Polyglyceryl-10 Undecylenate
Argan Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Dilaurate	Polyglyceryl-6 Tetraoleate	Polyglyceryl-15 Diisostearate
Astrocaryum Vulgare Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Distearate	Polyglyceryl-6 Trichilia Emetica Seedate	Polyglyceryl-20 Docosabehenate/Isostearate
Avocado Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Hazelnutseedate	Polyglyceryl-6 Tristearate	Polyglyceryl-20 Docosabehenate/Laurate
Babassu Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Isostearate/Laurate	Polyglyceryl-6 Undecylenate	Polyglyceryl-20 Docosabehenate/Oleate
Bertholletia Excelsa Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Laurate/Sebacate	Polyglyceryl-6 Ximania Americana Seedate	Polyglyceryl-20 Heptacaprylate
Borage Seed Oil Polyglyceryl-4 Esters	Polyglyceryl-4 Laurate/Succinate	Polyglyceryl-8 C12-20 Acid Ester	Polyglyceryl-20 Heptadecabehenate/Laurate
Borage Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Pentaoleate	Polyglyceryl-8 Oleate	Polyglyceryl-20 Hexacaprylate
Carapa Guaianensis Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Pentapalmitate/Stearate	Polyglyceryl-8 Stearate	Polyglyceryl-20 Octadecabehenate/Laurate
Castor Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Pentastearate	Polyglyceryl-10 Apricot Kernelate	Polyglyceryl-20 Octaiononanoate
Cocoa Butter Polyglyceryl-6 Esters	Polyglyceryl-4 Punicate	Polyglyceryl-10 Caprate	Pumpkin Seed Oil Polyglyceryl-4 Esters
Coffee Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Stearate	Polyglyceryl-10 Caprylate	Pumpkin Seed Oil Polyglyceryl-4 Esters Succinate
Hazelnut Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-4 Sweet Almondate	Polyglyceryl-10 Cocoate	Rice Bran Oil Polyglyceryl-3 Esters
Linseed Oil Polyglyceryl-4 Esters	Polyglyceryl-4 Tristearate	Polyglyceryl-10 Decaethylhexanoate	Rosa Rubiginosa Seed Oil Polyglyceryl-6 Esters
Macadamia Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-5 Caprate	Polyglyceryl-10 Decahydroxystearate	Safflower Seed Oil Polyglyceryl-6 Esters
Mauritia Flexuosa Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-5 Dicaprylate	Polyglyceryl-10 Decalinoleate	Schinziophyton Rautanenii Kernel Oil Polyglyceryl-6 Esters
Olive Oil Polyglyceryl-3 Esters	Polyglyceryl-5 Dilaurate	Polyglyceryl-10 Decamacadamiate	Sclerocarya Birrea Seed Oil Polyglyceryl-6 Esters
Olive Oil Polyglyceryl-4 Esters	Polyglyceryl-5 Hexastearate	Polyglyceryl-10 Decastearate	Sclerocarya Birrea Seed Oil Polyglyceryl-10 Esters
Olive Oil Polyglyceryl-6 Esters	Polyglyceryl-5 Myristate	Polyglyceryl-10 Dicoate	Sesame Oil Polyglyceryl-6 Esters
Palm Kernel Oil Polyglyceryl-4 Esters	Polyglyceryl-5 Pentamyrystate	Polyglyceryl-10 Didecanoate	Shea Butter Polyglyceryl-3 Esters
Palm Oil Polyglyceryl-3 Esters	Polyglyceryl-5 Ricinoleate	Polyglyceryl-10 Dilaurate	Shea Butter Polyglyceryl-4 Esters
Palm Oil Polyglyceryl-5 Esters	Polyglyceryl-5 Tribehenate	Polyglyceryl-10 Dimyrystate	Shea Butter Polyglyceryl-6 Esters
Palm Oil Polyglyceryl-6 Esters	Polyglyceryl-5 Trimyrystate	Polyglyceryl-10 Dodecabehenate	Soybean Oil Polyglyceryl-6 Esters
Parinari Curatellifolia Oil Polyglyceryl-6 Esters	Polyglyceryl-5 Tristearate	Polyglyceryl-10 Dodecacaprate	Sunflower Seed Oil Polyglyceryl-3 Esters
Pinus Sibirica Seed Oil Polyglyceryl-6 Esters	Polyglyceryl-6 Adansonia Digitata Seedate	Polyglyceryl-10 Dodecacaprylate	Sunflower Seed Oil Polyglyceryl-4 Esters
Polyglyceryl-2 Caprylate	Polyglyceryl-6 Apricot Kernelate	Polyglyceryl-10 Dodeca-Caprylate/Caprata	Sunflower Seed Oil Polyglyceryl-5 Esters
Polyglyceryl-2 Dioleate	Polyglyceryl-6 Argan Kernelate	Polyglyceryl-10 Eicosanedioate/Tetradecanedioate	Sunflower Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-2 Distearate	Polyglyceryl-6 Behenate	Polyglyceryl-10 Hepta(Behenate/Stearate)	Sunflower Seed Oil Polyglyceryl-10 Esters
Polyglyceryl-2 Isopalmitate/Sebacate	Polyglyceryl-6 Caprate	Polyglyceryl-10 Heptaoleate	Sweet Almond Oil Polyglyceryl-4 Esters
Polyglyceryl-2 Myristate	Polyglyceryl-6 Caprylate	Polyglyceryl-10 Heptastearate	Sweet Almond Oil Polyglyceryl-6 Esters
Polyglyceryl-2 Palmitate	Polyglyceryl-6 Citrullus Lanatus Seedate	Polyglyceryl-10 Hexaerucate	Theobroma Grandiflorum Seed Butter Polyglyceryl-6 Esters
Polyglyceryl-2 Sesquicaprylate	Polyglyceryl-6 Dicaprate	Polyglyceryl-10 Hexaisostearate	Trichilia Emetica Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-2 Sesquioleate	Polyglyceryl-6 Diisostearate	Polyglyceryl-10 Hexaoleate	Watermelon Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-2 Tetrabehenate/ Macadamiate/Sebacate	Polyglyceryl-6 Dipalmitate	Polyglyceryl-10 Linoleate	Watermelon Seed Oil Polyglyceryl-10 Esters
Polyglyceryl-2 Tetraoleate	Polyglyceryl-6 Heptacaprylate	Polyglyceryl-10 Mono/Dioleate	Ximania Americana Seed Oil Polyglyceryl-6 Esters
Polyglyceryl-2 Tetraoleate	Polyglyceryl-6 Heptaoleate	Polyglyceryl-10 Nonaerucate	
Polyglyceryl-2 Tetraoleate	Polyglyceryl-6 Hexastearate	Polyglyceryl-10 Palmate	
Polyglyceryl-3 Behenate	Polyglyceryl-6 Laurate	Polyglyceryl-10 Palmitate	
Polyglyceryl-3 Cocoate	Polyglyceryl-6 Myristate	Polyglyceryl-10 Pentacaprylate	
Polyglyceryl-3 Dicaprate	Polyglyceryl-6 Myristate	Polyglyceryl-10 Pentalaurate	
Polyglyceryl-3 Dicocoate	Polyglyceryl-6 Octacaprylate	Polyglyceryl-10 Pentalinoleate	
Polyglyceryl-3 Dicocoate	Polyglyceryl-6 Octapalmitate	Polyglyceryl-10 Pentaricinoleate	
Polyglyceryl-3 Di-Hydroxystearate	Polyglyceryl-6 Palmitate	Polyglyceryl-10 Sesquisteate	
Polyglyceryl-3 Dioleate	Polyglyceryl-6 Palmitate/Succinate	Polyglyceryl-10 Tetradecanedioate	
Polyglyceryl-3 Myristate	Polyglyceryl-6 Pentacaprylate	Polyglyceryl-10 Tetraoleate	
Polyglyceryl-3 Pentacaprylate/Caprata	Polyglyceryl-6 Pentaoleate		
Polyglyceryl-3 Pentaoliolate	Polyglyceryl-6 Pentaricinoleate		
Polyglyceryl-3 Rice Branate	Polyglyceryl-6 Schinziophyton Rautanenii Kernelate		

Table 11. Disposition of radioactivity in rats after a single oral dose (51 h after feeding)

Catabolism Study³⁶						
Test Compound - Ingredients	% radioactivity recovered					
	CO₂	urine	Feces	GI contents	carcass	
[¹⁴ C]Polyglyceryl-10 Oleate	2.1	36.8	9.5	46.5	5.3	
[¹⁴ C]Polyglyceryl-10 Decaoleate	3.5	33.5	15.5	44.6	3.0	
polyglyceryl-3 [¹⁴ C]oleate	68.2	1.3	0.1	2.8	27.7	
polyglyceryl-10 [¹⁴ C]oleate	68.5	2.2	0.6	4.0	24.7	
polyglyceryl-10 [¹⁴ C]decaoleate	66.0	1.7	0.9	2.8	28.7	
For Comparison						
glycerol-1,3- ¹⁴ C	73.3	5.2	0.7	1.3	19.5	
[¹⁴ C]polyglycerin-3	2.1	88.3	5.5	2.9	1.2	
[¹⁴ C]polyglycerin-10	4.2	34.1	23.9	35.2	2.5	
triglycerol [¹⁴ C]tetraoleate	70.4	1.4	1.5	3.0	23.6	
polyglycerin-10 [¹⁴ C]monoecosanoate	55.5	1.6	9.9	12.2	20.8	
Catabolism- Absorption Study³⁶						
Test Compound - Ingredients	% radioactivity recovered					
	CO₂	urine	feces	GI contents	carcass	lymph
[¹⁴ C]Polyglyceryl-10 Oleate	1.5	42.4	45.6	3.5	5.1	1.9
[¹⁴ C]Polyglyceryl-10 Decaoleate	1.7	25.6	60.8	3.1	3.8	5.0
polyglyceryl-3 [¹⁴ C]oleate	13.7	0.9	3.4	0.4	3.1	78.5
polyglyceryl-10 [¹⁴ C]oleate	14.4	1.0	6.1	1.6	1.9	75.0
polyglyceryl-10 [¹⁴ C]decaoleate	13.3	1.4	8.4	2.3	7.1	67.5
For Comparison						
glycerol-1,3- ¹⁴ C	73.6	4.8	1.7	0.4	12.7	6.8
[¹⁴ C]polyglycerin-3	1.7	69.5	20.2	0.6	4.7	3.3
[¹⁴ C]polyglycerin-10	3.9	45.4	34.0	4.3	11.6	0.8
triglycerol [¹⁴ C]tetraoleate	12.7	0.9	6.2	1.7	2.6	76.0
polyglycerin-10 [¹⁴ C]monoecosanoate	8.9					

Table 12. Acute Toxicity Studies

Ingredient	Animals	No./Group	Vehicle	Concentration/Dose/Protocol	LD ₅₀ /Results	Reference
DERMAL						
Polyglyceryl Multi-Esters						
1,2,3-propanetriol, homo-polymer, diisooctadecanoate (n not defined; most likely Polyglyceryl-3 Diisostearate)	Wistar rats	5/sex	undiluted	5 g/kg (5.2 mL/kg bw) was applied with a semi-occlusive patch for 24 h	>5 g/kg no local effects were observed	39
ORAL						
polyglyceryl ester (unspecified)	rats	not provided	not specified	7, 14 and 29 g/kg bw by gavage	no signs of any toxic effect	32
polyglyceryl ester (unspecified)	rabbits	not provided	not specified	10-29 g/kg bw	no signs of any toxic effect	32
Polyglyceryl Monoesters						
Polyglyceryl-3 Caprate	rat	not provided	not specified	OECD 401 (acute oral toxicity by gavage)	LD ₅₀ > 2 g/kg	40
Polyglyceryl-3 Caprylate	rat	not provided	not specified	OECD 423 (acute oral toxicity by gavage)	LD ₅₀ > 2 g/kg	41
Polyglyceryl-3 Isostearate	rat	not provided	not specified	FHSA, 16 CFR 1500.3	LD ₅₀ > 5 g/kg	42
Polyglyceryl-3 Oleate	rat	not provided	not specified	FHSA, 16 CFR 1500.3	LD ₅₀ > 5 g/kg	43
Polyglyceryl-4 Caprate	rat	not provided	not specified	OECD 401 (acute oral toxicity by gavage)	LD ₅₀ > 2 g/kg	44
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	Sprague-Dawley rats	3 females	arachis oil BP	2 g/kg bw by gavage (2 groups)	LD ₅₀ > 2.5 g/kg bw (estimated)	45
Polyglyceryl Multi-Esters						
Polyglyceryl-2 Diisostearate	female Wistar rats	10	water	not provided	>5 g/kg	38
Polyglyceryl-2 Diisostearate	rats	5/sex	not specified	not provided	>5 g/kg	38
Polyglyceryl-3 Diisostearate	NMRI mice	5 females	not specified	2 g/kg	>2 g/kg	46,47
1,2,3-propanetriol, homo-polymer, diisooctadecanoate (n not defined; most likely Polyglyceryl-3 Diisostearate)	Wistar rats	5/sex	peanut oil	single oral dose of 50% (w/v) by gavage	>5 g/kg	39
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	rat	not provided	not specified	OECD 423 (acute oral toxicity by gavage)	LD ₅₀ > 2 g/kg bw	48
tetraisostearoyl polyglyceryl-3 dimer dilinoleate (as read-across for Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate and Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate)	rats	not provided	not provided	not provided	>5 g/kg	49,50
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	Sprague-Dawley rats	3 females	arachis oil	dosed with 2 g/kg by gavage (2 groups)	>2.5 g/kg bw (estimated) no mortality	51
Polyglyceryl-8 Decabehenate/Caprate	Sprague-Dawley rats	1 female, 4 females	arachis oil BP	dosed with 2 g/kg by gavage (2 groups)	>2.0 g/kg bw (estimated) no mortality	52
Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate	Sprague-Dawley rats	3 females	none	dosed with 2 g/kg, neat, by gavage (2 groups)	>2.5 g/kg bw (estimated) no mortality	53
Polyglyceryl-10 Nonaisostearate	Sprague-Dawley rats	3 females	arachis oil	0.3 g/kg (30 mg/ml) in arachis oil or 2 g/kg neat by gavage	>2.5 g/kg bw (estimated) no mortality	54

Abbreviations: CFR – Code of Federal Regulations; FHSA – Federal Hazardous Substances Act; OECD – Organisation for Economic Co-operation and Development

Table 13. Genotoxicity studies

Test Article	Concentration/Vehicle	Test System	Procedure	Results	Reference
IN VITRO					
Polyglyceryl Monoesters					
Polyglyceryl-2 Oleate	333-5000 µg/plate in DMSO	<i>S. typhimurium</i> TA1535, TA1537, TA98 and TA100; <i>E. coli</i> WP2uvrA	Ames test, with and without metabolic activation (OECD Guideline 471)	not mutagenic cytotoxic at 5000 µg/plate in strain TA1537 without activation and TA1535 with activation positive and vehicle controls gave expected results	46
Polyglyceryl-2 Oleate	10-150 µg/ml, 4-h exposure with and without activation 5-75 µg/ml, 24-h exposure without activation in DMSO	mouse lymphoma L5178Y cells	mammalian cell gene mutation assay, with and without metabolic activation (OECD test guideline 476)	not genotoxic cytotoxic without activation at ≥30 µg/ml and with activation at ≥50 µg/ml positive and vehicle controls gave expected results	46
Polyglyceryl-2 Oleate	25-150 and 50-200 µg/ml, 4-h exposure without and with activation, respectively; 25-100 µg/ml, 22-h exposure without activation in DMSO	human peripheral blood lymphocytes	chromosomal aberration assay, with and without metabolic activation (OECD Guideline 473)	not genotoxic positive and vehicle controls gave expected results	46
Polyglyceryl-3 Caprate	not provided	not provided	Ames test; OECD 471	no evidence of mutagenic activity	40
Polyglyceryl-3 Caprylate	not provided	not provided	Ames test; OECD 471	no evidence of mutagenic activity	41
Polyglyceryl-3 Laurate	50-5000 µg/plate (vehicle not specified)	not provided	Ames test; details not provided	negative	36
Polyglyceryl-3 Isostearate	not provided	not provided	Ames test; details not provided	no evidence of mutagenic activity	42
Polyglyceryl-4 Caprate	not provided	not provided	Ames test; OECD 471	no evidence of mutagenic activity	44
Polyglyceryl-4 Isostearate	not provided	not provided	Ames test; details not provided	negative	43
Polyglyceryl-4 Laurate/Succinate	1.5-5000 µg/plate in distilled water	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, with and without metabolic activation	not mutagenic cytotoxicity was observed in <i>S. typhimurium</i> with several concentrations positive and vehicle controls gave expected results	37
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	50-5000 µg/plate in acetone	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, assayed in triplicate, with and without metabolic activation; (2 experiments performed)	not mutagenic positive and vehicle controls gave expected results	45
Polyglyceryl-6 Caprylate/Caprate	0.15-5000 µg/plate in distilled water	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, with and without metabolic activation	not mutagenic cytotoxicity was observed with several concentrations positive and vehicle controls gave expected results	39

Table 13. Genotoxicity studies

Test Article	Concentration/Vehicle	Test System	Procedure	Results	Reference
Polyglyceryl-10 Laurate (~60% pure, with ~40% polyglycerin-10 and ~2% sodium laurate)	0-125 µg/ml without activation 0-2250 µg/ml with activation	Chinese hamster V79 cells	chromosomal aberration assay; 20 h harvest time	equivocal without and positive with activation without activation, a slight increase of aberrant cells was seen with 50 and 70, but not 65, µg/ml with activation, the aberration rates with 1250 and 1500 µg/mL were significantly increased, and a dose relationship was observed	20
Polyglyceryl-10 Laurate (~60% pure, with ~40% polyglycerin-10 and ~2% sodium laurate)	10-1000 µg/ml, 4-h exposure without and with activation 10-500 µg/ml, 20-h exposure without activation	human peripheral lymphocytes	chromosomal aberration assay; 20 h harvest time metaphase analysis was performed with cultures exposed to 50 - 250 µg/ml for 4 h and 50 - 300 µg/ml for 20 h without metabolic activation, and to 125 -500 µg/ml with metabolic activation	not clastogenic; no significant increases in chromosomal aberrations were observed in any treatment group at any dose level	20
Polyglyceryl Multi-esters					
Polyglyceryl-2 Diisostearate	4-5000 µg/plate in acetone	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100	Ames test, with and without metabolic activation	not mutagenic	38
Polyglyceryl-2 Diisostearate	3.16 - 5000 µg/ml, 4-h exposure without and with activation 10-5000 µg/ml, 20-h exposure without activation cell culture medium (MEM) served as the vehicle	Chinese hamster lung fibroblasts V79 cells	mammalian cell gene mutation assay, with and without metabolic activation; 20 h harvest time chromosomal aberrations were evaluated in cultures exposed to 1000-5000 µg/ml for 4 h and 50 - 5000 µg/ml for 20 h without metabolic activation, and to 100 -5000 µg/ml with metabolic activation	no evidence of a concentration-related positive response	38
Polyglyceryl-2 Diisostearate	3.16-5000µg/ml in cell culture medium (MEM)	Chinese hamster lung fibroblasts V79 cells	chromosomal aberration assay, with and without metabolic activation	not clastogenic	38
1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined; most likely Polyglyceryl-3 Diisostearate)	8-5000 µg/plate in Tween 80/bidistilled water	<i>S. typhimurium</i> TA1535, TA1537, TA1538, TA98 and TA100	Ames test, with and without metabolic activation	not mutagenic positive and vehicle controls gave expected results	39
1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined; most likely Polyglyceryl-3 Diisostearate)	3.13 - 200 µg/ml, 4-h exposure without activation 3.13 - 150 µg/ml, 4-h exposure with activation in DMSO	CHO cells	mammalian cell gene mutation assay, with and without metabolic activation; 4-h exposure	not genotoxic positive and negative controls gave expected results	39
1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined; most likely Polyglyceryl-3 Diisostearate)	12.5-800µg/ml without and 3.13-800µg/ml with activation, in DMSO	Chinese hamster lung fibroblasts V79 cells	chromosomal aberration assay, with and without metabolic activation; 4 and 18-h exposure	not clastogenic	39
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	not provided	not provided	Ames test; OECD 471	negative	38
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	50-5000 µg/plate in acetone	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, assayed in triplicate, with and without metabolic activation; (2 experiments performed)	not mutagenic positive and vehicle controls gave expected results	40
Polyglyceryl-8 Decabehenate/Caprates	50-5000 µg/plate in tetrahydrofuran	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, assayed in triplicate, with and without metabolic activation; (2 experiments performed)	not mutagenic positive and vehicle controls gave expected results	40
Polyglyceryl-8 Decaerucate/Decaistearate/Decaricinoleate	50-5000 µg/plate in tetrahydrofuran	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, assayed in triplicate, with and without metabolic activation; (2 experiments performed)	not mutagenic positive and vehicle controls gave expected results	40

Table 13. Genotoxicity studies

Test Article	Concentration/Vehicle	Test System	Procedure	Results	Reference
Polyglyceryl-10 Decaethylhexanoate	range-finding test: 10-5000 µg/plate; main experiments: 5-5000 µg/plate; in DMF	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, with and without metabolic activation	not mutagenic positive and vehicle controls gave expected results	8
Polyglyceryl-10 Pentaisostearate	range-finding test: 10-5000 µg/plate; main experiments: 5-5000 µg/plate; in acetone	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, with and without metabolic activation	not mutagenic positive and vehicle controls gave expected results	8
Polyglyceryl-10 Nonaisostearate	50-5000 µg/plate in tetrahydrofuran	<i>S. typhimurium</i> TA1535, TA1537, TA98, TA100; <i>E. coli</i> WP2uvrA	Ames test, assayed in triplicate, with and without metabolic activation; (2 experiments performed)	not mutagenic positive and vehicle controls gave expected results	8

Abbreviations: CHO – Chinese hamster ovary; DMF – *N,N*-dimethylformamide; DMSO – dimethyl sulfoxide; MEM – minimum essential medium; OECD – Organisation for Economic Co-operation and Development

Table 14. Dermal irritation and sensitization

Test Article	Concentration/Dose	test system/# per Group	Procedure	Results	Reference
ALTERNATIVE STUDIES					
Polyglyceryl Monoesters					
Apricot Kernel Oil Polyglyceryl-4 Esters	16 ± 0.5 µl	reconstituted human epidermis	SkinEthic™ irritation test; test material was applied for 42 min; cell viability assessment by MTT method after 42 h	classified as non-irritant	47
Palm Oil Polyglyceryl-4 Esters	16 ± 0.5 µl	reconstituted human epidermis	SkinEthic™ irritation test; protocol as described previously	classified as non-irritant	47
Polyglyceryl-4 Laurate/Sebacate	neat	reconstituted human epidermis	EpiSkin™ model; 15 min treatment period with a 42 h post-exposure incubation period; cell viability was measured by MTT reduction	considered to be non-irritant relative mean viability was 105.4%	66
Polyglyceryl-4 Laurate/Succinate	neat	reconstituted human epidermis	EpiSkin™ model; protocol as described previously	considered to be non-irritant relative mean viability was 104.1%	67
Polyglyceryl-6 Caprylate/Caprates	neat	reconstituted human epidermis	EpiSkin™ model; protocol as described previously	considered to be non-irritant relative mean viability was 105.7%	68
Polyglyceryl-10 Decaethylhexanoate	neat; 30 µl	reconstituted human epidermis (surface: 0.63 cm ²); 3 tissues	EpiDerm™ model performed according to Method B.46; 60 min exposure time, followed by a 42-h incubation period; cell viability was measured in an MTT assay	considered to be non-irritating avg. viability was 101.4% of negative control avg. value	8
Polyglyceryl-10 Pentaisostearate	neat; 30 µl	reconstituted human epidermis (surface: 0.63 cm ²); 3 tissues	EpiDerm™ model; protocol as described previously	considered to be non-irritating avg. viability was 94.7% of negative control avg. value	8
ANIMAL					
Polyglyceryl Monoesters					
Polyglyceryl-2 Isostearate	undiluted; 0.5 ml	3 NZW rabbits	4-h, 2 x 3 cm semi-occlusive patch applied to clipped skin	PII of 0.8 (mildly irritating); very slight erythema was observed in all 3 animals and resolved in 2-7 days	85
Polyglyceryl-3 Caprate	not provided	rabbit	OECD TG 404 (acute dermal irritation/corrosion)	not irritating	40
Polyglyceryl-3 Caprate	not provided	guinea pig	OECD TG 406 (sensitization)	no skin sensitization effect	40

Table 14. Dermal irritation and sensitization

Test Article	Concentration/Dose	test system/# per Group	Procedure	Results	Reference
a polyglyceryl mono/diester of capric acid (C10) (provided as read-across for Polyglyceryl-3 Caprylate)	not provided	rabbit	OECD TG 404 (acute dermal irritation/corrosion)	not irritating	41
Polyglyceryl-3 Caprylate	not provided	mouse	OECD TG 429; LLNA	not sensitizing	41
Polyglyceryl-3 Isostearate	not provided	rabbit	FHSA, 16 CFR 1500.41	moderately irritating	42
Polyglyceryl-3 Isostearate	not provided	guinea pig	OECD TG 406 (sensitization)	no skin sensitization effect	42
Polyglyceryl-3 Oleate	not provided	rabbit	FHSA, 16 CFR 1500.41	moderately irritating	43
Polyglyceryl-4 Caprate	not provided	rabbit	OECD TG 404 (acute dermal irritation/corrosion)	not irritating	44
Polyglyceryl-4 Caprate	not provided	guinea pig	OECD TG 406 (sensitization)	no skin sensitization effect	44
Polyglyceryl-4 Isostearate	not provided	guinea pig	OECD TG 406 (sensitization)	no sensitizing effect	43
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	applied neat; 0.5 ml	1 NZW rabbit	single 3 min, 1 h, and 4 h semi-occlusive application using a 2.5 cm ² patch	no irritation observed after 3 min or 1 h (4 results included below)	45
		2 NZW rabbits	single 4-h semi-occluded patch to clipped skin on the dorsal/flank area	PII of 0.3 (mild irritant); very slight erythema in 2 animals at 24 h was resolved by 48-h	
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	12.5, 25, 50% in liquid paraffin; undiluted	2 or 3 female albino guinea pigs	preliminary sighting tests for sensitization study; 24 h occlusive patch; determination of concentration for topical induction (2 animals) and topical challenge (3 animals)	no skin reactions were observed in either group	45
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	intradermal induction: 25% in olive oil topical induction: 100% topical challenge: 100%; 50% in liquid paraffin	female albino guinea pigs; 10 test and 5 control animals	GPMT intradermal induction: 3 pairs of injections on day 1: 1.) FCA + isotonic sodium chloride (1:1) 2.) test article 3.) test article + FCA/ isotonic sodium chloride topical induction: 48-h occlusive patch on day 7 challenge: 24-h occlusive patches (study day not specified)	not sensitizing; no reactions were observed	45
Polyglyceryl Multi-Esters					
Polyglyceryl-2 Diisostearate	undiluted; 0.5 ml	3 NZW rabbits	4-h, 2.5 cm ² semi-occlusive patch	non-irritating; 1 animal had well-defined erythema 24 h after patch removal	38
Polyglyceryl-2 Diisostearate	1 and 10% in saline, and undiluted; 0.5 ml	2 Albino-Himalayan-Kaninchen rabbits/gp	24-h, 2.5 cm ² occlusive patch on intact and abraded skin	slightly irritating; with undiluted test substance, distinct erythema and slight to distinct edema was observed in both animals; with 10%, marked erythema was observed in 1 animal for a short time; with 1%, slight erythema in 1 animal	38
Polyglyceryl-2 Diisostearate	induction: 100% challenge: 20% in acetone	20 female Pirbright-White guinea pigs/gp	Buehler test using occlusive patches; 10 control animals were exposed to an ethanol-water (80:20) mixture	non-sensitizing	38
Polyglyceryl-3 Diisostearate	not specified	3 NZW rabbits	method was described as OECD Guideline 404, but study details were not provided; test sites were scored according to Draize	not irritating; slight erythema was seen on skin of all 3 animals tested starting 1 hour following application, and this effect was fully reversible within by 72 h	46,47
Polyglyceryl-3 Diisostearate	5-50% in paraffin perliquid DAB 8	3 Pirbright-White guinea pigs	in a range-finding study for a sensitization test, the test material was applied to the shaved flank for 6 h	not irritating after 24 h	46

Table 14. Dermal irritation and sensitization

Test Article	Concentration/Dose	test system/# per Group	Procedure	Results	Reference
1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined; most likely Polyglyceryl-3 Diisostearate)	undiluted; 0.5 ml	4 male rabbits	4-h occlusive patch to a shaved 6.25 cm ² area	not irritating; very slight to slight erythema in 3/4 animals at 24 and 48 h; slight and moderate erythema in 2/4 animals at 72 h; the effects were reversible in all animals within 7 d	³⁹
Polyglyceryl-3 Diisostearate	induction: 50% in paraffin perliquid DAB 8 (induction 1) or in petrolatum (inductions 2 and 3) challenge: 50% paraffin perliquid DAB 8 rechallenge: 25%	20 (test) or 19 (control) female Pirbright-White guinea pigs	test sites were pre-treated with 10% SDS in petrolatum, 24 h prior to each induction application <u>epicutaneous induction</u> : 6-h occlusive patches (0.2 ml) applied 1x/wk for 3 wks; half of the controls were pretreated with SDS 24 h prior to application of patches containing vehicle <u>challenge</u> : 6-h occlusive patch (0.1 ml) applied on day 28 <u>rechallenge</u> : 6-h occlusive patch (0.1 ml) applied on day 35	non-sensitizing very slight skin reactions (erythema and edema) were seen at 24-h following the challenge and rechallenge patches in test and control animals; these reactions were reversible in all animals within 48 h and were attributed to irritation	⁴⁶
Polyglyceryl-3 Diisostearate	intradermal induction: 0.1% or 0.2% topical induction: 40% challenge: 10 and 15% rechallenge: 8 and 4% vehicle was paraffinum perliquidum DAB 8 for all phases	20 (test) or 19 (control) female Pirbright-White guinea pigs	GPMT, no positive control <u>intradermal induction</u> : 3 pairs of injections on day 1: 1.) FCA + physiological saline in water (1:1) 2.) 0.1% test article 3.) 0.2% test article + FCA/ physiological saline in water (1:1) <u>topical induction</u> : 48-h occlusive patch on day 8 (0.1 ml) <u>challenge</u> : 24-h occlusive patches on day 22 (0.1 ml) <u>rechallenge</u> : 24 h occlusive patches on day 29 (0.1 ml)	results were inconclusive <u>intradermal induction</u> : 0.1 ml FCA (50% (v/v)), the test substance (0.1% (v/v)) and a 1:1 mixture of the test substance with FCA caused moderate to severe skin reactions; in the control group, 0.1 ml of the vehicle resulted in moderate skin reactions <u>epicutaneous induction</u> : after treatment with 40% of the test substance, the injection sites of the intradermal induction were bloody and purulent and at a later stage, this sites showed necrotic and scabby skin lesions <u>challenge with 15%</u> : at 24 h, erythema (1) was observed in 9 test and 2 control animals; edema (2) in 1 test animal, and edema (1) in 2 test and 2 control animals; at 48 h, erythema (2) in 1 test animal (that was 0 at 24 h), erythema (1) in 7 test animals, same edema scores as at 24 h for test animals, no edema in controls <u>challenge with 10%</u> : at 24 h, erythema (3) in 1 and erythema (1) in 5 test animals, edema (3) in 1 and edema (2) in 1 test animal; at 48 h, erythema (3) and edema (3) in 1 animal and erythema (1) and edema (1) in 1 test animal; no erythema or edema in controls at 24 or 48 h <u>rechallenge with 8%</u> : at 24 h, erythema (1) in 6 test and 4 control animals, no edema in test or controls; at 48-h, erythema (1) in 3 test and 1 control animals, no edema in test or controls <u>rechallenge with 4%</u> : no erythema or edema	⁴⁶
Polyglyceryl-4 Diisostearate/ Polyhydroxystearate/Sebacate (provided as read-across for Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate due to similar MW and chemical characteriza- tion)	not provided	guinea pig	OECD 406 (sensitization)	not sensitizing	⁴⁸

Table 14. Dermal irritation and sensitization

Test Article	Concentration/Dose	test system/# per Group	Procedure	Results	Reference
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	applied neat; 0.5 ml	1 NZW rabbit	single 3 min, 1 h, and 4 h semi-occlusive application using a 2.5 cm ² patch	no irritation observed after 3 min or 1 h (4 results included below)	74
		2 NZW rabbits	single 4-h semi-occluded patch to clipped skin on the dorsal/flank area	PII of 0.0 (non-irritant; very slight erythema was observed at two sites 1 h after patch removal)	
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	12.5, 25, 50% in liquid paraffin; undiluted	2 or 3 female albino guinea pigs	preliminary sighting tests for sensitization study; 24 h occlusive patch; determination of concentration for topical induction (2 animals) and topical challenge (3 animals)	no skin reactions were observed in either group	75
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	intradermal induction: 25% in olive oil topical induction: 100% topical challenge: 100%; 50% in liquid paraffin	female albino Dunkin Hartley guinea pigs; 10 test and 5 control animals	GPMI intradermal induction: 3 pairs of injections on day 1: 1.) FCA + isotonic sodium chloride (1:1) 2.) test article 3.) test article + FCA/ isotonic sodium chloride topical induction: 48-h occlusive patch on day 7 challenge: 24-h occlusive patches (study day not specified)	not sensitizing; no reactions were observed	75
Polyglyceryl-8 Decabehenate/Caprates	applied neat; 0.5 g moistened with 0.5 ml distilled water	1 NZW rabbit	single 3 min, 1 h, and 4 h semi-occlusive application using a 2.5 cm ² patch	no irritation observed after 3 min or 1 h (4 results included below)	76
		2 NZW rabbits	single 4-h semi-occluded patch to clipped skin on the dorsal/flank area	PII of 0.0 (non-irritant; very slight erythema was observed at two sites 1 h after patch removal)	
Polyglyceryl-8 Decabehenate/Caprates	7.5, 15, 30, and 60% in liquid paraffin	2 or 3 female albino guinea pigs	preliminary sighting tests for sensitization study; 24 h occlusive patch; determination of concentration for topical induction (2 animals) and topical challenge (3 animals)	no skin reactions were observed in either group	77
Polyglyceryl-8 Decabehenate/Caprates	intradermal induction: 5% in olive oil topical induction: 60% in liquid paraffin topical challenge: 30 and 60% in liquid paraffin	female albino Dunkin Hartley guinea pigs; 10 test and 5 control animals	GPMI intradermal induction: 3 pairs of injections on day 1: 1.) FCA + isotonic sodium chloride (1:1) 2.) test article 3.) test article + FCA/ isotonic sodium chloride topical induction: 10% SLS in vaseline was applied on day 6; 48-h occlusive patch on day 7 challenge: 24-h occlusive patches (study day not specified)	not sensitizing; no reactions were observed	77
Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate	applied neat; 0.5 ml	3 NZW rabbits	single 4 h semi-occlusive application to clipped skin on the dorsal/flank area using a 2.5 cm ² patch	PII of 0.0 (non-irritant)	78
Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate	undiluted and 25, 50, and 75% in arachis oil BP	2 male albino guinea pigs	preliminary sighting tests for sensitization study; animals were injected with FCA, and after 145 days, a 48 h occlusive patch was applied	1 h after patch removal, both animals had erythema scores of 2 (moderate and confluent erythema) at concentrations 50-100%, one animal had an erythema score of 2 and one had a score of 1 discrete or patchy erythema) with 25%; all reactions resolved by 24 h	79
Polyglyceryl-8 Decaerucate/Decaisostearate/Decaricinoleate	undiluted and 25, 50, and 75% in arachis oil BP	2 male albino guinea pigs	preliminary sighting tests for dermal induction in the sensitization study; 24 h occlusive patch; animals were not part of the main study, but were treated identically to controls up to day 14	1 h after patch removal, 1 animal had a score of 2 for erythema with 100% test article; all other erythema scores were 1 at 1 ; all reactions resolved by 24 h	79

Table 14. Dermal irritation and sensitization

Test Article	Concentration/Dose	test system/# per Group	Procedure	Results	Reference
Polyglyceryl-8 Decaerucate/ Decaistearate/Decaricinoleate	intradermal induction: 5% in arachis oil BP topical induction: 100% topical challenge: 100%; 75% arachis oil BP	male albino Dunkin Hartley guinea pigs; 10 test and 5 control animals	GPMT; intradermal induction: 3 pairs of injections on day 1: 1.) FCA + distilled water (1:1) 2.) test article 3.) test article + FCA/distilled water topical induction: 48-h occlusive patch (40 mm x 20 mm patch) on day 7 challenge: 24-h occlusive patch (20 mm x 20 mm) on day 21	not sensitizing at 24 h after intradermal induction, all test and control animals had an erythema score of 1 or 2, which was resolved in almost all control animals, but not test animals at 48 h; 1 h after topical induction, there was bleeding from the intradermal injection sites of 8/10 test animals, and at 24 h, 2 animals had an erythema score of 2	79
Polyglyceryl-10 Nonaisostearate	undiluted; 0.5 ml	3 rabbits	24-h closed patch to intact and abraded skin	very slightly irritation; PII = 1.08 PII of untreated patch was 0.42) intact skin: very slight erythema was observed in all 3 animals at 24 h and in 2 animals at 72 h abraded skin: very slight to slight erythema was observed in all 3 animals at 24 h, and slight erythema was still observed at 72 h	81
Polyglyceryl-10 Nonaisostearate	100%; 50 µl	Dunkin Hartley albino guinea pigs, 4/sex	the test material was applied daily for 14 days to a 2 cm x 2 cm area of the right flank; paraffin oil was applied to the left flank and served as the control	practically non-irritant; the wk 1 and maximum WII was 0.06; the week 2 WII was 0 slight erythema was observed in 3 test animals on day 2	82
Polyglyceryl-10 Nonaisostearate	undiluted and 0, 25, and 50% v/v in acetone, olive oil (4:1); 25 µl/ear	4 CBA/Ca mice	LLNA; the test material was applied to the dorsal surface of each ear for 3 consecutive days; all mice were injected with HTdR on day 6	non-sensitizer; stimulation index of 0.68, 0.70, and 0.87 with 25, 50, and 100%	80
HUMAN					
Polyglyceryl Monoesters					
Polyglyceryl-2 Isostearate	7% in ESTOL 1512 (i.e., isopropyl myristate); 0.4 ml	30 subjects	three 24-h occlusive patches, with 24 to 48-h between applications	elicited slight irritation; significantly less irritating than the positive control (0.3% sodium lauryl sulfate) and significantly more irritating than the negative control (deionized water) (p=0.05)	83
Polyglyceryl-3 Laurate	100%; 150 µl/patch	114 subjects	HRIPT	not an irritant or a sensitizer	86
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	100%; 0.01 g	45 subjects	24-h occlusive patch test using Finn chambers applied to the upper arm; petrolatum and 0.5% "soap" were used as controls	no reactions 1 or 24 h after patch removal	84
Polyglyceryl-10 Laurate	5% in purified water; 0.03 g	35 subjects	24-h occlusive patch applied to the upper arm	not irritating; no responses were observed 1 or 24 h after patch removal	85
Polyglyceryl-10 Myristate	5% in purified water; 0.03 g	35 subjects	24-h occlusive patch applied to the upper arm	not irritating; no responses were observed 1 or 24 h after patch removal	85
Polyglyceryl-10 Myristate	10%	48 subjects	48-h occlusive patch test	negative	86
Polyglyceryl-10 Isostearate	5% in purified water; 0.03 g	35 subjects	24-h occlusive patch applied to the upper arm	not irritating; no responses were observed 1 or 24 h after patch removal	85
Polyglyceryl-10 Oleate	5% in purified water; 0.03 g	35 subjects	24-h occlusive patch applied to the upper arm	not irritating; no responses were observed 1 or 24 h after patch removal	85
Polyglyceryl-10 Stearate	10%	48 subjects	48-h occlusive patch test	non-irritating	87
60% Polyglyceryl-10 Eicosanedioate/ Tetradecanedioate/40% glycerin mixture	undiluted	45 subjects	closed patch test; details not provided	negative	88

Table 14. Dermal irritation and sensitization

Test Article	Concentration/Dose	test system/# per Group	Procedure	Results	Reference
Polyglyceryl Multi-Esters					
Polyglyceryl-2 Sesquiossearate	undiluted	50 subjects	24-h semi-occlusive patches	not irritating	38
1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined; likely Polyglyceryl-3 Diisostearate)	20% "active substance" in "cosmetic alcohol"; 70 µl	20 subjects	24-h occlusive patches	not irritating slight erythema in 3 and slight scaling in 2 subjects	39
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	not provided	no provided	occlusive patch test; details not provided	"no concern"	48
Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate	100%; 150 µl/patch	103 subjects	HRIPT	not an irritant or a sensitizer	56
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	100%; 0.01 g	45 subjects	24-h occlusive patch test using Finn chambers applied to the upper arm; petrolatum and 0.5% "soap" were used as controls	no reactions 1 or 24 h after patch removal	89
Polyglyceryl-8 Decabehenate/ Caprate	100%; 0.01 g	43 subjects	24-h occlusive patch test using Finn chambers applied to the upper arm; petrolatum and 0.5% "soap" were used as controls	no reactions 1 or 24 h after patch removal	90
Polyglyceryl-10 Decaethylhexanoate	100%	43 subjects	24-h occlusive patch test using Finn chambers applied to the upper arm; purified water served as the control	at 1 h after patch removal, erythema with swelling or with papule was observed at the test and control site of 1 subject, and the test site had well-defined erythema at 24 h after patch removal; well-defined erythema was observed in 3 subjects; 3 controls also had well-defined erythema	91
Polyglyceryl-10 Decaethylhexanoate	100%; 25 µl	50 subjects	induction: 48-h occlusive patches applied using 8 mm Finn chambers 3x/wk for 3 wks challenge: 48-h occlusive patch was applied following a 2-wk non-treatment period	non-irritating and non-sensitizing	92
Polyglyceryl-10 Diisostearate	5% in purified water; 0.03 g	35 subjects	24-h occlusive patch applied to the upper arm	not irritating; no responses were observed 1 or 24 h after patch removal	88
Polyglyceryl-10 Pentaisostearate	50%	44 Japanese subjects	24-h occlusive patch	negative	96
Polyglyceryl-10 Pentaisostearate	100%	43 subjects	24-h occlusive patch test using Finn chambers applied to the upper arm; purified water served as the control	1 subject exhibited well-defined erythema at 1h after patch removal (this subject had erythema with swelling at the control site)	95
Polyglyceryl-10 Pentaisostearate	100%; 25 µl	51 subjects	induction: 48-h occlusive patches applied using 8 mm Finn chambers 3x/wk for 3 wks challenge: 48-h occlusive patch was applied following a 2-wk non-treatment period	non-irritating and non-sensitizing	94
Polyglyceryl-10 Nonaisostearate	0.01 g	35 subjects	24-h occlusive application to the upper arm using a Finn chamber	negative; no responses were observed 1 or 24 h after patch removal	95
Polyglyceryl-10 Decaoleate	neat	44 Japanese subjects	24-h occlusive patch	negative	97

Abbreviations: CFR – Code of Federal Regulations; CPSC – Consumer Product Safety Commission; FCA – Freund’s Complete Adjuvant; FHSA – Federal Hazardous Substances Act; GPMT – guinea pig maximization test; HET-CAM – hen’s egg test chorioallantoic membrane; HRIPT – human repeated insult patch test; ³HTdR – ³H-methyl thymidine; LLNA – local lymph node assay; ME – microemulsion; MW – molecular weight; OECD – Organisation for Economic Co-operation and Development; SDS – sodium dodecyl sulfate; SLS – sodium lauryl sulfate; TG – test guideline; WII – weakly irritation indices

Table 15. Ocular irritation studies

Test Article	Concentration/Dose	#/Animals/Grp	Method	Results	Reference
ALTERNATIVE STUDIES					
Polyglyceryl Monoesters					
Polyglyceryl-3 Laurate	10% in corn oil	---	EpiOcular™ tissue model	classified as non-irritating ET ₅₀ was >256 min	99
ME containing 30% Polyglyceryl-4 Laurate	100 µl	6 replicates	HET-CAM assay; the test article also contained 1 or 2% linoleic acid, 4 or 5% isopropyl palmitate, and 65% water-1,2-pentanediol (1:9) or 63 or 65% water-1,2-pentanediol (1.5:8.5)	non-irritant	30
ME containing 40% Polyglyceryl-4 Laurate	100 µl	6 replicates	HET-CAM; this test article also contained 2% linoleic acid, 5% isopropyl palmitate, 53% water-1,2-pentanediol (1:9)	non-irritant	30
Apricot Kernel Oil Polyglyceryl-4 Esters	0.3 g	# of replicates not stated	HET-CAM; CAM was rinsed with 5 ml physiological saline after 240 s of contact	practically non-irritating	47
Palm Oil Polyglyceryl-4 Esters	0.3 g	# of replicates not stated	HET-CAM; CAM was rinsed with 5 ml physiological saline after 240 s of contact	practically non-irritating	47
Polyglyceryl-4 Laurate/Sebacate	30 µl	human corneal epithelial cells	SkinEthic™ reconstituted HCE model; protocol as described previously	considered to be non-irritant relative mean viability was 85.9%	100
Polyglyceryl-4 Laurate/Succinate	30 µl	human corneal epithelial cells	SkinEthic™ reconstituted HCE model; protocol as described previously	considered to be non-irritant relative mean viability was 70.0%	101
Polyglyceryl-6 Caprylate/Caprate	30 µl	human corneal epithelial cells	SkinEthic™ reconstituted HCE model; protocol as described previously	considered to be non-irritant relative mean viability was 88.4%	229
Polyglyceryl-10 Laurate	0.1 ml	3 rabbit enucleated eyes	REET; test material was applied onto the cornea 0.9% saline was applied to 2 controls	considered unlikely to cause severe ocular irritation <i>in vivo</i>	105
Polyglyceryl-10 Myristate	1000 mg/l (max)	rabbit corneal epithelial cells	SIRC-NR	non-irritant	86
Polyglyceryl-10 Myristate	0.1 ml	3 rabbit enucleated eyes	REET; test material was applied onto the cornea 0.9% saline was applied to 2 controls	considered unlikely to cause severe ocular irritation <i>in vivo</i>	106
Polyglyceryl-10 Isostearate	0.1 ml	3 rabbit enucleated eyes	REET; test material was applied onto the cornea 0.9% saline was applied to 2 controls	considered unlikely to cause severe ocular irritation <i>in vivo</i>	114
Polyglyceryl-10 Stearate	1000 mg/l (max)	rabbit corneal epithelial cells	SIRC-NR	non-irritant	87
60% Polyglyceryl-10 Eicosanedioate/ Tetradecanedioate/40% glycerin mixture	undiluted	---	EpiOcular™ test	non-irritant	88
Polyglyceryl Multi-Esters					
Polyglyceryl-2 Dioleate	undiluted; 300 µl	6 eggs	HET-CAM assay	classified as non-irritating Q-score <1.2 (up to 300 s)	46
Diisostearoyl Polyglyceryl-3 Dimer Dilinoleate	not stated	not stated	HET-CAM assay	minor irritation	48
Triisostearoyl Polyglyceryl-3 Dimer Dilinoleate	10% in corn oil	----	EpiOcular™ tissue model	classified as non-irritating ET ₅₀ was >256 min	49
Polyglyceryl-10 Decaethylhexanoate	undiluted; 100 µl	human-derived epidermal keratinocytes	EpiOcular™ tissue model distilled water served as a negative control	classified as non-irritating ET ₅₀ was >256 min	106
Polyglyceryl-10 Diisostearate	1000 mg/l (max)	rabbit corneal epithelial cells	SIRC-NR	non-irritant	106
Polyglyceryl-10 Pentaisostearate	undiluted; 100 µl	human-derived epidermal keratinocytes	EpiOcular™ tissue model distilled water served as a negative control	classified as non-irritating ET ₅₀ was >256 min	107

Table 15. Ocular irritation studies

Test Article	Concentration/Dose	#/Animals/Grp	Method	Results	Reference
ANIMAL					
Polyglyceryl Monoesters					
Polyglyceryl-3 Caprate	not provided	rabbits; # not stated	OECD 405 (acute eye irritation/corrosion)	not irritating	40
a polyglyceryl mono/diester of capric acid (C10) (provided as read-across for Polyglyceryl-3 Caprylate)	not provided	rabbits; # not stated	OECD 405 (acute eye irritation/corrosion)	not irritating	41
Polyglyceryl-3 Isostearate	not provided	rabbits;# not stated	FHSA/CPSC 16 CFR 1500.42	mildly irritating	42
Polyglyceryl-3 Oleate	not provided	rabbits;# not stated	FHSA/CPSC 16 CFR 1500.42	mildly irritating	43
Polyglyceryl-4 Caprate	not provided	rabbits; # not stated	OECD 405 (acute eye irritation/corrosion)	not irritating	44
Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters	undiluted; 0.1 ml	3 NZW rabbits	single instillation into the conjunctival sac of the right eye, and the eyes were not rinsed; the contralateral eye served as a control	minimal irritant; maximum group mean score of 2.7 minimal conjunctival irritation was observed in all treated eyes 1 h after instillation; 2 eyes were normal after 24 h, and all 3 were normal at 48 h	108
Polyglyceryl-10 Laurate	undiluted; 0.1ml	3 NZW rabbits	in accordance with OECD 405 test guideline eyes were not rinsed	minimal irritant; maximum group mean score of 10.7/110 (at 1 h); moderate conjunctival irritation observed after 1 h and minimal conjunctival irritation at 24 h was completely reversible by 48 h	108
Polyglyceryl-10 Myristate	undiluted; 0.1 ml	3 NZW rabbits	in accordance with OECD 405 test guideline eyes were not rinsed	minimal irritant; maximum group mean score of 10.0/110 (at 1 h); moderate conjunctival irritation observed after 1 h and minimal conjunctival irritation at 24 h was completely reversible by 48 h	104
Polyglyceryl-10 Isostearate	undiluted; 0.1 ml	3 NZW rabbits	OECD 405 test guideline eyes were not rinsed	minimal irritant; maximum group mean score of 8.0/110 (at 1 h); moderate conjunctival irritation observed after 1 h was completely reversible by 48 h	104
Polyglyceryl Multi-Esters					
Polyglyceryl-2 Diisostearate	undiluted, 0.1 ml	3 NZW rabbits	in accordance with OECD test guideline 405 eyes were rinsed after 24 h and at all exams	not irritating; some observations were made at 24 h, but were fully reversible at 48 h	38
Polyglyceryl-2 Diisostearate	undiluted, 0.1 ml	6 NZW rabbits	rinsing not specified	not a primary eye irritant; at 24 h, 4 animals had injected vessels and 1 had swelling; at 48 h, 2 animals had erythema and 2 had swelling; no effects were seen at 72 h	38
Polyglyceryl-2 Diisostearate	0.1 and 10% in saline and undiluted; 0.1 ml	2 Albino-Himalayan-Kaninchen rabbits/gp	eyes were rinsed after 24 h	some ocular effects, including reddening were observed at all concentrations tested, but the results were not quantified	38
Polyglyceryl-2 Dioleate	undiluted	3 rabbits	rinsing not specified	not irritating; no signs of irritation were observed	46
Polyglyceryl-3 Diisostearate	not stated; assumed to be undiluted	3 New Zealand albino rabbits	in accordance with OECD test guideline 405	non-irritating; at 1 h in animals, chemosis (score of 1) and redness (score of 2) were reported; at 72 h, chemosis was completely resolved and the redness score was 1	47
1,2,3-propanetriol, homopolymer, diisooctadecanoate (n not defined most likely Polyglyceryl-3 Diisostearate)	undiluted; 0.1 ml	4 male Kleinrusse rabbits	eyes were not rinsed	not irritating; at 24 h, very slight redness of the conjunctivae was observed in 1 animal, and the effect was reversible within 48 h	39
Macadamia Seed Oil Polyglyceryl-6 Esters Behenate	undiluted; 0.1 ml	3 NZW rabbits	single instillation into the conjunctival sac of the right eye, and the eyes were not rinsed; the contralateral eye served as a control	minimal irritant; maximum group mean score of 3.3 minimal conjunctival irritation was observed in all treated eyes 1 h after instillation; all eyes were normal after 24 h	109

Table 15. Ocular irritation studies

Test Article	Concentration/Dose	#/Animals/Grp	Method	Results	Reference
Polyglyceryl-8 Decabehenate/ Caprate	undiluted; 0.1 ml	3 NZW rabbits	single instillation into the conjunctival sac of the right eye, and the eyes were not rinsed; the contralateral eye served as a control	minimal irritant; maximum group mean score of 13.0 moderate conjunctival irritation was observed in all treated eyes at 1 h and minimal conjunctival irritation in all treated eyes at 24 h after instillation; all eyes were normal after 48 h	10
Polyglyceryl-8 Decaerucate/ Decaisostearate/Decaricinoleate	undiluted; 0.1 ml	3 NZW rabbits	single instillation into the conjunctival sac of the right eye, and the eyes were not rinsed; the contralateral eye served as a control	mild irritant; maximum group mean score of 10.0 moderate conjunctival irritation was observed in all treated eyes 1 h after instillation; minimal conjunctival irritation was observed in all treated eyes at 24 h and in 1 eye at 48 h after instillation	10
Polyglyceryl-10 Nonaisostearate	undiluted; 0.1 ml	3 NZW rabbits	in accordance with OECD 405 test guideline eyes were not rinsed	mild irritant; maximum group mean score of 6.7/110 (at 1 h); minimal to moderate conjunctival irritation was completely reversible by 48 h (2 animals) to 72 h	10
HUMAN					
Polyglyceryl Monoesters					
Polyglyceryl-10 Laurate (~60% pure, with ~40% polyglycerin-10 and ~2% sodium laurate)	not provided	not provided	not provided	possibly slightly irritating to the eyes	20

Abbreviations: HCE – human corneal epithelium; HET-CAM - Hen's Egg Test – Chorioallantoic Membrane; ME – microemulsion; NR – neutral red; NZW – New Zealand White; OECD – Organisation for Economic Co-operation and Development; REET – rabbit enucleated eye test; SIRC – Statens Seruminstitut rabbit cornea cells

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ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST03B - Eyeliner		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST03F - Mascara		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST04E - Other Fragrance Preparati		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST07A - Blushers (all types)		2
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST07E - Lipstick		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST07I - Other Makeup Preparations		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST10E - Other Personal Cleanliness		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST12C - Face and Neck (exc shave)		3
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST12D - Body and Hand (exc shave)		1
ACACIA DECURRENS/JOJOBA/SUNFLOWER SEED WAX/POLYGLYCERYL-3 EST12F - Moisturizing		2
BABASSU OIL POLYGLYCERYL-4 ESTERS	05F - Shampoos (non-coloring)	17
BABASSU OIL POLYGLYCERYL-4 ESTERS	12A - Cleansing	1
BABASSU OIL POLYGLYCERYL-6 ESTERS	12A - Cleansing	1
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	01B - Baby Lotions, Oils, Powders	1
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	03D - Eye Lotion	4
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	03G - Other Eye Makeup Preparat	4
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	07C - Foundations	1
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	07E - Lipstick	1
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	12A - Cleansing	1
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	12C - Face and Neck (exc shave)	2
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	12D - Body and Hand (exc shave)	1
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	12F - Moisturizing	2
CANDELILLA/JOJOBA/RICE BRAN POLYGLYCERYL-3 ESTERS	12G - Night	3
CAPRYLIC/CAPRIC GLYCERIDES POLYGLYCERIN-10 ESTERS	12A - Cleansing	2
CAPRYLIC/CAPRIC GLYCERIDES POLYGLYCERIN-10 ESTERS	12C - Face and Neck (exc shave)	1
CAPRYLIC/CAPRIC GLYCERIDES POLYGLYCERIN-10 ESTERS	12D - Body and Hand (exc shave)	2
CAPRYLIC/CAPRIC GLYCERIDES POLYGLYCERIN-10 ESTERS	12F - Moisturizing	1
COCONUT OIL POLYGLYCERYL-6 ESTERS	10E - Other Personal Cleanliness	1
COCONUT OIL POLYGLYCERYL-6 ESTERS	12A - Cleansing	1
DIISOSTEAROYL POLYGLYCERYL-3 DIMER DILINOLEATE	03C - Eye Shadow	1
DIISOSTEAROYL POLYGLYCERYL-3 DIMER DILINOLEATE	12G - Night	3
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	03B - Eyeliner	1
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	03C - Eye Shadow	1
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	07A - Blushers (all types)	1
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	07C - Foundations	2
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	07E - Lipstick	2
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	12D - Body and Hand (exc shave)	1
GLYCERYL/POLYGLYCERYL-6 ISOSTEARATE/BEHENATE ESTERS	12J - Other Skin Care Preps	2
MACADAMIA SEED OIL POLYGLYCERYL-6 ESTERS BEHENATE	03C - Eye Shadow	1
MACADAMIA SEED OIL POLYGLYCERYL-6 ESTERS BEHENATE	03F - Mascara	1
MACADAMIA SEED OIL POLYGLYCERYL-6 ESTERS BEHENATE	03G - Other Eye Makeup Preparat	1
MACADAMIA SEED OIL POLYGLYCERYL-6 ESTERS BEHENATE	07G - Rouges	1
MACADAMIA SEED OIL POLYGLYCERYL-6 ESTERS BEHENATE	13A - Suntan Gels, Creams, and L	1
PALM OIL POLYGLYCERYL-4 ESTERS	12D - Body and Hand (exc shave)	1

POLYGLYCERYL-2 CAPRATE	04E - Other Fragrance Preparati	1
POLYGLYCERYL-2 CAPRATE	12D - Body and Hand (exc shave)	4
POLYGLYCERYL-2 CAPRATE	12F - Moisturizing	1
POLYGLYCERYL-2 DIISOSTEARATE	03C - Eye Shadow	1
POLYGLYCERYL-2 DIISOSTEARATE	03D - Eye Lotion	3
POLYGLYCERYL-2 DIISOSTEARATE	03F - Mascara	2
POLYGLYCERYL-2 DIISOSTEARATE	07A - Blushers (all types)	1
POLYGLYCERYL-2 DIISOSTEARATE	07C - Foundations	1
POLYGLYCERYL-2 DIISOSTEARATE	07E - Lipstick	39
POLYGLYCERYL-2 DIISOSTEARATE	07F - Makeup Bases	2
POLYGLYCERYL-2 DIISOSTEARATE	07G - Rouges	7
POLYGLYCERYL-2 DIISOSTEARATE	07H - Makeup Fixatives	3
POLYGLYCERYL-2 DIISOSTEARATE	07I - Other Makeup Preparations	4
POLYGLYCERYL-2 DIISOSTEARATE	12A - Cleansing	1
POLYGLYCERYL-2 DIISOSTEARATE	12C - Face and Neck (exc shave)	11
POLYGLYCERYL-2 DIISOSTEARATE	12D - Body and Hand (exc shave)	3
POLYGLYCERYL-2 DIISOSTEARATE	12F - Moisturizing	5
POLYGLYCERYL-2 DIISOSTEARATE	12H - Paste Masks (mud packs)	1
POLYGLYCERYL-2 DIISOSTEARATE	13A - Suntan Gels, Creams, and L	2
POLYGLYCERYL-2 ISOPALMITATE	07E - Lipstick	9
POLYGLYCERYL-2 ISOSTEARATE	07B - Face Powders	2
POLYGLYCERYL-2 ISOSTEARATE	07C - Foundations	2
POLYGLYCERYL-2 ISOSTEARATE	07E - Lipstick	1
POLYGLYCERYL-2 ISOSTEARATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-2 ISOSTEARATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-2 ISOSTEARATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-2 LAURATE	03D - Eye Lotion	1
POLYGLYCERYL-2 LAURATE	05F - Shampoos (non-coloring)	1
POLYGLYCERYL-2 LAURATE	12A - Cleansing	2
POLYGLYCERYL-2 LAURATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-2 LAURATE	12F - Moisturizing	1
POLYGLYCERYL-2 LAURATE	12G - Night	1
POLYGLYCERYL-2 LAURATE	12I - Skin Fresheners	1
POLYGLYCERYL-2 LAURATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-2 OLEATE	07C - Foundations	1
POLYGLYCERYL-2 OLEATE	12C - Face and Neck (exc shave)	2
POLYGLYCERYL-2 OLEATE	12F - Moisturizing	1
POLYGLYCERYL-2 SESQUIISOSTEARATE	07C - Foundations	1
POLYGLYCERYL-2 SESQUIISOSTEARATE	07E - Lipstick	2
POLYGLYCERYL-2 SESQUIISOSTEARATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-2 SESQUIISOSTEARATE	08G - Other Manicuring Preparatic	1

POLYGLYCERYL-2 SESQUIISOSTEARATE	12A - Cleansing	2
POLYGLYCERYL-2 SESQUIISOSTEARATE	12C - Face and Neck (exc shave)	2
POLYGLYCERYL-2 SESQUIISOSTEARATE	12F - Moisturizing	2
Polyglyceryl-2 Stearate	no VCRP, but conc of use	
POLYGLYCERYL-2 TETRAISOSTEARATE	07C - Foundations	2
POLYGLYCERYL-2 TETRAISOSTEARATE	07E - Lipstick	27
POLYGLYCERYL-2 TETRAISOSTEARATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-2 TRIISOSTEARATE	03A - Eyebrow Pencil	6
POLYGLYCERYL-2 TRIISOSTEARATE	03B - Eyeliner	3
POLYGLYCERYL-2 TRIISOSTEARATE	03C - Eye Shadow	10
POLYGLYCERYL-2 TRIISOSTEARATE	03E - Eye Makeup Remover	2
POLYGLYCERYL-2 TRIISOSTEARATE	03F - Mascara	1
POLYGLYCERYL-2 TRIISOSTEARATE	07A - Blushers (all types)	7
POLYGLYCERYL-2 TRIISOSTEARATE	07B - Face Powders	2
POLYGLYCERYL-2 TRIISOSTEARATE	07C - Foundations	9
POLYGLYCERYL-2 TRIISOSTEARATE	07E - Lipstick	89
POLYGLYCERYL-2 TRIISOSTEARATE	07F - Makeup Bases	2
POLYGLYCERYL-2 TRIISOSTEARATE	07G - Rouges	9
POLYGLYCERYL-2 TRIISOSTEARATE	07I - Other Makeup Preparations	13
POLYGLYCERYL-2 TRIISOSTEARATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-2 TRIISOSTEARATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-2 TRIISOSTEARATE	12D - Body and Hand (exc shave)	2
POLYGLYCERYL-2 TRIISOSTEARATE	12F - Moisturizing	4
POLYGLYCERYL-2 TRIISOSTEARATE	12G - Night	2
POLYGLYCERYL-2 TRIISOSTEARATE	12J - Other Skin Care Preps	2
POLYGLYCERYL-3 BEESWAX	02D - Other Bath Preparations	1
POLYGLYCERYL-3 BEESWAX	03C - Eye Shadow	1
POLYGLYCERYL-3 BEESWAX	03D - Eye Lotion	6
POLYGLYCERYL-3 BEESWAX	03F - Mascara	3
POLYGLYCERYL-3 BEESWAX	03G - Other Eye Makeup Preparat	1
POLYGLYCERYL-3 BEESWAX	04E - Other Fragrance Preparatio	1
POLYGLYCERYL-3 BEESWAX	07C - Foundations	11
POLYGLYCERYL-3 BEESWAX	07E - Lipstick	9
POLYGLYCERYL-3 BEESWAX	07F - Makeup Bases	1
POLYGLYCERYL-3 BEESWAX	07I - Other Makeup Preparations	2
POLYGLYCERYL-3 BEESWAX	10A - Bath Soaps and Detergents	8
POLYGLYCERYL-3 BEESWAX	11E - Shaving Cream	3
POLYGLYCERYL-3 BEESWAX	12A - Cleansing	9
POLYGLYCERYL-3 BEESWAX	12C - Face and Neck (exc shave)	6
POLYGLYCERYL-3 BEESWAX	12D - Body and Hand (exc shave)	9
POLYGLYCERYL-3 BEESWAX	12F - Moisturizing	29
POLYGLYCERYL-3 BEESWAX	12G - Night	3
POLYGLYCERYL-3 BEESWAX	12H - Paste Masks (mud packs)	5

POLYGLYCERYL-3 BEESWAX	12J - Other Skin Care Preps	3
POLYGLYCERYL-3 CAPRATE	10A - Bath Soaps and Detergents	1
POLYGLYCERYL-3 CAPRATE	10B - Deodorants (underarm)	11
POLYGLYCERYL-3 CAPRYLATE	10A - Bath Soaps and Detergents	2
POLYGLYCERYL-3 CAPRYLATE	10B - Deodorants (underarm)	3
POLYGLYCERYL-3 CAPRYLATE	12A - Cleansing	1
POLYGLYCERYL-3 CAPRYLATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-3 CAPRYLATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-3 DICITRATE/STEARATE	05G - Tonics, Dressings, and Other	3
POLYGLYCERYL-3 DICITRATE/STEARATE	12C - Face and Neck (exc shave)	2
POLYGLYCERYL-3 DICITRATE/STEARATE	12D - Body and Hand (exc shave)	5
POLYGLYCERYL-3 DICITRATE/STEARATE	12F - Moisturizing	3
POLYGLYCERYL-3 DIISOSTEARATE	02A - Bath Oils, Tablets, and Salts	1
POLYGLYCERYL-3 DIISOSTEARATE	03B - Eyeliner	7
POLYGLYCERYL-3 DIISOSTEARATE	03C - Eye Shadow	18
POLYGLYCERYL-3 DIISOSTEARATE	03D - Eye Lotion	2
POLYGLYCERYL-3 DIISOSTEARATE	03F - Mascara	5
POLYGLYCERYL-3 DIISOSTEARATE	03G - Other Eye Makeup Preparations	5
POLYGLYCERYL-3 DIISOSTEARATE	07A - Blushers (all types)	5
POLYGLYCERYL-3 DIISOSTEARATE	07B - Face Powders	5
POLYGLYCERYL-3 DIISOSTEARATE	07C - Foundations	23
POLYGLYCERYL-3 DIISOSTEARATE	07E - Lipstick	216
POLYGLYCERYL-3 DIISOSTEARATE	07F - Makeup Bases	3
POLYGLYCERYL-3 DIISOSTEARATE	07I - Other Makeup Preparations	10
POLYGLYCERYL-3 DIISOSTEARATE	10A - Bath Soaps and Detergents	1
POLYGLYCERYL-3 DIISOSTEARATE	10E - Other Personal Cleanliness	3
POLYGLYCERYL-3 DIISOSTEARATE	11E - Shaving Cream	1
POLYGLYCERYL-3 DIISOSTEARATE	12A - Cleansing	2
POLYGLYCERYL-3 DIISOSTEARATE	12C - Face and Neck (exc shave)	14
POLYGLYCERYL-3 DIISOSTEARATE	12D - Body and Hand (exc shave)	11
POLYGLYCERYL-3 DIISOSTEARATE	12F - Moisturizing	23
POLYGLYCERYL-3 DIISOSTEARATE	12G - Night	4
POLYGLYCERYL-3 DIISOSTEARATE	12J - Other Skin Care Preps	4
POLYGLYCERYL-3 DIISOSTEARATE	13A - Suntan Gels, Creams, and Lotions	5
POLYGLYCERYL-3 DIISOSTEARATE	13B - Indoor Tanning Preparations	2
POLYGLYCERYL-3 DIISOSTEARATE	13C - Other Suntan Preparations	1
POLYGLYCERYL-3 DISTEARATE	05A - Hair Conditioner	1
POLYGLYCERYL-3 DISTEARATE	05B - Hair Spray (aerosol fixatives)	1
POLYGLYCERYL-3 DISTEARATE	05F - Shampoos (non-coloring)	2
POLYGLYCERYL-3 DISTEARATE	05G - Tonics, Dressings, and Other	2
POLYGLYCERYL-3 DISTEARATE	12F - Moisturizing	4

POLYGLYCERYL-3 ISOSTEARATE	03D - Eye Lotion	1
POLYGLYCERYL-3 ISOSTEARATE	07F - Makeup Bases	1
POLYGLYCERYL-3 ISOSTEARATE	12A - Cleansing	2
POLYGLYCERYL-3 ISOSTEARATE	12C - Face and Neck (exc shave)	2
POLYGLYCERYL-3 ISOSTEARATE	12D - Body and Hand (exc shave)	2
POLYGLYCERYL-3 ISOSTEARATE	12F - Moisturizing	3
POLYGLYCERYL-3 LAURATE	05F - Shampoos (non-coloring)	3
POLYGLYCERYL-3 LAURATE	10A - Bath Soaps and Detergents	185
POLYGLYCERYL-3 LAURATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-3 LAURATE	12A - Cleansing	1
POLYGLYCERYL-3 LAURATE	12D - Body and Hand (exc shave)	1
POLYGLYCERYL-3 LAURATE	12H - Paste Masks (mud packs)	1
POLYGLYCERYL-3 OLEATE	03G - Other Eye Makeup Preparat	2
POLYGLYCERYL-3 OLEATE	12A - Cleansing	1
POLYGLYCERYL-3 OLEATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-3 OLEATE	12D - Body and Hand (exc shave)	1
POLYGLYCERYL-3 OLEATE	12F - Moisturizing	3
POLYGLYCERYL-3 OLEATE	12H - Paste Masks (mud packs)	2
POLYGLYCERYL-3 OLEATE	12I - Skin Fresheners	1
POLYGLYCERYL-3 OLEATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-3 OLEATE	13A - Suntan Gels, Creams, and L	2
POLYGLYCERYL-3 PALMITATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-3 RICINOLEATE	03F - Mascara	2
POLYGLYCERYL-3 RICINOLEATE	03G - Other Eye Makeup Preparat	3
POLYGLYCERYL-3 RICINOLEATE	07C - Foundations	3
POLYGLYCERYL-3 RICINOLEATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-3 RICINOLEATE	12D - Body and Hand (exc shave)	3
POLYGLYCERYL-3 RICINOLEATE	12F - Moisturizing	35
POLYGLYCERYL-3 RICINOLEATE	13B - Indoor Tanning Preparations	1
POLYGLYCERYL-3 STEARATE	07A - Blushers (all types)	1
POLYGLYCERYL-3 STEARATE	07E - Lipstick	1
POLYGLYCERYL-3 STEARATE	12A - Cleansing	3
POLYGLYCERYL-3 STEARATE	12C - Face and Neck (exc shave)	3
POLYGLYCERYL-3 STEARATE	12D - Body and Hand (exc shave)	5
POLYGLYCERYL-3 STEARATE	12F - Moisturizing	2
POLYGLYCERYL-3 STEARATE	12G - Night	2
POLYGLYCERYL-4 CAPRATE	02A - Bath Oils, Tablets, and Salts	1
POLYGLYCERYL-4 CAPRATE	03E - Eye Makeup Remover	2
POLYGLYCERYL-4 CAPRATE	05G - Tonics, Dressings, and Othe	1
POLYGLYCERYL-4 CAPRATE	07I - Other Makeup Preparations	2
POLYGLYCERYL-4 CAPRATE	10A - Bath Soaps and Detergents	3

POLYGLYCERYL-4 CAPRATE	10B - Deodorants (underarm)	1
POLYGLYCERYL-4 CAPRATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-4 CAPRATE	12A - Cleansing	5
POLYGLYCERYL-4 CAPRATE	12C - Face and Neck (exc shave)	2
POLYGLYCERYL-4 CAPRATE	12H - Paste Masks (mud packs)	1
POLYGLYCERYL-4 COCOATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-4 ISOSTEARATE	01B - Baby Lotions, Oils, Powders	1
POLYGLYCERYL-4 ISOSTEARATE	03A - Eyebrow Pencil	1
POLYGLYCERYL-4 ISOSTEARATE	03B - Eyeliner	3
POLYGLYCERYL-4 ISOSTEARATE	03C - Eye Shadow	23
POLYGLYCERYL-4 ISOSTEARATE	03D - Eye Lotion	2
POLYGLYCERYL-4 ISOSTEARATE	03F - Mascara	4
POLYGLYCERYL-4 ISOSTEARATE	03G - Other Eye Makeup Preparat	18
POLYGLYCERYL-4 ISOSTEARATE	05G - Tonics, Dressings, and Othe	2
POLYGLYCERYL-4 ISOSTEARATE	07A - Blushers (all types)	3
POLYGLYCERYL-4 ISOSTEARATE	07B - Face Powders	3
POLYGLYCERYL-4 ISOSTEARATE	07C - Foundations	88
POLYGLYCERYL-4 ISOSTEARATE	07D - Leg and Body Paints	3
POLYGLYCERYL-4 ISOSTEARATE	07E - Lipstick	44
POLYGLYCERYL-4 ISOSTEARATE	07F - Makeup Bases	17
POLYGLYCERYL-4 ISOSTEARATE	07G - Rouges	1
POLYGLYCERYL-4 ISOSTEARATE	07H - Makeup Fixatives	2
POLYGLYCERYL-4 ISOSTEARATE	07I - Other Makeup Preparations	28
POLYGLYCERYL-4 ISOSTEARATE	08G - Other Manicuring Preparatic	1
POLYGLYCERYL-4 ISOSTEARATE	12C - Face and Neck (exc shave)	7
POLYGLYCERYL-4 ISOSTEARATE	12F - Moisturizing	12
POLYGLYCERYL-4 ISOSTEARATE	12G - Night	1
POLYGLYCERYL-4 ISOSTEARATE	12H - Paste Masks (mud packs)	1
POLYGLYCERYL-4 ISOSTEARATE	12J - Other Skin Care Preps	10
POLYGLYCERYL-4 ISOSTEARATE	13B - Indoor Tanning Preparations	5
POLYGLYCERYL-4 LAURATE	03D - Eye Lotion	1
POLYGLYCERYL-4 LAURATE	07C - Foundations	2
POLYGLYCERYL-4 LAURATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-4 LAURATE	12A - Cleansing	4
POLYGLYCERYL-4 LAURATE	12F - Moisturizing	3
POLYGLYCERYL-4 LAURATE	13B - Indoor Tanning Preparations	1
POLYGLYCERYL-4 OLEATE	03D - Eye Lotion	2
POLYGLYCERYL-4 OLEATE	07C - Foundations	1
POLYGLYCERYL-4 OLEATE	07D - Leg and Body Paints	1
POLYGLYCERYL-4 OLEATE	12F - Moisturizing	3
POLYGLYCERYL-5 DIOLEATE	10E - Other Personal Cleanliness	1

POLYGLYCERYL-5 ISOSTEARATE	03G - Other Eye Makeup Preparat	1
POLYGLYCERYL-5 ISOSTEARATE	12D - Body and Hand (exc shave)	1
POLYGLYCERYL-5 LAURATE	02B - Bubble Baths	1
POLYGLYCERYL-5 LAURATE	10A - Bath Soaps and Detergents	1
POLYGLYCERYL-5 OLEATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-5 OLEATE	12A - Cleansing	1
POLYGLYCERYL-5 OLEATE	12F - Moisturizing	2
POLYGLYCERYL-5 OLEATE	12I - Skin Fresheners	5
POLYGLYCERYL-5 OLEATE	12J - Other Skin Care Preps	2
POLYGLYCEROL-5 STEARATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-5 TRIOLEATE	12C - Face and Neck (exc shave)	5
POLYGLYCERYL-5 TRIOLEATE	12F - Moisturizing	2
Polyglyceryl-6 Caprylate/Caprato	no VCRP, but conc of use	
POLYGLYCERYL-6 DIOLEATE	05A - Hair Conditioner	6
POLYGLYCERYL-6 DIOLEATE	07E - Lipstick	2
POLYGLYCERYL-6 DIOLEATE	07I - Other Makeup Preparations	7
POLYGLYCERYL-6 DIOLEATE	12A - Cleansing	1
POLYGLYCERYL-6 DIOLEATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-6 DIOLEATE	12D - Body and Hand (exc shave)	9
POLYGLYCERYL-6 DIOLEATE	12F - Moisturizing	2
POLYGLYCERYL-6 DIOLEATE	12J - Other Skin Care Preps	2
POLYGLYCERYL-6 DISTEARATE	01B - Baby Lotions, Oils, Powders	1
POLYGLYCERYL-6 DISTEARATE	02D - Other Bath Preparations	1
POLYGLYCERYL-6 DISTEARATE	03B - Eyeliner	1
POLYGLYCERYL-6 DISTEARATE	03C - Eye Shadow	1
POLYGLYCERYL-6 DISTEARATE	03D - Eye Lotion	2
POLYGLYCERYL-6 DISTEARATE	03F - Mascara	3
POLYGLYCERYL-6 DISTEARATE	07C - Foundations	1
POLYGLYCERYL-6 DISTEARATE	07E - Lipstick	1
POLYGLYCERYL-6 DISTEARATE	10A - Bath Soaps and Detergents	8
POLYGLYCERYL-6 DISTEARATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-6 DISTEARATE	12A - Cleansing	9
POLYGLYCERYL-6 DISTEARATE	12C - Face and Neck (exc shave)	8
POLYGLYCERYL-6 DISTEARATE	12D - Body and Hand (exc shave)	8
POLYGLYCERYL-6 DISTEARATE	12F - Moisturizing	23
POLYGLYCERYL-6 DISTEARATE	12G - Night	2
POLYGLYCERYL-6 DISTEARATE	13B - Indoor Tanning Preparations	1
POLYGLYCERYL-6 ISOSTEARATE	07E - Lipstick	1
POLYGLYCERYL-6 ISOSTEARATE	12C - Face and Neck (exc shave)	7

POLYGLYCERYL-6 ISOSTEARATE	12D - Body and Hand (exc shave)	1
POLYGLYCERYL-6 ISOSTEARATE	12F - Moisturizing	3
POLYGLYCERYL-6 ISOSTEARATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-6 ISOSTEARATE	13A - Suntan Gels, Creams, and L	1
POLYGLYCERYL-6 OCTASTEARATE	12F - Moisturizing	1
POLYGLYCERYL-6 OLEATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-6 RICINOLEATE	07E - Lipstick	1
POLYGLYCERYL-6 RICINOLEATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-8 DECAERUCATE/DECAISOSTEARATE/DECARICINOLEATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-10 BEHENATE/EICOSADIOATE	12A - Cleansing	1
POLYGLYCERYL-10 BEHENATE/EICOSADIOATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-10 CAPRYLATE/CAPRATE	12A - Cleansing	1
POLYGLYCERYL-10 DECAISOSTEARATE	03C - Eye Shadow	3
POLYGLYCERYL-10 DECAOLEATE	07C - Foundations	1
POLYGLYCERYL-10 DECAOLEATE	07E - Lipstick	3
POLYGLYCERYL-10 DECAOLEATE	07F - Makeup Bases	1
POLYGLYCERYL-10 DECAOLEATE	12F - Moisturizing	5
POLYGLYCERYL-10 DECAOLEATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-10 DIISOSTEARATE	07F - Makeup Bases	1
POLYGLYCERYL-10 DIISOSTEARATE	12A - Cleansing	1
POLYGLYCERYL-10 DIISOSTEARATE	12C - Face and Neck (exc shave)	4
POLYGLYCERYL-10 DIISOSTEARATE	12F - Moisturizing	4
POLYGLYCERYL-10 DIPALMITATE	02A - Bath Oils, Tablets, and Salts	2
POLYGLYCERYL-10 DIPALMITATE	07E - Lipstick	1
POLYGLYCERYL-10 DIPALMITATE	10E - Other Personal Cleanliness	9
POLYGLYCERYL-10 DIPALMITATE	12A - Cleansing	2
POLYGLYCERYL-10 DIPALMITATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-10 DIPALMITATE	12H - Paste Masks (mud packs)	1
POLYGLYCERYL-10 DIPALMITATE	12J - Other Skin Care Preps	1
POLYGLYCERYL-10 DISTEARATE	10E - Other Personal Cleanliness	1
POLYGLYCERYL-10 DISTEARATE	12F - Moisturizing	9
POLYGLYCERYL-10 HEPTAHYDROXYSTEARATE	07C - Foundations	1
POLYGLYCERYL-10 HYDROXYSTEARATE/STEARATE/EICOSADIOATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-10 HYDROXYSTEARATE/STEARATE/EICOSADIOATE	12A - Cleansing	1
POLYGLYCERYL-10 ISOSTEARATE	12C - Face and Neck (exc shave)	1
POLYGLYCERYL-10 ISOSTEARATE	12F - Moisturizing	4
POLYGLYCERYL-10 ISOSTEARATE	12G - Night	1
POLYGLYCERYL-10 LAURATE	01A - Baby Shampoos	2

POLYGLYCERYL-10 LAURATE	01C - Other Baby Products	5
POLYGLYCERYL-10 LAURATE	03B - Eyeliner	1
POLYGLYCERYL-10 LAURATE	03D - Eye Lotion	2
POLYGLYCERYL-10 LAURATE	03G - Other Eye Makeup Preparat	2
POLYGLYCERYL-10 LAURATE	04A - Cologne and Toilet waters	1
POLYGLYCERYL-10 LAURATE	04B - Perfumes	1
POLYGLYCERYL-10 LAURATE	05A - Hair Conditioner	2
POLYGLYCERYL-10 LAURATE	05I - Other Hair Preparations	2
POLYGLYCERYL-10 LAURATE	07I - Other Makeup Preparations	2
POLYGLYCERYL-10 LAURATE	12A - Cleansing	5
POLYGLYCERYL-10 LAURATE	12C - Face and Neck (exc shave)	10
POLYGLYCERYL-10 LAURATE	12D - Body and Hand (exc shave)	2
POLYGLYCERYL-10 LAURATE	12F - Moisturizing	8
POLYGLYCERYL-10 LAURATE	12G - Night	2
POLYGLYCERYL-10 LAURATE	12I - Skin Fresheners	1
POLYGLYCERYL-10 LAURATE	12J - Other Skin Care Preps	4
POLYGLYCERYL-10 MYRISTATE	01A - Baby Shampoos	1
POLYGLYCERYL-10 MYRISTATE	03C - Eye Shadow	1
POLYGLYCERYL-10 MYRISTATE	03D - Eye Lotion	1
POLYGLYCERYL-10 MYRISTATE	07I - Other Makeup Preparations	1
POLYGLYCERYL-10 MYRISTATE	12A - Cleansing	6
POLYGLYCERYL-10 MYRISTATE	12C - Face and Neck (exc shave)	4
POLYGLYCERYL-10 MYRISTATE	12F - Moisturizing	1
POLYGLYCERYL-10 MYRISTATE	13A - Suntan Gels, Creams, and L	3
POLYGLYCERYL-10 MYRISTATE	13B - Indoor Tanning Preparations	1
POLYGLYCERYL-10 NONAISOSTEARATE	03C - Eye Shadow	15
POLYGLYCERYL-10 NONAISOSTEARATE	03G - Other Eye Makeup Preparat	5
POLYGLYCERYL-10 NONAISOSTEARATE	07C - Foundations	2
POLYGLYCERYL-10 NONAISOSTEARATE	07E - Lipstick	16
POLYGLYCERYL-10 NONAISOSTEARATE	07I - Other Makeup Preparations	7
POLYGLYCERYL-10 OLEATE	01A - Baby Shampoos	1
POLYGLYCERYL-10 OLEATE	05A - Hair Conditioner	2
POLYGLYCERYL-10 OLEATE	05F - Shampoos (non-coloring)	2
POLYGLYCERYL-10 OLEATE	05G - Tonics, Dressings, and Oth	1
POLYGLYCERYL-10 OLEATE	11G - Other Shaving Preparation I	1
POLYGLYCERYL-10 OLEATE	12C - Face and Neck (exc shave)	8
POLYGLYCERYL-10 OLEATE	12D - Body and Hand (exc shave)	2
POLYGLYCERYL-10 OLEATE	12F - Moisturizing	5
POLYGLYCERYL-10 OLEATE	12H - Paste Masks (mud packs)	2
POLYGLYCERYL-10 OLEATE	12J - Other Skin Care Preps	2
POLYGLYCERYL-10 OLEATE	13A - Suntan Gels, Creams, and L	3
POLYGLYCERYL-10 PENTAHYDROXYSTEARATE	03F - Mascara	1
POLYGLYCERYL-10 PENTAHYDROXYSTEARATE	12G - Night	1
POLYGLYCERYL-10 PENTAHYDROXYSTEARATE	12H - Paste Masks (mud packs)	1
POLYGLYCERYL-10 PENTAOLEATE	05B - Hair Spray (aerosol fixatives	3
POLYGLYCERYL-10 PENTAOLEATE	05G - Tonics, Dressings, and Oth	1
POLYGLYCERYL-10 PENTAOLEATE	07E - Lipstick	1
POLYGLYCERYL-10 PENTAOLEATE	12G - Night	1
POLYGLYCERYL-10 PENTASTEARATE	03D - Eye Lotion	2

POLYGLYCERYL-10 PENTASTEARATE	05A - Hair Conditioner	1
POLYGLYCERYL-10 PENTASTEARATE	07C - Foundations	1
POLYGLYCERYL-10 PENTASTEARATE	12A - Cleansing	1
POLYGLYCERYL-10 PENTASTEARATE	12C - Face and Neck (exc shave)	5
POLYGLYCERYL-10 PENTASTEARATE	12F - Moisturizing	3
POLYGLYCERYL-10 PENTASTEARATE	12G - Night	2
POLYGLYCERYL-10 STEARATE	03C - Eye Shadow	3
POLYGLYCERYL-10 STEARATE	03D - Eye Lotion	2
POLYGLYCERYL-10 STEARATE	03G - Other Eye Makeup Preparat	8
POLYGLYCERYL-10 STEARATE	05G - Tonics, Dressings, and Othe	1
POLYGLYCERYL-10 STEARATE	07C - Foundations	2
POLYGLYCERYL-10 STEARATE	07F - Makeup Bases	1
POLYGLYCERYL-10 STEARATE	12A - Cleansing	5
POLYGLYCERYL-10 STEARATE	12C - Face and Neck (exc shave)	19
POLYGLYCERYL-10 STEARATE	12D - Body and Hand (exc shave)	14
POLYGLYCERYL-10 STEARATE	12E - Foot Powders and Sprays	1
POLYGLYCERYL-10 STEARATE	12F - Moisturizing	23
POLYGLYCERYL-10 STEARATE	12G - Night	5
POLYGLYCERYL-10 STEARATE	12H - Paste Masks (mud packs)	2
POLYGLYCERYL-10 STEARATE	12I - Skin Fresheners	1
POLYGLYCERYL-10 STEARATE	12J - Other Skin Care Preps	9
POLYGLYCERYL-10 STEARATE	13A - Suntan Gels, Creams, and L	3
POLYGLYCERYL-10 TRISTEARATE	03D - Eye Lotion	1
TRISOSTEAROYL POLYGLYCERYL-3 DIMER DILINOLEATE	03C - Eye Shadow	2
TRISOSTEAROYL POLYGLYCERYL-3 DIMER DILINOLEATE	07E - Lipstick	17
TRISOSTEAROYL POLYGLYCERYL-3 DIMER DILINOLEATE	07I - Other Makeup Preparations	1



Memorandum

TO: Lillian Gill, D.P.A.
Director - COSMETIC INGREDIENT REVIEW (CIR)

FROM: Beth A. Lange, Ph.D.
Industry Liaison to the CIR Expert Panel

DATE: March 25, 2016

SUBJECT: Information on Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters (SLR posted January 28, 2016)

SafePharm Laboratories. 2006. Acute dermal irritation in the rabbit (Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters).

Japan Hair Science Association. 2006. Patch test on the cosmetic ingredient Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters.

SafePharm Laboratories. 2006. Acute eye irritation in the rabbit Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters).

Phycher. 2006. Skin sensitization in the guinea pig- Magnusson and Kligman maximisation method (Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters).


SafePharm Laboratories. 2006. Acute oral toxicity in the rat - acute toxic class method (Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters).

SafePharm Laboratories. 2006. Reverse mutation assay "Ames test" using *Salmonella typhimurium* and *Escherichia coli* (Glyceryl/Polyglyceryl-6 Isostearate/Behenate Esters).



Memorandum

TO: Lillian Gill, D.P.A.
Director - COSMETIC INGREDIENT REVIEW (CIR)

FROM: Beth A. Lange, Ph.D. 
Industry Liaison to the CIR Expert Panel

DATE: March 24, 2016

SUBJECT: Comments on the Draft Report: Safety Assessment of Polyglyceryl Fatty Acid Esters as Used in Cosmetics (prepared for the March 31-April 1, 2016 CIR Expert Panel meeting)

Cosmetic Use, Summary - Please state the product category in which the highest use concentrations of Polyglyceryl-2 Triisostearate and Polyglyceryl-3 Diisostearate were reported.

Non-Cosmetic Use - The FDA inactive ingredient data base (<http://www.accessdata.fda.gov/scripts/cder/iig/index.Cfm>) is also a useful source for drug use of ingredients. For example, this database indicates that Polyglyceryl-3 Oleate is used in vaginal drug products at a concentration up to 2.7%.

Toxicokinetics - It is not clear how GLC analysis showing a dose-related increase in oleic acid indicated "that the absorption of dietary Polyglyceryl-10 Decaoleate was not complete" (reference32) In what, e.g., urine, feces, did they measure the oleic acid?

Ocular Irritation, Summary, Table 15 - SIRC is a type of cell - Statens Seruminstitut Rabbit Cornea Cells. NR stands for neutral red. The following reference provides details about the method.

Tani N, Knoshita S, Okamoto Y. 1999. Interlaboratory validation of the *in vitro* eye irritation tests for cosmetic ingredients (8) Evaluation of cytotoxicity tests on SIRC cells. *Toxicol In Vitro* 13(1): 175-187.

Table 3 - For the sections of Table 3 that show the same structure multiple times, e.g., Polyglyceryl-3 mixed esters (and other Polyglyceryl-n mixed esters), perhaps the structure could be shown once in the row with the group heading. For example, in the heading for Polyglyceryl-3 mixed esters, the monoester structure can be shown with n replaced by 3 and there could be a statement in the heading that the R structures vary by ingredient and are stated in the definitions.

Table 3, Olive Oil Polyglyceryl-3 Esters - There is a "4" with this structure that does not belong.

Table 7 - BHT can be deleted from the bottom of the Table as it is not in the table.

PubMed

Abstract

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Toxicol In Vitro. 1999 Feb;13(1):175-87.

Interlaboratory validation of the in vitro eye irritation tests for cosmetic ingredients. (8) Evaluation of cytotoxicity tests on SIRC cells.

Tani N¹, Kinoshita S, Okamoto Y, Kotani M, Itagaki H, Murakami N, Sugiura S, Usami M, Kato K, Kojima H, Ohno T, Saijo K, Kato M, Hayashi M, Ohno Y.

Author information

Abstract

Two common assays, the neutral red uptake assay (SIRC-NRU) and the crystal violet staining assay (SIRC-CVS), were evaluated as alternatives to the Draize eye irritation test (Draize test). The cytotoxicity of thirty-eight cosmetic ingredients as well as a physiological saline solution was determined on SIRC cells at five to seven laboratories. SIRC-NRU and SIRC-CVS were performed according to the common standard operating procedure (SOP). The 50% effective concentration (EC(50)) was determined for each ingredient. The EC(50) of SIRC-CVS was similar to that of SIRC-NRU, showing a strong correlation ($r=0.995$). The coefficient of variation (CV) of EC(50) which represents the interlaboratory reproducibility of SIRC-NRU was 32.1%, whereas that of SIRC-CVS was 32.8%. The logarithmically transformed EC(50) values showed a strong correlation with the maximal average Draize total score (MAS) (SIRC-NRU: $r=-0.816$ ($n=30$), SIRC-CVS: $r=-0.805$ ($n=29$)). Both methods could be applied to water-insoluble substances and dyes. However, strong acids, alkanolamines and alcohols had a tendency to deviate from the linear regression lines which were obtained from the in vivo and in vitro data for both methods in the present study. These results suggest that cytotoxicological testing on SIRC cells may provide an alternative method to the Draize test for cosmetic ingredients.

PMID: 20654475 [PubMed]

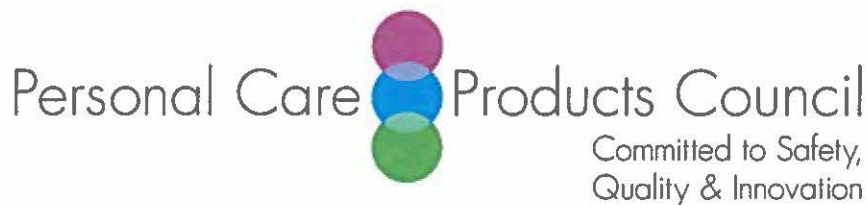
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Memorandum

TO: Lillian Gill, D.P.A.
Director - COSMETIC INGREDIENT REVIEW (CIR)

FROM: Beth A. Lange, Ph.D.
Industry Liaison to the CIR Expert Panel 

DATE: June 22, 2016

SUBJECT: Comments on the Tentative Report: Safety Assessment of Polyglyceryl Fatty Acid Esters as Used in Cosmetics (posted June 10, 2016)

Cosmetic Use, Summary - Please state the product category in which the highest use concentrations of Polyglyceryl-2 Triisostearate and Polyglyceryl-3 Diisostearate were reported.

Non-Cosmetic Use - Rather than a company website (reference 26), the FDA inactive ingredient database (<http://www.accessdata.fda.gov/scripts/cder/iig/index.Cfm>) would be a more authoritative reference to indicate that these ingredients are used in drugs. For example, this database indicates that Polyglyceryl-3 Oleate is used in vaginal drug products at a concentration up to 2.7%.

Penetration Enhancement; Polyglyceryl-3 Dioleate - This section should include descriptions of studies concerning penetration enhancement rather than statements found on a company website (reference 26).

It is not clear why the structure of ceramide AP is shown but not the structure of ceramide NP. What is the difference between these two materials?

ADME, Polyglyceryl Oleates and Decaoleates, Table 11 - There is no time frame stated for the studies from reference 31. Over what time periods were the urine and feces collected? In the description of these studies in the text, it is not always clear that it was just radioactivity that was measured, e.g., "No more than 5% of the glycerol-labeled esters were absorbed via the lymphatic system..." - unless they did additional analysis to identify the compound absorbed, this is more likely "No more than 5% of the radioactivity from the glycerol-labeled esters was absorbed via the lymphatic system".

It is not clear how GLC analysis showing a dose-related increase in oleic acid indicated "that the absorption of dietary Polyglyceryl-10 Decaoleate was not complete" (reference 32) In what, e.g., urine, feces, did they measure the oleic acid?

Chronic Toxicity Studies - The 2-year study in rats presented in the Carcinogenicity section should also be mentioned in the Chronic section.

Developmental and Reproductive Toxicity Studies, Oral, Polyglyceryl Esters - Were the rats fed "polyglycerol" as stated or polyglyceryl esters as suggested by the subtitle of the section?

Table 1 - As the ingredients are listed in the same order in the conclusion as in Table 1, is Table 1 really needed?

Table 3 - For the sections of Table 3 that show the same structure multiple times, e.g., Polyglyceryl-3 mixed esters (and other Polyglyceryl-n mixed esters), perhaps the structure could be shown once in the row with the group heading. For example, in the heading for Polyglyceryl-3 mixed esters, the monoester structure can be shown with n replaced by 3 and there could be a statement in the heading that the R structures vary by ingredient and are stated in the definitions.

Table 7 - BHT can be deleted from the bottom of the Table as it is not in the table. The abbreviation "EG" at the bottom of Table 7 needs to be corrected.

Table 14 - Although the reference may not have stated the species, the method used was OECD 429 and it says mouse.

Table 13 - Please correct: "not evidence of mutagenic activity" and "aberrant aberrations"

Ocular Irritation, Summary, Table 15 - SIRC is a type of cell - Statens Seruminstitut Rabbit Cornea Cells. NR stands for neutral red (as stated earlier in the report). The following reference provides details about the method.

Tani N, Knoshita S, Okamoto Y. 1999. Interlaboratory validation of the *in vitro* eye irritation tests for cosmetic ingredients (8) Evaluation of cytotoxicity tests on SIRC cells. *Toxicol In Vitro* 13(1): 175-187.