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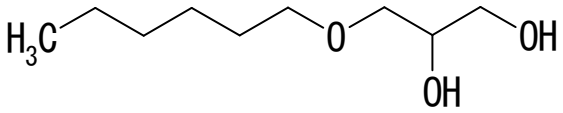
ADEKA NOL NHG

ADEKA NOL NHG is new preservation booster for cosmetics and toiletries.



$C_9H_{20}O_3$: 176.25
CAS No. 10305-38-1

Appearance : Light yellow liquid
[Added 0.2% tocopherol as antioxidant]
Purity : >99%
INCI name : HEXYL GLYCERIN

Minimal Inhibitory Concentration (MIC(μg/ml))

Test microorganism	MIC (μg/ml)			
	ADEKA NOL NHG	Methyl paraben	Caprylyl glycol	Ethylhexyl glycerin
E.coli	**2500**	1900	1300	2500
P.aeruginosa	**7500**	2500	3800	10000<
S.aureus	**7500**	3800	3800	1900
B.subtilis	**4000**	2000	2600	1500
C.albicans	**3800**	1300	2500	1900
Z.rouxii	**3200**	2000	2000	4000
A.brasiliensis	**1300**	600	<900	<900

TEST MICROORGANISM :

BACTERIA
Escherichia coli ATCC 8739
Pseudomonas aeruginosa ATCC 9027
Staphylococcus aureus ATCC 6538
Bacillus subtilis IFO 3134

FUNGI
Candida albicans ATCC 10231
Zygosaccharomyces rouxii IFO 1876
Aspergillus brasiliensis ATCC 16404

Combination effect of NHG

NHG has a synergistic effect with a combination use of Caprylyl glycol and Phenoxyethanol.

Test microorganism	MIC（μg/ml）				
	Caprylyl glycol	**NHG: Caprylyl glycol (1:1)**	ADEKA NOL NHG	**NHG: Phenoxyethanol (1:2)**	Phenoxyl ethanol
E.coli	1300	**1900**	2500	**3800**	5000
P.aeruginosa	3800	**5000**	7500	**5000**	5000
S.aureus	3800	**3800**	7500	**7500**	10000
C.albicans	2500	**3800**	3800	**5000**	5000
A.brasiliensis	<900	**<900**	1300	**1900**	2500

Challenge test

Trial formula: Lotion		**Trial formula: Cream**	
Ingredient	**Amount(%)**	**Ingredient**	**Amount(%)**
SORBETH-30 TETRAOLEATE	4.0	TRIETHYLHEXANOIN	20.0
GLYCERIN	0.2	SORBETH-30 TETRAOLEATE	4.0
SODIUM ACRYLATES/C10-30 ALKYL ACRYLATES CROSSPOLYMER	0.1	CETEARYL ALCOHOL	0.2
Antimicrobial constituent	0～1.0	GLYCERIN	0.2
Water	to 100	SODIUM ACRYLATES/C10-30 ALKYL ACRYLATES CROSSPOLYMER	0.1
		Antimicrobial constituent	0～3.0
		Water	to 100

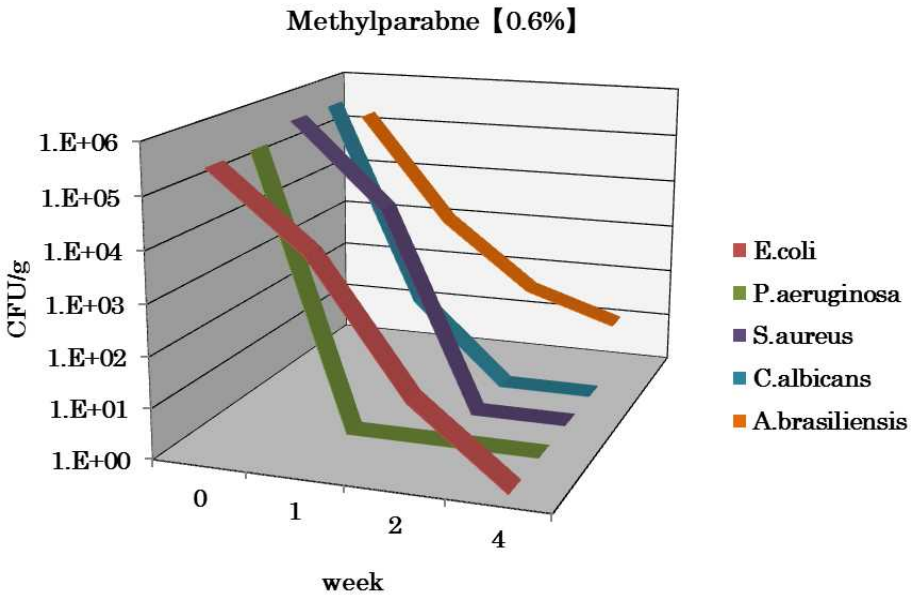
Criteria for evaluation

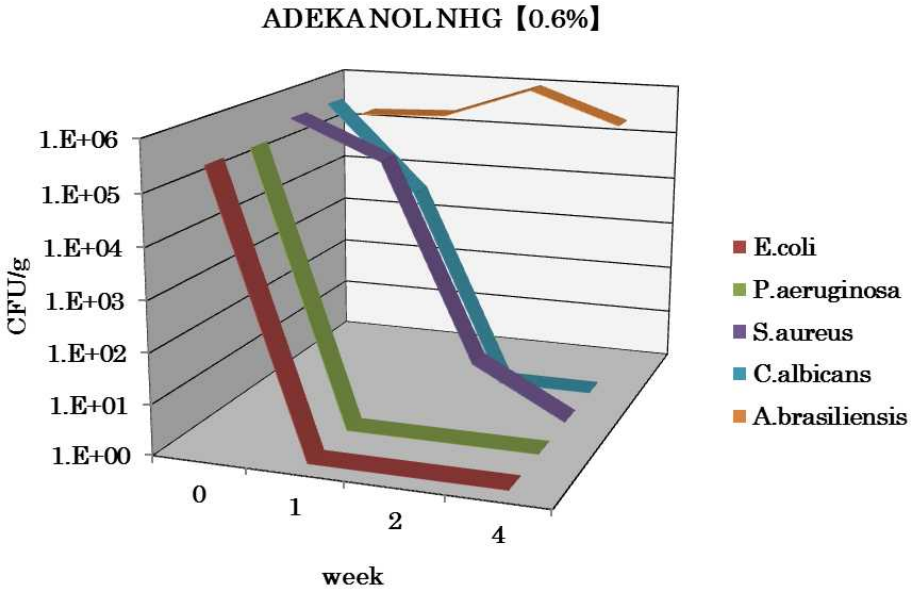
	Bacteria *C.albicans*	*A.brasiliensis*
14 days after	Less than 0.1% of the inoculum organism count	Less than blank and Inoculum organism count
28 days after	Less than or equal to the level after 14 days	Less than or equal to the level after 14 days

Effective concentration【Lotion】

	ADEKA NOL NHG	Methylparaben	Phenoxyethanol
E.coli	**0.4%**	0.6%	1.0%
P.aeruginosa	**0.6%**	0.4%	1.0%
S.aureus	**0.6%**	0.6%	1.0%
C.albicans	**0.6%**	0.4%	1.0%
A.brasiliensis	**0.8%<**	0.4%	1.0%

The effective concentration of NHG is similar to methylparaben in aquatic lotion except mold.
NHG needs to combine with other ingredients to enhance an effect against mold.

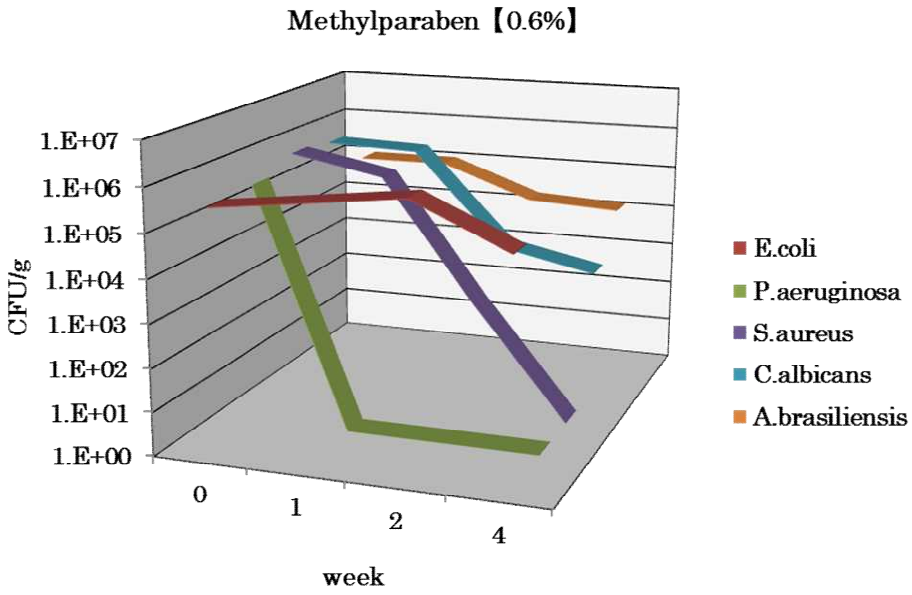


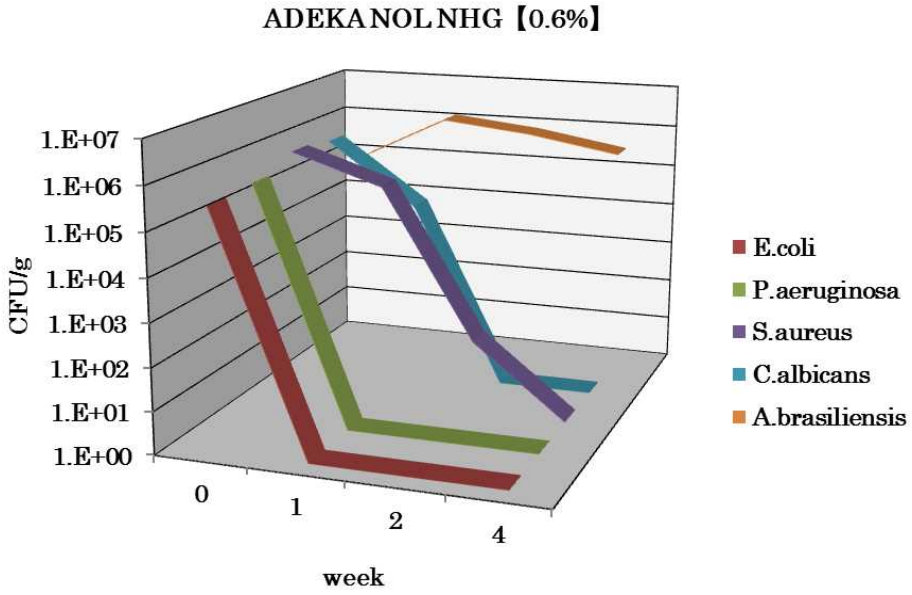


Effective concentration【Cream】

	ADEKA NOL NHG	Methylparaben	Ethylhexyl glycerin	Phenoxyethanol
E.coli	**0.4%**	0.8%<	0.6%	1.5%
P.aeruginosa	**0.4%**	0.6%	1.0%	1.0%
S.aureus	**0.4%**	0.6%	0.8%	1.0%
C.albicans	**0.6%**	0.8%	0.8%	1.5%
A.brasiliensis	**0.8%<**	0.6%	1.0%<	2.0%<

The effective concentration of NHG is less influenced by oily ingredients.
The effect of NHG is the same or more than methylparaben in cream.





Solubility to water solutions and oils

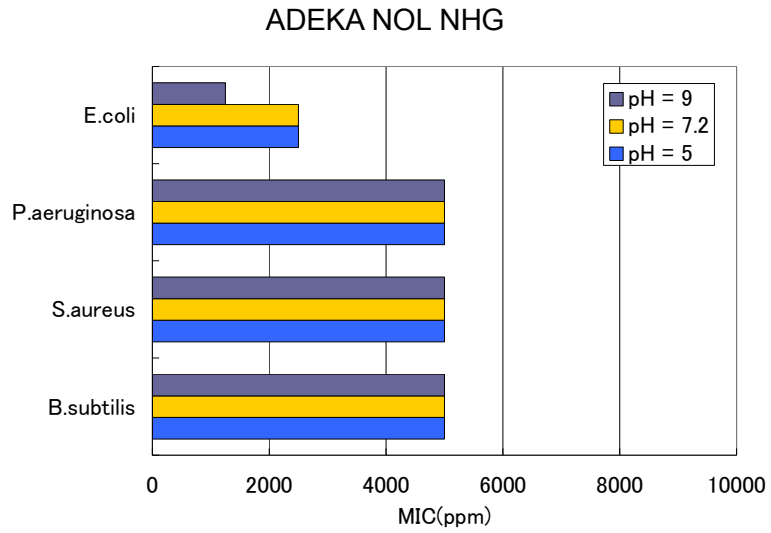
NHG has higher water solubility than methylparaben and other glycols with bacteriostatic property. Therefore, even if hydrophobic ingredients are included in formulation, NHG can exert an bacteriostatic effect.

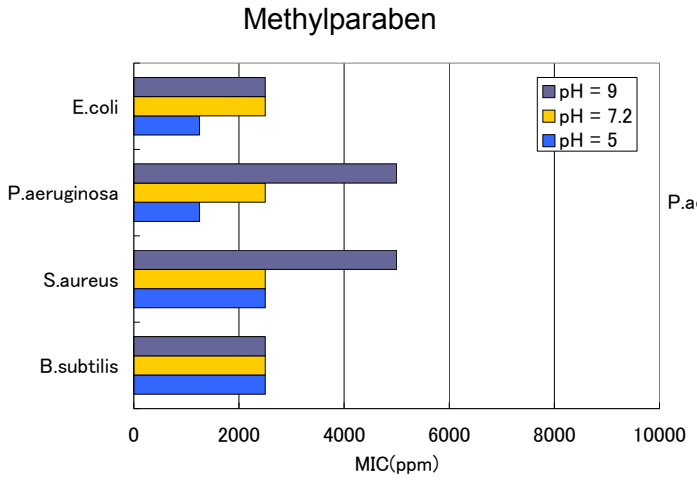
		NHG	Methyl paraben	Caprylyl glycol	Ethylhexyl glycerine
Water solution	Water	1.0%	0.2%	0.3%	0.2%
	10%EtOH	∞	0.3%	0.3%	0.3%
	10%PG	∞	0.3%	0.3%	0.3%
	10%DPG	∞	0.3%	0.6%	0.3%
	10%BG	∞	0.3%	0.5%	0.2%
	10%Glycerine	1.2%	0.2%	0.6%	0.2%
Oil	Squalene	1.0%	Insoluble	Insoluble	Insoluble
	Paraffin	4.4%	Insoluble	Insoluble	∞
	Silicone	Insoluble	Insoluble	Insoluble	Insoluble
	Soybean oil	∞	1.2%	∞	∞
	C8 triglyceride	∞	1.6%	∞	∞

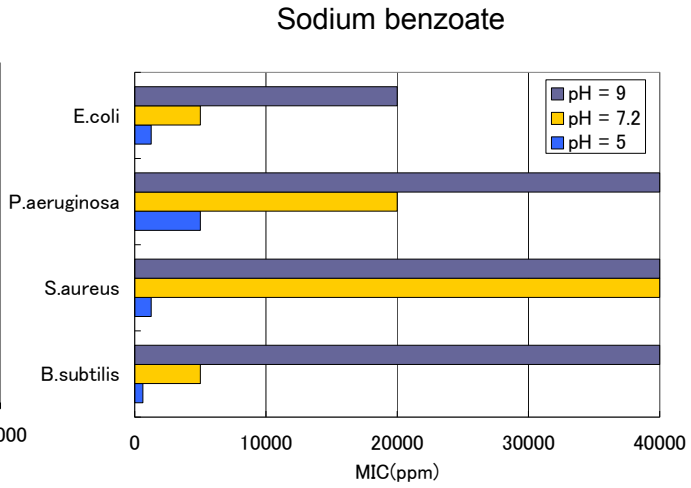
EtOH : Ethanol PG : Propyleneglycol DPG : Dipropyleneglycol BG : 1,3-Butanediol

Effect of pH

NHG is not affected by pH because it is nonionic substance.



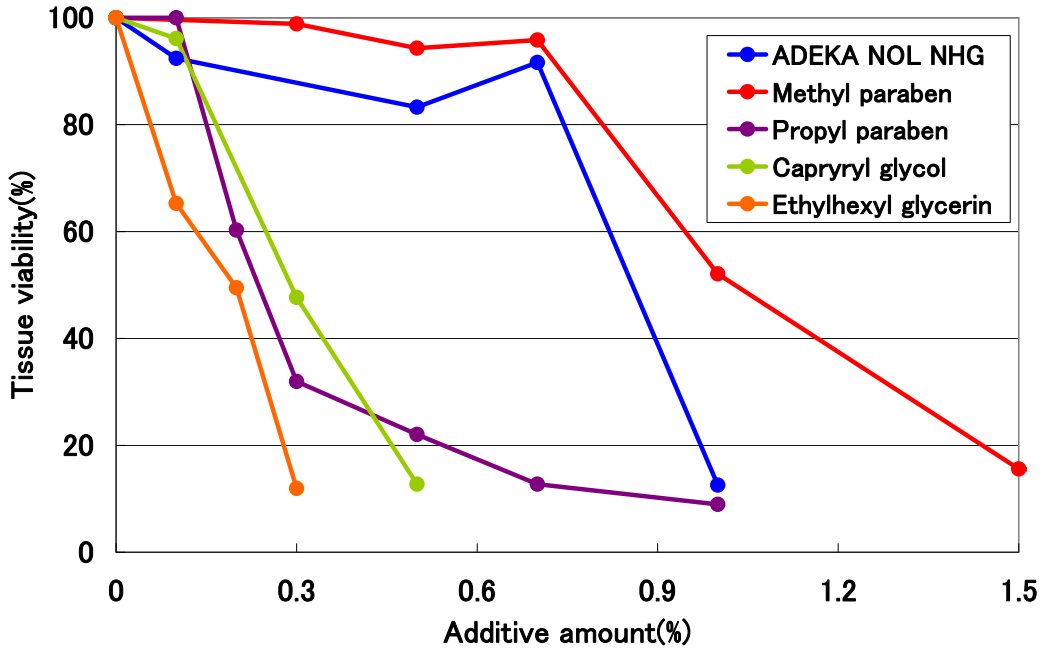




Skin irritation

NHG shows higher tissue viability at MIC range than other antimicrobial agents. Therefore, it is expected that the skin irritation of NHG is milder.

In vitro skin irritation test by reconstructed human cultured epidermal model



PREPARATION METHOD : Capryryl glycol and ethylhexyl glycerin were dissolved in distilled water. The solvent of ADEKA NOL NHG, methyl paraben and propyl paraben were used 50% 1,3-butanediol solution.

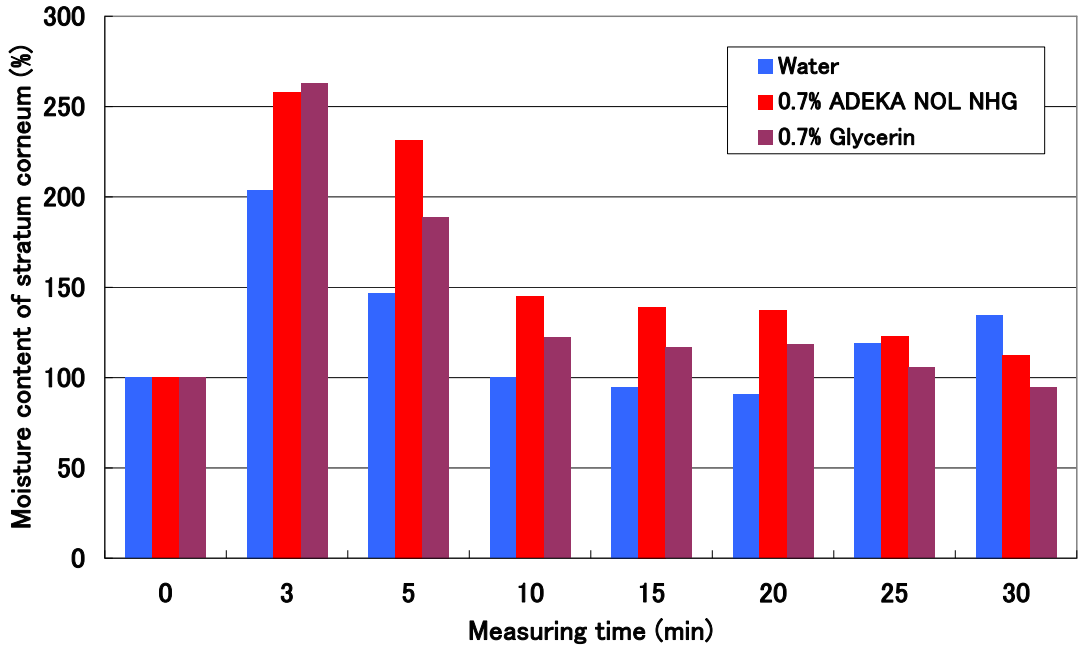
TEST METHOD : Reconstructed human cultured epidermal model used LabCyte EPI-MODEL (Japan Tissue Engineering Co., Ltd). The tissues were exposed to the test materials and incubated with the assay medium for 24 hr (37°C, 5% CO_2). Then, the tissues were transferred to MTT medium and incubated for 3 hr (37°C, 5% CO_2). The tissues were extracted with isopropanol (IPA) and absorbance was measured.

CALCULATING :

$$\text{Tissue viability (\%)} = \frac{\text{[Test material absorbance] – [IPA absorbance]}}{\text{[Reference absorbance] – [IPA absorbance]}}$$

Moisture-retaining property

NHG improves moisture-retaining property.



MEASURING CONDITION :
Measuring equipment : SKICON-200
Room air temperature : 22°C
Humidity : 50%

TEST METHOD : 1.5cm square filter paper containing 0.1ml test solution was worn on the skin on the inner side of arm for 5 min. Moisture content of stratum corneum was measured for 3, 5, 10, 15, 20, 25 and 30min after taking down filter paper.