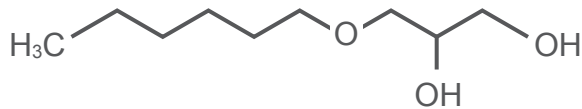


# ADEKA NOL NHG

ADEKA NOL NHG is a product that has an excellent balance of antibacterial effects, low skin irritation and water solubility, with bacteriostatic and moisturizing effects.



C<sub>9</sub>H<sub>20</sub>O<sub>3</sub>: 176.25

CAS No.: 10305-38-1

INCI name: HEXYL GLYCERIN

## Product Properties

Purity	Appearance	Water solubility
99% or more	Light yellow liquid	Approx. 1 wt%

\*Contains 0.2% tocopherol as a stabilizer.

## Antibacterial Properties

○ The minimum inhibitory concentration (MIC) for each bacterial strain

Test organism	MIC (µg/ml)			
	ADEKA NOL NHG	Methylparaben	Caprylyl glycol	Ethylhexylglycerin
<i>E. coli</i>	2500	1900	1300	2500
<i>P. aeruginosa</i>	7500	2500	3800	10000 <
<i>S. aureus</i>	7500	3800	3800	1900
<i>B. subtilis</i>	4000	2000	2600	1500
<i>C. albicans</i>	3800	1300	2500	1900
<i>Z. rouxii</i>	3200	2000	2000	4000
<i>A. brasiliensis</i>	1300	600	< 900	< 900

### Test organisms:

#### 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

## Data on Combined Antibacterial Properties

Synergistic effects can be expected when ADEKA NOL NHG is used in combination with caprylyl glycol and phenoxyethanol.

### ○ The MIC for each bacterial strain when combined with other ingredients

Test organism	MIC (µg/ml)				
	Caprylyl glycol	NHG: Caprylyl glycol (1:1)	ADEKA NOL NHG	NHG: Phenoxy-ethanol (2:1)	Phenoxy-ethanol
<i>E. coli</i>	1300	<b>1900</b>	2500	<b>3800</b>	5000
<i>P. aeruginosa</i>	3800	<b>5000</b>	7500	<b>5000</b>	5000
<i>S. aureus</i>	3800	<b>3800</b>	7500	<b>7500</b>	10000
<i>C. albicans</i>	2500	<b>3800</b>	3800	<b>5000</b>	5000
<i>A. brasiliensis</i>	< 900	<b>&lt; 900</b>	1300	<b>1900</b>	2500

## Preservative Effectiveness Test

Changes in the bacterial count were observed following the forced inoculation of strains in the formulations according to reference information on preservative effectiveness tests in the 16th edition of the Japanese Pharmacopoeia.

Formulation example: Formula for a lotion		Formulation example: Formula for a cream	
Ingredients	Compounding amount (%)	Ingredients	Compounding amount (%)
Polyoxyethylene sorbitol tetraoleate (30EO)	4.0	2-ethylhexanoic acid triglyceride	20.0
Glycerin	0.2	Polyoxyethylene sorbitol tetraoleate (30EO)	4.0
Acrylates/C10-30 alkyl acrylate crosspolymer - NA	0.1	Glycerin	0.2
Antibacterial ingredients	0~1.0	Cetostearyl alcohol	0.2
Water	Rest	Acrylates/C10-30 alkyl acrylate crosspolymer - NA	0.1
		Antibacterial ingredients	0~1.0
		Water	Rest

### ○ Evaluation Criteria

	Bacteria: <i>C. albicans</i>	<i>A. brasiliensis</i>
After 14 days	0.1% of the inoculum count or less	Less than the inoculum count and blank
After 28 days	Same or less than the inoculum count at 14 days	Same or less than the inoculum count at 14 days

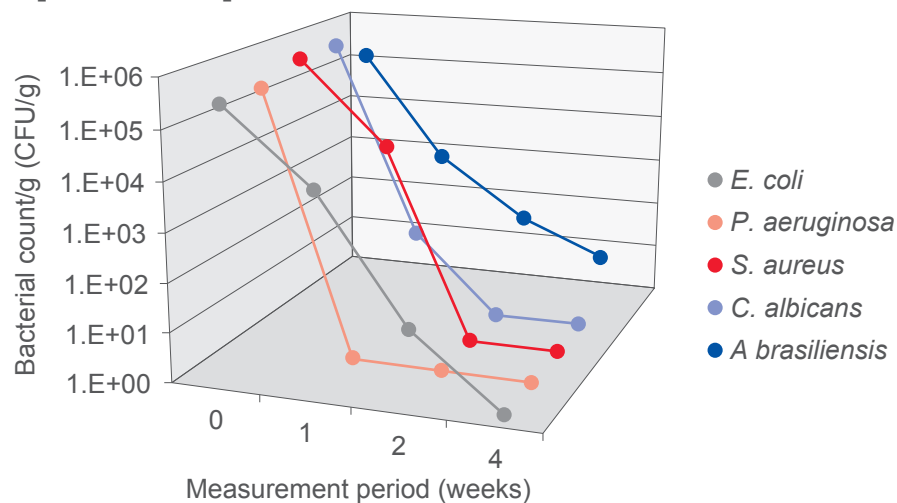
## Formula for a Lotion

### ○ Effective concentrations [Lotion formula]

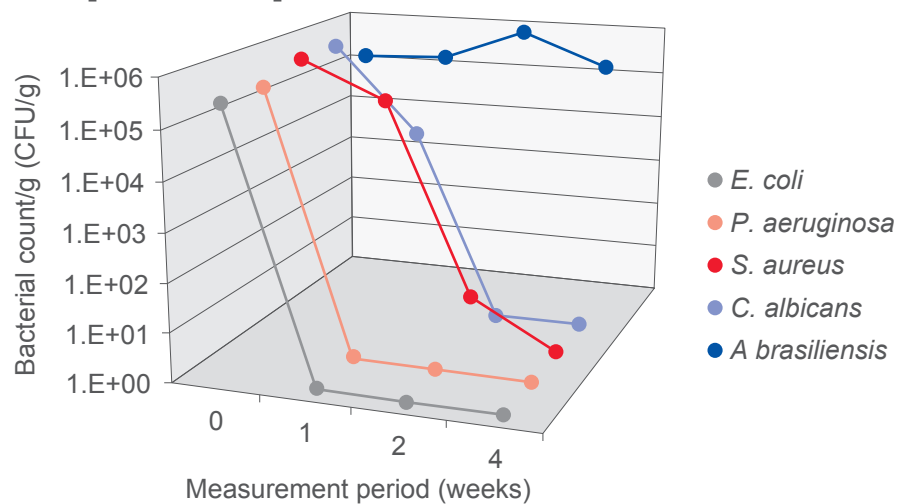
	ADEKA NOL NHG	Methylparaben	Phenoxyethanol
<i>E. coli</i>	0.4%	0.6%	1.0%
<i>P. aeruginosa</i>	0.6%	0.4%	1.0%
<i>S. aureus</i>	0.6%	0.6%	1.0%
<i>C. albicans</i>	0.6%	0.4%	1.0%
<i>A. brasiliensis</i>	0.8% <	0.4%	1.0%

Effects equivalent to those of methylparaben can be expected for strains other than mold. Needs to be used in combination with other ingredients for mold.

### Methylparaben [0.6% added]



### ADEKA NOL NHG [0.6% added]



## Formula for a Cream

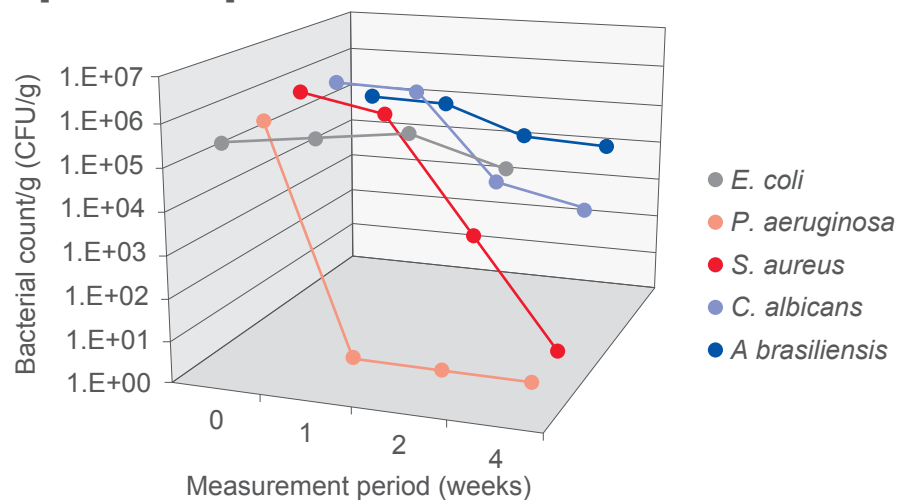
### ○ Effective concentrations [Cream formula]

	ADEKA NOL NHG	Methylparaben	Ethylhexylglycerin	Phenoxyethanol
<i>E. coli</i>	0.4%	0.8% <	0.6%	1.5%
<i>P. aeruginosa</i>	0.4%	0.6%	1.0%	1.0%
<i>S. aureus</i>	0.4%	0.6%	0.8%	1.0%
<i>C. albicans</i>	0.6%	0.8%	0.8%	1.5%
<i>A. brasiliensis</i>	0.8% <	0.6%	1.0% <	2.0% <

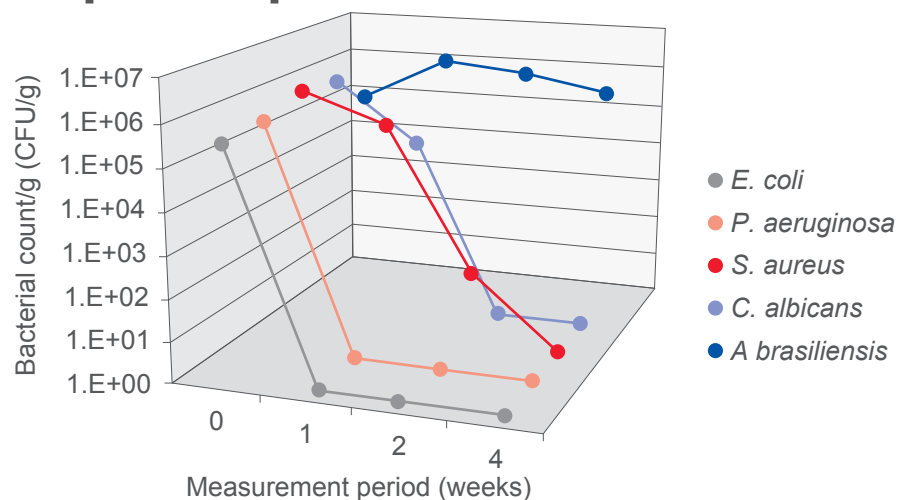
In an emulsified formulation, ADEKA NOL NHG is not readily incorporated into the oily ingredients and thus does not require an increased amount to be added.

Effects equivalent to or higher than those of methylparaben and ethylhexylglycerin can be expected.

### Methylparaben [0.6% added]



### ADEKA NOL NHG [0.6% added]



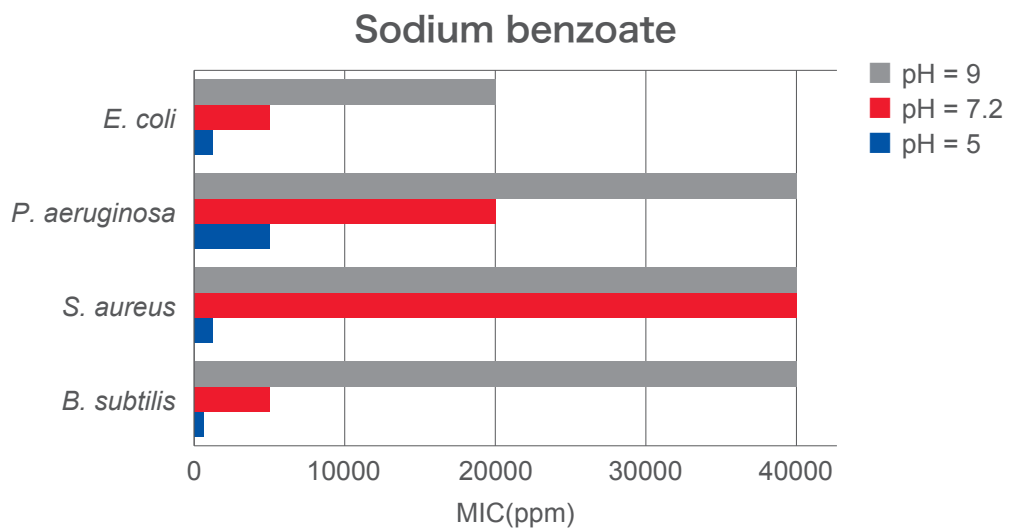
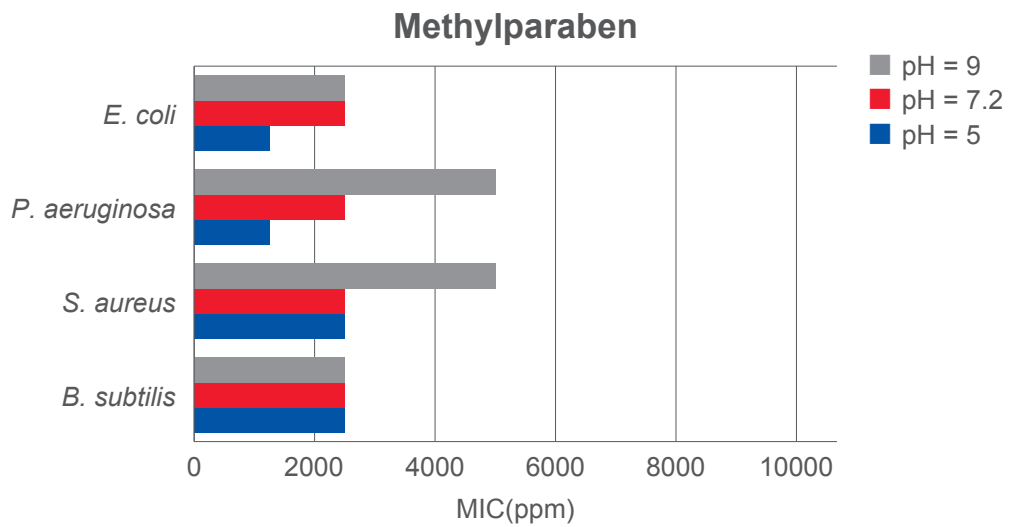
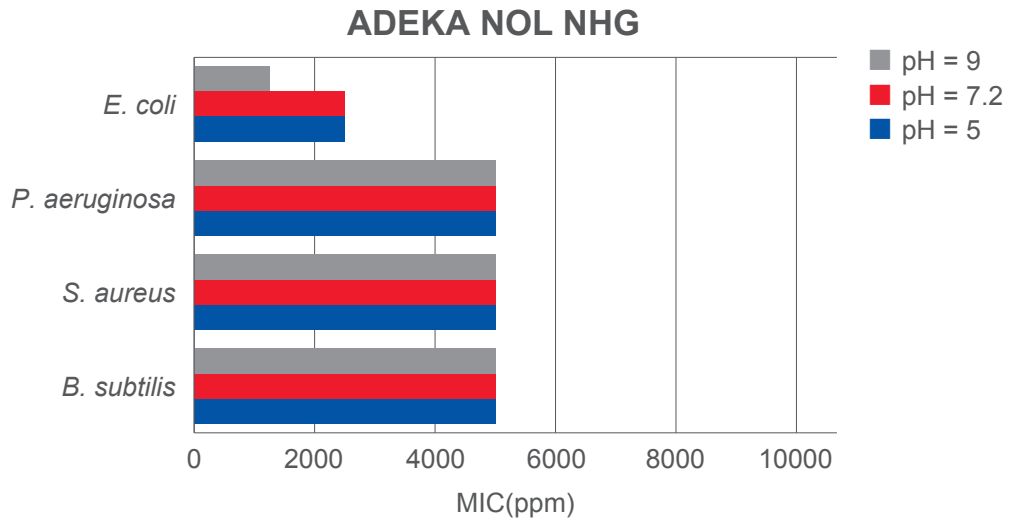
## Solubility in Various Solvents and Oils

ADEKA NOL NHG has improved solubility in aqueous solutions compared to methylparaben and other glycol-based compounds with bacteriostatic effects. It is an ingredient that is less influenced by oily ingredients in emulsified formulas.

		ADEKA NOL NHG	Methylparaben	Caprylyl glycol	Ethylhexylglycerin
Aqueous solution system	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% Glycerin	1.2%	0.2%	0.6%	0.2%
Oil system	Squalane	1.0%	Insoluble	Insoluble	∞
	Paraffin	4.4%	Insoluble	Insoluble	∞
	Silicone	Insoluble	Insoluble	Insoluble	Insoluble
	Soybean oil	∞	1.2%	∞	∞
	C8 Triglyceride	∞	1.6%	∞	∞

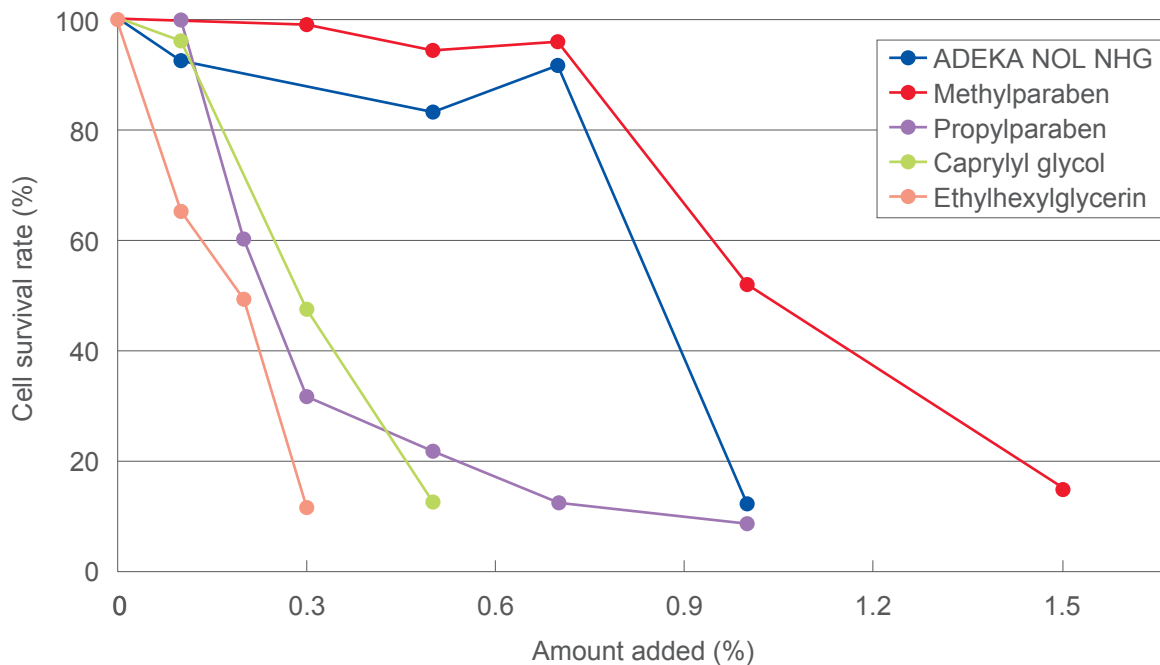
## pH Dependence

Bacteriostatic effects of ADEKA NOL NHG are not influenced by pH.



## Irritation

### ○ Irritation test using a three-dimensional human epidermis culture model



#### Method of preparation:

ADEKA NOL NHG, methylparaben and propylparaben were dissolved in a 50% aqueous solution of 1,3-butanediol for measurement. Caprylyl glycol and ethylhexylglycerin were dissolved in distilled water for measurement.

#### Testing method:

The test substance was added to a three-dimensional human epidermis culture model (Japan Tissue Engineering Co., Ltd.) and grown in an assay medium for 24 hours (5% CO<sub>2</sub>, 37°C). It was then transferred to an MTT assay medium and grown for another 24 hours (5% CO<sub>2</sub>, 37°C). Lastly, the colored three-dimensional human epidermis culture model was extracted using isopropanol to calculate the cell survival rate from the absorbance.

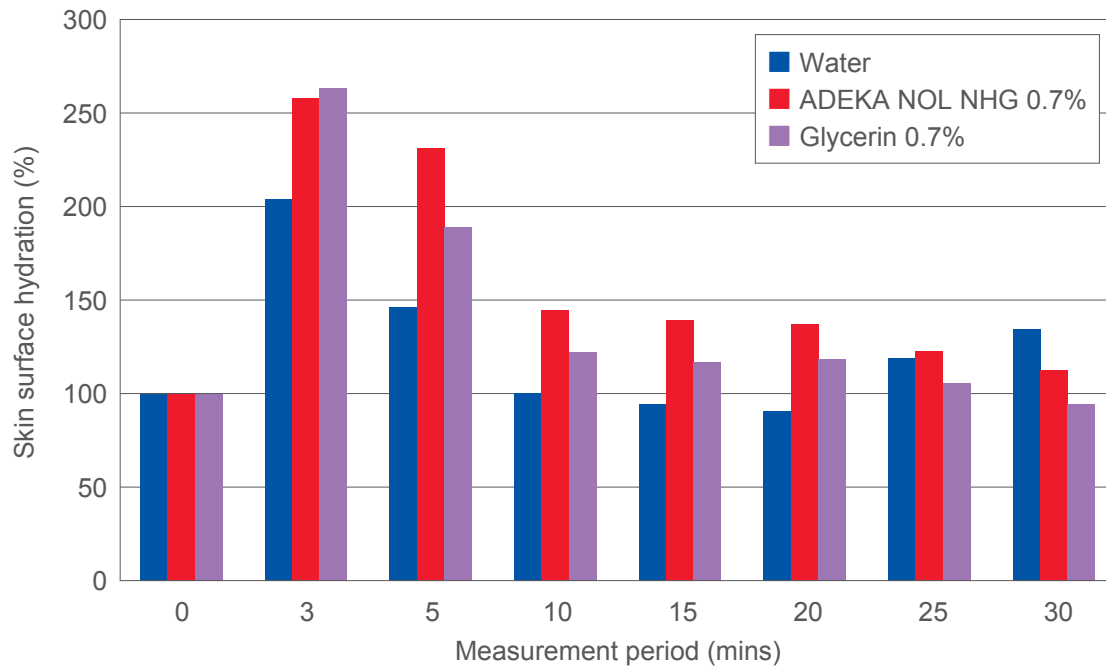
#### Calculation formula:

$$\text{Cell survival rate (\%)} = \frac{(\text{Absorbance of test substance} - \text{Absorbance of blank})}{(\text{Absorbance of negative control} - \text{Absorbance of blank})} \times 100$$

A higher cell survival rate indicates a lower level of irritation. A higher cell survival rate is maintained with ADEKA NOL NHG at the MIC (0.7%) compared to the cell survival rates at the MICs of caprylyl glycol and ethylhexylglycerin (0.4-0.5%).

## Moisture Retention

ADEKA NOL NHG has moisture retaining properties as is the case with polyalcohol, such as glycerin.



### Measurement conditions:

Moisture retention was measured with a skin surface hydrometer (SKICON-200) in a constant temperature and humidity room at 22°C and at 50% humidity.

### Measurement method:

Before starting the measurement, the skin surface hydration of the inner arm was measured with the SKICON-200. (Consider this measurement value to be 100.) 0.1 mL of test solution was impregnated onto a filter paper cut into a 1.5 cm square, which was then attached to the skin where the initial value had been measured. The skin surface hydration was measured 3, 5, 10, 15, 20, 25 and 30 minutes after removing the filter paper.

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