

20 General References

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21 Authors

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22 Date of Revision

4 May 2017.

Hydroxyethylpiperazine Ethane Sulfonic Acid

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1 Nonproprietary Names

None adopted.

2 Synonyms

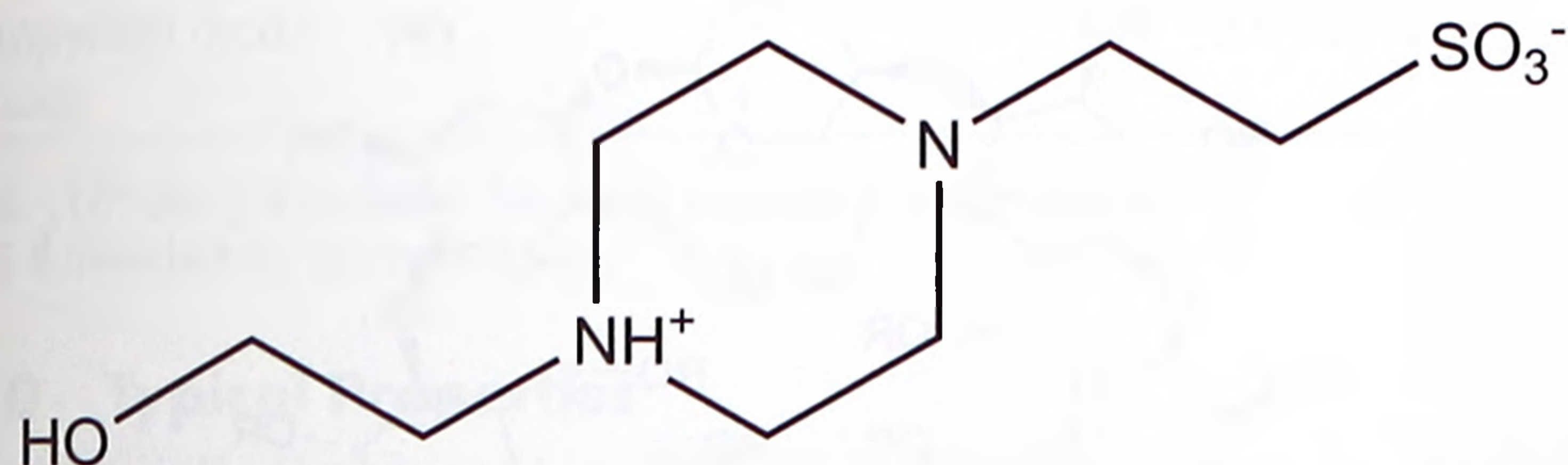
HEPES; 1-[4-(2-hydroxyethyl)-1-piperazinyl]ethane-2-sulfonic acid; 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid; *N*-(2-hydroxyethyl)piperazine-*N'*-2-ethanesulfonic acid.

3 Chemical Name and CAS Registry Number

2-[4-(2-Hydroxyethyl)piperazin-1-yl]ethanesulfonic acid
[7365-45-9]

4 Empirical Formula and Molecular Weight

C₈H₁₈N₂O₄S 238.30

5 Structural Formula**6 Functional Category**

Buffering agent.

7 Applications in Pharmaceutical Formulation or Technology

Hydroxyethylpiperazine ethane sulfonic acid (HEPES) is used as a buffering agent in injections.^(1–3)

8 Description

HEPES occurs as an odorless white crystalline powder.

9 Pharmacopeial Specifications

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10 Typical Properties

Acidity/alkalinity pH 5.0–6.5 (1 M aqueous solution)

Dissociation constants

$pK_{a1} \sim 3$;

$pK_{a2} = 7.55$ (20°C);

$\Delta pK_a/^\circ C = -0.014$.

Melting point Approx. 236°C, with decomposition.

Solubility Soluble in water; saturated solution is 2.25 M at 0°C.

11 Stability and Storage Conditions

HEPES is hygroscopic. Store in the original container in a cool, dry place, protected from direct sunlight. Keep the container tightly closed and sealed until ready for use.

12 Incompatibilities

HEPES is incompatible with strong oxidizing agents.

13 Method of Manufacture

HEPES is synthetically manufactured via a sulfonation process from sodium bromoethanesulfonate and *N*-2-hydroxyethylpiperazine.

14 Safety

HEPES can cause irritation to the eyes, respiratory system, and skin if improperly handled. May be harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting, and diarrhea. Hazardous thermal decomposition products may include carbon dioxide, carbon monoxide, nitrogen oxides, and sulfur oxides. Toxicological properties have not been fully investigated.

LD₅₀ (oral, quail): > 0.316 g/kg