

COVATIONBIO|PDO
zemea[®]



**100% plant-based
performance
for skin care**



Zemea[®] propanediol for skin care

Zemea[®] propanediol is a natural, skin-friendly, and preservative-boosting alternative to petroleum-based glycols and glycerin for formulators who desire versatile, multifunctional, and innovative cosmetic ingredients.

Zemea[®] propanediol is ideally suited for many different skin and body care applications including, but not limited to, moisturizers, cleansers, anti-aging products, sunscreens, anti-acne products, sensitive skin products, deodorants, wipes, and baby care.

Common	Ingredient	CAS#	Formula	Structure	MW	BP (°C)	MP (°C)	Density
Propylene glycol	1,2-propanediol	57-55-6	C ₃ H ₈ O ₂		76.1	187.3	-60	1.038
Zemea [®] propanediol	1,3-propanediol	504-63-2	C ₃ H ₈ O ₂		76.1	214	-24	1.053
Butylene glycol	1,3-butanediol	107-88-0	C ₄ H ₁₀ O ₂		90.1	204	-50	1.0053
Glycerin	1,2,3-propanediol	504-63-2	C ₃ H ₈ O ₃		92.1	290	18	1.261
DPG	dipropylene glycol	25265-71-8	C ₆ H ₁₄ O ₃		134.17	231	-40	1.023

Zemea[®] propanediol benefits in skin care formulations

Studies have demonstrated the unique performance benefits of Zemea[®] propanediol in skin care products.

1. No skin irritation or sensitization
2. Skin moisturization and hydration that lasts
3. High-scoring sensorials
4. Boosts preservative efficacy
5. Differentiating solubility
6. Ideal carrier of polar active ingredient to the skin
7. Skin barrier benefactor





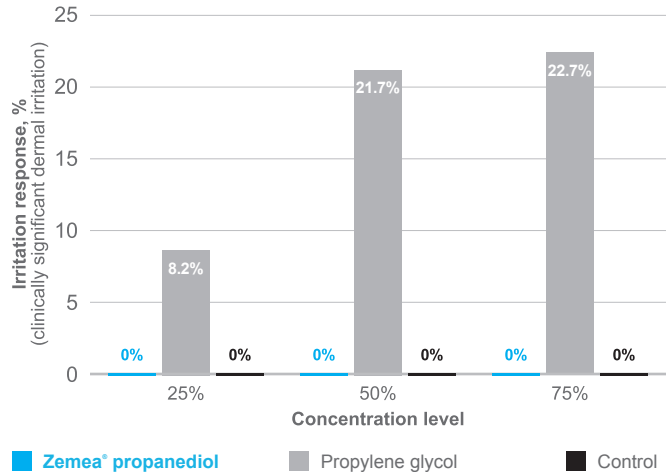
Reduced skin irritation

In multiple studies using the modified Draize Repeated Insult Patch Test method, Zemea® propanediol produced no skin irritation, fatigue, or sensitization—even at high concentrations.¹ Researchers observed no clinically significant dermal irritation or allergic contact following exposure of up to 75% Zemea® propanediol at three different pH levels.

By contrast, skin irritation was observed with propylene glycol (PG) at a concentration of 25%, with nearly one-quarter of the test population indicating positive irritation at a 75% concentration. Results from these studies show that Zemea® propanediol has low potential to irritate or sensitize human skin.

Human skin patch test results

207 individuals exposed to Zemea® propanediol or propylene glycol or control at 7 pH

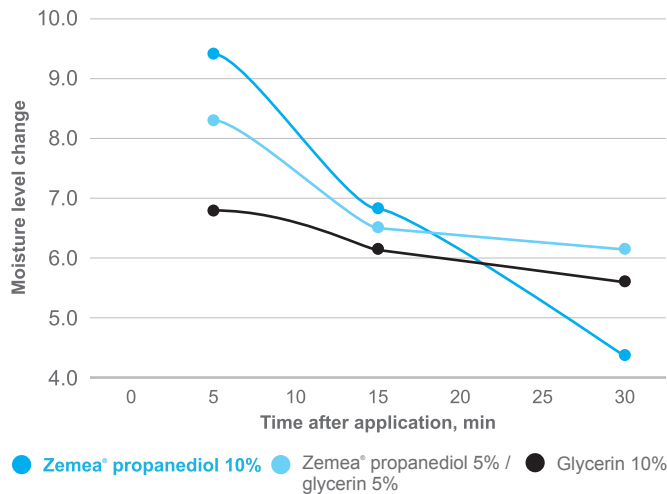


At concentrations as high as 75%, Zemea® propanediol has not produced skin irritation or sensitization reactions.


Moisturization performance versus glycerin

In tests comparing the moisturizing effect of Zemea® propanediol to glycerin at a 10% use level, measurements taken with a Corneometer® ASA-M2 showed that Zemea® propanediol provides improved skin moisturization during initial application.² A mixture of 5% Zemea® propanediol/ 5% glycerin in formulation demonstrated a synergistic effect that improved and extended skin moisturization. Formulating with a Zemea® propanediol/glycerin mixture also requires less glycerin, may reduce tackiness commonly observed with glycerin alone, and provides both short-term and long-term benefits.

Skin moisturization increase compared to 10% glycerin



1. CovationBio PDO, Miller, Robert, et al., Evaluation of Plant-based 1,3-Propanediol as a 100% Natural Glycol Replacement.
 2. CovationBio PDO, Technical Bulletin: Zemea® Propanediol: Skin Moisturizing Performance.



Zemea® propanediol is ideally suited for many different skin and body care applications including, but not limited to, moisturizers, cleansers, anti-aging products, sunscreens, anti-acne products, sensitive skin products, deodorants, wipes, and baby care.

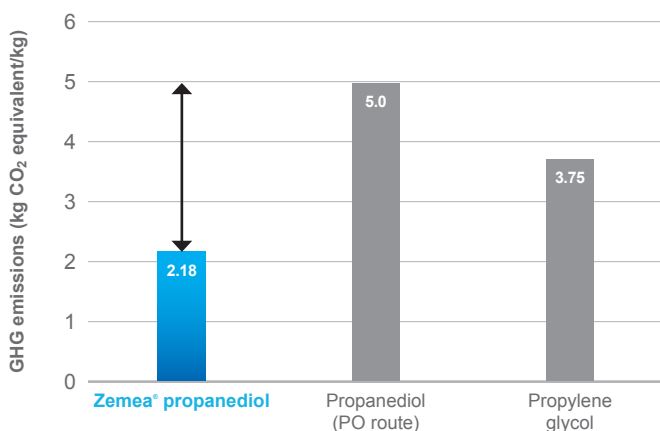
The greener alternative

Zemea® propanediol is produced through a proprietary fermentation process using plant-derived glucose instead of petroleum-based feedstocks. The resulting product is typically 99.99% pure.

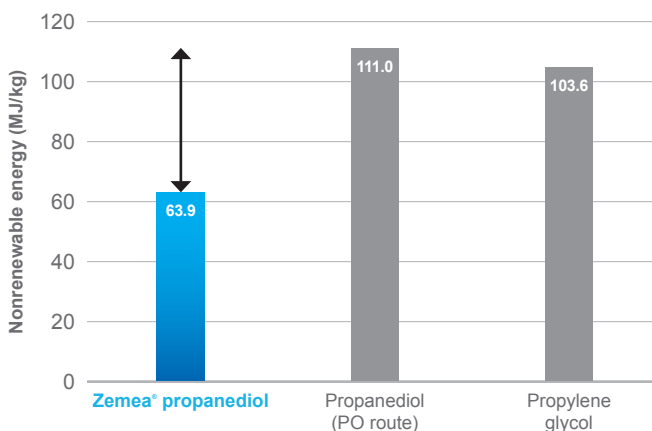
From cradle to gate, Zemea® propanediol produces 47% less greenhouse gas emissions and consumes 49% less nonrenewable energy than petroleum-based

1,3-propanediol. Compared with PG, Zemea® propanediol produces 42% less greenhouse gas emissions and uses 41% less nonrenewable energy from cradle to gate.³

Zemea® propanediol is certified 100% bio-based under the USDA's BioPreferred® Program and is the world's first 100% plant-based glycol alternative to have earned certification from the Natural Products Association.



Greenhouse gas emissions
47% less than propanediol
49% less than propylene glycol



Nonrenewable energy use
42% less than propanediol
41% less than propylene glycol

Zemea® propanediol approvals, certifications, and registrations

Approvals and certifications

- Natural Products Association (NPA)
- USDA BioPreferred® Program – 100% bio-based
- Natural Health Products Ingredient – Health Canada
- Complies with ISO 16128-1:2016
- Safer Choice Ingredient (SCI)
- FDA GRAS and FEMA GRAS
- Halal
- Kosher
- USP-NF
- Microbiome-friendly certification (MyMicrobiome Standard 18.10)

Registrations

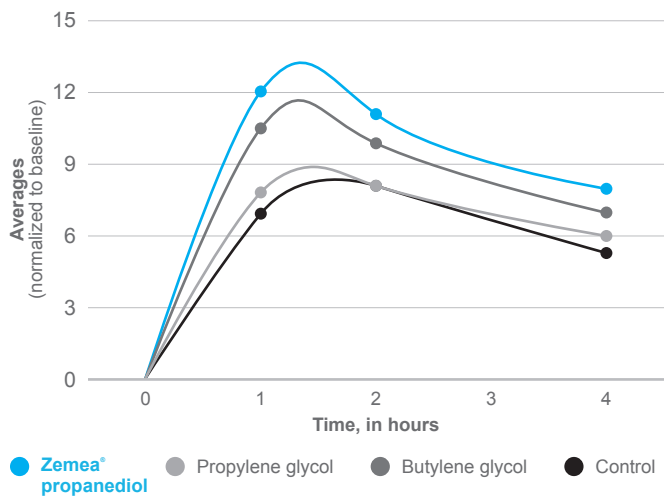
- INCI name: Propanediol
- EINECS number: 207-997-3
- CAS number: 504-63-2
- REACH registration number: 01-2119489383-28-0000

³ Zemea® propanediol LCA data based on Loudon process design data; peer reviewed by Five Winds International.



Moisturization performance versus petroleum-based glycols

In two independent tests conducted between Zemea® propanediol and petroleum-based glycols, measurements with a Corneometer® 825 PC (Courage + Khazaka) revealed that Zemea® propanediol was more efficient than either PG or butylene glycol (BG) at moisturizing the skin at a 5% use level.⁴



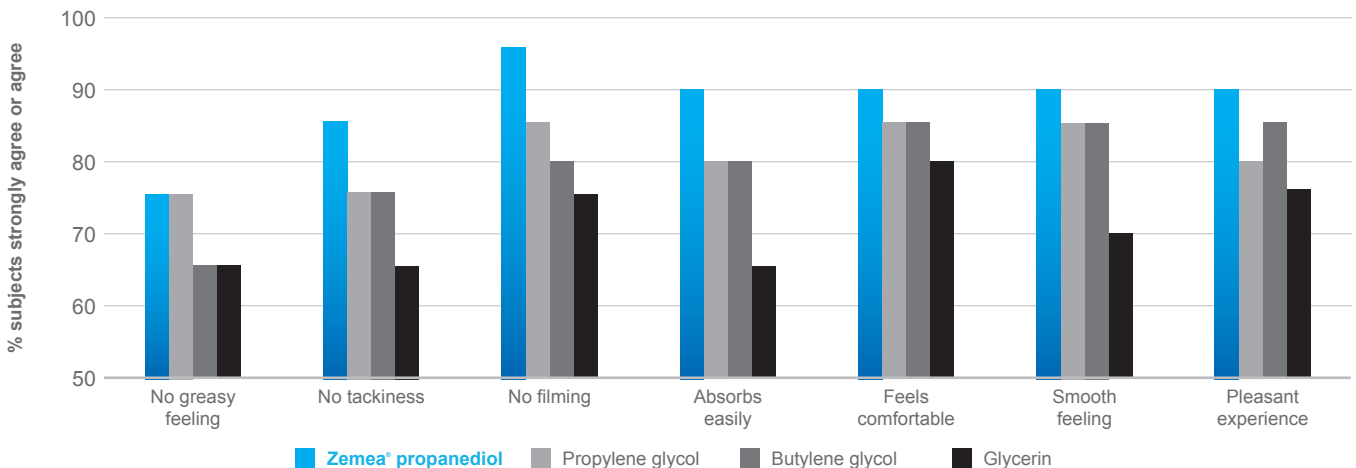
High-scoring sensorials

In repeated consumer sensory studies, lotions formulated with Zemea® propanediol rated higher for all sensory attributes than lotions formulated with glycerin.

Zemea® propanediol is also effective at reducing the tackiness associated with high concentrations of glycerin in certain formulations.⁵

Consumer sensory testing

Skin lotion with 5% glycol



4. CovationBio PDO, Miller, Robert, et al., Evaluation of Plant-based 1,3-Propanediol as a 100% Natural Glycol Replacement.

5. Ibid.

Preservative-boosting performance

CTFA Preservative Challenge Testing has shown that Zemea® propanediol can boost the efficacy of preservatives in a formulation. Seven different preservatives were tested at 50% of the recommended use level in a skin care emulsion. The Zemea® propanediol use level was varied from 0–6% to determine the minimum level of Zemea® propanediol needed to pass the challenge test.⁶

It is noted that the average minimum inhibitory concentration (MIC) and average minimum lethal concentration (MLC) for Zemea® propanediol is 8.36 (MIC50), 9.90% (MIC90), and 10.40% (MLC), respectively.⁷

Minimum percentage of Zemea® propanediol needed to boost preservative efficacy

		Challenge organisms				
		gram-positive Staphylococcus aureus	gram-negative Escherichia coli	gram-negative Pseudomonas aeruginosa	yeast Candida albicans	mold Aspergillus niger
Preservatives	phenoxyethanol-based					
	Microcare® PM3 (0.15%)	2%	2%	2%	4%	2% (1 log reduction)
	euxyl™ pe 9010 (0.25%)	4%	4%	2%	6%	2% (1 log reduction)
	Neolone™ PE (0.3%)	2%	2%		6%	2% (1 log reduction)
	Jeecide® CAP-4 Optiphen (0.25%)	2%	2%		6%	2% (1 log reduction)
	Lexgard® Natural (0.5%)					2% (1 log reduction)
	natural					
dermosoft® 688 ECO (0.1%)	Preservative levels provided sufficient reduction to <1.00 CFU/g without addition of Zemea® propanediol.			2%	2% (1 log reduction)	
Geogard ULTRA® (0.5%)				2%	2% (1 log reduction)	

Organisms reduced to <1.00 CFU/g at Day 7

Effective solubility

Zemea® propanediol has a unique set of Hansen Solubility Parameters. Software modeling suggested that Zemea® propanediol can be an effective solvent for actives and functional materials in skin care products and sunscreens.⁸

In tests, Zemea® propanediol worked well as a primary solvent to maximize the solubility of ferulic acid and allantoin. Zemea® propanediol worked well as a secondary solvent to

manage the solubility and extend delivery time of ascorbic acid and glycolic acid. Zemea® propanediol worked well as a solvent to optimize formulation design and efficacy for salicylic acid and hexylresorcinol. In a broad-spectrum, daily-wear facial moisturizer, the addition of Zemea® propanediol effectively kept the sunscreen actives ensulizole and sulisobenzone in solution during the evaporative process on the skin, leading to greater efficacy.⁹

6. CovationBio PDO, Technical Bulletin: Zemea® Propanediol: Potential for Boosting Preservative Efficacy.

7. CovationBio PDO, Technical Bulletin Antibacterial and Antifungal Properties of 1,3 Propanediol and Propylene Glycol.

8. CovationBio PDO, Technical Bulletin: Zemea® Propanediol: A Natural Solvent for Active Ingredients.

9. CovationBio PDO, Technical Bulletin: Zemea® Propanediol in Broad Spectrum Protection Daily Facial Moisturizer.

Zemea[®] propanediol
Learn more at CovationBioPDO.com/Zemea.

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For additional information or samples, please contact customer service.

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