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# Pentazocine and Aspirin Tablets

## DEFINITION

Pentazocine and Aspirin Tablets contain an amount of Pentazocine Hydrochloride equivalent to NLT 90.0% and NMT 110.0% of the labeled amount of pentazocine ($C_{19}H_{27}NO$) and NLT 90.0% and NMT 110.0% of the labeled amount of aspirin ($C_9H_8O_4$).

## IDENTIFICATION

• **A. Thin-Layer Chromatographic Identification Test ⟨201⟩**

**Diluent:** Chloroform and methanol (1:1)

**Standard solution A:** 2.5 mg/mL of USP Pentazocine RS in *Diluent*

**Standard solution B:** 65 mg/mL of USP Aspirin RS in *Diluent*

**Sample solution:** Shake a quantity of finely powdered Tablets, nominally equivalent to about 25 mg of pentazocine and 650 mg of aspirin, with 10 mL of *Diluent* in an unltrasonic bath for 2 min. Allow the solids to settle.

**Chromatographic system**

**Developing solvent system:** Ethyl acetate, methanol, and formic acid (90:5:5)

**Spray reagent:** Iodoplatinate spray reagent. Dissolve 300 mg of platinic chloride in 100 mL of water, and add 100 mL of potassium iodide solution (6 in 100).

**Analysis:** Evaporate the solvents from the spots in warm circulating air. Place the plate in the developing chamber, and after developing the plate, remove it, and mark the solvent front. Evaporate the solvents thoroughly in warm circulating air, and examine the plate under short-wavelength UV light. Expose the plate to iodine vapor for about 5 min, and observe. Then spray the plate with *Spray reagent*.

**Acceptance criteria:** Two principal spots from the *Sample solution* correspond in $R_F$ values, size, and intensity of color with the pentazocine spot of *Standard solution A* and the aspirin spot of *Standard solution B*, respectively.

## ASSAY

• **Procedure**

**Diluent A:** Methanol and water (1:1)

**Diluent B:** Methanol and 6 N hydrochloric acid (1:1)

**Diluent C:** Water, methanol, and 6 N hydrochloric acid (6:1:1)

**Chromatographic column:** Use a 200-mm tube consisting of about a 90-mm length of 22-mm tubing fused to about a 100-mm length of 5-mm tubing having a stopcock at the bottom of this section. Place a pledget of glass wool at the bottom of the 5-mm portion just above the stopcock. Transfer a suitable quantity of sulfonic acid cation-exchange resin to a beaker, and wash three times with water, discarding the water wash each time by decantation. Cover the resin with *Diluent B*, and allow to stand for 1 h. Decant the acid wash; if it is colored yellow or orange, repeat this step until the wash is almost colorless. Then wash the resin by repeated 15-min soakings in *Diluent A* followed by decantation until the wash is neutral to wide-range indicator paper. Fill the tube to a height of 100 mm with slurry of the washed resin in *Diluent A*. Wash the column with 25 mL of *Diluent A*.

**Standard solution A:** 18 µg/mL of USP Salicylic Acid RS in 0.1 N sodium hydroxide

**Standard solution B:** 62.5 µg/mL of USP Pentazocine RS in *Diluent C*

**Sample stock solution A:** Transfer a portion of fine powder from NLT 20 freshly powdered Tablets, nominally equivalent to about 25 mg of pentazocine and 650 mg of aspirin from NLT 20 finely powdered Tablets, to a suitable 250-mL flask. Add 100.0 mL of *Diluent A*, and shake by mechanical means for 20 min. Centrifuge a suitable quantity for 5 min.

**Sample stock solution B:** Transfer 25.0 mL of the clear supernatant from *Sample stock solution A* to the prepared *Chromatographic column*, followed by five 10-mL portions of *Diluent A*, collecting the eluate in a 250-mL volumetric flask containing 10.0 mL of 2.5 N sodium hydroxide. Dilute with water to volume, and mix.

**Sample solution A:** Pipet 4 mL of *Sample stock solution B* into a 100-mL volumetric flask, and dilute with 0.1 N sodium hydroxide to volume, and mix.

**Sample solution B:** Pass through the column after *Sample stock solution B* five 5-mL portions of *Diluent B*, followed by 10 mL of water. Collect the eluate in a 100-mL volumetric flask, and dilute with water to volume.

**Instrumental conditions**

**Mode:** UV

**Analytical wavelength:** 296 nm (maximum absorbance) for the analysis of aspirin; 278 nm (maximum absorbance) for the analysis of pentazocine

**Cell:** 1 cm

**Blank:** 0.1 N sodium hydroxide for the analysis of aspirin; *Diluent C* for the analysis of pentazocine

**Analysis**

**Samples:** *Standard solution A*, *Standard solution B*, *Sample solution A*, and *Sample solution B*

Calculate the percentage of aspirin ($C_9H_8O_4$) in the portion of Tablets taken:

$$\text{Result} = (A_U/A_S) \times (C_S/C_U) \times (M_{r1}/M_{r2}) \times 100$$

$A_U$ = absorbance from *Sample solution A*

$A_S$ = absorbance from *Standard solution A*

$C_S$ = concentration of USP Salicylic Acid RS in *Standard solution A* (µg/mL)

$C_U$ = nominal concentration of aspirin in *Sample solution A* (µg/mL)

$M_{r1}$ = molecular weight of aspirin, 180.16

$M_{r2}$ = molecular weight of salicylic acid, 138.12

Calculate the percentage of pentazocine ($C_{19}H_{27}NO$) in the portion of Tablets taken:

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

$A_U$ = absorbance from *Sample solution B*

$A_S$ = absorbance from *Standard solution B*

$C_S$ = concentration of USP Pentazocine RS in *Standard solution B* (µg/mL)

$C_U$ = nominal concentration of pentazocine in *Sample solution B* (µg/mL)

**Acceptance criteria:** 90.0%–110.0% each of the labeled amounts of aspirin ($C_9H_8O_4$) and pentazocine ($C_{19}H_{27}NO$)

## PERFORMANCE TESTS

• **Dissolution ⟨711⟩**

**Medium:** Water; 900 mL

**Apparatus 1:** 80 rpm

**Time:** 30 min

**Standard solution A:** 15 µg/mL of USP Salicylic Acid RS in 0.1 N sodium hydroxide

**Standard solution B:** 13 µg/mL of USP Pentazocine RS in dilute glacial acetic acid (1 in 50)

**Strongly basic, anion-exchange resin:** Mix a suitable quantity of anion-exchange resin with 10 volumes of dilute glacial acetic acid (1 in 50), and shake for 20 min. Allow the resin to settle, and decant the supernatant. Repeat the acetic acid washing four more times. Wash with water until 5.0 mL of the water wash gives a negligible response when substituted for 5.0 mL of *Sample solution*, and carried through the *Analysis* for pentazocine.

**Sample solution:** To a suitable 50-mL flask add 0.4 g of *Strongly basic, anion-exchange resin* and 25 mL of the solution under test. Shake by mechanical means for 15 min. Allow to settle, and use the clear supernatant.

**Instrumental conditions**

**Mode:** UV-Vis

**Analytical wavelength:** 296 nm (maximum absorbance) for the analysis of aspirin; 408 nm (maximum absorbance) for the analysis of pentazocine

**Cell:** 1 cm

**Blank:** 0.1 N sodium hydroxide for the analysis of aspirin; the chloroform layer from the reagent blank for the analysis of pentazocine

**Analysis**

**Samples:** *Standard solution A*, *Standard solution B*, and *Sample solution*

For aspirin, transfer 1.0 mL of the *Sample solution* to a 25-mL volumetric flask containing 1.0 mL of sodium hydroxide solution (1 in 10), and swirl. Allow to stand for 10 min. Dilute with water to volume, and mix. Determine the absorbances of the *Sample solution* and *Standard solution A* against the *Blank* for the analysis of aspirin.

Calculate the percentage of the labeled amount of aspirin ($C_9H_8O_4$) dissolved:

$$\text{Result} = (A_U/A_S) \times (C_S/L) \times V \times (M_{r1}/M_{r2}) \times 100$$

$A_U$ = absorbance from the *Sample solution*

$A_S$ = absorbance from *Standard solution A*

$C_S$ = concentration of USP Salicylic Acid RS in *Standard solution A* (mg/mL)

$L$ = labeled amount of aspirin (mg/Tablet)

$V$ = volume of *Medium*, 900 mL

$M_{r1}$ = molecular weight of aspirin, 180.16

$M_{r2}$ = molecular weight of salicylic acid, 138.12

For pentazocine, transfer 5.0-mL portions of the *Sample solution*, *Standard solution B*, and water to serve as the reagent blank into three separate 125-mL separators. To each separator add 10 mL of a filtered solution (1 in 4000) of bromocresol purple in dilute glacial acetic acid (1 in 50) and 20.0 mL of chloroform. Insert the stopper, and shake gently for 1 min, accurately timed. Allow the layers to separate, and determine the absorbances of the clear chloroform layers from *Standard solution B* and the *Sample solution* against the chloroform layer from the reagent blank.

Calculate the percentage of the labeled amount of pentazocine ($C_{19}H_{27}NO$) dissolved:

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

$A_U$ = absorbance from the *Sample solution*

$A_S$ = absorbance from *Standard solution B*

$C_S$ = concentration of USP Pentazocine RS in *Standard solution B* (mg/mL)

$L$ = labeled amount of pentazocine (mg/Tablet)

$V$ = volume of *Medium*, 900 mL

**Tolerances:** NLT 80% (*Q*) of the labeled amount of pentazocine ($C_{19}H_{27}NO$) and NLT 70% (*Q*) of the labeled amount of aspirin ($C_9H_8O_4$) are dissolved.

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

## IMPURITIES

• **Nonaspirin Salicylates**

**Ferric chloride–urea reagent:** To a mixture of 8 mL of ferric chloride solution (6 in 10) and 42 mL of 0.05 N hydrochloric acid, add 60 g of urea. Dissolve the urea by swirling and without the aid of heat, and adjust the resulting solution, if necessary, with 6 N hydrochloric acid to a pH of 3.2. Prepare on the day of use.

**Standard stock solution:** 150 µg/mL of salicylic acid in chloroform

**Standard solution:** Pipet 5 mL of *Standard stock solution* into a 50-mL volumetric flask containing 10 mL of methanol, 2 drops of hydrochloric acid, and 10 mL of a solution (1 in 10) of glacial acetic acid in ether. Add chloroform to volume, and mix.

**Sample solution**

Insert a small pledget of glass wool above the stem constriction of a 20- × 2.5-cm chromatographic tube, and uniformly pack with a mixture of about 1 g of chromatographic siliceous earth and 0.5 mL of 5 M phosphoric acid. Directly above this layer, pack a similar mixture of about 3 g of chromatographic siliceous earth and 2 mL of *Ferric chloride–urea reagent*. To a quantity nominally equivalent to 50 mg of aspirin from finely powdered Tablets add 10 mL of chloroform, stir for 3 min, and transfer to the chromatographic adsorption column with the aid of 5 mL of chloroform. Pass 50 mL of chloroform in several portions through the column, rinse the tip of the chromatographic tube with chloroform, and discard the eluate. If the purple zone reaches the bottom of the tube, discard the column, and repeat the test with a smaller quantity of powdered Tablets.

Elute the adsorbed salicylic acid into a 100-mL volumetric flask containing 20 mL of methanol and 4 drops of hydrochloric acid by passing two 10-mL portions of a solution (1 in 10) of glacial acetic acid in water-saturated ether, and then 30 mL of chloroform, through the column, and dilute the eluate with chloroform to volume.

**Instrumental conditions**

**Mode:** UV

**Analytical wavelength:** 306 nm (maximum absorbance)

**Cell:** 1 cm

**Analysis:** Concomitantly determine the absorbances of both the *Sample solution* and *Standard solution*, using a solvent mixture of the same composition as that of the *Standard solution* as the blank.

**Acceptance criteria:** 3.0%; the absorbance of the *Sample solution* does not exceed that of the *Standard solution*, any necessary adjustment being made for having used a smaller sample.

## ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in tight, light-resistant containers.
- **USP Reference Standards** ⟨11⟩

USP Aspirin RS

USP Pentazocine RS

USP Salicylic Acid RS

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

| Topic/Question | Contact | Expert Committee |
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| PENTAZOCINE AND ASPIRIN TABLETS | Documentary Standards Support | SM22020 Small Molecules 2 |
| REFERENCE STANDARD SUPPORT | RS Technical Services<br>RSTECH@usp.org | SM22020 Small Molecules 2 |

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