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Bethanechol Chloride Tablets

DEFINITION
Bethanechol Chloride Tablets contain NLT 90.0% and NMT 110.0% of the labeled amount of bethanechol chloride ($C_7H_{17}ClN_2O_2$).

IDENTIFICATION

Change to read:

• **A.** ▲Spectroscopic Identification Tests ⟨197⟩, *Infrared Spectroscopy*: **197M**▲ (CN 1-May-2020)

Sample: Nominally 100 mg of bethanechol chloride from a suitable portion of pulverized Tablets prepared as follows. Pulverize a portion of Tablets equivalent to 100 mg of bethanechol chloride. Add 15 mL of ether, and allow to digest for 15 min. Decant the ether, again extract the residue with 10 mL of ether, and discard the ether extracts. Add 30 mL of alcohol to the residue. Shake for 10 min, and allow to stand for 1 h with frequent agitation. Filter with suction, and evaporate the filtrate on a steam bath to dryness: the bethanechol chloride so obtained is recrystallized from alcohol and dried at 105° for 2 h.

• **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**

Buffer: 29 mg/L of edetic acid in solution prepared as follows. Transfer a portion of edetic acid to a suitable volumetric flask. Dissolve with water, using 50% of the final volume. Add 0.3 mL of nitric acid per L, and dilute with water to volume.

Mobile phase: Acetonitrile and *Buffer* (5:95)

System suitability solution: 0.1 mg/mL of bethanechol chloride in solution prepared as follows. Transfer a portion of bethanechol chloride to a suitable volumetric flask. Add 4% of the final volume of 0.1 N sodium hydroxide, and allow to stand for 15 min. Add 4% of the final volume of 0.1 N hydrochloric acid. Dissolve in and dilute with *Mobile phase* to volume.

Standard solution: 0.1 mg/mL of USP Bethanechol Chloride RS in *Mobile phase*

Sample solution: Nominally 0.1 mg/mL of bethanechol chloride from a suitable amount of powdered Tablets in solution prepared as follows. Add a portion of fine powder, equivalent to 1 Tablet, from NLT 20 Tablets to a suitable volumetric flask. Dissolve in *Mobile phase*, using 60%–70% of the final volume. Sonicate for 20 min. Shake by mechanical means for 15 min. Dilute with *Mobile phase* to volume, and mix. Allow to stand for 10 min, and pass through a 1-µm glass filter, discarding the first 3 mL of the filtrate.

Chromatographic system

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

Mode: LC

Detector: Conductivity

Column: 3.9-mm × 15.0-cm; packing L55

Temperatures

Detector: 35°

Column: 30°

Flow rate: 1 mL/min

Injection volume: 50 µL

System suitability

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

[Note—See *Table 1* for the relative retention times.]

Suitability requirements

Resolution: NLT 0.8 between desacetyl methacholine and bethanechol chloride, *System suitability solution*

Tailing factor: NMT 3.5, *Standard solution*

Relative standard deviation: NMT 3.0%, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of the labeled amount of bethanechol chloride ($C_7H_{17}ClN_2O_2$) 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 Bethanechol Chloride RS in the *Standard solution* (mg/mL)

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

Acceptance criteria: 90.0%–110.0%

PERFORMANCE TESTS

• **Dissolution** ⟨711⟩

Medium: 0.1 N hydrochloric acid; 900 mL

Apparatus 2: 50 rpm

Time: 30 min

Buffer, Mobile phase, and **System suitability solution:** Proceed as directed in the *Assay*.

Standard solution: (*L*/900) mg/mL of USP Bethanechol Chloride RS in *Medium*, where *L* is the label claim in mg/Tablet

Sample solution: A portion of solution under test

Chromatographic system and **System suitability:** Proceed as directed in the *Assay*, except for the following parameters:

Injection volumes

For the System suitability solution: 50 µL

For the Standard solution and **Sample solution:** 100 µL

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of the labeled amount (*Q*) of bethanechol chloride ($C_7H_{17}ClN_2O_2$) dissolved:

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

r_U = peak response from the *Sample solution*

r_S = peak response from the *Standard solution*

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

V = volume of the *Medium*, 900 mL

L = label claim (mg/Tablet)

Tolerances: NLT 80% (*Q*) of the labeled amount of bethanechol chloride ($C_7H_{17}ClN_2O_2$) is dissolved.

• **Uniformity of Dosage Units** ⟨905⟩**:** Meet the requirements

IMPURITIES

• **Organic Impurities**

Buffer: 0.48 g/L of methanesulfonic acid in water

Mobile phase: Acetonitrile and *Buffer* (5:95)

System suitability solution: 0.1 mg/mL of bethanechol chloride in solution prepared as follows. Transfer the bethanechol chloride to a suitable volumetric flask. Add 4% of the final volume of 0.1 N sodium hydroxide, and allow to stand for 15 min. Add 4% of the final volume of 0.1 N hydrochloric acid. Dissolve in and dilute with *Mobile phase* to volume.

Standard solution: 1 µg/mL of USP Bethanechol Chloride RS in *Mobile phase*

Sample solution: Nominally 0.1 mg/mL of bethanechol chloride from a suitable amount of powdered Tablets in solution prepared as follows. Add a portion of fine powder, equivalent to 1 Tablet, from NLT 20 Tablets to a suitable volumetric flask. Dissolve in *Mobile phase*, using 60%–70% of the final volume. Sonicate for 20 min. Shake by mechanical means for 15 min. Dilute with *Mobile phase* to volume, and mix. Allow to stand for 10 min, and pass through a 1-µm glass filter, discarding the first 3 mL of the filtrate.

Chromatographic system

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

Mode: LC

Detector: Conductivity

Column: 3.9-mm × 15.0-cm; packing L55

Temperatures

Detector: 35°

Column: 30°

Flow rate: 1 mL/min

Injection volume: 50 µL

System suitability

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

[Note—See *Table 1* for the relative retention times.]

Suitability requirements

Resolution: NLT 0.8 between desacetyl methacholine and bethanechol chloride, *System suitability solution*

Relative standard deviation: NMT 10.0% for bethanechol chloride, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of each impurity 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 for any impurity in the *Sample solution*

r_S = peak response of bethanechol chloride from the *Standard solution*

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

C_U = nominal concentration of bethanechol chloride in the *Sample solution* (mg/mL)

F = relative response factor (see *Table 1*)

Acceptance criteria: See *Table 1*.

Table 1

Name	Relative Retention Time	Relative Response Factor	Acceptance Criteria, NMT (%)
Desacetyl methacholine[a]	0.9	1.2	1.0
Bethanechol chloride	1.0	—	—
Any unspecified degradation product	—	1.0	0.2
Total impurities	—	—	1.5

[a] 2-Hydroxypropyltrimethyl ammonium chloride.

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in tight containers.
- **USP Reference Standards** ⟨11⟩
  USP Bethanechol Chloride RS

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

Topic/Question	Contact	Expert Committee
BETHANECHOL CHLORIDE TABLETS	Documentary Standards Support	SM42020 Small Molecules 4

Chromatographic Database Information: Chromatographic Database

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