
Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics

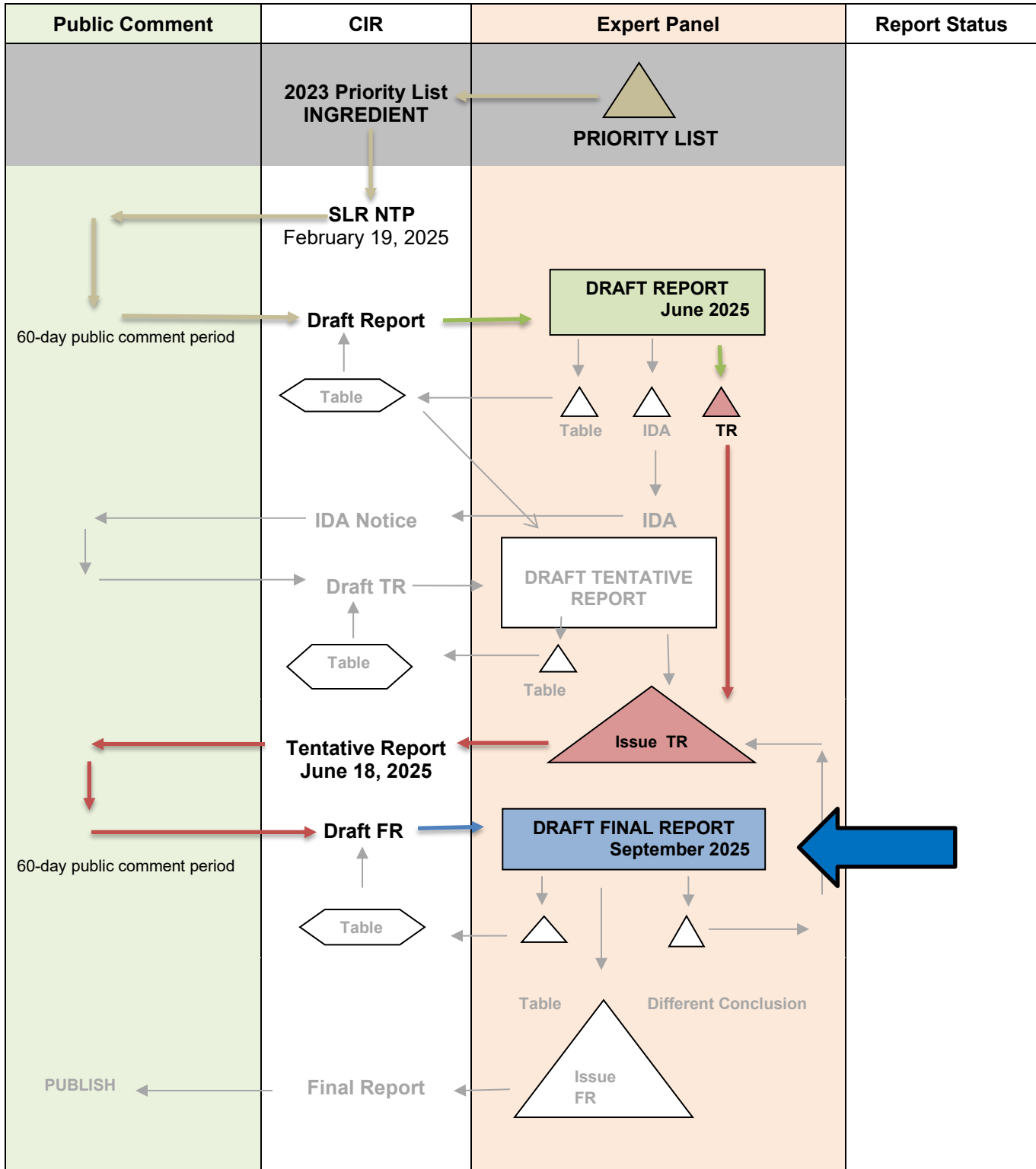
Status: Draft Final Report for Panel Review
Release Date: August 15, 2025
Panel Meeting Date: September 8 – 9, 2025

The Expert Panel for Cosmetic Ingredient Safety members are: Chair, Wilma F. Bergfeld, M.D., F.A.C.P.; Donald V. Belsito, M.D.; David E. Cohen, M.D.; Samuel M. Cohen, M.D., Ph.D.; Curtis D. Klaassen, Ph.D.; Allan E. Rettie, Ph.D.; David Ross, Ph.D.; Paul W. Snyder, D.V.M., Ph.D.; and Susan C. Tilton, Ph.D. The Cosmetic Ingredient Review (CIR) Executive Director is Bart Heldreth, Ph.D., and the Senior Director is Monice Fiume, M.B.A. This safety assessment was prepared by Priya Ferguson, M.S., Senior Scientific Analyst/Writer, CIR.

SAFETY ASSESSMENT FLOW CHART

INGREDIENT/FAMILY *Lactobacillus* Ferment Ingredients

MEETING September 2025





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Memorandum

To: Expert Panel for Cosmetic Ingredient Safety Members and Liaisons
From: Priya Ferguson, M.S., Senior Scientific Analyst/Writer, CIR
Date: August 15, 2025
Subject: Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics

Enclosed is the Draft Final Report on the Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics. (It is identified as *report_LactobacillusFerment_092025* in the pdf document). At the June 2025 meeting, the Panel concluded that *Lactobacillus* Ferment, *Lactobacillus* Ferment Filtrate, *Lactobacillus* Ferment Lysate, *Lactobacillus* Ferment Lysate Filtrate are safe as used in cosmetics. Since the Tentative Report was issued, CIR has received no new data. Comments and responses for the Draft Report (*PCPCcomments1_LactobacillusFerment_092025* and *response-PCPCcomments1_LactobacillusFerment_092025*) and the Tentative Report (*PCPCcomments2_LactobacillusFerment_092025* and *response-PCPCcomments2_LactobacillusFerment_092025*) have been included herein.

Additional supporting documents for this report package include a flow chart (*flow_LactobacillusFerment_092025*), report history (*history_LactobacillusFerment_092025*), a search strategy (*search_LactobacillusFerment_092025*), meeting transcripts (*transcripts_LactobacillusFerment_092025*), and a data profile (*datapofile_LactobacillusFerment_092025*).

The Panel should carefully review the Abstract, Discussion, and Conclusion, and issue a Final Report.

Lactobacillus Ferment Ingredients – History

November 2024

NTP issued requesting the following data:

- Composition (on products produced via the fermentation of relevant *Lactobacillus* species) and impurities data
- Method of manufacturing data
- Toxicokinetics data relevant to routes of exposure expected with cosmetic use
- General toxicity data
- Developmental and reproductive toxicity data
- Genotoxicity data
- Carcinogenicity data
- Dermal irritation and sensitization data
- Inhalation toxicity data
- Clarification on the species of *Lactobacilli* used in the production of these ingredients

April 2025

Data received from industry:

- Composition information on Lactobacillus Ferment, trade name mixtures containing 2% Lactobacillus Ferment, a trade name mixture containing 10% Lactobacillus Ferment Lysate and 2% Lactobacillus Ferment, and a trade name mixture containing 2% Lactobacillus Ferment Lysate
- Ames assays on Lactobacillus Ferment, trade name mixtures containing 2% Lactobacillus Ferment, a trade name mixture containing 10% Lactobacillus Ferment Lysate and 2% Lactobacillus Ferment, and a trade name mixture containing 2% Lactobacillus Ferment Lysate
- Steroidogenesis assays on Lactobacillus Ferment and on a trade name mixture containing 2% Lactobacillus Ferment Lysate
- In vitro dermal and ocular irritation assays on Lactobacillus Ferment, trade name mixtures containing 2% Lactobacillus Ferment, a trade name mixture containing 10% Lactobacillus Ferment Lysate and 2% Lactobacillus Ferment, and a trade name mixture containing 2% Lactobacillus Ferment Lysate
- In chemico and in vitro dermal sensitization assays on Lactobacillus Ferment, trade name mixtures containing 2% Lactobacillus Ferment, a trade name mixture containing 10% Lactobacillus Ferment Lysate and 2% Lactobacillus Ferment, and a trade name mixture containing 2% Lactobacillus Ferment Lysate
- Human repeat insult patch tests (HRIPTs) on Lactobacillus Ferment
- In vitro phototoxicity assays on Lactobacillus Ferment, trade name mixtures containing 2% Lactobacillus Ferment, a trade name mixture containing 10% Lactobacillus Ferment Lysate and 2% Lactobacillus Ferment, and a trade name mixture containing 2% Lactobacillus Ferment Lysate
- Composition information on Lactobacillus Ferment Lysate Filtrate
- HRIPT using a product containing 5% Lactobacillus Ferment Lysate Filtrate
- In vitro dermal and ocular irritation assays on Lactobacillus Ferment Lysate Filtrate
- Ames assay on Lactobacillus Ferment Lysate Filtrate
- Summary information regarding the composition of the Lactobacillus Ferment ingredients, including the species used in manufacturing
- Manufacturing flow charts

June 2025

Panel reviews Draft Report and issues a safe as used conclusion for all 4 Lactobacillus ferment ingredients.

Tentative Report posted

Comments on Tentative Report received from Personal Care Products Council

September 2025

Panel reviews Draft Final Report

Lactobacillus Ferment Ingredients Data Profile* - September 2025 - Writer, Priya Ferguson

				Toxicokinetics			Acute Tox			Repeated Dose Tox			DART		Genotox		Carci		Dermal Irritation			Dermal Sensitization					Ocular Irritation		Clinical Studies	
	Reported Use	Method of Mfg	Impurities	log P/log K _{ow}	Dermal Penetration	ADME	Dermal	Oral	Inhalation	Dermal	Oral	Inhalation	Dermal	Oral	In Vitro	In Vivo	Dermal	Oral	In Vitro	Animal	Human	In Vitro	Animal	Human	Phototoxicity	In Vitro	Animal	Single center	Case Reports	
Lactobacillus Ferment	x	x	x											x				x			x		x	x				x		
Lactobacillus Ferment Filtrate	x	x																												
Lactobacillus Ferment Lysate	x	x												x				x		x				x	x					
Lactobacillus Ferment Lysate Filtrate	x	x	x											x				x			x		x		x					

* "x" indicates that data were available in a category for the ingredient

Lactobacillus Ferment Ingredients

Ingredient/species	CAS #	PubMed	FDA	HPVIS	NIOSH	NTIS	NTP	FEMA	EU	ECHA	ECETOC	SIDS	SCCS	AICIS	FAO	WHO	Web
Lactobacillus Ferment	2380025-37-4 (generic)	x							x								x
Lactobacillus Ferment Lysate	-	x							x								
Lactobacillus Ferment Lysate Filtrate	1686112-36-6								x								x
Lactobacillus Ferment Filtrate	-								x								

“x” noted if relevant information was found

Search Strategy

- INCI names searched in links provided below
- Species used in manufacturing searched along with the following key words
 - Heat
 - Heat-killed
 - Inactive
 - Dead
 - Cosmetic
- INCI names and species searched along with keywords in PubMed:
 - metabolism
 - dermal
 - inhalation
 - skin
 - toxicity
 - drugs
 - medicine
 - irritation
 - ocular
 - eye
 - sensitization
 - allergy
 - manufacture
 - cancer
 - probiotic
 - food
 - production
 - case report
 - cosmetic

LINKS

Search Engines

- Pubmed - <http://www.ncbi.nlm.nih.gov/pubmed>
- Connected Papers - <https://www.connectedpapers.com/>

Pertinent Websites

- wINCI - <https://incipedia.personalcarecouncil.org/winci/ingredient-custom-search/>
- FDA databases <http://www.ecfr.gov/cgi-bin/ECFR?page=browse>
- FDA search databases: <http://www.fda.gov/ForIndustry/FDABasicsforIndustry/ucm234631.htm>;
- Substances Added to Food (formerly, EAFUS): <https://www.fda.gov/food/food-additives-petitions/substances-added-food-formerly-eafus>
- GRAS listing: <http://www.fda.gov/food/ingredientspackaginglabeling/gras/default.htm>
- SCOGS database: <http://www.fda.gov/food/ingredientspackaginglabeling/gras/scogs/ucm2006852.htm>
- Indirect Food Additives: <http://www.accessdata.fda.gov/scripts/fdcc/?set=IndirectAdditives>
- Drug Approvals and Database: <http://www.fda.gov/Drugs/InformationOnDrugs/default.htm>
- FDA Orange Book: <https://www.fda.gov/Drugs/InformationOnDrugs/ucm129662.htm>
- (inactive ingredients approved for drugs: <http://www.accessdata.fda.gov/scripts/cder/iig/>)
- HPVIS (EPA High-Production Volume Info Systems) - https://iaspub.epa.gov/opptpv/public_search.html_page
- NIOSH (National Institute for Occupational Safety and Health) - <http://www.cdc.gov/niosh/>
- NTIS (National Technical Information Service) - <http://www.ntis.gov/>
 - technical reports search page: <https://ntrl.ntis.gov/NTRL/>
- NTP (National Toxicology Program) - <http://ntp.niehs.nih.gov/>
- Office of Dietary Supplements <https://ods.od.nih.gov/>
- FEMA (Flavor & Extract Manufacturers Association) GRAS: <https://www.femaflavor.org/fema-gras>
- EU CosIng database: <http://ec.europa.eu/growth/tools-databases/cosing/>
- ECHA (European Chemicals Agency – REACH dossiers) – <http://echa.europa.eu/information-on-chemicals;jsessionid=A978100B4E4CC39C78C93A851EB3E3C7.live1>
- ECETOC (European Centre for Ecotoxicology and Toxicology of Chemicals) - <http://www.ecetoc.org>
- European Medicines Agency (EMA) - <http://www.ema.europa.eu/ema/>
- OECD SIDS (Organisation for Economic Co-operation and Development Screening Info Data Sets)- <http://webnet.oecd.org/hpv/ui/Search.aspx>
- SCCS (Scientific Committee for Consumer Safety) opinions: http://ec.europa.eu/health/scientific_committees/consumer_safety/opinions/index_en.htm
- AICIS (Australian Industrial Chemicals Introduction Scheme)- <https://www.industrialchemicals.gov.au/>
- International Programme on Chemical Safety <http://www.inchem.org/>
- FAO (Food and Agriculture Organization of the United Nations) - <http://www.fao.org/food/food-safety-quality/scientific-advice/jecfa/jecfa-additives/en/>
- WHO (World Health Organization) technical reports - http://www.who.int/biologicals/technical_report_series/en/
- www.google.com - a general Google search should be performed for additional background information, to identify references that are available, and for other general information

Botanical Websites, if applicable

- Dr. Duke's - <https://phytochem.nal.usda.gov/phytochem/search>
- Taxonomy database - <http://www.ncbi.nlm.nih.gov/taxonomy>
- GRIN (U.S. National Plant Germplasm System) - <https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysimple.aspx>
- Sigma Aldrich plant profiler- <http://www.sigmaaldrich.com/life-science/nutrition-research/learning-center/plant-profiler.html>
- American Herbal Products Association Botanical Safety Handbook (database) - <http://www.ahpa.org/Resources/BotanicalSafetyHandbook.aspx>
- National Agricultural Library NAL Catalog (AGRICOLA) <https://agricola.nal.usda.gov/>
- The Seasoning and Spice Association List of Culinary Herbs and Spices
- http://www.seasoningandspice.org.uk/ssa/background_culinary-herbs-spices.aspx



Memorandum

TO: Bart Heldreth, Ph.D.
Executive Director - Cosmetic Ingredient Review

FROM: Alexandra Kowcz, MS, MBA
Industry Liaison to the CIR Expert Panel

DATE: June 4, 2025

SUBJECT: Draft Report: Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics (draft prepared for the June 9-10, 2025 meeting)

The Personal Care Products Council respectfully submits the following comments on the draft report, Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics.

Key Issues

In the Introduction, it would be helpful to briefly mention the INCI naming convention for ferments. If the fermentation is completed with an atypical substrate, the atypical substrate would be included in the INCI name. Because no substrates are specifically listed in the INCI names under review in this report, the fermentations for the preparation of these ingredients are completed with standard substrates.

Composition and Impurities – In this section, it would be helpful to note that these ingredients are often sold to the industry as complex mixtures with other ingredients, and that some of the data provided are on these complex mixtures. The basic composition information on these tested mixtures is included in Table 8, 9 and 10 and not elsewhere in the report.

Additional Considerations

Cosmetic Use – It would be helpful to list all the product categories for which airbrush use was reported (makeup bases, foundations, indoor tanning products).

Effect on Damaged Skin – If available, please state how much *Lacticaseibacillus rhamnosus* ferment lysate was included in the cream used in reference 52.

Heat-Killed *Lactobacillus* – If available, please provide the doses used in the clinical studies (references 28 and 56). What was the frequency of dosing, e.g., daily, in the 12-week study (reference 57)? If available, please provide the dose and frequency of dosing in the 4-week study of the *Lactobacillus helveticus* powder.

Dermal Irritation and Sensitization; Summary – It is not clear what is meant by “The majority of these test substances”.

Clinical Studies – If available, please include the concentration of the ferment complex used in reference 90.

Summary – If available, the concentrations of the ferment ingredients used in the clinical studies should also be stated in the Summary.

Lactobacillus Ferment – September 2025 – Priya Ferguson	
Comment Submitter: Personal Care Products Council	
Date of Submission: June 4, 2025	
Comment	Response/Action
In the Introduction, it would be helpful to briefly mention the INCI naming convention for ferments. If the fermentation is completed with an atypical substrate, the atypical substrate would be included in the INCI name. Because no substrates are specifically listed in the INCI names under review in this report, the fermentations for the preparation of these ingredients are completed with standard substrates	Added to Method of Manufacture section.
Composition and Impurities – In this section, it would be helpful to note that these ingredients are often sold to the industry as complex mixtures with other ingredients, and that some of the data provided are on these complex mixtures. The basic composition information on these tested mixtures is included in Table 8, 9 and 10 and not elsewhere in the report	Addressed.
Cosmetic Use – It would be helpful to list all the product categories for which airbrush use was reported (makeup bases, foundations, indoor tanning products)	Addressed.
Effect on Damaged Skin – If available, please state how much Lacticaseibacillus rhamnosus ferment lysate was included in the cream used in reference 52	Not available.
Heat-Killed Lactobacillus – If available, please provide the doses used in the clinical studies (references 28 and 56). What was the frequency of dosing, e.g., daily, in the 12-week study (reference 57)? If available, please provide the dose and frequency of dosing in the 4-week study of the Lactobacillus helveticus powder	Doses included when available.
Dermal Irritation and Sensitization; Summary – It is not clear what is meant by “The majority of these test substances”.	This statement refers to the test substances in the previous paragraph (Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate (pure ingredient or trade name mixture)
Clinical Studies – If available, please include the concentration of the ferment complex used in reference 90	Concentration not available.
Summary – If available, the concentrations of the ferment ingredients used in the clinical studies should also be stated in the Summary	Concentration provided when available.



Memorandum

TO: Bart Heldreth, Ph.D.
Executive Director - Cosmetic Ingredient Review

FROM: Alexandra Kowcz, MS, MBA
Industry Liaison to the CIR Expert Panel

DATE: July 2, 2025

SUBJECT: Tentative Report: Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics (release date: June 18, 2025)

The Personal Care Products Council respectfully submits the following comments on the tentative report, Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics.

Key Issue

Introduction – As the Expert Panel for Cosmetic Ingredient Safety did not ask for additional information, the following should be deleted from the Introduction. “As there are many potential byproducts, and the composition of these ingredients is unknown, clarification and information on composition is requested from industry.”

Additional Considerations

Chemical Properties – As there are two ingredients mentioned, “are liquids that is clear to yellow in color” needs to be revised to “are liquids that are clear to yellow in color”.

Cosmetic Use – It should be made clear that FDA requests information on airbrush use for a few of their cosmetic product categories.

Effects on Pigmentation; Summary – What concentration of the *Lacticasebacillus rhamnosus* spent-culture supernatant was evaluated for tyrosinase inhibitory activity?

Heat-Killed *Lactobacillus*; Summary – It is not clear what is meant by “potentiate immunity”? What was measured?

Clinical Studies – Is the subheading “Single Center Study” necessary? As there are two studies in this section, if the subheading is needed, it should be “Studies”.

Table 1 – As no structures are included in Table 1, “and idealized structures” needs to be deleted from the title of this table.

Table 7 – It should be made clear that the cosmetic product categories listed are MoCRA cosmetic product categories, and that the 2022 PCPC survey and the VCRP used slightly different cosmetic product categories. For example, in the 2022 max concentration column, the following categories should have NA (not applicable) rather than NR (not reported) because these categories were not included in the 2022 concentration of use survey: Baby wipes; Eyelash and Eyebrow Preparations; Foundations (airbrush); and Disposable Wipes.

Lactobacillus ferment ingredients – September 2025 – Priya Ferguson	
Comment Submitter: Personal Care Products Council	
Date of Submission: July 2, 2025	
Comment	Response/Action
Introduction – As the Expert Panel for Cosmetic Ingredient Safety did not ask for additional information, the following should be deleted from the Introduction. “As there are many potential byproducts, and the composition of these ingredients is unknown, clarification and information on composition is requested from industry.”	Addressed
Chemical Properties – As there are two ingredients mentioned, “are liquids that is clear to yellow in color” needs to be revised to “are liquids that are clear to yellow in color”	Addressed
Cosmetic Use – It should be made clear that FDA requests information on airbrush use for a few of their cosmetic product categories.	Addressed
Effects on Pigmentation; Summary – What concentration of the <i>Lacticasebacillus rhamnosus</i> spent-culture supernatant was evaluated for tyrosinase inhibitory activity?	Addressed
Heat-Killed Lactobacillus; Summary – It is not clear what is meant by “potentiate immunity”? What was measured	Addressed
Clinical Studies – Is the subheading “Single Center Study” necessary? As there are two studies in this section, if the subheading is needed, it should be “Studies”.	Addressed
Table 1 – As no structures are included in Table 1, “and idealized structures” needs to be deleted from the title of this table.	Addressed
Table 7 – It should be made clear that the cosmetic product categories listed are MoCRA cosmetic product categories, and that the 2022 PCPC survey and the VCRP used slightly different cosmetic product categories. For example, in the 2022 max concentration column, the following categories should have NA (not applicable) rather than NR (not reported) because these categories were not included in the 2022 concentration of use survey: Baby wipes; Eyelash and Eyebrow Preparations; Foundations (airbrush); and Disposable Wipes	Addressed

JUNE 2025 MEETING – FIRST REVIEW/DRAFT REPORT**Belsito Team – June 9, 2025**

DR. SNYDER: All right, moving on to Lactobacillus Ferment ingredients. This is a Draft Report of four ingredients: Ferment, Ferment Filtrate, Ferment Lysate, Ferment Lysate Filtrate. In November of 2024, we had a Notice To Proceed without preparation of an SLR, due to a lack of relevant data. There was a question as to what studies to be included on the report.

New data received on Page 3. And so, there was a question that we don't know what the byproducts are and the finished ingredients. It's kind of a diverse group here. If no new data are needed, then we go with a Tentative Report. If additional data are needed, we need to go with the IDA. What was the preference there on Lactobacillus Ferment?

DR. BELSITO: I thought we had good data on the Ferment and the Ferment Lysate. Where we didn't have good data was on the filtrates of these two. But wouldn't we expect the filtrates just to get rid of, like, cell walls and particulate matter, and essentially then be the same as the Lysates?

I mean, so do we need the data on the filtrates? Because we really don't have good data on the filtrates.

DR. RETTIE: Yeah, I had the same question. Do the other two products clear the filtrates? I thought they did.

DR. BELSITO: You thought we did what, Allan?

DR. RETTIE: I thought the other two product ingredients cleared the filtrates.

DR. BELSITO: Oh the Ferment and the Ferment, not cleared -- yeah. Yeah, I sort of did as well. I mean, the tox data is missing, but, I mean, essentially, these are almost all food products, right?

DR. RETTIE: Yep.

DR. BELSITO: At least, living bacteria.

DR. SNYDER: So, you think we should move to a Tentative Report? We don't need any more data?

DR. BELSITO: I thought they were safe as used.

DR. SNYDER: Okay.

MS. FERGUSON: I just have to make one comment before we move on. We do have an updated concentration of use survey that Carol sent us from 2025.

DR. SNYDER: Okay.

MS. FERGUSON: And that max concentration is 5.6 for Lactobacillus Ferment.

DR. SNYDER: Okay.

DR. BELSITO: And then just one comment, Priya. They didn't really give you a break, a honeymoon here, did they? Congratulations by the way, beautiful pictures.

On PDF Page 30, the title of "Photosensitization." These are really photo irritation. When you think of photosensitization, you think of photo allergy, or at least I do. I would just retitle that "Photo Irritation."

MS. FERGUSON: Got you.

DR. SNYDER: Okay, we're going to go safe as used with some editorial comments.

DR. BELSITO: Yeah. I mean, basically, in the Discussion, the tox data, but they're almost all accepted as foods.

DR. SNYDER: Okay.

DR. BELSITO: And also in Discussion, there was that effect on melanogenesis, so cosmetic products would not be expected to affect pigmentation. That data was on PDF Page 16: "Effect on Pigmentation."

DR. SNYDER: Okay. Anything else?

DR. BELSITO: That was it for me.

DR. SNYDER: All right. Anybody else? Curt?

DR. KLAASSEN: Just fine. Yep.

DR. SNYDER: Allan? Okay? You okay, Priya?

MS. FERGUSON: Yes.

DR. SNYDER: Good.

Cohen Team – June 9, 2025

DR. DAVID COHEN: All right. Next is Lactobacillus Ferment. This is a Draft Report, so it's new. Four ingredients are being reviewed: Lactobacillus Ferment, Lactobacillus Ferment Filtrate, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate.

They function as miscellaneous skin conditioning agents. Ample data were found on these species as live bacteria; however, the data in these reports are not relevant to the cosmetic review that we're looking at. The main components of the ingredients reviewed in this report are not live bacteria but byproducts of the fermentation of the bacteria: enzymes, peptides, teichoic acids, polysaccharides, organic acids, fragments of dead bacteria.

According to the 2023 VCRP data, and the 2024 RLD, Lactobacillus Ferment is reported to have the highest number of uses in 266 and 2106 formulations. The results of the concentration of use survey by the Council indicate that Lactobacillus Ferment has the highest concentration in the leave on formulation at 1.5 percent in makeup bases. These can be incidentally ingested as they're used near the mouth, used in lipsticks and lip glosses. They also may be used near the eyes in eye lotions, and they may be used in baby products.

We have a fair amount of data. We have ample sensitization data. I think there was a comment on pigment somewhere. We might want to make that obvious by using a pigment boilerplate.

DR. SAM COHEN: It said something about there was evidence that the Ferment Filtrate inhibited tyrosinase.

DR. DAVID COHEN: Yeah, exactly.

DR. SAM COHEN: The fact that it does that, does it make it a drug?

DR. DAVID COHEN: No. I think that, you know, seeing biologic effects under certain circumstances, I think, in this case the product should be formulated that they don't have that effect.

DR. ROSS: And that can go in our Discussion?

DR. DAVID COHEN: I think that should go in the Discussion.

MS. FIUME: There's boilerplate language for the Discussion, yeah.

DR. DAVID COHEN: We see ingredients over the years that have effect on tyrosinase, and it's important not to have that effect because it is a drug effect, right.

DR. SAM COHEN: There's basically little tox data. I mean, there's Ames negative on three of the four ingredients. There's lack of estrogenic and androgenic activity, but really very little tox data, and not that we'd expect any toxicity. I'm not sure what more could be done in the neutral. They did cytotoxicity assays.

DR. DAVID COHEN: So, what are your needs?

DR. SAM COHEN: I think it's fine, actually.

DR. DAVID COHEN: All right. Let's run the room. Susan?

DR. TILTON: We do have in vitro genotox, negative in vitro dermal irritation and epiderm at undiluted. You mentioned sensitization data, so non-sensitizing, both the DPRA and HRIPT up to 100 percent. Let's see, I think I was looking primarily at the Ferment Filtrate where we aren't missing essentially any data.

DR. SAM COHEN: I guess what comes up with the whole read across is the Ferment Filtrate, does it have anything in it that's not covered by the other three?

DR. ROSS: I think if you clear the Ferments you can probably just work all down the line.

DR. SAM COHEN: That's what I was assuming.

DR. ROSS: I think my only issue here was we didn't have concentration for the Ferment Lysate Filtrate. This gets quite involved, doesn't it? But yeah, we got 1.5 percent on the Ferment, .09 on the Filtrate, .5 on the Lysate, but nothing -- no reported --

DR. DAVID COHEN: You mean concentration of use?

DR. ROSS: Yeah. On the Lysate Filtrate. But getting back to all of the discussion, I guess that was one issue. We had dermal irritation and sensitization for Lactobacillus Ferment. The concentrations which exceeded max, ocular was at neat. We're going to clarify the tyrosinase inhibition in the Discussion.

We got genotox, getting back to the tox, do we actually need any? That's the question. And the answer is probably not.

DR. SAM COHEN: The cytotoxicity actually was negative.

DR. ROSS: Yeah.

DR. SAM COHEN: I think that's enough. I mean, nothing -- you can't do the animal studies, so.

DR. ROSS: I'm not sure you --

DR. SAM COHEN: There's nothing in the composition that would suggest that.

DR. DAVID COHEN: That's the issue, was the composition.

DR. ROSS: Yeah, it's whether it gets in, you know, whether the stuff gets in.

DR. SAM COHEN: Yeah.

DR. ROSS: And, peptides, polysaccharides, acids, that bit. The bits of dead bacteria won't get in, so I think we're (inaudible).

DR. DAVID COHEN: But, we eat this, right?

DR. SAM COHEN: (Inaudible).

DR. BERGFELD: That would be a contaminant. Wouldn't you think, contaminant to live?

DR. SAM COHEN: Well, it shouldn't be live on here because you've got fermentation.

DR. DAVID COHEN: No, no, no, I'm saying -- no, there not alive here.

DR. SAM COHEN: Right.

DR. DAVID COHEN: Well, aren't we routinely exposed to this --

DR. SAM COHEN: Yeah.

DR. TILTON: I mean, they're derived from intestinal bacteria.

DR. SAM COHEN: Yeah, we carry these around in us.

DR. TILTON: Yeah.

DR. DAVID COHEN: Right, so their activity is all around us.

DR. SAM COHEN: Yeah.

DR. ROSS: Priya, this one yours?

MS. FERGUSON: Yes.

DR. ROSS: I have a question then on Table 3. I'm a bit confused by this, because, you know, you've got these different strains. You've got the Ferment and the Filtrate, you know, if it's used in the Filtrate, shouldn't it be used in the Ferment?

MS. FERGUSON: No. These were just reported by industry and they'll give me a species per ingredient. So I only know -- it might be used in all of these. Every species might be used in all of these, but this is all that I have reported.

DR. ROSS: You might want to put a little asterisk at the bottom of the paragraph.

MS. FERGUSON: Okay.

DR. ROSS: Because I spent some time trying to figure out which ones are in the same layer. I'm okay with clearing the data, but with respect to the last one, the Ferment Lysate Filtrate, do we need concentration of these?

MS. FIUME: So the survey was done in 20- -- do we have an updated survey? One wasn't done on this one when Carol updated? Let me check. Let's see. I'm checking to see if an updated survey was done.

DR. ROSS: And your BRCP only had six uses. RLD had 39.

DR. DAVID COHEN: I have one question on PDF 14. I think it's a boilerplate. It's the first paragraph under Use, under Cosmetic Use. It starts in the middle: "However, to utilize the exemptions, the small business must not C-E-L-L eye area products." Is it sell eye area products? It's just --

MS. FERGUSON: It's sell, S-E-L-L.

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DR. DAVID COHEN: Yeah, yeah, no, I'm -- and so the exemption -- for my own refresher, so eye area products, you can't -- even if you're a small business, if you're selling eye area products, you can't use the exemption, right? So eye area products, even if you're selling \$10,000 worth of product, you have to report? Okay.

I don't think that same typo is in all of them.

MS. FERGUSON: It's probably --

DR. DAVID COHEN: Yeah. I was reading through it, and I'm like, all right, I just want to make sure that it's correct. Okay. Anything else?

DR. ROSS: I didn't see the cytotox. Where did you see the cytotox in the report, Sam?

DR. SAM COHEN: I don't remember. I wrote it down.

DR. DAVID COHEN: So I'm looking at my notes, thinking was there anything.

DR. SAM COHEN: We got phototoxicity data.

DR. ROSS: Phototoxicity was okay.

DR. SAM COHEN: Yeah. Phototoxicity was clear.

DR. DAVID COHEN: There is under endocrine effects, this test substance was determined to be non-cytotoxic and did not inhibit or induce the production of 17-beta-estradiol or testosterone.

DR. ROSS: Oh, well, then, okay. I got it. Oh, it's H29 stuff.

DR. BERGFELD: Do you think you need the concentration of the Lysate? It says it's different, then it breaks down the bacteria into component parts.

DR. ROSS: I get hung up when we have these dossiers without concentration of these.

DR. BERGFELD: Okay.

DR. DAVID COHEN: Can I ask a technical question? This comes up a lot where we don't have concen- -- like we might have eight constituent ingredients we're looking at, right, and we have concentration of use on six of them. And we go ahead and clear, and we clear safe as used as described in this report. So what is industry to do with no concentration of use?

MS. FIUME: So a lot of times we say that if something is reported to be used, but the concentrations aren't reported, that it's expected that it's the same -- similar concentrations.

DR. TILTON: To the other ingredients?

MS. FERGUSON: Yeah. So we would expect that the one without the concentration listed would be used at probably 1.5 or less.

DR. DAVID COHEN: The highest concentration used?

MS. FERGUSON: Yeah.

DR. DAVID COHEN: So max concentration of any of the constituents becomes the anchor?

DR. ROSS: Yeah.

DR. SAM COHEN: That makes sense.

DR. DAVID COHEN: Is that clear?

DR. ROSS: No -- to me. But I mean, you can state it, though.

DR. BERGFELD: It says a trade mixture can be up to 2 percent Ferment Lysate, here in the Summary.

MS. FERGUSON: 1.5 is for leave ons.

DR. BERGFELD: Huh?

MS. FERGUSON: The 1.5 was for leave ons.

DR. BERGFELD: Okay.

MS. FIUME: So, these ingredients were surveyed in January but we have not received anything that had -- yeah.

DR. BERGFELD: You've not received any 2 percent?

MS. FIUME: We didn't receive any updated concentration of use results.

DR. ROSS: But Wilma says that she's pulling out the 2 percent for the Lysate Filtrate, right?

MS. FIUME: Can we ask Carol if she has preliminary results, or will she not have those yet?

MS. NORMAN: I'll ask for it now.

MS. FIUME: Okay, thank you.

DR. DAVID COHEN: So, the question is, are we going to put in an IDA for concentration of use, or are we going to clear this?

DR. SAM COHEN: If we're making the assumption that it has to be 1.5 percent or less, then we can clear it.

DR. DAVID COHEN: Right. Like, we're not caught up on that. If we get -- now, if this is going to go to a Draft Tentative, we may have RLD data or new concentration of use data that we would put in the report. And unless we see something like 48 percent, right, we just update the report for that. Right?

MS. FIUME: So you have these options. Carol, when she is conducting the new concentration of use surveys, she's doing them for the MoCRA categories. A concentration of use survey was done in January. Kim is going to check with Carol now to see if she has any results back yet.

One of the options is to go ahead, you can put in the Discussion because it would go out as a tentative that the assumption is that it's used at the same concentrations or lower. And then if you get the information, you can update the report appropriately. Or, if there's still no concentrations reported, then that caveat in the Discussion would just carry forward into the Final Report if you were comfortable with that.

DR. SAM COHEN: So based on that, would you include this?

DR. DAVID COHEN: Yeah, if that's what we choose to do. And it sounds like we are choosing to do that.

DR. TILTON: Yeah, I would support that. I'm okay with up to the reported concentration.

DR. DAVID COHEN: Okay.

DR. ROSS: I'm not wild about in vitro toxicity data replacing -- you know, having done a lot of that in my scientific career I know what it actually means, but --

DR. SAM COHEN: Well everything said that (inaudible) is driving concentration sky high.

DR. ROSS: But, as David originally pointed out, I'm not too (inaudible) about the components in this. I think I'm okay with this.

DR. TILTON: You mean in terms of dermal tox?

DR. ROSS: Yeah, and absorption. You know, and what subsequent toxicity from absorption, peptides, saccharides. I think it's going to be fine.

DR. BERGFELD: I was just looking. I found a note to myself that there was a test in the irritation studies of these and they were testing at neat.

DR. ROSS: Yeah.

DR. BERGFELD: And they were testing at 10 percent.

DR. DAVID COHEN: Yeah, there's a lot.

DR. ROSS: It's non-irritating.

DR. BERGFELD: Yeah.

DR. DAVID COHEN: If he was -- you're talking about more absorption?

DR. ROSS: Yeah, systemic.

DR. DAVID COHEN: What items?

DR. ROSS: I'm not worried about anything. I have my point.

DR. DAVID COHEN: All right.

MS. FIUME: So for the Discussion, is there language -- unless you've already captured it -- Priya, that you want to use to say we recognize that there are no toxicological studies but the Panel concern was mitigated because --

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DR. SAM COHEN: We can't say there's none, because there is an Ames assay, there are hormone assays, and a cytotoxicity assay. And we're going to have to get used to that because we're not going to be able to do animal studies.

DR. ROSS: I don't think you need any additional language. I defer to my other Panel members.

DR. SAM COHEN: I think the statement saying that the ingredients in the Ferment kind of cover all the ingredients across.

DR. BERGFELD: Without saying the concentration, I think that's a good idea. The testing is a little higher.

MS. FIUME: So then the studies that are under the other relevant studies are predictive enough to cover the -- I'm just asking because if we know -- if it says under toxicological studies, if says we have none then sometimes we'll get comments, then why isn't that addressed in the Discussion?

DR. ROSS: You might get comments tomorrow from the other team.

DR. SAM COHEN: I don't think we can say none because there are some with the genotox and the hormone and the cytotoxicity.

DR. TILTON: But if the primary concern is (inaudible) sensitization and irritation, you could say (inaudible).

DR. SAM COHEN: Yeah. Okay. And then maybe a statement saying the composition -- the components of composition don't raise concern for toxicity.

DR. DAVID COHEN: That's the reason you feel better, right?

DR. SAM COHEN: Right.

DR. DAVID COHEN: To a degree, David?

DR. ROSS: Yeah.

DR. SAM COHEN: Do we want to make mention of the fact that there was nothing about allergenicity in here? They made a sentence in there that indicated that we didn't have any of the components of known allergens? I don't have any allergenicity concern.

DR. DAVID COHEN: The data is good. The data is okay. It's quiet data so I don't want to make it more complicated than it is if we don't have to.

Full Panel – June 10, 2025

DR. SNYDER: Lactobacillus Ferment Ingredients; it includes four ingredients. The Ferment, the Ferment Filtrate, the Ferment Lysate and the Ferment Lysate Filtrate. This is a Draft Report. We came up with a safe as used conclusion.

DR. DAVID COHEN: Second.

DR. BERGFELD: Second. Any further discussion regarding this ingredient? Seeing none, I call the question. All those in favor of a safe conclusion indicate by raising your hands. Thank you. Unanimous. Comments.

DR. SNYDER: We had a couple things, editorial.

DR. BERGFELD: Okay.

DR. SNYDER: Just so the other team is aware, on Page 30 that photo irritation, it's a photo irritation study on Page 30, not photosensitization. It needs to be retitled. And then Don wanted in the Discussion regarding melanogenesis on Page 16. That cosmetic products would not be expected to affect pigmentation. Right, Don?

DR. DAVID COHEN: Yes. We need a pigment boilerplate.

DR. SNYDER: Just so we're clear.

DR. BERGFELD: Okay. Thank you. Then moving on to our next ingredient, that's Dr. Cohen, 2-Nitro-p-Phenylenediamine.

Safety Assessment of *Lactobacillus* Ferment Ingredients as Used in Cosmetics

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The Expert Panel for Cosmetic Ingredient Safety members are: Chair, Wilma F. Bergfeld, M.D., F.A.C.P.; Donald V. Belsito, M.D.; David E. Cohen, M.D.; Samuel M. Cohen, M.D., Ph.D.; Curtis D. Klaassen, Ph.D.; Allan E. Rettie, Ph.D.; David Ross, Ph.D.; Paul W. Snyder, D.V.M., Ph.D.; and Susan C. Tilton, Ph.D. The Cosmetic Ingredient Review (CIR) Executive Director is Bart Heldreth, Ph.D., and the Senior Director is Monice Fiume, M.B.A. This safety assessment was prepared by Priya Ferguson, M.S., Senior Scientific Analyst/Writer, CIR.

ABBREVIATIONS

ARE	antioxidant/electrophile response element
BoSS	Burden of Sensitive Skin
CAS	Chemical Abstracts Service
CFU	colony-forming units
CIR	Cosmetic Ingredient Review
Council	Personal Care Products Council
<i>Dictionary</i>	<i>International Cosmetic Ingredient Dictionary and Handbook</i>
DPRA	direct peptide reactivity assay
EFSA	European Food Safety Authority
FDA	Food and Drug Administration
FOU	frequency of use
HRIPT	human repeated-insult patch test
INCI	International Nomenclature of Cosmetic Ingredients
l.o.	leave-on
MoCRA	Modernization of Cosmetics Regulation Act
MTT	3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
Nrf2	nuclear factor erythroid 2-related factor 2
OECD	Organisation for Economic Co-operation and Development
OTC	over-the-counter
QPS	qualified presumption of safety
Panel	Expert Panel for Cosmetic Ingredient Safety
RLD	Registration and Listing Data
r.o.	rinse-off
SLS	sodium lauryl sulfate
TEWL	transepidermal water loss
TG	test guideline
US	United States
UVA	ultraviolet A
VCRP	Voluntary Cosmetic Registration Program

ABSTRACT

The Expert Panel for Cosmetic Ingredient Safety (Panel) assessed the safety of 4 *Lactobacillus*-ferment derived ingredients, which are predominantly reported to function as skin-conditioning agents – miscellaneous in cosmetic products. The Panel reviewed the available data and determined that these ingredients are safe in cosmetics in the present practices of use and concentration as described in this safety assessment.

INTRODUCTION

This assessment reviews the safety of the following 4 ingredients as used in cosmetic formulations:

Lactobacillus Ferment
Lactobacillus Ferment Filtrate
Lactobacillus Ferment Lysate
Lactobacillus Ferment Lysate Filtrate

According to the web-based *International Cosmetic Ingredient Dictionary and Handbook (Dictionary)*, all of these *Lactobacillus* ferment ingredients are reported to function in cosmetics as skin-conditioning agents – miscellaneous; Lactobacillus Ferment is reported to have numerous other functions in cosmetics (Table 1).¹ These ingredients were grouped together as they are products of the fermentation of bacteria, predominantly from the genus *Lactobacillus*.

This safety assessment includes relevant published and unpublished data that are available for each endpoint that is evaluated. Published data are identified by conducting an extensive search of the world's literature; a search was last conducted April 2025. A listing of the search engines and websites that are used and the sources that are typically explored, as well as the endpoints that the Panel typically evaluates, is provided on the Cosmetic Ingredient Review (CIR) website (<https://www.cir-safety.org/supplementaldoc/preliminary-search-engines-and-websites>; <https://www.cir-safety.org/supplementaldoc/cir-report-format-outline>). Unpublished data are provided by the cosmetics industry, as well as by other interested parties.

The cosmetic ingredient names, according to the *Dictionary*, are written as listed above, without italics and without abbreviations. When referring to the bacterial species from which these ingredients are derived, the standard scientific practice of using italics will be followed (i.e., *Lactobacillus acidophilus*). If it is not known whether the substance being discussed is equivalent to the cosmetic ingredient, the test substance will be identified by the name used in the publication (e.g., *Lactobacillus* ferment lysate or *Lactobacillus acidophilus* ferment lysate) that is being cited. However, if it is known that the substance is a cosmetic ingredient, the *Dictionary* nomenclature (e.g., Lactobacillus Ferment or Lactobacillus Ferment derived from *Lactobacillus acidophilus*) will be used.

A search was performed on the ingredients and relevant bacterial species included in this grouping. Abundant data were found on *Lactobacilli* as live bacteria (e.g., as probiotics in clinical studies, safety assessments, and case reports); however, these data were not included herein as they are not relevant to the cosmetic ingredients reviewed. The main components of the ingredients reviewed in this report are not the live bacteria themselves, but byproducts of the fermentation of the bacteria (e.g., intracellular and extracellular metabolites, enzymes, peptides, teichoic acids, polysaccharides, organic acids (e.g., lactic acid), fragments of the dead bacteria).^{2,3}

In addition, a sampling of relevant studies found on heat-killed bacteria have been briefly summarized in the “Other Relevant Studies” section of this report. Details on these studies were omitted as these dead bacteria are assumed to be only a potential component of the finished ingredient (the amount of dead bacteria/bacterial fragments in finished ingredients is unknown).

CHEMISTRY

Definition

Lactobacillus Ferment is the product obtained through fermentation by the organism, *Lactobacillus*.¹ The definitions of the ingredients included in this review are provided in Table 1.

Chemical Properties

Lactobacillus Ferment and Lactobacillus Ferment Lysate Filtrate are liquids that are clear to yellow in color.^{4,5} Other chemical properties on these two ingredients may be found in Table 2.^{5,6}

Bacteria Identification

According to personal communication with Personal Care Products Council and data from industry, several species of bacteria have been reported to be used in the manufacture of these *Lactobacillus* ferment ingredients. A listing of these species may be found in Table 3. The majority of the species of bacteria used in the preparation of these ingredients belong to the genus *Lactobacillus*.⁷ Several of these species previously belonged to the *Lactobacillus* genus, but have recently been renamed. All listed species are non-spore-forming, gram-positive, lactic-acid producing bacteria, that are a normal part of the intestinal microbiota of various mammalian species, including humans.⁸ The taxonomy of all of the species that have been reported to be used in the manufacturing of these ingredients may be found in Table 4.⁹

Method of Manufacture

To manufacture *Lactobacillus* ferment-derived cosmetic ingredients, an appropriate growth medium is chosen and sterilized to ensure no unexpected microorganisms are present.² Bacteria are typically grown in modified media supplemented with determined substances (e.g., cysteine).³ The *Lactobacillus* species is then inoculated into the media and incubated at an appropriate temperature for optimal growth. When the number of bacteria reaches a critical concentration, the culture is harvested. If only intracellular content is desired, cells are harvested by centrifugation, and cell pellets are washed and then disrupted; washing and disruption are not performed if extracellular contents are desired.³ Medium centrifugation is performed to remove intact cells and cellular debris. The products taken during this process (e.g., growth media, cellular content) to compose these ingredients is dependent upon ingredient type (described below). It should be noted that growth conditions, substrates, and manufacturing specifics may vary depending on the postbiotics (non-viable bacterial products or metabolic byproducts produced by probiotic microorganisms)¹⁰ of interest.

It should be noted that according to International Nomenclature of Cosmetic Ingredients (INCI) naming conventions for ferments, if fermentation is completed with an atypical substrate, the atypical substrate would be included in the INCI name.¹¹ Because no substrates are specifically listed in the INCI names under review of this report, the fermentations for the preparation of these ingredients are completed with standard substrates.

Manufacturing data on several trade name mixtures containing Lactobacillus Ferment, Lactobacillus Ferment Filtrate, and Lactobacillus Ferment Lysate were submitted by industry.¹²⁻¹⁷ These data may be found in Table 5.

Lactobacillus Ferment

According to a manufacturer, the fermentation process for Lactobacillus Ferment occurs in the presence of both standard growth media components and undecylenic acid derived from castor beans.⁶ Secondary metabolites (e.g., water-soluble undecylenates) are formed as a stress response from the change in pH and oxygen levels for the bacteria. After fermentation, lysozyme is added to the culture to facilitate a controlled cell lysis to ensure the release of the antimicrobial peptides for maximized activity. Any existing lactic acid bacteria is removed via filtration.

Lactobacillus Ferment derived from *Lactobacillus acidophilus* is prepared by first testing for acceptance of the materials.^{18,19} Following acceptance, fermentation of *Lactobacillus acidophilus* is performed in a defined media, under controlled conditions (pH, temperature, and time). Refiltration is then performed, followed by quality control, packing, sampling for micro, and shipping.

In the production of Lactobacillus Ferment, the whole culture is taken, and therefore the ingredient comprises both the microorganism and growth media.² The ferment is typically sterilized to kill the active bacteria.

Lactobacillus Ferment Filtrate

When preparing Lactobacillus Ferment Filtrate, following fermentation, the growth media and bacteria are filtered to separate the spent media from the bacterial cells.² The ingredient is composed of the conditioned media which contains the products that were excreted by the bacteria into the culture media.

Lactobacillus Ferment Lysate

In the preparation of Lactobacillus Ferment Lysate, the bacteria are broken open into the culture media.² The bacteria are lysed (and thus, killed), and the cellular contents are spilled into the media. The final ingredient contains the media containing these cellular contents, along with bacterial cell remainders (e.g., cell membranes, cell wall components, exopolysaccharides).

Lactobacillus Ferment Lysate Filtrate

Lactobacillus Ferment Lysate Filtrate is prepared by breaking open the bacteria into cultured media.² The resulting spilled cellular contents in the media, as well as the remainders of the lysed bacteria are then filtered and clarified.

Composition and Impurities

The *Lactobacillus* fermentation process produces postbiotics of interest including intracellular and extracellular metabolites, bacterial components, lactic acid, lipotechoic acid, and other organic acids through conversion of the sugars in the growth media, enzymes, and peptides.^{2,3} Finished ingredients may contain all these components, including residual dead bacteria fragments, at varying amounts. It should be noted that these ingredients are often sold as complex mixtures with other ingredients.

Lactobacillus Ferment

According to a manufacturer's specifications, Lactobacillus Ferment contains < 20 ppm heavy metals, < 10 ppm lead, < 2 ppm arsenic, and < 1 ppm cadmium, and may contain up to 10% water-soluble undecylenates.²⁰ In addition, none of the potential fragrance allergens listed in Annex III of European Union (EU) Cosmetic Regulation (EC) No. 1223/2009 or pesticides are present in this ingredient or in several trade name mixtures containing this ingredient.²¹⁻²⁶

Lactobacillus Ferment derived from *Lactobacillus acidophilus* was determined to contain < 20 ppm heavy metals.²⁵ This ingredient was also reported to contain < 20 ppm chromium, < 10 ppm lead, < 10 ppm nickel, < 10 ppm cobalt, < 5 ppm antimony, < 2 ppm arsenic, < 1 ppm mercury, and < 1 ppm cadmium. This ingredient may contain 1 – 10% bacteriocins.

Lactobacillus Ferment Lysate Filtrate

According to a manufacturer, Lactobacillus Ferment Lysate Filtrate is derived from *Lactobacillus bulgaricus* isolated from a yogurt starter culture and propagated on animal product-free media.²⁷ In addition, specifications indicate that this ingredient is 10 – 16% solids and contains < 20 ppm heavy metals, < 10 ppm lead, < 2 ppm arsenic, and < 1 ppm cadmium. The microbial content is reported to be < 100 colony-forming units (CFU)/g aerobic mesophiles, < 10 CFU/g anaerobic mesophiles, < 100 CFU/g mold and yeast, and no pathogens. None of the potential fragrance allergens listed in Annex III of EU/Cosmetic Regulation (EC) No. 1223/2009 or pesticides are present in this ingredient.²⁸

Lactobacillus Ferment, Lactobacillus Ferment Filtrate, Lactobacillus Ferment Lysate

Composition information regarding trade name mixtures containing Lactobacillus Ferment, Lactobacillus Ferment Filtrate, and Lactobacillus Ferment Lysate were received. The majority of these mixtures contain Lactobacillus Ferment (97 – 99%) and 1,2-hexanediol (2 – 3%).²⁹ These data may be found in Table 6.

USE Cosmetic

The safety of the cosmetic ingredients addressed in this assessment is evaluated based on data received from the US Food and Drug Administration (FDA) and the cosmetics industry on the expected use of *Lactobacillus* ferment ingredients in cosmetics. Data included herein were obtained from the FDA and in response to a survey of maximum use concentrations conducted by the Council, and it is these values that define the present practices of use and concentration. Frequencies of use obtained from the FDA include data from the Voluntary Cosmetic Registration Program (VCRP) database as well as Registration and Listing Data (RLD). As a result of the Modernization of Cosmetics Regulation Act (MoCRA) of 2022, the VCRP was discontinued in 2023 and, as of 2024, manufacturers and processors are required to register facilities and list their products (and ingredients therein) with the FDA (i.e., RLD). An exception is made for small businesses (average gross annual sales in the US of cosmetic products for the previous 3-year period is less than \$1,000,000, adjusted for inflation), which are exempt from MoCRA reporting for most cosmetic product categories. However, to utilize the exemption, the small business must not sell eye area products, injected products, internal use products, or products that alter appearance for more than 24 h, and the facilities that manufacture these products, are not included in this exemption.³⁰ Please note, at this time, it is not appropriate to contrast data from the VCRP and RLD to determine a trend in frequency of use because there are numerous differences in the ways the data for the VCRP and the RLD were collected and processed, and because reporting frequency of use is now mandatory (as opposed to the past practice of voluntary reporting). Although the VCRP program is now defunct, trends in frequency of use from the RLD alone are not yet possible in that a baseline is currently not available.

According to 2023 VCRP data and 2024 RLD, Lactobacillus Ferment is reported to have the highest number of uses (it is reported to be used in 266 and 2106 formulations, respectively; Table 7).^{31,32} All other ingredients are reported to be used in 876 formulations or less (according to 2024 RLD). The results of the concentration of use survey conducted by the Council indicate Lactobacillus Ferment also has the highest concentration of use in a leave-on formulation; it is used at up to 5.6% in face and neck products (not spray) and other skin care preparations.³³

These ingredients are used in formulations that may result in incidental ingestion and ocular exposure as they are reported to be used in products applied near the mouth (e.g., Lactobacillus Ferment is used in lipsticks and lip glosses; concentration not reported) and near the eyes (e.g., Lactobacillus Ferment Lysate is used in eye lotions at up to 4.6%).^{31,32,34} In addition, these ingredients are reported to be used in baby products (e.g., Lactobacillus Ferment is used in several baby products categories).

Additionally, some of the *Lactobacillus* ferment-derived ingredients are used in cosmetic powders and sprays and could possibly be inhaled; for example, Lactobacillus Ferment is reported to be used in cologne and toilet waters and face powders (concentrations not stated). In practice, as stated in the Panel's respiratory exposure resource document (<https://www.cir-safety.org/cir-findings>), most droplets/particles incidentally inhaled from cosmetic sprays would be deposited in the nasopharyngeal and tracheobronchial regions and would not be respirable (i.e., they would not enter the lungs) to any appreciable amount. Conservative estimates of inhalation exposures to respirable particles during the use of loose powder cosmetic products are 400-fold to 1000-fold less than protective regulatory and guidance limits for inert airborne respirable particles in the workplace.

Some products containing these ingredients are marketed for use with airbrush delivery systems. With the advent of MoCRA and the current product categories outlined by the FDA, it is now mandatory that cosmetic products used in airbrush delivery systems be reported as such for some, but not all, product categories in the RLD. In other words, a reliable source of frequency of use data regarding the use of cosmetic ingredients in conjunction with airbrush delivery systems is now available, in some instances. Some of the reported product categories for this ingredient as listed in the RLD do require designation if airbrush application is used, and this type of application was reported (e.g., Lactobacillus Ferment is reported

to be used in foundations, makeup bases, and indoor tanning products with airbrush application). Additionally, the Council currently surveys the cosmetic industry for maximum reported use concentrations of ingredients in products which may be used in conjunction with an airbrush delivery system; thus, this type of data may also be available when submitted. Please note that no concentration of use data were provided indicating airbrush application. Nevertheless, no consumer habits and practices data or particle size data are publicly available to evaluate the exposure associated with this use type, thereby preempting the ability to evaluate risk or safety. Without information regarding the consumer habits and practices data or product particle size data (or other relevant particle data, e.g., diameter) related to this use technology, the data profile is incomplete, and the Panel is not able to determine safety for use in airbrush formulations. Accordingly, the data are insufficient to evaluate the exposure resulting from cosmetics applied via airbrush delivery systems.

None of the *Lactobacillus* ferment ingredients named in the report are restricted from use in any way under the rules governing cosmetic products in the European Union.³⁵

Non-Cosmetic

The following information is on live bacterial strains; therefore, the relevance to the ingredients in this report is unknown.

According to 21CFR131.200, yogurt may be produced by culturing dairy ingredients with the lactic acid-producing bacteria, *Lactobacillus delbrueckii* subsp. *bulgaricus*. Prior sanctions were granted for the use of harmless lactic acid producing bacteria, such as *Lactobacillus acidophilus*, as optional ingredients in specified standardized foods.³⁶ These bacteria are permitted for use in cultured milk (which includes buttermilk) (21CFR131.112), sour cream (21CFR131.160), cottage cheese (21CFR133.128), and yogurt (21CFR131.200), provided that the mandatory cultures of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* are also used in the yogurt. All of the bacterial species reported to be used in the production of the *Lactobacillus* ferment ingredients derived herein have a qualified presumption of safety (QPS) status, excluding *Lactobacillus crispatus*, *Lactobacillus curvatus*, *Lactobacillus kunkeei*, and *Lactobacillus gasseri*, as designated by the European Food Safety Authority (EFSA).³⁷

In addition, all of the bacterial species (as listed in Table 3 and Table 4) are also found/used in common food products.³⁸⁻⁴⁹ These products include, but are not limited to, yogurt, dairy products, fermented foods, and dietary supplements.

TOXICOKINETIC STUDIES

No relevant toxicokinetics studies on the *Lactobacillus* ferment-derived ingredients were found in the published literature, and unpublished data were not submitted.

TOXICOLOGICAL STUDIES

Acute and repeated-dose toxicity studies were not found in the published literature, and unpublished data were not submitted.

DEVELOPMENTAL AND REPRODUCTIVE TOXICITY STUDIES

Developmental and reproductive toxicity studies were not found in the published literature, and unpublished data were not submitted.

GENOTOXICITY STUDIES

Details regarding the Ames assays summarized below may be found in Table 8.

Ames assays were performed with Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate, either as pure ingredients or as part of a trade name mixture.⁵⁰⁻⁵⁷ The assays were performed in various strains for *Salmonella typhimurium* and with *Escherichia coli*, with and without metabolic activation, at concentrations up to 5000 µg/plate, and yielded negative results.

CARCINOGENICITY STUDIES

Carcinogenicity studies were not found in the published literature, and unpublished data were not submitted.

OTHER RELEVANT STUDIES

Endocrine Effects

Lactobacillus Ferment

An in vitro H295R steroidogenesis assay was performed in order to determine the potential of Lactobacillus Ferment derived from *Lactobacillus acidophilus* to induce or inhibit the production of 17β-estradiol and testosterone.⁵⁸ Human adrenocarcinoma H295R cells were exposed for 48 h to the test substance, diluted in dimethyl sulfoxide, at concentrations of 0.01, 0.1, 1, 10, 100, 1000, and 10,000 µM (each concentration evaluated in triplicate). Solvent and appropriate negative and

positive controls were used. Following incubation, medium was removed, and cellular viability was analyzed. Concentrations of 17 β -estradiol and testosterone were then measured, and absorbance values evaluated. The test substance was determined to be non-cytotoxic, and did not inhibit or induce the production of 17 β -estradiol or testosterone. Control substances performed as expected.

Lactobacillus Ferment Lysate

An in vitro H295R steroidogenesis assay was performed according to the same procedure and concentrations stated above using a trade name mixture consisting of 2% Lactobacillus Ferment Lysate derived from *Lactobacillus acidophilus* and 98% *Medicago sativa* (alfalfa) callus culture conditioned media extract.⁵⁹ The test substance was determined to be non-cytotoxic, and did not inhibit or induce the production of 17 β -estradiol or testosterone. Control substances performed as expected.

Effects on Pigmentation

Postbiotics obtained via fermentative processes of *Lactobacillus* bacteria, such as lactic acid, have been reported to result in skin depigmentation.⁶⁰ Other tyrosinase-inhibitors that may be present in these ingredients include cyclotetrapeptide, lipotechoic acid, daidzein, equol, uracil, and exo-polysaccharides (derived from *Lactobacillus sakei*). These acids may be a component of the finished cosmetic ingredients reviewed in this report.

Lactobacillus Ferment Filtrate

A *Lactobacillus rhamnosus* spent-culture supernatant (heated for 30 min at 100°C; at a concentration of 100%) was evaluated for tyrosinase inhibitory activity in vitro.⁶¹ An aqueous solution of mushroom tyrosinase was incubated with the test substance for 30 min. The amount of dopachrome produced in the reaction mixture was determined via spectrophotometric analysis, and percent inhibition of tyrosinase activity was calculated. Kojic acid (2 and 10 mM) was used as a standard. The test substance resulted in a 72.1 \pm 1.2% inhibition of tyrosinase activity. (Inhibitory activities for 2 and 10 mM kojic acid were 43.6 \pm 2.5 and 83.6 \pm 1.0%, respectively.)

Effect on Damaged Skin

Lactobacillus Ferment Lysate

The effect of a cream containing *Lacticaseibacillus rhamnosus* ferment lysate on damaged skin was evaluated in 24 healthy female subjects.⁶² Two sites of the skin were chosen on the forearms. Sites were treated with a 1% sodium lauryl sulfate (SLS) solution under occlusive conditions to induce skin damage. After a 24-h patch treatment with SLS, sites were evaluated, and subjects began application of the test substance to one site (application amount not stated), 2x/d, for 5 d. (The second site was left untreated for comparison.) After 5-d, redness and drying by the SLS treatment were reduced in cream-treated sites compared to non-treated sites.

Heat-Killed Lactobacillus

Tyndallized *Lactobacillus acidophilus* has been observed to induce anti-melanogenesis via the reduction of mRNA expression of melanogenesis-related genes such as tyrosinase, tyrosinase-related protein 1, and tyrosinase-related protein 2.⁶³ Oral administration of heat-killed *Lactobacillus brevis* (0.05 or 0.5%) in mice via diet for 4 wk resulted in an inhibition of immunoglobulin E production.⁶⁴ Heat-killed *Lacticaseibacillus paracasei* is reported to induce high levels of interleukin-12, resulting in immunomodulation, in studies performed in mice.³⁸ Oral administration (via diet; 55-d treatment) of heat-treated *Lactobacillus delbrueckii* subsp. *lactis* (0.08 and 0.33%) resulted in the prevention and alleviation of atopic dermatitis symptoms in mice.⁶⁵ In clinical studies, heat-killed *Lacticaseibacillus paracasei* was reported to enhance key immune markers and prevent infection when orally administered to subjects (n = 45 – 241).^{38,66} No adverse effects were reported in these studies. No adverse effects caused by the test substance were observed in a study in which 42 subjects were orally administered heat-killed *Lactobacillus brevis*.⁶⁷ Subjects were instructed to take either 25 or 50 mg of the test substance for 12 wk. Similarly, no adverse effects were observed in an assay in which subjects (n = 29) were orally given heat-killed *Lactobacillus helveticus* powder 1x/d for 4 wk.⁶⁸

DERMAL IRRITATION AND SENSITIZATION STUDIES

Details regarding the dermal irritation, sensitization, and phototoxicity studies summarized below may be found in Table 9.

EpiDerm™ assays were performed using Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate (either as a pure ingredient or as part of a trade name mixture).⁶⁹⁻⁷⁵ All test substances were tested undiluted and were predicted to be non-irritating. No irritation was reported in a use assay in which 21 females applied cream containing *Lacticaseibacillus rhamnosus* lysate filtrate to the face, 2x/d, for 4 wk.⁶²

The majority of the test substances listed above were evaluated in direct peptide reactivity assays (DPRAs; at 100 mM) and antioxidant/electrophile response element (ARE)-nuclear factor erythroid 2-related factor (Nrf2) luciferase assays (at up to 2000 μ M).⁷⁶⁻⁸⁹ All test substances were predicted to be non-sensitizing. Human repeated-insult patch tests (HRIPTs) were performed using Lactobacillus Ferment in 2 assays (tested at 4 - 10%; 50 - 51 subjects) and using a product containing 5%

Lactobacillus Ferment Lysate Filtrate (tested at 100%; 50 subjects).⁹⁰⁻⁹² All test substances were considered to be non-irritating and non-sensitizing.

Phototoxicity

In vitro phototoxicity assays were performed using Lactobacillus Ferment and Lactobacillus Ferment Lysate (either as pure ingredients or part of a trade name mixture).⁹³⁻⁹⁶ The test substances were considered to be non-phototoxic. In vitro phototoxicity assays were also performed on Lactobacillus Ferment derived from *Lactobacillus acidophilus* (tested at 0.4, 1.3, 3.8, and 12%), Lactobacillus Ferment derived from *Lactobacillus acidophilus* (tested at 0.5, 1.5, 5, and 10%), and Lactobacillus Ferment (tested at 0.4, 1.2, 3.7, and 11%).^{6,97,98} In these assays, no phototoxicity was observed at lower concentrations; however, at the highest concentrations tested, a decrease in cell viability was observed in non-irradiated and irradiated tissues (compared to 100% viability in non-irradiated and irradiated tissues in the negative control groups).

OCULAR IRRITATION STUDIES

Details regarding the in vitro ocular irritation studies summarized below may be found in Table 10.

EpiOcular™ assays were performed using Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate (either as pure ingredients or as part of a trade name mixture).⁶⁹⁻⁷⁵ All test substances were tested at 100% and considered to be non-irritating.

CLINICAL STUDIES

Lactobacillus Ferment

A redness assessment (evaluated using melanin measurement probes; redness profiles created using facial imaging system) and sensitivity self-assessment (Burden of Sensitive Skin (BoSS) questionnaire) was performed in 52 subjects with confirmed sensitive skin following use of a lotion containing a trade mixture consisting of fermented cultures of both *Lactobacillus rhamnosus* and *Lactobacillus paracasei* (this mixture comprised 3% of the total lotion composition).⁹⁹ Lotion (0.6 – 0.8 g) was applied 2x/d, for 30 d. The mean value of skin redness decreased from 33.98 at day 0 to 29.3 at day 30 was determined to be statistically significant compared to baseline ($p < 0.01$). The median skin redness profile values decreased from 12.79 to 11.08 after 30 d of treatment (compared to baseline; $p < 0.01$). Mean total BoSS questionnaire scores decreased from 23.29 to 17.63 after 30 d of treatment (compared to baseline; $p < 0.01$). Users reported decreased inflammation, scaling, itching, tingling, and pain following use of lotion.

The effect of topical application of postbiotic Himalaya-derived *Saccharomyces* and *Lactobacillus* ferment complex (details regarding composition of complex not provided) on the alleviation of sensitive scalp syndrome was evaluated in female volunteers ($n = 30$).¹⁰⁰ Subjects were treated with the ferment complex, 2x/d, for 4 wk. Symptoms were evaluated using a self-assessment questionnaire on day 0, 14, and 28. The self-assessment questionnaire revealed an overall syndrome alleviation effect of 100% after 14 and 28 d of treatment. The self-assessment demonstrated that all subjects felt alleviation of itching symptoms, 96% felt alleviation of prickling, tightness, pain, and dandruff symptoms, and 92% felt alleviation of burning symptoms.

SUMMARY

The safety of Lactobacillus Ferment, Lactobacillus Ferment Filtrate, Lactobacillus Ferment Lysate and Lactobacillus Ferment Lysate Filtrate is reviewed in this safety assessment. According to the *Dictionary*, all of these ingredients are mainly reported to function in cosmetics as skin-conditioning agents – miscellaneous. It should be noted that the main components of the ingredients reviewed in this report are not the live bacteria themselves, but byproducts of the fermentation of the bacteria (e.g., intracellular and extracellular metabolites, enzymes, peptides, teichoic acids, polysaccharides, organic acids (e.g., lactic acid), fragments of the dead bacteria).

According to 2023 FDA VCRP data and 2024 RLD, Lactobacillus Ferment is reported to have the highest number of uses (266 and 2106 formulations, respectively). Lactobacillus Ferment also has the highest concentration of use (it is used at up to 5.6% in face and neck products (not spray) and other skin care preparations).

No genotoxicity was observed in Ames assays performed with Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate (either as a pure ingredient or as part of a trade name mixture). All test substances were evaluated with and without metabolic activation, at up to 5000 µg/plate.

In vitro H295R steroidogenesis assays were performed using a Lactobacillus Ferment derived from *Lactobacillus acidophilus* and a trade name mixture consisting of 2% Lactobacillus Ferment Lysate derived from *Lactobacillus acidophilus* and 98% *Medicago sativa* (alfalfa) callus culture conditioned media extract. Both test substances were tested at up to 10,000 µM, and neither test substance inhibited or induced the production of 17β-estradiol or testosterone.

Postbiotics obtained via a fermentative process of *Lactobacillus* bacteria (e.g., lactic acid, lipoteichoic acid) are tyrosinase-inhibitors, and thus, may result in skin depigmentation. A heated *Lactobacillus rhamnosus* spent-culture supernatant (tested at 100%) resulted in a $72.1 \pm 1.2\%$ inhibition of tyrosinase activity in in vitro assay using mushroom

tyrosinase. (The standard, 2 and 10 mM kojic acid, resulted in 43.6 ± 2.5 and $83.6 \pm 1.0\%$ tyrosinase inhibition, respectively).

A cream containing *Lacticaseibacillus rhamnosus* ferment lysate resulted in an alleviation of redness and drying induced by SLS, compared to sites untreated with cream. The cream was applied to the forearms of 24 female subjects 2x/d, for 5 d, after treatment with SLS.

Heat-killed *Lactobacillus* species have been reported to induce anti-melanogenesis in vitro, and inhibit immunoglobulin E production, induce high levels of interleukin-12, and alleviate atopic dermatitis symptoms in mice. In humans, heat-killed *Lactobacillus* species were reported to enhance key immune markers and prevent infection. No adverse effects were observed in studies in which humans were orally given heat-killed *Lactobacillus*.

EpiDerm™ assays were performed using Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate (either as a pure ingredient or as part of a trade name mixture). All test substances were tested undiluted and were predicted to be non-irritating. No irritation was reported in a use assay in which 21 females applied cream containing *Lacticaseibacillus rhamnosus* lysate filtrate to the face, 2x/d, for 4 wk.

The majority of these test substances listed above were evaluated in direct peptide reactivity assays (DPRAs; at 100 mM) and antioxidant/electrophile response element (ARE)-nuclear factor erythroid 2-related factor (Nrf2) luciferase assays (at up to 2000 μM). All test substances were predicted to be non-sensitizing. HRIPTs were performed using Lactobacillus Ferment in 2 assays (tested at 4 - 10%; 50 - 51 subjects) and using a product containing 5% Lactobacillus Ferment Lysate Filtrate (tested at 100%; 50 subjects). All test substances were considered to be non-irritating and non-sensitizing.

EpiOcular™ assays were performed using Lactobacillus Ferment, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate (either as pure ingredients or as part of a trade name mixture). All test substances were tested at 100% and considered to be non-irritating.

Skin redness, skin redness profile values, and BoSS questionnaire scores were statistically significantly decreased in patients (n = 52) with sensitive skin following the use of a lotion containing a trade mixture consisting of fermented cultures of both *Lacticaseibacillus rhamnosus* and *Lactobacillus paracasei* (this mixture comprised 3% of the total lotion composition) 2x/d for 30 d. Alleviation of itching, prickling, tightness, dandruff, and burning was reported in female volunteers (n = 30) with sensitive scalp syndrome treated with a topical application of postbiotic *Saccharomyces* and *Lactobacillus* ferment complex.

DISCUSSION

This assessment reviews the safety of Lactobacillus Ferment, Lactobacillus Ferment Filtrate, Lactobacillus Ferment Lysate, and Lactobacillus Ferment Lysate Filtrate as used in cosmetic formulations, in accordance with the product categories and concentrations of use identified in the Use section and Use table. The Panel considered the available data and concluded that these ingredients are safe in cosmetics in the present practices of use and concentration.

Data included in this report indicate that these ingredients may have a skin lightening effect. The Panel noted that skin lightening is considered a drug effect, and should not occur during the use of cosmetic products. Because of that caveat, the Panel's knowledge of the mechanism of action (i.e., inhibition of tyrosinase activity resulting in reduced melanin synthesis), and clinical experience, concern for this effect in cosmetics was mitigated. Nevertheless, cosmetic formulators should only use this ingredient in products in a manner that does not cause skin depigmentation.

The Panel discussed the issue of incidental inhalation exposure resulting from these ingredients (e.g., Lactobacillus Ferment is used in hair sprays (concentration not stated)). Inhalation toxicity data were not available. However, the Panel noted that the majority of droplets/particles would not be respirable to any appreciable amount. Furthermore, droplets/particles deposited in the nasopharyngeal or tracheobronchial 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 low concentrations at which these ingredients are used (or expected to be used) in potentially inhaled products, 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 <https://www.cir-safety.org/cir-findings>.

The Panel's respiratory exposure resource document (see link above) notes that airbrush technology presents a potential safety concern. Although frequency and/or concentration of use data are now available (and in some cases mandated) for ingredients marketed for use with airbrush delivery systems in certain product categories, no data are available for consumer habits and practices thereof, product particle size, or other relevant particle data (e.g., diameter). As a result of deficiencies in these critical data needs, the data profile is incomplete, and the safety of cosmetic ingredients applied by airbrush delivery systems cannot be determined by the Panel. Accordingly, the Panel has concluded the data are insufficient to support the safe use of cosmetic ingredients applied via an airbrush delivery system.

CONCLUSION

The Expert Panel for Cosmetic Ingredient Safety concluded that the following *Lactobacillus* ferment ingredients are safe in cosmetics in the present practices of use and concentration described in this safety assessment:

Lactobacillus Ferment

Lactobacillus Ferment Lysate

Lactobacillus Ferment Lysate Filtrate

Lactobacillus Ferment Filtrate

TABLES**Table 1. Definitions and reported functions of the ingredients in this safety assessment.¹**

Ingredient & CAS No.	Definition	Functions
Lactobacillus Ferment	Lactobacillus Ferment is the product obtained through fermentation by the microorganism, <i>Lactobacillus</i>	antiacne agents antidandruff agents antioxidants emulsion stabilizers film formers humectants skin-conditioning agents - miscellaneous viscosity increasing agents - aqueous
Lactobacillus Ferment Lysate	Lactobacillus Ferment Lysate is a lysate of the product obtained by the fermentation of <i>Lactobacillus</i> .	skin-conditioning agents - miscellaneous
Lactobacillus Ferment Lysate Filtrate CAS No. 1686112-36-6)	Lactobacillus Ferment Lysate Filtrate is a filtrate of the lysate of the product obtained by the fermentation of <i>Lactobacillus</i> .	skin-conditioning agents - miscellaneous
Lactobacillus Ferment Filtrate	Lactobacillus Ferment Filtrate is a filtrate of the product obtained by the fermentation of the growth media by the microorganism, <i>Lactobacillus</i> .	antioxidants skin-conditioning agents - miscellaneous

Table 2. Chemical properties

Property	Value	Reference
Lactobacillus Ferment		
Physical Form	liquid	4
Color	colorless - yellow	4
Odor	characteristic	4
pH	3.0 – 7.0	4
Specific Gravity (@ 25°C)	0.990 – 1.11	4
Boiling Point (°C)	100	6
Freezing Point (°C)	0	6
Lactobacillus Ferment Lysate Filtrate		
Physical Form	semi-viscous liquid	5
Color	clear to slightly hazy; yellow	5
Odor	characteristic	5
pH (@ 25°C)	3.5 – 5.5	5
Specific Gravity (@ 25°C)	1.02 – 1.07	5

Table 3. Species* used in the manufacturing of *Lactobacillus* ferment ingredients⁷

	Lactobacillus Ferment	Lactobacillus Ferment Filtrate	Lactobacillus Ferment Lysate	Lactobacillus Ferment Lysate Filtrate
<i>Lactobacillus acidophilus</i>	X		X	
<i>Lactobacillus bifidus</i>				X
<i>Lactobacillus brevis</i>	X		X	
<i>Lactobacillus bulgaricus</i>		X	X	X
<i>Lactobacillus casei</i>			X	
<i>Lactobacillus crispatus</i>	X	X		
<i>Lactobacillus curvatus</i>	X			
<i>Lactobacillus delbrueckii</i>			X	
<i>Lactobacillus gasseri</i>			X	
<i>Lactobacillus helveticus</i>			X	
<i>Lactobacillus kunkeei</i>	X			
<i>Lactobacillus paracasei</i>	X	X		
<i>Lactobacillus pentosus</i>	X			
<i>Lactobacillus plantarum</i>	X	X	X	
<i>Lactobacillus reuteri</i>	X			
<i>Lactobacillus rhamnosus</i>	X	X	X	
<i>Lactobacillus reuteri</i>		X		
<i>Lactobacillus sakei</i>			X	

*Some species listed herein are outdated species names. Table 4 lists the outdated names along with currently accepted names. Several of these species are reported to be used in more than one ingredient.

Table 4. Taxonomy of species reported to be used in *Lactobacillus* ferment-derived cosmetic ingredients⁹

Class	Order	Family	Genus	Species
Bacilli	Lactobacillales	Lactobacillaceae	<i>Apilactobacillus</i>	<i>Apilactobacillus kunkeei</i> (previously known as <i>Lactobacillus kunkeei</i>)
Actinomycetes	Bifidobacteriales	Bifidobacteriaceae	<i>Bifidobacterium</i>	<i>Bifidobacterium bifidum</i> (previously known as <i>Lactobacillus bifidus</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lacticaseibacillus</i>	<i>Lacticaseibacillus casei</i> (previously known as <i>Lactobacillus casei</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lacticaseibacillus</i>	<i>Lacticaseibacillus paracasei</i> (previously known as <i>Lactobacillus paracasei</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lacticaseibacillus</i>	<i>Lacticaseibacillus rhamnosus</i> (previously known as <i>Lactobacillus rhamnosus</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactiplantibacillus</i>	<i>Lactiplantibacillus pentosus</i> (previously known as <i>Lactobacillus pentosus</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactiplantibacillus</i>	<i>Lactiplantibacillus plantarum</i> (previously known as <i>Lactobacillus plantarum</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactobacillus</i>	<i>Lactobacillus acidophilus</i>
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactobacillus</i>	<i>Lactobacillus bulgaricus</i> (synonymous to <i>Lactobacillus delbrueckii</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactobacillus</i>	<i>Lactobacillus crispatus</i>
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactobacillus</i>	<i>Lactobacillus delbrueckii</i> (synonymous to <i>Lactobacillus bulgaricus</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactobacillus</i>	<i>Lactobacillus gasseri</i>
Bacilli	Lactobacillales	Lactobacillaceae	<i>Lactobacillus</i>	<i>Lactobacillus helveticus</i>
Bacilli	Lactobacillales	Lactobacillaceae	<i>Latilactobacillus</i>	<i>Latilactobacillus curvatus</i> (previously known as <i>Lactobacillus curvatus</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Latilactobacillus</i>	<i>Latilactobacillus sakei</i> (previously known as <i>Lactobacillus sakei</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Levilactobacillus</i>	<i>Levilactobacillus brevis</i> (previously known as <i>Lactobacillus brevis</i>)
Bacilli	Lactobacillales	Lactobacillaceae	<i>Limosilactobacillus</i>	<i>Limosilactobacillus reuteri</i>

Table 5. Method of manufacture of *Lactobacillus* ferment-derived ingredients¹²⁻¹⁷

Ingredient	Method	Manufacturing process
Lactobacillus Ferment	A	media preparation → sterilization and filtration → fermentation (addition of <i>Lactobacillus</i> sp.) → sterilization and filtration → decolorization and deodorization → addition of other ingredients (as indicated in table 5 (e.g., 1,2-hexanediol)) → stabilization → quality control → packing
Lactobacillus Ferment	B	media preparation → media preparation → sterilization and filtration → fermentation (addition of <i>Lactobacillus plantarum</i>) → sterilization and filtration → addition of ethyl acetate and fraction → dehydration and concentration → addition of water and butylene glycol and dissolving → filtration → stabilization → quality control → packing
Lactobacillus Ferment	C	media preparation → sterilization and filtration → fermentation at 35°C for 48 h (addition of 1,2-hexanediol → sterilization → quality control → packing
Lactobacillus Ferment	D	media preparation → sterilization and filtration → fermentation (addition of <i>Lactobacillus brevis</i>) → sterilization and filtration → decolorization and deodorization → addition of 1,2-hexanediol → stabilization → quality control → packing
Lactobacillus Ferment Filtrate	E	media preparation → sterilization and filtration → fermentation (addition of <i>Lactobacillus</i> sp.) → sterilization and filtration → decolorization and deodorization → addition of 1,2-hexanediol → filtration → stabilization → quality control → packing
Lactobacillus Ferment Lysate	F	media preparation (glucose, yeast extract, soy peptone) → sterilization → fermentation at 35°C for 72 h (addition of <i>Lactobacillus plantarum</i>) → quality control → tyndallization at 80°C for 1 h/d for 3 d → addition of 1,2-hexanediol → quality control → packing

*Some species listed herein are outdated species names. Table 4 lists the outdated names along with currently accepted names.

Table 6. Summary composition of *Lactobacillus* ferment-derived ingredients²⁹

Ingredient	Species used in manufacturing*	Composition	Manufacturing method**
Lactobacillus Ferment	<i>Lactobacillus brevis</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus brevis</i>	97.8% Lactobacillus Ferment 2.2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus brevis</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus curvatus</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	E
Lactobacillus Ferment	<i>Lactobacillus curvatus</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus kunkeei</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	E
Lactobacillus Ferment	<i>Lactobacillus curvatus</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	C
Lactobacillus Ferment	<i>Lactobacillus paracasei</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus paracasei</i>	97.5% Lactobacillus Ferment 2.5% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus pentosus</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	E
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	87.9% Lactobacillus Ferment 10% butylene glycol 2% 1,2-hexanediol 0.1% ethylhexylglycerin	A
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	97% Lactobacillus Ferment 3% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	97.5% Lactobacillus Ferment 2.5% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	0.1% Lactobacillus Ferment 69.9% water 30% butylene glycol	B
Lactobacillus Ferment	<i>Lactobacillus plantarum</i>	99% Lactobacillus Ferment 0.8% propanediol 0.15% caprylyl glycol 0.05% ethylhexylglycerin	E
Lactobacillus Ferment	<i>Lactobacillus reuteri</i>	97.5% Lactobacillus Ferment 2.5% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus rhamnosus</i>	97.5% Lactobacillus Ferment 2.5% 1,2-hexanediol	A
Lactobacillus Ferment	<i>Lactobacillus rhamnosus</i>	98% Lactobacillus ferment 2% 1,2-hexanediol	A
Lactobacillus Ferment Filtrate	<i>Lactobacillus plantarum</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	E

Table 6. Summary composition of *Lactobacillus* ferment-derived ingredients²⁹

Ingredient	Species used in manufacturing*	Composition	Manufacturing method**
Lactobacillus Ferment Filtrate	<i>Lactobacillus reuteri</i>	97.5% Lactobacillus Ferment 2.5% 1,2-hexanediol	E
Lactobacillus Ferment Filtrate	<i>Lactobacillus rhamnosus</i>	97.8% Lactobacillus Ferment 2.2% 1,2-hexanediol	E
Lactobacillus Ferment Lysate	<i>Lactobacillus brevis</i>	97.5% Lactobacillus Ferment 2.5% 1,2-hexanediol	D
Lactobacillus Ferment Lysate	<i>Lactobacillus brevis</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	E
Lactobacillus Ferment Lysate	<i>Lactobacillus plantarum</i>	98% Lactobacillus Ferment 2% 1,2-hexanediol	F

*Some species listed herein are outdated species names. Table 4 lists the outdated names along with currently accepted names.

**Method of manufacture number correlates to the corresponding method in Table 5

Table 7. Frequency (RLD/VCRP) and concentration of use according to likely duration and exposure and by product category

	# of Uses		Max Conc of Use		# of Uses		Max Conc of Use	
	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³
	Lactobacillus Ferment				Lactobacillus Ferment Filtrate			
Totals*	2106	266	0.001 – 1.5	0.000025 – 5.6	32	8	0.0005 – 0.09	NR
summarized by likely duration and exposure**								
Duration of Use								
<i>Leave-On</i>	***	216	0.001 – 1.5	0.000025 – 5.6	***	4	0.09	NR
<i>Rinse-Off</i>	***	49	0.04	0.0002 – 5.6	***	4	0.0005	NR
<i>Diluted for (Bath) Use</i>	***	1	NR	NR	***	NR	NR	NR
Exposure Type								
Eye Area	***	8	0.1	0.000025 – 4.6	***	NR	NR	NR
Incidental Ingestion	***	17	NR	NR	***	NR	NR	NR
Incidental Inhalation-Spray	***	1; 98 ^a ; 54 ^b	0.2 ^a	4.6; 1.5 ^b	***	2 ^a ; 2 ^b	NR	NR
Incidental Inhalation-Powder	***	2; 54 ^b ; 1 ^c	0.18 ^c	0.0013; 1.5 ^b ; 0.015 – 5.6 ^c	***	2 ^b	NR	NR
Dermal Contact	***	233	0.01 – 1.5	0.000025 – 5.6	***	8	0.0005 – 0.09	NR
Deodorant (underarm)	***	NR	NR	0.5	***	NR	NR	NR
Hair - Non-Coloring	***	16	0.001	0.0002	***	NR	NR	NR
Hair-Coloring	***	NR	NR	NR	***	NR	NR	NR
Nail	***	NR	NR	NR	***	NR	NR	NR
Mucous Membrane	***	32	NR	0.0003 – 5.6	***	3	NR	NR
Baby Products	***	1	NR	NR	***	NR	NR	NR
as reported by product category								
Baby Products	6							
Baby Shampoos	3	NR	NR	NR				
Baby Lotions, Oils, Powders, Creams	2	1	NR	NR				
Baby Wipes	1	NA	NA	NR				
Other Baby Products								
Bath Preparations	10							
Other Bath Preparations	10	1	NR					
Eye Makeup Preparations (not children's)	71							
Eyeliner	2	1	NR	NR				
Eye Shadow	1	NR	NR	NR				
Eye Lotion	24	1	0.1	0.1 – 4.6				
Eye Makeup Remover	1	NR	NR	NR				
Mascara	35	NR	NR	NR				
Eyelash and Eyebrow Preparations (primers, conditioners, serums, fortifiers)	8	NA	NA	NR				
Other Eye Makeup Preparations				0.000025				
Fragrance Preparations	25							
Cologne and Toilet Water	19	NR	NR	NR				
Perfumes	NR	1	NR	NR				
Other Fragrance Preparation	6	NR	NR	NR				
Hair Preparations (non-coloring)	310				2			
Hair Conditioners	20 (l.o.); 70 (r.o.)	7	NR	0.0002 (l.o.); 0.0002 (r.o.)				
Hair Sprays (aerosol fixatives)	10	NR	NR	NR				
Permanent Waves	1	NR	NR	NR				
Rinses (non-coloring)	13	1	NR	NR				
Shampoos (non-coloring)	4 (l.o.); 76 (r.o.)	4	NR	NR				

Table 7. Frequency (RLD/VCRP) and concentration of use according to likely duration and exposure and by product category

	# of Uses		Max Conc of Use		# of Uses		Max Conc of Use	
	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³
Tonics, Dressings, Other Hair Grooming Aids	32	3	NR	NR	1	NR	NR	NR
Wave Sets	2	NR	NR	NR				
Other Hair Preparations	68 (l.o.); 30 (r.o.)	1	0.001	NR	1 (r.o.)	NR	NR	NR
Hair Coloring Preparations	81							
Hair Dyes and Colors (all types requiring caution statements and patch tests)	80	NR	NR	NR				
Hair Shampoos (coloring)	1 (r.o.)	NR	NR	NR				
Other Hair Coloring Preparation								
Makeup Preparations (not eye or children's)	186							
Blushers and Rouges (all types)	12	NR	NR	NR				
Face Powders	7	2	NR	0.0013				
Foundations	111 (traditional application); 37 (airbrush application)	1	NR	0.0056 (traditional application)				
Lipstick and Lip Glosses	24	15	NR	NR				
Makeup Bases	7 (traditional application); 2 (airbrush application)	2	1.5	NR				
Makeup Fixatives	9	NR	NR	0.019				
Other Makeup Preparations	15 (l.o.); 6 (r.o.)	3	0.19	NR				
Manicuring Preparations	5							
Basecoats and Undercoats	2	NR	NR	NR				
Nail Polish and Enamel	3	NR	NR	NR				
Oral Products	11							
Dentifrices	7	NR	NR	NR				
Mouthwashes and Breath Fresheners	3	NR	NR	NR				
Other Oral Products	1	2	NR	NR				
Personal Cleanliness	96							
Bath Soaps and Body Washes	30	6	NR	NR				
Deodorants (underarm)	41	NR	NR	0.5 (not spray)				
Douches				NR				
Feminine Deodorants	NR	1	NR	NR	NR	2	NR	NR
Disposable Wipes	8	NA	NA	NR				
Other Personal Cleanliness Products	5 (l.o.); 12 (r.o.)	7	NR	0.003 – 5.6 (r.o.)	NR	1	NR	NR
Shaving Preparations	3							
Beard Softeners	1	NR	NR	NR				
Other Shaving Preparations	2	NR	NR	NR				
Skin Care Preparations	1310				30			
Cleansing	127	15	0.04	0.014 – 1	3	3	0.0005	NR
Face and Neck (excluding shaving preps)	737 (l.o.); 74 (r.o.)	49	0.18	0.015 – 5.6 (l.o.)	24 (l.o.); 3 (r.o.)	NR	0.09	NR
Body and Hand (excluding shaving preps)	66 (l.o.); 6 (r.o.)	4	NR	0.02 (l.o.); 4.6 (spray)	1 (l.o.)	NR	NR	NR
Foot Powders and Sprays	NR	NR	NR	1.5				

Table 7. Frequency (RLD/VCRP) and concentration of use according to likely duration and exposure and by product category

	# of Uses		Max Conc of Use		# of Uses		Max Conc of Use	
	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³
Moisturizing	326	76	0.01 (not spray)	0.1 – 4.6 (not spray)	3	2	NR	NR
Night	40	14	NR	NR				
Paste Masks (mud packs)	41	7	NR	0.0063				
Skin Fresheners	52	3	0.2	NR	2	NR	NR	NR
Other Skin Care Preparations	163 (l.o.); 74 (r.o.)	32	NR	5.6 (not spray; l.o.); 5.6 (not spray; r.o.)	4 (l.o.)	NR	NR	NR
Suntan Preparations	9							
Suntan Gels, Creams, and Liquids	7	NR	NR	NR				
Indoor Tanning Preparations	2 (spray application); 2 (professional spray application); 1 (airbrush application); 1 (professional airbrush application)	NR	NR	NR				
Tattoo Preparations	1							
Other Tattoo Preparations	1	NA	NR	NR				
Other Preparations (i.e., those preparations that do not fit another category)	10							
Totals*	876	47	0.17 – 0.5	0.05 – 0.17	39	6	NR	0.003 – 0.1
summarized by likely duration and exposure**								
Duration of Use								
Leave-On	***	34	0.5	0.05 – 0.17	***	6	NR	0.015 – 0.1
Rinse-Off	***	13	0.17	NR	***	NR	NR	0.003
Diluted for (Bath) Use	***	NR	NR	NR	***	NR	NR	NR
Exposure Type								
Eye Area	***	3	0.5	NR	***	NR	NR	NR
Incidental Ingestion	***	1	NR	NR	***	NR	NR	NR
Incidental Inhalation-Spray	***	21 ^a , 9 ^b	NR	NR	***	3 ^a , 3 ^b	NR	NR
Incidental Inhalation-Powder	***	9 ^b	NR	0.05 – 0.12 ^c	***	3 ^b	NR	0.1 ^c
Dermal Contact	***	44	0.17 – 0.5	0.05 – 0.17	***	6	NR	0.003 – 0.1
Deodorant (underarm)	***	NR	NR	NR	***	NR	NR	0.015
Hair - Non-Coloring	***	2	NR	NR	***	NR	NR	NR
Hair-Coloring	***	NR	NR	NR	***	NR	NR	NR
Nail	***	NR	NR	NR	***	NR	NR	NR
Mucous Membrane	***	4	NR	NR	***	NR	NR	0.003
Baby Products	***	NR	NR	NR	***	NR	NR	NR
as reported by product category								
Baby Products	9							
Baby Shampoos	1	NR	NR	NR				
Baby Lotions, Oils, Powders, Creams	5	NR	NR	NR				
Baby Wipes								
Other Baby Products	3 (r.o.)	NR	NR	NR				

Table 7. Frequency (RLD/VCRP) and concentration of use according to likely duration and exposure and by product category

	# of Uses		Max Conc of Use		# of Uses		Max Conc of Use	
	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³
<i>Bath Preparations (diluted for use)</i>								
Other Bath Preparations								
<i>Eye Makeup Preparations</i>	13							
Eyeliner								
Eye Shadow	1	NR	NR	NR				
Eye Lotion	10	1	0.5	NR				
Eye Makeup Remover								
Mascara								
Eyelash and Eyebrow Preparations (primers, conditioners, serums, fortifiers)	2	NA	NA	NR				
Other Eye Makeup Preparations	NR	2	NR	NR				
<i>Fragrance Preparations</i>								
Cologne and Toilet Water								
Perfumes								
Other Fragrance Preparation								
<i>Hair Preparations (non-coloring)</i>	139							
Hair Conditioners	6 (l.o.); 37 (r.o.)	NR	NR	NR				
Hair Sprays (aerosol fixatives)	1	NR	NR	NR				
Permanent Waves								
Rinses (non-coloring)	7	1	NR	NR				
Shampoos (non-coloring)	64 (r.o.)	1	NR	NR				
Tonics, Dressings, Other Hair Grooming Aids	15	NR	NR	NR				
Wave Sets								
Other Hair Preparations	18 (l.o.); 8 (r.o.)	NR	NR	NR				
<i>Hair Coloring Preparations</i>	5							
Hair Dyes and Colors (all types requiring caution statements and patch tests)	2	NR	NR	NR				
Hair Shampoos (coloring)	1 (r.o.)	NR	NR	NR				
Other Hair Coloring Preparation	2 (l.o.)	NR	NR	NR				
<i>Makeup Preparations (not eye or children's)</i>	39							
Blushers and Rouges (all types)	2	NR	NR	NR				
Face Powders								
Foundations	23 (traditional application)	NR	NR	NR				
Lipstick and Lip Glosses	3	NR	NR	NR				
Makeup Bases	4 (traditional application)	NR	NR	NR				
Makeup Fixatives	3	NR	NR	NR				
Other Makeup Preparations	4 (l.o.)	NR	NR	NR				
<i>Manicuring Preparations (Nail)</i>								
Basecoats and Undercoats								
Nail Polish and Enamel								
<i>Oral Hygiene Products</i>	4							
Dentifrices	3	NR	NR	NR				
Mouthwashes and Breath Fresheners	1	1	NR	NR				
Other Oral Products								
<i>Personal Cleanliness Products</i>	99							

Table 7. Frequency (RLD/VCRP) and concentration of use according to likely duration and exposure and by product category

	# of Uses		Max Conc of Use		# of Uses		Max Conc of Use	
	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³	RLD (2024) ³²	VCRP (2023) ³¹	% (2022) ³⁴	% (2025) ³³
Bath Soaps and Body Washes	11	NR	NR	NR				
Deodorants (underarm)	1	NR	NR	NR	NR	NR	NR	0.015 (not spray)
Douches	4	NR	NR	NR				
Feminine Deodorants	3 (r.o.)	NR	NR	NR				
Disposable Wipes	76	NA	NA	NR				
Other Personal Cleanliness Products	1 (l.o.); 3 (r.o.)	3	NR	NR	NR	NR	NR	0.003 (r.o.)
Shaving Preparations								
Beard Softeners								
Other Shaving Preparations								
Skin Care Preparations	575				38			
Cleansing	59	6	NR	NR	2	NR	NR	NR
Face and Neck (excluding shaving preps)	353 (l.o.); 27 (r.o.)	9	NR	0.05 – 0.12 (not spray; l.o.); 0.05 (not spray; r.o.)	16 (l.o.); 2 (r.o.)	NR	NR	NR
Body and Hand (excluding shaving preps)	29 (l.o.); 5 (r.o.)	NR	NR	NR	2 (l.o.)	3	NR	0.1 (not spray; l.o.)
Foot Powders and Sprays								
Moisturizing	209	19	NR	0.17 (not spray)	15	1	NR	NR
Night	7	NR	NR	NR	1	2	NR	NR
Paste Masks (mud packs)	9	1	0.17	NR				
Skin Fresheners	19	NR	NR	NR	6	NR	NR	NR
Other Skin Care Preparations	37 (l.o.); 6 (r.o.)	2	NR	NR	3 (l.o.)	NR	NR	NR
Suntan Preparations	2							
Suntan Gels, Creams, and Liquids	2	NR	NR	NR				
Indoor Tanning Preparations								
Tattoo Preparations								
Other Tattoo Preparations								
Other Preparations (i.e., those preparations that do not fit another category)	6				1			

NR – not reported; NA – not applicable (this category was not part of the VCRP)

l.o. – leave-on; r.o. – rinse-off

*The total FOU provided for RLD refers to the ingredient count supplied by FDA, and is not a summation of the number of uses per category because each product may be categorized under multiple product categories.

For data supplied via the VCRP or by the Council survey, the sum of all exposure types may not equal the sum of total uses because each ingredient may be used in cosmetics with multiple exposure types.

**Likely duration and exposure are derived from VCRP and survey data based on product category (see Use Categorization <https://www.cir-safety.org/cir-findings>)

*** In the RLD each ingredient may be reported under several product categories, making a summation of RLD misleading in comparison to VCRP data. Accordingly, RLD are presented below by product category (as supplied by FDA), but are not summarized by likely duration and exposure.

^a It is possible these products are sprays, but it is not specified whether the reported uses are sprays.^b Not specified whether a spray or a powder, but it is possible the use can be as a spray or a powder, therefore the information is captured in both categories^c It is possible these products are powders, but it is not specified whether the reported uses are powders.

Table 8. In vitro genotoxicity studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test System	Protocol	Results	Reference
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 48% water, 30% glycerin, and 20% pereskia aculeata callus extract	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; sterile water used as negative control; a known mutagen used as positive control	non-genotoxic; controls performed as expected	⁵³
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 20% momordica cochinchinesis seed extract, and 78% water	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵⁵
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵¹
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵⁷
Lactobacillus Ferment	Lactobacillus Ferment	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵²
Lactobacillus Ferment Lysate	trade name mixture consisting of 2% Lactobacillus Ferment Lysate (derived from <i>Lactobacillus acidophilus</i>) and 98% <i>Medicago sativa</i> (alfalfa) callus culture conditioned media extract	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵⁰
Lactobacillus Ferment Lysate Filtrate	Lactobacillus Ferment Lysate Filtrate derived from <i>Lactobacillus bifidus</i> (98% purity)	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵⁶

Table 8. In vitro genotoxicity studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test System	Protocol	Results	Reference
Lactobacillus Ferment and Lactobacillus Ferment Lysate	trade name mixture consisting of 10% Lactobacillus Ferment Lysate, 2% Lactobacillus Ferment, 67% water, 10% camelia sinensis leaf extract, 10% punica granatum extract, and 1% caffeine <i>Lactobacillus</i> species used in manufacturing of Lactobacillus Ferment ingredients in this trade name mixture include <i>Lactobacillus bulgaricus</i> and <i>Lactobacillus acidophilus</i> (unknown which species corresponds to the ferment or ferment lysate)	distilled water	1.5, 5, 15, 50, 150, 500, 1500, 5000 µg/plate	<i>S. typhimurium</i> TA98, TA100, TA1535, TA1537 and <i>E. coli</i> WP2uvrA	OECD TG 471; Ames assay performed with and without metabolic activation; as described above	non-genotoxic; controls performed as expected	⁵⁴

OECD = Organisation for Economic Cooperation and Development; TG = test guidelines

Table 9. Dermal irritation, sensitization, and photoirritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population/System	Protocol	Results	Reference
IRRITATION							
IN VITRO							
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 20% <i>Momordica cochinchinesis</i> seed extract, and 78% water	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay; cell viability evaluated using MTT assay; phosphate-buffered saline used as negative control; sodium dodecyl sulfate used as positive control	predicted to be non-irritating; controls gave expected results	⁷⁰
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay. as described above	predicted to be non-irritating; controls gave expected results	⁷⁴
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay. as described above	predicted to be non-irritating; controls gave expected results	⁷⁵
Lactobacillus Ferment	Lactobacillus Ferment	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay. as described above	predicted to be non-irritating; controls gave expected results	⁷³
Lactobacillus Ferment Lysate	trade name mixture consisting of 2% Lactobacillus Ferment Lysate (derived from <i>Lactobacillus acidophilus</i>) and 98% <i>Medicago sativa</i> (alfalfa) callus culture conditioned media extract	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay. as described above	predicted to be non-irritating; controls gave expected results	⁷²
Lactobacillus Ferment Lysate Filtrate	Lactobacillus Ferment Lysate Filtrate derived from <i>Lactobacillus bifidus</i> (98% purity)	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay. as described above	predicted to be non-irritating; controls gave expected results	⁶⁹

Table 9. Dermal irritation, sensitization, and photoirritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population/System	Protocol	Results	Reference
Lactobacillus Ferment and Lactobacillus Ferment Lysate	trade name mixture consisting of 10% Lactobacillus Ferment Lysate, 2% Lactobacillus Ferment, 67% water, 10% <i>Camelia sinensis</i> leaf extract, 10% <i>Punica granatum</i> extract, and 1% caffeine Lactobacillus species used in manufacturing of Lactobacillus Ferment ingredients in this trade name mixture include <i>Lactobacillus bulgaricus</i> and <i>Lactobacillus acidophilus</i> (unknown which species corresponds to the ferment or ferment lysate)	none	tested neat; 30 µl	reconstructed human epidermis (n = 3)	EpiDerm™ assay. as described above	predicted to be non-irritating; controls gave expected results	71
HUMAN							
Lactobacillus Ferment Lysate	cream containing <i>Lacticaseibacillus rhamnosus</i> ferment lysate (composition of cream not stated)	none	tested neat	21 female subjects	use study; subjects instructed to apply cream to face 2x/d for 4 wk	no erythema, edema, stinging, burning, tingling, or tightness reported	62
SENSITIZATION							
IN CHEMICO/IN VITRO							
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 48% water, 30% glycerin, and 20% <i>Pereskia aculeata</i> callus extract	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; negative control: dimethyl sulfoxide; positive control: cinnamic aldehyde	predicted to be non-sensitizing; reference control gave expected results	80
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment, 20% <i>Momordica cochinchinesis</i> seed extract, and 78% water	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; as described above	predicted to be non-sensitizing; reference control gave expected results	82
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; as described above	predicted to be non-sensitizing; reference control gave expected results	77
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; as described above	predicted to be non-sensitizing; reference control gave expected results	76
Lactobacillus Ferment	Lactobacillus Ferment	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; as described above	predicted to be non-sensitizing; reference control gave expected results	78
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 48% water, 30% glycerin, and 20% <i>Pereskia aculeata</i> callus extract	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; solvent control; cinnamic aldehyde as positive control	predicted to be non-sensitizing; controls gave expected results	87
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 20% <i>Momordica cochinchinesis</i> seed extract, and 78% water	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; as described above	predicted to be non-sensitizing; controls gave expected results	89
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; as described above	predicted to be non-sensitizing; controls gave expected results	84
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; as described above	predicted to be non-sensitizing; controls gave expected results	83

Table 9. Dermal irritation, sensitization, and photoirritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population/System	Protocol	Results	Reference
Lactobacillus Ferment	Lactobacillus Ferment	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; as described above	predicted to be non-sensitizing; controls gave expected results	85
Lactobacillus Ferment Lysate	trade name mixture consisting of 2% Lactobacillus Ferment Lysate (derived from <i>Lactobacillus acidophilus</i>) and 98% <i>Medicago sativa</i> (alfalfa) callus culture conditioned media extract	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; as described above	predicted to be non-sensitizing; reference control gave expected results	79
Lactobacillus Ferment Lysate	trade name mixture consisting of 2% Lactobacillus Ferment Lysate (derived from <i>Lactobacillus acidophilus</i>) and 98% <i>Medicago sativa</i> (alfalfa) callus culture conditioned media extract	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; as described above	predicted to be non-sensitizing; controls gave expected results	86
Lactobacillus Ferment and Lactobacillus Ferment Lysate	trade name mixture consisting of 10% Lactobacillus Ferment Lysate, 2% Lactobacillus Ferment, 67% water, 10% camelia sinensis leaf extract, 10% punica granatum extract, and 1% caffeine Lactobacillus species used in manufacturing of Lactobacillus Ferment ingredients in this trade name mixture include <i>Lactobacillus bulgaricus</i> and <i>Lactobacillus acidophilus</i> (unknown which species corresponds to the ferment or ferment lysate)	acetonitrile	100 mM	cysteine and lysine peptides	OECD TG 442C; DPRA; as described above	predicted to be non-sensitizing; reference control gave expected results	81
Lactobacillus Ferment and Lactobacillus Ferment Lysate	trade name mixture consisting of 10% Lactobacillus Ferment Lysate, 2% Lactobacillus Ferment, 67% water, 10% camelia sinensis leaf extract, 10% punica granatum extract, and 1% caffeine Lactobacillus species used in manufacturing of Lactobacillus Ferment ingredients in this trade name mixture include <i>Lactobacillus bulgaricus</i> and <i>Lactobacillus acidophilus</i> (unknown which species corresponds to the ferment or ferment lysate)	dimethyl sulfoxide	0.98 – 2000 µM	KeratinoSens™ tissues; 50 µl	OECD TG 442D; ARE-Nrf2 luciferase assay; as described above	predicted to be non-sensitizing; controls gave expected results	88

Table 9. Dermal irritation, sensitization, and photoirritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population/System	Protocol	Results	Reference
HUMAN							
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	distilled water	4%; 0.2 ml	50 subjects	HRIPT; test material applied under occlusive patches placed directly on the skin of the infrascapular region of the back; patch removed after 24 h; procedure repeated 3x/wk for 3 wk until a series of 9 consecutive 24 h applications were made ; following a 10 – 14 d non-treatment period; a challenge patch was applied to previously unexposed site; reactions scored 24 and 48 h after application	non-irritating and non-sensitizing	⁹²
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	distilled water	10%; 0.2 ml	51 subjects	HRIPT performed under occlusive conditions according to the same procedures as stated above	non-irritating and non-sensitizing 9 d after study initiation, one subject had an allergic reaction on the face that was treated with methylprednisolone; investigator discontinued this subject's participation, and judged that it was unlikely that the reaction was related to the test material	⁹⁰
Lactobacillus Ferment Lysate Filtrate	product containing 5% Lactobacillus Ferment Lysate Filtrate derived from <i>Lactobacillus bulgaricus</i> (purity 99.1%)	NR	tested neat; 0.2 ml	50 subjects	HRIPT performed under occlusive conditions according to the same procedures as stated above	non-irritating and non-sensitizing	⁹¹
PHOTOIRRITATION							
IN VITRO							
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 48% water, 30% glycerin, and 20% <i>Pereskia aculeata</i> callus extract	NR	0.5, 1.5, 5, and 10%	reconstructed human epidermis tissues (n = 2/concentration)	phototoxicity assay; tissue inserts incubated with test substance or negative (sterile deionized water) or positive (chlorpromazine) controls; appropriate tissues were irradiated with UVA (6 J/cm ²) for 60 min (some tissues left un-irradiated for comparison); after incubation and irradiation, cell viability was evaluated in MTT assay	non-phototoxic; controls gave expected results	⁹³
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 20% <i>Momordica cochinchinesis</i> seed extract, and 78% water	NR	0.5, 1.5, 5, and 10%	reconstructed human epidermis tissues (n = 2/concentration)	phototoxicity assay performed according to the same procedures as above	non-phototoxic; controls gave expected results	⁹⁶

Table 9. Dermal irritation, sensitization, and photoirritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population/System	Protocol	Results	Reference
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	NR	0.4, 1.3, 3.8, and 12%	reconstructed human epidermis tissues (n = 2/concentration)	phototoxicity assay performed according to the same procedures as above	test substance considered to be non-phototoxic at concentrations of 0.4, 1.3, and 3.8%; a decrease in viability at the 12% test concentration was observed with and without irradiation (tissue viability was approximately 70 and 50% in non-irradiated and irradiated tissues, respectively, compared to 100% viability in the negative control group); negative and positive controls performed as expected	98
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	NR	0.5, 1.5, 5, and 10%	reconstructed human epidermis tissues (n = 2/concentration)	phototoxicity assay performed according to the same procedures as above	test substance considered to be non-phototoxic at concentrations of 0.5, 1.5, and 5%; a decrease in viability at the 10% concentration was observed with and without irradiation (tissue viability was approximately 85 and 80% in non-irradiated and irradiated tissues, respectively, compared to 100% viability in non-irradiated and irradiated tissues in the negative control group); negative and positive controls performed as expected	97
Lactobacillus Ferment	Lactobacillus Ferment	NR	0.4, 1.2, 3.7, and 11%	reconstructed human epidermis tissues (n = 2/concentration)	phototoxicity assay performed according to the same procedures as above	test substance was considered to be non-phototoxic at concentrations of 0.4, 1.2, and 3.7%; a decrease in cell viability at the 11% concentration was observed with and without irradiation (tissue viability was approximately 70 and 60% in non-irradiated and irradiated tissues, respectively, compared to 100% viability in both non-irradiated and irradiated tissues in the negative control group); negative and positive controls performed as expected	6
Lactobacillus Ferment Lysate	trade name mixture consisting of 2% Lactobacillus Ferment Lysate (derived from <i>Lactobacillus acidophilus</i>) and 98% <i>Medicago sativa</i> (alfalfa) callus culture conditioned media extract	NR	0.5, 1.5, 5, and 10%	reconstructed human epidermis tissues (n = 2/concentration)	phototoxicity assay performed according to the same procedures as above	non-phototoxic; controls gave expected results	94

Table 9. Dermal irritation, sensitization, and photoirritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population/System	Protocol	Results	Reference
Lactobacillus Ferment and Lactobacillus Ferment Lysate	trade name mixture consisting of 10% Lactobacillus Ferment Lysate, 2% Lactobacillus Ferment, 67% water, 10% <i>Camelia sinensis</i> leaf extract, 10% <i>Punica granatum</i> extract, and 1% caffeine <i>Lactobacillus</i> species used in manufacturing of Lactobacillus Ferment ingredients in this trade name mixture include <i>Lactobacillus bulgaricus</i> and <i>Lactobacillus acidophilus</i> (unknown which species corresponds to the ferment or ferment lysate)	NR	0.5, 1.5, 5, and 10%	reconstructed human epidermis tissues (n = 2/ concentration)	phototoxicity assay performed according to the same procedures as above	non-phototoxic; controls gave expected results	⁹⁵

ARE = antioxidant/electrophile response element; DPRA = direct peptide reactivity assay; HRIPT = human repeat insult patch test; MTT = 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium; NR = not reported; Nrf2 = nuclear factor erythroid 2-related factor 2; OECD = Organisation for Economic Cooperation and Development; TG = test guideline; UVA = ultraviolet A

Table 10. In vitro ocular irritation studies

Ingredient	Test Article	Vehicle	Concentration/Dose	Test Population	Protocol	Results	Reference
IN VITRO							
Lactobacillus Ferment	trade name mixture consisting of 2% Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i> , 20% <i>Momordica cochinchinensis</i> seed extract, and 78% water	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; 90 min incubation; cell viability evaluated via MTT assay; sterilized deionized water as negative control; methyl acetate as positive control	non-irritating; controls gave expected results	70
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; as described above	non-irritating; controls gave expected results	74
Lactobacillus Ferment	Lactobacillus Ferment derived from <i>Lactobacillus acidophilus</i>	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; as described above	non-irritating; controls gave expected results	75
Lactobacillus Ferment	Lactobacillus Ferment	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; as described above	non-irritating; controls gave expected results	73
Lactobacillus Ferment Lysate	trade name mixture consisting of 2% Lactobacillus Ferment Lysate derived from <i>Lactobacillus acidophilus</i> and 98% <i>Medicago sativa</i> (alfalfa) callus culture conditioned media extract	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; as described above	non-irritating; controls gave expected results	72
Lactobacillus Ferment Lysate Filtrate	Lactobacillus Ferment Lysate Filtrate derived from <i>Lactobacillus bifidus</i> (98% purity)	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; as described above	non-irritating; controls gave expected results	69
Lactobacillus Ferment and Lactobacillus Ferment Lysate	trade name mixture consisting of 10% Lactobacillus Ferment Lysate, 2% Lactobacillus Ferment, 67% water, 10% <i>Camelia sinensis</i> leaf extract, 10% <i>Punica granatum</i> extract, and 1% caffeine Lactobacillus species used in manufacturing of Lactobacillus Ferment ingredients in this trade name mixture include <i>Lactobacillus bulgaricus</i> and <i>Lactobacillus acidophilus</i> (unknown which species corresponds to the ferment or ferment lysate)	none	tested neat; 50 µl	cornea epithelial model (n = 2)	EpiOcular™ assay; as described above	non-irritating; controls gave expected results	71

MTT = 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium; OECD = Organisation for Economic Cooperation and Development; TG = test guidelines

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