# Monothioglycerol

## 1 Nonproprietary Names

USPNF: Monothioglycerol

## 2 Synonyms

1-Mercaptoglycerol; 1-mercapto-2,3-propanediol; monothioglycerin; α-monothioglycerol; thioglycerin; 1-thioglycerol.

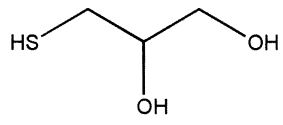
## 3 Chemical Name and CAS Registry Number

3-Mercapto-1,2-propanediol [96-27-5]

## 4 Empirical Formula / Molecular Weight

$C_3H_8O_2S$ | 108.16

## 5 Structural Formula




## 6 Functional Category

Antimicrobial preservative; antioxidant.

## 7 Applications in Pharmaceutical Formulation or Technology

Monothioglycerol is used as an antioxidant in pharmaceutical formulations, mainly in parenteral preparations.[1] Monothioglycerol is reported to have some antimicrobial activity.[2–4] It is also widely used in cosmetic formulations such as depilating agents.

Therapeutically, monothioglycerol has been used in a 0.02% w/w aqueous solution to stimulate wound healing, and as a 0.1% w/w jelly in atrophic rhinitis.

## 8 Description

Monothioglycerol occurs as a colorless or pale-yellow colored, viscous, hygroscopic liquid with a slight odor of sulfide.

## 9 Pharmacopeial Specifications

*See* Table I.

**Table I:** Pharmacopeial specifications for monothioglycerol.

| Test | USPNF 20 |
|---|---|
| Identification | + |
| Specific gravity | 1.241–1.250 |
| Refractive index | 1.521–1.526 |
| pH (10% aqueous solution) | 3.5–7.0 |
| Water | ≤5.0% |
| Residue on ignition | ≤0.1% |
| Selenium | ≤0.003% |
| Heavy metals | ≤0.002% |
| Organic volatile impurities | + |
| Assay (anhydrous basis) | 97.0–101.0% |

## 10 Typical Properties

**Acidity/alkalinity:** pH = 3.5–7.0 (10% w/v aqueous solution)
**Boiling point:** 118 °C
**Flash point:** 110 °C
**Refractive index:** $n_D^{25}$ = 1.521–1.526
**Solubility:** miscible with ethanol (95%); freely soluble in water; practically insoluble in ether.
**Specific gravity:** 1.241–1.250

## 11 Stability and Storage Conditions

Monothioglycerol is unstable in alkaline solutions. Monothioglycerol should be stored in a well-closed container in a cool, dry place.

## 12 Incompatibilities

Monothioglycerol can react with oxidizing materials.

## 13 Method of Manufacture

Monothioglycerol is prepared by heating an ethanolic solution of 3-chloro-1,2-propanediol with potassium bisulfide.

## 14 Safety

Monothioglycerol is generally regarded as a relatively nontoxic and nonirritant material at the concentrations used as a pharmaceutical excipient. It is used in topical and injectable preparations.

Undiluted monothioglycerol is considered a poison by the IP and IV routes; it has also been reported to be mutagenic.[5]

$LD_{50}$ (cat, IV): 0.22 g/kg[5]
$LD_{50}$ (mouse, IP): 0.34 g/kg
$LD_{50}$ (rabbit, IV): 0.25 g/kg
$LD_{50}$ (rat, IP): 0.39 g/kg

## 15 Handling Precautions

Observe normal precautions appropriate to the circumstances and quantity of material handled. Monothioglycerol is

flammable when exposed to heat or flame; when heated to decomposition it emits toxic fumes of $SO_x$.

## 16 Regulatory Status

Included in the FDA Inactive Ingredients Guide (IM, IV and other injections).

## 17 Related Substances

—

## 18 Comments

The EINECS number for monothioglycerol is 202-495-0.

## 19 Specific References


1 Kasraian K, Kuzniar AA, Wilson GG, Wood JA. Developing an injectable formula containing an oxygen sensitive drug: case study of danofloxacin injectable. *Pharm Dev Technol* 1999; **4**(4): 475–480.

2 Jensen KK, Javor GT. Inhibition of *Escherichia coli* by thioglycerol. *Antimicrob Agents Chemother* 1981; **19**: 556–561.

3 Javor GT. Depression of adenoslymethionine content of *Escherichia coli* by thioglycerol. *Antimicrob Agents Chemother* 1983; **24**: 860–867.

4 Javor GT. Inhibition of respiration of *Escherichia coli* by thioglycerol. *Antimicrob Agents Chemother* 1983; **24**: 868–870.

5 Lewis RJ, ed. *Sax's Dangerous Properties of Industrial Materials*, 10th edn. New York: Wiley, 2000: 2576.


## 20 General References


Nealon DA, Pettit SM, Henderson AR. Diluent pH and the stability of the thiol group in monothioglycerol, *N*-acetyl-L-cysteine, and 2-mercaptoethanol. *Clin Chem* 1981; **27**(3): 505–506.


## 21 Authors

PJ Sheskey, PJ Weller.

## 22 Date of Revision

10 June 2002.