Edition: BP 2025 (Ph. Eur. 11.6 update)

Betaxolol Eye Drops, Solution

General Notices

Action and use

Beta-adrenoceptor antagonist.

DEFINITION

Betaxolol Eye Drops, Solution are a sterile solution of Betaxolol Hydrochloride in Purified Water.

The eye drops comply with the requirements stated under Eye Preparations and with the following requirements.

Content of betaxolol, $C_{18}H_{29}NO_3$

90.0 to 110.0% of the stated amount.

IDENTIFICATION

A. Carry out the method for *thin-layer chromatography*, Appendix III A, using the following solutions.
(1) Dilute the eye drops with *water* to produce a solution containing the equivalent of 0.1% w/v of betaxolol. Shake 1 mL of the solution with 4 mL of *water*, 0.1 mL of 13.5M *ammonia* and 2 mL of *chloroform*, centrifuge and use the chloroform layer.
(2) Prepare solution (2) in the same manner as solution (1) but using a 0.1% w/v solution of *betaxolol hydrochloride BPCRS* in place of the eye drops.
(3) A mixture of equal volumes of solution (1) and solution (2).

CHROMATOGRAPHIC CONDITIONS

(a) Use as the coating *silica gel* (Merck silica gel 60 plates are suitable).
(b) Use the mobile phase as described below.
(c) Apply 5 µL of each solution.
(d) Develop the plate to 15 cm.
(e) After removal of the plate, dry in air, spray with a solution prepared by dissolving 5 g of *iodine* and 10 g of *potassium iodide* in sufficient *water* to produce 100 mL and mixing 20 mL of the resulting solution with 30 mL of *water* and 50 mL of 2 M *acetic acid*. Examine the plate immediately; spots due to betaxolol appear brown.

MOBILE PHASE

30 volumes of a solution prepared by diluting 1 volume of 13.5M *ammonia* to 50 volumes with *propan-2-ol* immediately before use and 70 volumes of *chloroform*.

SYSTEM SUITABILITY

The test is not valid unless the chromatogram obtained with solution (3) shows a single, compact spot.

CONFIRMATION

The principal spot in the chromatogram obtained with solution (1) corresponds in position and colour to that in the chromatogram obtained with solution (2).

B. In the Assay, the chromatogram obtained with solution (1) shows a principal peak with the same retention time as the principal peak in the chromatogram obtained with solution (2).

TESTS

Acidity or alkalinity

pH, 6.0 to 7.8, Appendix V L.

Related substances

Carry out the method for *liquid chromatography*, Appendix III D, using the following solutions in the mobile phase.

(1) Dilute a suitable volume of the eye drops to produce a solution containing the equivalent of 0.02% w/v of betaxolol.
(2) Dilute 1 volume of solution (1) to 100 volumes.

CHROMATOGRAPHIC CONDITIONS

(a) Use a stainless steel column (25 cm × 4.6 mm) packed with *octadecylsilyl silica gel for chromatography* (10 µm) (Spherisorb ODS-2 is suitable).
(b) Use isocratic elution and the mobile phase described below.
(c) Use a flow rate of 1.5 mL per minute.
(d) Use an ambient column temperature.
(e) Use a detection wavelength of 220 nm.
(f) Inject 20 µL of each solution.

MOBILE PHASE

Dissolve 3 g of *sodium dodecyl sulfate* in 450 mL of the following solution. 45 volumes of a buffer solution prepared as described below and 55 volumes of *acetonitrile*. To prepare the buffer solution add 5 mL of *orthophosphoric acid* to 990 mL of *water*, adjust the pH to 3.0 with 2M *ammonia* and add sufficient *water* to produce 1000 mL.

SYSTEM SUITABILITY

The test is not valid unless, in the chromatogram obtained with solution (2), the *column efficiency*, determined on the peak due to betaxolol is at least 8000 *theoretical plates* per metre and the *symmetry factor* of the principal peak is not more than 2.5.

LIMITS

In the chromatogram obtained with solution (1):

the area of any *secondary peak* is not greater than the area of the principal peak in the chromatogram obtained with solution (2) (1%);

the area of not more than one *secondary peak* is greater than 0.3 times the area of the principal peak in the chromatogram obtained with solution (2) (0.3%).

ASSAY

Carry out the method for *liquid chromatography*, Appendix III D, using the following solutions in the mobile phase.

(1) Dilute the eye drops to produce a solution containing the equivalent of 0.01% w/v of betaxolol.
(2) 0.012% w/v of *betaxolol hydrochloride BPCRS*.

CHROMATOGRAPHIC CONDITIONS

(a) Use a stainless steel column (25 cm × 4.6 mm) packed with *octadecylsilyl silica gel for chromatography* (10 µm) (Spherisorb ODS-2 is suitable).
(b) Use isocratic elution and the mobile phase described below.
(c) Use a flow rate of 1 mL per minute.
(d) Use an ambient column temperature.
(e) Use a detection wavelength of 220 nm.
(f) Inject 10 µL of each solution.

MOBILE PHASE

45 volumes of *acetonitrile* and 55 volumes of *water* containing 0.71% w/v of *anhydrous disodium hydrogen orthophosphate* and 0.91% w/v of *dimethylamine hydrochloride*, adjusted to pH 3.0 with *orthophosphoric acid*.

DETERMINATION OF CONTENT

Calculate the content of $C_{18}H_{29}NO_3$ in the eye drops using the declared content of $C_{18}H_{29}NO_3$ in *betaxolol hydrochloride BPCRS*.

STORAGE

Betaxolol Eye Drops, Solution should be protected from light.

LABELLING

The quantity of active ingredient is stated in terms of the equivalent amount of betaxolol.