



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

## Tobramycin Eye Drops

### [General Notices](#)

#### Action and use

Aminoglycoside antibacterial.

### DEFINITION

Tobramycin Eye Drops are a sterile solution of Tobramycin in a suitable vehicle

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

#### Content of tobramycin, $C_{18}H_{37}N_5O_9$

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 a suitable volume of the eye drops with [water](#) to produce a solution containing 0.3% w/v of Tobramycin.
- (2) 0.3% w/v of [tobramycin BPCRS](#) in [water](#).
- (3) 0.4% w/v each of [kanamycin monosulfate BPCRS](#), [neomycin sulfate EPCRS](#) and [tobramycin BPCRS](#) in [water](#).

#### CHROMATOGRAPHIC CONDITIONS

- (a) Use as the coating [silica gel](#).
- (b) Use the mobile phase as described below.
- (c) Apply 5  $\mu$ L of each solution.
- (d) Develop the plate to 15 cm.
- (e) After removal of the plate, dry it in a current of warm air, spray with a mixture of equal volumes of a 0.2% w/v solution of [naphthalene-1,3-diol](#) in [ethanol](#) (96%) and a 46% w/v solution of [sulfuric acid](#) and heat at 105° for 5 to 10 minutes.

#### MOBILE PHASE

17 volumes of [dichloromethane](#), 33 volumes of 13.5M [ammonia](#) and 50 volumes of [methanol](#).

#### SYSTEM SUITABILITY

The test is not valid unless the chromatogram obtained with solution (3) shows three clearly separated principal spots.

#### CONFIRMATION

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

B. In the test for Assay, the retention time of the principal peak in the chromatogram obtained with solution (1) is similar to that of the peak due to tobramycin in the chromatogram obtained with solution (2).

## TESTS

### Acidity

pH, 3.5 to 6.0, [Appendix V L](#).

### Related substances

Carry out the method for [liquid chromatography, Appendix III D](#), using the following solutions. Derivatise the solutions prior to analysis.

**Solution A** 1% w/v solution of [1-fluoro-2,4-dinitrobenzene](#) in [ethanol \(96%\)](#).

**Solution B** Dilute 1 volume of a 1.5% w/v solution of [tris\(hydroxymethyl\)methylamine](#) to 5 volumes with [dimethyl sulfoxide](#).

- (1) Dilute a volume of the eye drops with sufficient [water](#), if necessary, to produce a solution containing 0.02% w/v of Tobramycin.
- (2) Dilute 1 volume of solution (1) to 100 volumes with [water](#).
- (3) Dilute 1 volume of solution (2) to 10 volumes with [water](#).
- (4) Dissolve 50 mg of [tobramycin BPCRS](#) in 1 mL of 0.5M [sulfuric acid](#) and 30 mL of [water](#), add sufficient [water](#) to produce 50 mL and mix. Dilute 1 volume of this solution to 5 volumes with [water](#).
- (5) Heat a 50-mL portion of solution (4) at 100° for 8 to 9 hours, allow to cool and dilute to 50 mL with [water](#) (generation of impurity B).
- (6) [water](#) (blank solution).

Derivatise the solutions using the following method. Transfer 3.75 mL of each of the 6 solutions separately into 15-mL glass tubes. To each solution add 2.5 mL solution A and 2.5 mL of solution B. Heat in a water bath at 60° for 50 minutes. Remove the tubes, allow to cool to room temperature, add 3.75 mL of [acetonitrile](#).

### CHROMATOGRAPHIC CONDITIONS

- (a) Use a stainless steel column (25 cm × 4.6 mm) packed with [phenyl silica gel for chromatography](#) (5 µm) (Waters XBridge Phenyl is suitable).
- (b) Use gradient elution and the mobile phase described below.
- (c) Use a flow rate of 1.2 mL per minute.
- (d) Use a column temperature of 25°.
- (e) Use a detection wavelength of 365 nm.
- (f) Inject 45 µL of each solution.

### MOBILE PHASE

**Mobile phase A** 0.08 volumes of [orthophosphoric acid](#), 5 volumes of [acetonitrile](#) and 95 volumes of [water](#).

**Mobile phase B** 0.08 volumes of [orthophosphoric acid](#), 25 volumes of [water](#) and 75 volumes of [acetonitrile](#).

Time (Minutes)	Mobile phase A (% v/v)	Mobile phase B (% v/v)	Comment
0-2	79	21	isocratic
2-16	79→66	21→34	linear gradient
16-27	66→30	34→70	linear gradient
27-37	30	70	isocratic
37-42	30→20	70→80	linear gradient
42-52	20→5	80→95	linear gradient
52-62	5	95	isocratic
62-67	5→79	95→21	linear gradient
67-72	79	21	re-equilibration

When the chromatograms are recorded under the prescribed conditions the retention times relative to tobramycin (retention time about 49 minutes) are: impurity 1, about 0.59; impurity 2, about 0.62; impurity C, about 0.9; impurity B,

about 0.96 and impurity A, about 0.96.

#### SYSTEM SUITABILITY

The test is not valid unless, in the chromatogram obtained with solution (5), the [resolution](#) between the peaks due to impurity A and impurity B is at least 1.0.

#### LIMITS

Use the chromatograms obtained with solutions (4) and (5) to identify the peaks due to impurities A and B. The peak due to impurity B is observed to increase in solution (5).

Identify any peak in the chromatogram obtained with solution (1) corresponding to impurities A, B and 1 and subtract from the area the response from any corresponding peak in the chromatogram obtained with solution (6).

Identify any peak in the chromatogram obtained with solution (1) corresponding to impurity 1 and multiply the area of this peak by a correction factor of 2.1.

In the chromatogram obtained with solution (1):

the area of any [secondary peak](#) is not greater than twice the area of the principal peak in the chromatogram obtained with solution (2) (2.0%);

the sum of the areas of all the [secondary peaks](#) is not greater than 3 times the area of the principal peak in the chromatogram obtained with solution (2) (3.0%).

Disregard any unknown [secondary peaks](#) corresponding to any peaks in the chromatograms obtained with solution (4) or solution (6), and any peak with an area less than the area of the principal peak in the chromatogram obtained with solution (3) (0.1%).

## ASSAY

Carry out the method for [liquid chromatography, Appendix III D](#), using the following solutions.

*Solution A* 1% w/v solution of [1-fluoro-2,4-dinitrobenzene](#) in [ethanol \(96%\)](#).

*Solution B* Dilute 20 volumes of a 1.5% w/v solution of [tris\(hydroxymethyl\)methylamine](#) to 100 volumes with [dimethyl sulfoxide](#).

- (1) Dilute a volume of the eye drops, if necessary, with sufficient [water](#) to produce a solution containing 0.02% w/v of tobramycin.
- (2) Add 1 mL of 0.5M [sulfuric acid](#) to 50 mg of [tobramycin BPCRS](#), dissolve in [water](#), add sufficient [water](#) to produce 50 mL and mix. Dilute 1 volume of this solution to 5 volumes with [water](#).
- (3) Dilute 1 volume of a 0.024% w/v solution of [1-naphtholbenzein](#) in [acetonitrile](#) to 5 volumes with derivatised solution (2).

Derivatise solutions (1) and (2) using the following method.

Transfer 4 mL of each solution separately into 50-mL volumetric flasks. To each solution add 10 mL of solution A and 10 mL of solution B and mix. Heat in a water bath at 60° for 50 minutes. Remove the flasks, allow to stand for 10 minutes and add [acetonitrile](#) to about 2 mL below the meniscus. Allow to cool to room temperature and add sufficient [acetonitrile](#) to produce 50 mL.

#### CHROMATOGRAPHIC CONDITIONS

- (a) Use a stainless steel column (25 cm × 4.6 mm) packed with [octadecylsilyl silica gel for chromatography](#) (5 µm) (Symmetry C18 is suitable).
- (b) Use isocratic elution and the mobile phase described below.
- (c) Use a flow rate of 1.2 mL per minute.
- (d) Use an ambient column temperature.
- (e) Use a detection wavelength of 365 nm.
- (f) Inject 20 µL of each solution.

#### MOBILE PHASE

Dissolve 2.0 g of [tris\(hydroxymethyl\)methylamine](#) in 800 mL of [water](#), add 20 mL of 0.5M [sulfuric acid](#) and sufficient [acetonitrile](#) to produce 2000 mL; mix, allow to cool and filter through a 0.45-µm filter.

#### SYSTEM SUITABILITY

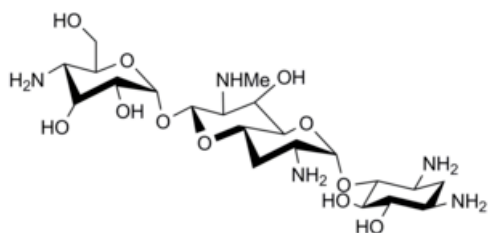
The test is not valid unless, in the chromatogram obtained with solution (3), the [resolution](#) between the peaks due to 1-naphtholbenzein and tobramycin is at least 4.0.

#### DETERMINATION OF CONTENT

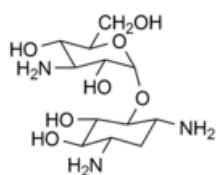
Calculate the content of  $C_{18}H_{37}N_5O_9$  in the eye drops using the declared content of  $C_{18}H_{37}N_5O_9$  in [tobramycin BPCRS](#).

## IMPURITIES

The impurities limited by the requirements of this monograph include those listed under Tobramycin and the following:



#### 1. Apramycin,



#### 2. Deoxystreptamine kanosamide.