

Phenoxyethanol

1 Nonproprietary Names

BP: Phenoxyethanol
PhEur: Phenoxyethanolum

2 Synonyms

Arosol; *Emmerescence 1160*; ethyleneglycol monophenyl ether; β -hydroxyethyl phenyl ether; 1-hydroxy-2-phenoxyethane; *Phenoxen*; *Phenoxetol*; β -phenoxyethyl alcohol; phenyl cellulose; *Uniphen P-23*.

3 Chemical Name and CAS Registry Number

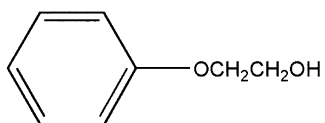
2-Phenoxyethanol [122-99-6]

4 Empirical Formula Molecular Weight

C₈H₁₀O₂

138.16

5 Structural Formula



6 Functional Category

Antimicrobial preservative; disinfectant.

7 Applications in Pharmaceutical Formulation or Technology

Phenoxyethanol is an antimicrobial preservative used in cosmetics and topical pharmaceutical formulations at a concentration of 0.5–1.0%; it may also be used as a preservative and antimicrobial agent for vaccines.^(1,2) Therapeutically, a 2.2% solution or 2.0% cream has been used as a disinfectant for superficial wounds, burns, and minor infections of the skin and mucous membranes.^(3–5)

Phenoxyethanol has a narrow spectrum of activity and is thus frequently used in combination with other preservatives, see Section 10.

8 Description

Phenoxyethanol is a colorless, slightly viscous liquid with a faint pleasant odor and burning taste.

9 Pharmacopeial Specifications

See Table I.

Table I: Pharmacopeial specifications for phenoxyethanol.

Test	PhEur 2002
Identification	+
Characters	+
Refractive index	1.537–1.539
Relative density	1.105–1.110
Phenol	≤0.1%
Related substances	+
Assay	99.0–100.5%

10 Typical Properties

Acidity/alkalinity: pH = 6.0 for a 1% v/v aqueous solution.

Antimicrobial activity: phenoxyethanol is an antibacterial preservative effective over a wide pH range against strains of *Pseudomonas aeruginosa* and to a lesser extent against *Proteus vulgaris* and other Gram-negative organisms. It is most frequently used in combination with other preservatives, such as parabens, to obtain a wider spectrum of antimicrobial activity.^(6–8) See also Section 12. For reported minimum inhibitory concentrations (MICs) see Table II.⁽⁹⁾

Table II: Minimum inhibitory concentrations (MICs) of phenoxyethanol.

Microorganism	MIC (μg/mL)
<i>Aspergillus niger</i> ATCC 16404	3300
<i>Candida albicans</i> ATCC 10231	5400
<i>Escherichia coli</i> ATCC 8739	3600
<i>Pseudomonas aeruginosa</i> ATCC 9027	3200
<i>Staphylococcus aureus</i> ATCC 6538	8500

Autoignition temperature: 135 °C

Boiling point: 245.2 °C

Flash point: 121 °C (open cup)

Melting point: 14 °C

Partition coefficients:

Isopropyl palmitate : water = 2.9

Mineral oil : water = 0.3

Peanut oil : water = 2.6

Refractive index: n_D^{20} = 1.537–1.539

Solubility: see Table III.

Table III: Solubility of phenoxyethanol.

Solvent	Solubility at 20 °C
Acetone	Miscible
Ethanol (95%)	Miscible
Glycerin	Miscible
Isopropyl palmitate	1 in 26
Mineral oil	1 in 143
Olive oil	1 in 50
Peanut oil	1 in 50
Water	1 in 43

Specific gravity: 1.11 at 20 °C

11 Stability and Storage Conditions

Aqueous phenoxyethanol solutions are stable and may be sterilized by autoclaving. The bulk material is also stable and should be stored in a well-closed container in a cool, dry place.

12 Incompatibilities

The antimicrobial activity of phenoxyethanol may be reduced by interaction with nonionic surfactants and possibly by absorption by polyvinyl chloride.⁽¹⁰⁾ The antimicrobial activity of phenoxyethanol against *Pseudomonas aeruginosa* may be reduced in the presence of cellulose derivatives (methylcellulose, sodium carboxymethylcellulose, and hypromellose (hydroxypropylmethylcellulose)).⁽¹¹⁾

13 Method of Manufacture

Phenoxyethanol is prepared by treating phenol with ethylene oxide in an alkaline medium.

14 Safety

Phenoxyethanol produces a local anesthetic effect on the lips, tongue, and other mucous membranes. The pure material is a moderate irritant to the skin and eyes. In animal studies, a 10% v/v solution was not irritant to rabbit skin and a 2% v/v solution was not irritant to the rabbit eye.⁽¹²⁾ Long-term exposure to phenoxyethanol may result in CNS toxic effects similar to other organic solvents.⁽¹³⁾

LD₅₀ (rabbit, skin): 5 g/kg⁽¹⁴⁾

LD₅₀ (rat, oral): 1.26 g/kg

15 Handling Precautions

Observe normal precautions appropriate to the circumstances and quantity of material handled. Phenoxyethanol may be irritant to the skin and eyes; eye protection and gloves are recommended.

16 Regulatory Status

Included in nonparenteral medicines licensed in the UK.

17 Related Substances

Chlorophenoxyethanol; phenoxypropanol.

Chlorophenoxyethanol

Empirical formula: C₈H₉ClO₂

Molecular weight: 172.60

CAS number: [29533-21-9]

Phenoxypropanol

Empirical formula: C₉H₁₂O₂

Molecular weight: 152.18

CAS number: [4169-04-4]

Synonyms: 1-phenoxypropan-2-ol.

18 Comments

Aqueous solutions are best prepared by shaking phenoxyethanol with hot water until dissolved, followed by cooling and adjusting the volume to the required concentration.

The EINECS number for phenoxyethanol is 204-589-7.

19 Specific References

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20 General References

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21 Author

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22 Date of Revision

1 May 2002.