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Betaxolol Tablets

DEFINITION

Betaxolol Tablets contain an amount of Betaxolol Hydrochloride equivalent to NLT 90.0% and NMT 110.0% of the labeled amount of betaxolol hydrochloride ($C_{18}H_{29}NO_3 \cdot HCl$).

IDENTIFICATION

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

ASSAY

- **Procedure**

Buffer: 3.4 g/L of monobasic potassium phosphate in water, adjusted with phosphoric acid to a pH of 3.0

Mobile phase: Acetonitrile, methanol, and *Buffer* (175:175:650)

Standard solution: 1 mg/mL of USP Betaxolol Hydrochloride RS in *Mobile phase*

Sample solution: Nominally 1 mg/mL of betaxolol hydrochloride prepared as follows. Powder NLT 30 Tablets, transfer a portion of the powder containing nominally 20 mg of betaxolol hydrochloride to a 20-mL volumetric flask, and add 15 mL of *Mobile phase*. Sonicate for 10 min, and centrifuge for 30 min. Use the clear supernatant.

Chromatographic system

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

Mode: LC

Detector: UV 222 nm. For *Identification B*, use a diode array detector in the range of 210–400 nm.

Column: 4.6-mm × 25-cm; 5-µm packing L7

Flow rate: 1.5 mL/min

Injection volume: 10 µL

System suitability

Sample: *Standard solution*

Suitability requirements

Tailing factor: NMT 3.0

Relative standard deviation: NMT 1.0%

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of the labeled amount of betaxolol hydrochloride ($C_{18}H_{29}NO_3 \cdot HCl$) in the portion of Tablets taken:

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

r_U = peak response from the *Sample solution*

r_S = peak response from the *Standard solution*

C_S = concentration of USP Betaxolol Hydrochloride RS in the *Standard solution* (mg/mL)

C_U = nominal concentration of betaxolol hydrochloride in the *Sample solution* (mg/mL)

Acceptance criteria: 90.0%–110.0%

PERFORMANCE TESTS

- **Dissolution ⟨711⟩**

Medium: 0.01 N hydrochloric acid; 500 mL

Apparatus 2: 50 rpm

Time: 30 min

Standard solution: USP Betaxolol Hydrochloride RS in *Medium*

Sample solution: Sample per *Dissolution ⟨711⟩*. Dilute with *Medium* to a concentration that is similar to that of the *Standard solution*.

Instrumental conditions

Mode: UV

Analytical wavelength: 274 nm

Cell path length: A 5-cm path length cell may be used for lower dosage levels.

Analysis

Samples: *Standard solution* and *Sample solution*

Determine the percentage of the labeled amount of betaxolol hydrochloride ($C_{18}H_{29}NO_3 \cdot HCl$) dissolved:

$$(A_U/A_S) \times C_S \times D \times (V/L) \times 100$$

A_U = absorbance of the *Sample solution*

A_S = absorbance of the *Standard solution*

C_S = concentration of the *Standard solution* (mg/mL)

D = dilution factor for the *Sample solution*, if needed

V = volume of *Medium*, 500 mL

L = label claim (mg/Tablet)

Tolerances: NLT 80% (Q) of the labeled amount of betaxolol hydrochloride ($C_{18}H_{29}NO_3 \cdot HCl$) is dissolved.

Change to read:

• **Uniformity of Dosage Units ⟨905⟩:** ▲Meet the requirements▲ (CN 1-Aug-2023)

Procedure for content uniformity

Standard solution: 0.1 mg/mL of USP Betaxolol Hydrochloride RS in 0.1 N hydrochloric acid

Sample solution: Place 1 Tablet in a suitable volumetric flask to obtain a concentration of betaxolol hydrochloride, based on the label claim, of 0.1 mg/mL. Add an amount of 0.1 N hydrochloric acid equal to 70% of the volume of the flask. Shake by mechanical means until dissolved, dilute with 0.1 N hydrochloric acid to volume, and mix. Filter, and discard the first 20 mL of the filtrate.

Instrumental conditions

Mode: UV

Analytical wavelength: 274 nm

Cell path length: 1 cm

Blank: 0.1 N hydrochloric acid

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of the labeled amount of betaxolol hydrochloride ($C_{18}H_{29}NO_3 \cdot HCl$) in the Tablet taken:

$$\text{Result} = (A_U/A_S) \times (C_S/C_U) \times 100$$

A_U = absorbance of the *Sample solution*

A_S = absorbance of the *Standard solution*

C_S = concentration of USP Betaxolol Hydrochloride RS in the *Standard solution* (mg/mL)

C_U = nominal concentration of betaxolol hydrochloride in the *Sample solution* (mg/mL)

▲▲ (CN 1-Aug-2023)

IMPURITIES

• **Organic Impurities**

Buffer, Mobile phase, Sample solution, and **Chromatographic system:** Proceed as directed in the *Assay*.

System suitability solution: 1 mg/mL of USP Betaxolol Hydrochloride RS and 30 µg/mL of USP Betaxolol Related Compound A RS in *Mobile phase*

Standard solution: 6 µg/mL of USP Betaxolol Hydrochloride RS in *Mobile phase*

System suitability

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

[Note—The relative retention times for betaxolol related compound A and betaxolol are 0.9 and 1.0, respectively.]

Suitability requirements

Resolution: NLT 2.0 between betaxolol related compound A and betaxolol, *System suitability solution*

Relative standard deviation: NMT 5.0%, *Standard solution*

Analysis

Samples: *Sample solution* and *Standard solution*

Calculate the percentage of each degradation product in the portion of Tablets taken:

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

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

r_S = peak response from the *Standard solution*

C_S = concentration of USP Betaxolol Hydrochloride RS in the *Standard solution* (mg/mL)

C_U = nominal concentration of betaxolol hydrochloride in the *Sample solution* (mg/mL)

F = relative response factor for each individual impurity (see *Table 1*)

Acceptance criteria: See *Table 1*.

Table 1

Name	Relative Retention Time	Relative Response Factor	Acceptance Criteria, NMT (%)
Betaxolol hydroxyethyl analog[a]	0.3	1.3	0.5
Betaxolol related compound A[b,c]	0.9	1.2	—
Betaxolol	1.0	1.0	—
Betaxolol phenol analog[d]	1.6	1.3	0.5
Betaxolol open chain analog[e]	1.7	0.95	0.5
Betaxolol oxirane analog[c,f]	3.7	1.3	—
Any unspecified degradation product	—	1.0	0.2
Total degradation products	—	—	1.0

[a] 1-[4-(2-Hydroxyethyl)phenoxy]-3-(isopropylamino)propan-2-ol.

[b] 1-(4-Ethylphenoxy)-3-(isopropylamino)propan-2-ol.

[c] It is a process impurity and is listed for identification only. It is controlled in the drug substance, is not reported for the drug product, and should not be included in the total degradation products.

[d] 4-[2-Cyclopropylmethoxy)ethyl]phenol.

[e] 1-[4-(2-Butoxyethyl)phenoxy]-3-(isopropylamino)propan-2-ol.

[f] 2-({[4-(2-Cyclopropylmethoxy)ethyl]phenoxy}methyl)oxirane.

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in tight containers.

• **Labeling:** Label the Tablets to state both the content of the betaxolol active moiety and the content of betaxolol hydrochloride used in formulating them.

• **USP Reference Standards** ⟨11⟩

USP Betaxolol Hydrochloride RS

USP Betaxolol Related Compound A RS

1-(4-Ethylphenoxy)-3-(isopropylamino)propan-2-ol.

$C_{14}H_{23}NO_2$ 237.34

Topic/Question	Contact	Expert Committee
BETAXOLOL TABLETS	Documentary Standards Support	SM32020 Small Molecules 3
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM32020 Small Molecules 3

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