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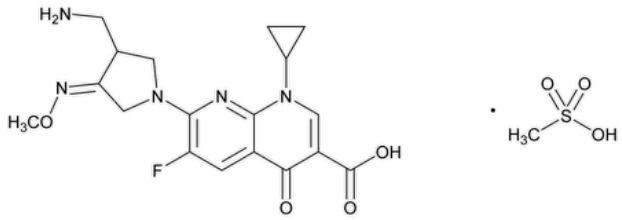
***Add the following:***

# ▲Gemifloxacin Mesylate



$C_{18}H_{20}FN_5O_4 \cdot CH_4O_3S$ 485.49

(*Z*)-7-[3-(Aminomethyl)-4-(methoxyimino)-1-pyrrolidinyl]-1-cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-1,8-naphthyridine-3-carboxylic acid monomethanesulfonate;

(±)-7-[3-(Aminomethyl)-4-oxo-1-pyrrolidinyl]-1-cyclopropyl-6-fluoro-1,4-dihydro-4-oxo-1,8-naphthyridine-3-carboxylic acid, $7^4$-(*Z*)-(*O*-methyloxime), monomethanesulfonate;

(*Z*)-7-[3-(Aminomethyl)-4-(methoxyimino)pyrrolidin-1-yl]-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-1,8-naphthyridine-3-carboxylic acid methanesulfonate CAS RN®: 210353-53-0.

## DEFINITION

Gemifloxacin Mesylate contains NLT 98.0% and NMT 102.0% of gemifloxacin mesylate ($C_{18}H_{20}FN_5O_4 \cdot CH_4O_3S$), calculated on the anhydrous and solvent-free basis.

## IDENTIFICATION

• **A.** **Spectroscopic Identification Tests ⟨197⟩, *Infrared Spectroscopy*:** 197K or 197M

• **B.** The retention time of the major peak of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.

## ASSAY

• **Procedure**

Store the solutions in amber vials and protect from light.

**Mobile phase:** Acetonitrile, water, and trifluoroacetic acid (20: 80: 0.1)

**Standard solution:** 0.5 mg/mL of USP Gemifloxacin Mesylate RS in water

**Sample solution:** 0.5 mg/mL of Gemifloxacin Mesylate in water

**Chromatographic system**

(See *Chromatography ⟨621⟩, System Suitability*.)

**Mode:** LC

**Detector:** UV 272 nm

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

**Column temperature:** 40°

**Flow rate:** 1 mL/min

**Injection volume:** 5 µL

**Run time:** NLT 1.2 times the retention time of gemifloxacin

**System suitability**

**Sample:** *Standard solution*

**Suitability requirements**

**Resolution:** NLT 5.0 between *E*-gemifloxacin and gemifloxacin

**Tailing factor:** NMT 1.5 for gemifloxacin

**Relative standard deviation:** NMT 1.0% for gemifloxacin

**Analysis**

**Samples:** *Standard solution* and *Sample solution*

Calculate the percentage of gemifloxacin mesylate ($C_{18}H_{20}FN_5O_4 \cdot CH_4O_3S$) in the portion of Gemifloxacin Mesylate taken:

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

$r_U$ = peak response of gemifloxacin from the *Sample solution*

$r_S$ = peak response of gemifloxacin from the *Standard solution*

$C_S$ = concentration of USP Gemifloxacin Mesylate RS in the *Standard solution* (mg/mL)

$C_U$ = concentration of Gemifloxacin Mesylate in the *Sample solution* (mg/mL)

**Acceptance criteria:** 98.0%–102.0% on the anhydrous and solvent-free basis

## IMPURITIES

• **Residue on Ignition ⟨281⟩:** NMT 0.1%

• **Organic Impurities**

Store the solutions in amber vials and protect from light.

**Solution A:** Acetonitrile, water, and trifluoroacetic acid (20: 80: 0.1)

**Solution B:** Acetonitrile, water, and trifluoroacetic acid (80: 20: 0.1)

**Mobile phase:** See *Table 1*.

**Table 1**

| Time (min) | Solution A (%) | Solution B (%) |
|---|---|---|
| 0 | 100 | 0 |
| 15 | 100 | 0 |
| 35 | 0 | 100 |
| 37 | 100 | 0 |

**Diluent:** Acetonitrile and water (20:80)

**Peak identification solution:** 0.5 mg/mL of USP Gemifloxacin Mesylate RS, and 0.001 mg/mL each of USP Gemifloxacin Related Compound B RS and USP Gemifloxacin Related Compound C RS in *Diluent*. [Note—It is recommended to use freshly prepared USP Gemifloxacin Related Compound C RS.]

**System suitability solution:** 0.5 mg/mL of USP Gemifloxacin Mesylate RS in *Diluent*

**Sensitivity solution:** 0.25 µg/mL of USP Gemifloxacin Mesylate RS in *Diluent*

**Standard solution:** 0.0005 mg/mL of USP Gemifloxacin Mesylate RS in *Diluent* from the *System suitability solution*

**Sample solution:** 0.5 mg/mL of Gemifloxacin Mesylate in *Diluent*

**Chromatographic system**

(See *Chromatography ⟨621⟩, System Suitability*.)

**Mode:** LC

**Detectors**

**UV 207 nm:** 0–5 min

**UV 272 nm:** 5.1–37 min

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

**Column temperature:** 40°

**Flow rate:** 1.0 mL/min

**Injection volume:** 5 µL

**System suitability**

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

**Suitability requirements**

**Resolution:** NLT 5.0 between *E*-gemifloxacin and gemifloxacin, *System suitability solution*

**Relative standard deviation:** NMT 10% for gemifloxacin, *Standard solution*

**Signal-to-noise ratio:** NLT 10, *Sensitivity solution*

**Analysis**

**Samples:** *Standard solution* and *Sample solution*

Calculate the percentage of each individual impurity in the portion of Gemifloxacin Mesylate taken:

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

$r_U$ = peak response of each individual impurity from the *Sample solution*

$r_S$ = peak response of gemifloxacin from the *Standard solution*

$C_S$ = concentration of USP Gemifloxacin Mesylate RS in the *Standard solution* (mg/mL)

$C_U$ = concentration of Gemifloxacin Mesylate in the *Sample solution* (mg/mL)

$F$ = relative response factor (see *Table 2*)

**Acceptance criteria:** See *Table 2*. The reporting threshold is 0.05%.

**Table 2**

| Name | Relative Retention Time | Detection Wavelength (nm) | Relative Response Factor | Acceptance Criteria, NMT (%) |
|---|---|---|---|---|
| Gemifloxacin related compound A[a,b] | 0.16 | 207 | 0.43 | 0.15 |
| Gemifloxacin related compound B | 0.33 | 272 | 1.0 | 0.2 |
| Gemifloxacin related compound C | 0.37 | 272 | 1.0 | 0.1 |
| Gemifloxacin *E*-isomer[c] | 0.77 | 272 | 1.0 | 0.7 |
| Gemifloxacin | 1.0 | 272 | — | — |
| Naphthyridine carboxylic acid analog[b,d] | 1.79 | 272 | 0.45 | 0.15 |
| Gemifloxacin dimer[e] | 1.97 | 272 | 0.90 | 0.15 |
| Any other individual impurity | — | 272 | 1.0 | 0.1 |
| Total impurities | — | — | — | 1.5 |

[a] (*Z*)-4-(Aminomethyl)pyrrolidin-3-one *O*-methyl oxime dimethanesulfonate.

[b] This impurity should be included, if present, in the synthetic route used by the manufacturer.

[c] (*E*)-7-[3-(Aminomethyl)-4-(methoxyimino)pyrrolidin-1-yl]-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-1,8-naphthyridine-3-carboxylic acid monomethanesulfonate.

[d] 7-Chloro-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-1,8-naphthyridine-3-carboxylic acid.

[e] (*Z*)-7-({[1-(6-Carboxy-8-cyclopropyl-3-fluoro-5-oxo-5,8-dihydro-1,8-naphthyridin-2-yl)-4-(methoxyimino)pyrrolidin-3-yl]methyl}amino)-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-1,8-naphthyridine-3-carboxylic acid.

**SPECIFIC TESTS**

- **Water Determination** ⟨921⟩, *Method I*

**Sample:** 0.1 g

**Acceptance criteria:** 4.0%–7.0%

## ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Store in tightly closed containers, protected from light. Store at room temperature.

• **USP Reference Standards** ⟨11⟩

USP Gemifloxacin Mesylate RS

USP Gemifloxacin Related Compound B RS

7-[3-(Aminomethyl)-4-hydroxypyrrolidin-1-yl]-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-1,8-naphthyridine-3-carboxylic acid monomethanesulfonate.

$C_{17}H_{19}FN_4O_4 \cdot CH_4O_3S$ 458.46

USP Gemifloxacin Related Compound C RS

7-[3-(Aminomethyl)-4-oxopyrrolidin-1-yl]-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydro-1,8-naphthyridine-3-carboxylic acid monomethanesulfonate.

$C_{17}H_{17}FN_4O_4 \cdot CH_4O_3S$ 456.45▲ (USP 1-May-2021)

**Auxiliary Information** - Please check for your question in the FAQs before contacting USP.

| Topic/Question | Contact | Expert Committee |
|---|---|---|
| GEMIFLOXACIN MESYLATE | Documentary Standards Support | SM12020 Small Molecules 1 |

**Chromatographic Database Information:** Chromatographic Database

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