Analysis
Samples: *Standard solution* and *Sample solution*
Calculate the percentage of aminobenzoic acid and ethyl 4-nitrobenzoate in the portion of Topical Solution taken:

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

r_U = peak response of aminobenzoic acid or ethyl 4-nitrobenzoate from the *Sample solution*
r_S = peak response of aminobenzoic acid or ethyl 4-nitrobenzoate from the *Standard solution*
C_S = concentration of USP Aminobenzoic Acid RS or USP Ethyl 4-Nitrobenzoate RS in the *Standard solution* (mg/mL)
C_U = nominal concentration of benzocaine in the *Sample solution* (mg/mL)

Calculate the percentage of any other individual unspecified impurity in the portion of Topical Solution taken:

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

r_U = peak response of any other individual unspecified impurity from the *Sample solution*
r_S = peak response of benzocaine from the *Standard solution*
C_S = concentration of USP Benzocaine RS in the *Standard solution* (mg/mL)
C_U = nominal concentration of benzocaine in the *Sample solution* (mg/mL)

Acceptance criteria: See *Table 3*. Disregard peaks less than 0.05%.

Table 3

Name	Relative Retention Time	Acceptance Criteria, NMT (%)
Aminobenzoic acid	0.27	0.20
Benzocaine	1.0	—
Ethyl 4-nitrobenzoate	2.5	0.20
Any other individual unspecified impurity	—	0.10
Total impurities	—	1.0

SPECIFIC TESTS

- **MICROBIAL ENUMERATION TESTS ⟨61⟩ and TESTS FOR SPECIFIED MICROORGANISMS ⟨62⟩:** It meets the requirements of the tests for absence of *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

ADDITIONAL REQUIREMENTS

- **PACKAGING AND STORAGE:** Preserve in tight containers, protected from light, and avoid prolonged exposure to temperatures exceeding 30°.
- **USP REFERENCE STANDARDS ⟨11⟩**
  USP Aminobenzoic Acid RS
  Benzoic acid, 4-amino.
  $C_7H_7NO_2$ 137.14
  USP Benzocaine RS
  USP Ethyl 4-Nitrobenzoate RS
  Benzoic acid, 4-nitro-, ethyl ester.
  $C_9H_9NO_4$ 195.17

Benzocaine, Butamben, and Tetracaine Hydrochloride Topical Aerosol

DEFINITION

Benzocaine, Butamben, and Tetracaine Hydrochloride Topical Aerosol is Benzocaine, Butamben, and Tetracaine Hydrochloride Topical Solution packaged in a pressurized container with a suitable inert propellant. It contains NLT 90.0% and NMT 110.0% of the labeled amount of benzocaine ($C_9H_{11}NO_2$), butamben ($C_{11}H_{15}NO_2$), and tetracaine hydrochloride ($C_{15}H_{24}N_2O_2 \cdot HCl$).

IDENTIFICATION

- **A.** The retention times of the major peaks of the *Sample solution* correspond to those of the *Standard solution*, as obtained in the *Assay*.
- **B.** The UV spectrum of the major peaks of the *Sample solution* corresponds to that of the *Standard solution*, as obtained in the *Assay*.

ASSAY

- **PROCEDURE**
  Solution A: 0.1% formic acid in water
  Solution B: 0.1% formic acid in acetonitrile
  Mobile phase: See *Table 1*.

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	91	9
2.5	50	50
3.9	50	50
4	91	9
5	91	9

Diluent: Acetonitrile and water (10:90)
Standard stock solution A: 1750 µg/mL of USP Benzocaine RS prepared as follows. Transfer a suitable amount of USP Benzocaine RS to a suitable volumetric flask and dissolve in 10% of the total volume of acetonitrile. Dilute with water to volume.
Standard stock solution B: 250 µg/mL each of USP Butamben RS and USP Tetracaine Hydrochloride RS prepared as follows. Transfer a suitable amount of USP Butamben RS and USP Tetracaine Hydrochloride RS to a suitable volumetric flask and dissolve in 10% of the total volume of acetonitrile. Dilute with water to volume.
Standard solution: 175 µg/mL of USP Benzocaine RS from *Standard stock solution A* and 25 µg/mL each of USP Butamben RS and USP Tetracaine Hydrochloride RS from *Standard stock solution B* diluted in *Diluent*
Sample solution: Nominally 175 µg/mL of benzocaine and 25 µg/mL each of butamben and tetracaine hydrochloride, prepared as follows. Accurately weigh about 125 mg of the evaporated sample into a 100-mL volumetric flask. Dissolve in 50 mL of methanol and dilute with *Diluent* to volume.
Chromatographic system
(See *Chromatography ⟨621⟩, System Suitability*.)
Mode: LC
Detector: UV 300 nm. For *Identification B*, use a diode array detector in the range of 200–400 nm.
Column: 2.1-mm × 5-cm; 1.7-µm packing L1
Flow rate: 0.6 mL/min
Injection volume: 1 µL
System suitability
Sample: *Standard solution*
[NOTE—The relative retention times for benzocaine, tetracaine, and butamben are about 0.71, 0.74, and 1.0, respectively.]