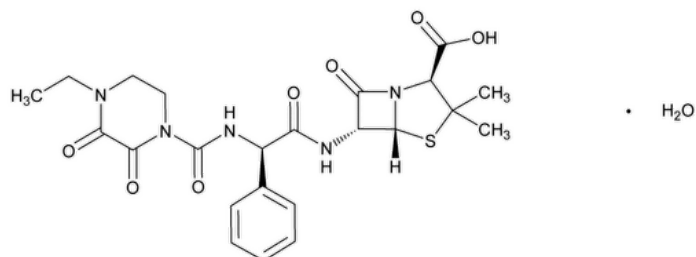


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Piperacillin



$C_{23}H_{27}N_5O_7 \cdot H_2O$ 535.57

$C_{23}H_{27}N_5O_7S$ 517.56

4-Thia-1-azabicyclo[3.2.0]heptane-2-carboxylic acid, 6-[[[(4-ethyl-2,3-dioxo-1-piperazinyl)carbonyl] amino]phenylacetyl]amino]-3,3-dimethyl-7-oxo-, monohydrate, [2S-2 α ,5 α ,6 β (S*)]]; (2S,5R,6R)-6-[(R)-2-(4-Ethyl-2,3-dioxo-1-piperazinecarboxamido)-2-phenylacetamido]-3,3-dimethyl-7-oxo-4-thia-1-azabicyclo[3.2.0]heptane-2-carboxylic acid monohydrate CAS RN®: 66258-76-2; UNII: X00B0D500E. Anhydrous CAS RN®: 61477-96-1; UNII: 9I628532GX.

DEFINITION

Piperacillin contains NLT 960 µg/mg and NMT 1030 µg/mg of piperacillin ($C_{23}H_{27}N_5O_7S$), calculated on the anhydrous basis.

IDENTIFICATION

- **A. [SPECTROSCOPIC IDENTIFICATION TESTS \(197\)](#), [Infrared Spectroscopy: 197K](#)**

ASSAY

• PROCEDURE

Mobile phase: Methanol, water, 0.2 M monobasic sodium phosphate, and 0.4 M tetrabutylammonium hydroxide (450:447:100:3). Adjust with phosphoric acid to a pH of 5.50.

System suitability solution: 0.1 mg/mL of [USP Ampicillin RS](#) and 0.2 mg/mL of [USP Piperacillin RS](#) in *Mobile phase*

Standard solution: 0.4 mg/mL of [USP Piperacillin RS](#) in *Mobile phase*. Dissolve in a few drops of methanol, and dilute with *Mobile phase* to volume. Use this solution within 1 h.

Sample solution: 0.4 mg/mL of Piperacillin in *Mobile phase*. Dissolve in a few drops of methanol, and dilute with *Mobile phase* to volume. Use this solution within 1 h.

Chromatographic system

(See [Chromatography \(621\)](#), [System Suitability](#).)

Mode: LC

Detector: UV 220 nm

Column: 4.6-mm × 25-cm; 5-µm packing L1

Flow rate: 1 mL/min

Injection volume: 10 µL

System suitability

Samples: *System suitability solution* and *Standard solution*

[NOTE—See [Table 1](#) for the relative retention times.]

Suitability requirements

Resolution: NLT 16 between ampicillin and piperacillin, *System suitability solution*

Tailing factor: NMT 1.2 for the piperacillin peak, *System suitability solution*

Relative standard deviation: NMT 2%, *Standard solution*

Analysis**Samples:** *Standard solution* and *Sample solution*Calculate the potency of piperacillin ($C_{23}H_{27}N_5O_7S$) in the portion of Piperacillin taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times P$$

 r_U = peak response from the *Sample solution* r_S = peak response from the *Standard solution* C_S = concentration of [USP Piperacillin RS](#) in the *Standard solution* (mg/mL) C_U = concentration of the *Sample solution* (mg/mL) P = potency of piperacillin in [USP Piperacillin RS](#) (µg/mg)**Acceptance criteria:** 960–1030 µg/mg on the anhydrous basis**IMPURITIES**• **AMPICILLIN, PIPERACILLIN PENICILLOIC ACID, PIPERACILLIN RELATED COMPOUND E, AND ACETYLATED PENICILLOIC ACID OF PIPERACILLIN****Mobile phase, Sample solution, Chromatographic system, and System suitability:** Proceed as directed in the Assay.**Standard solution 1:** 0.08 mg/mL of [USP Ampicillin RS](#) in *Mobile phase***Standard solution 2:** 0.04 mg/mL of [USP Piperacillin RS](#) in *Mobile phase*. Dissolve in a few drops of methanol, and dilute with *Mobile phase* to volume. Use this solution within 1 h.**Analysis****Samples:** *Standard solution 1*, *Standard solution 2*, and *Sample solution*

Calculate the percentage of ampicillin in the portion of Piperacillin taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times P \times F \times 100$$

 r_U = peak response of ampicillin from the *Sample solution* r_S = peak response of ampicillin from *Standard solution 1* C_S = concentration of [USP Ampicillin RS](#) in *Standard solution 1* (mg/mL) C_U = concentration of the *Sample solution* (mg/mL) P = potency of ampicillin in [USP Ampicillin RS](#) (µg/mg) F = conversion factor, 0.001 mg/µg

Calculate the percentages of specified impurities other than ampicillin in the portion of Piperacillin taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times P \times (1/F_1) \times F_2 \times 100$$

 r_U = peak response of each specified impurity other than ampicillin from the *Sample solution* r_S = peak response of piperacillin from *Standard solution 2* C_S = concentration of [USP Piperacillin RS](#) in *Standard solution 2* (mg/mL) C_U = concentration of the *Sample solution* (mg/mL) P = potency of piperacillin in [USP Piperacillin RS](#) (µg/mg) F_1 = relative response factor (see [Table 1](#)) F_2 = conversion factor, 0.001 mg/µg**Acceptance criteria:** See [Table 1](#).**Table 1**