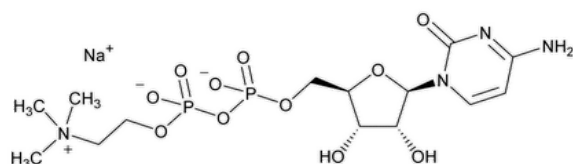


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Citicoline Sodium



$C_{14}H_{25}N_4NaO_{11}P_2$ 510.31

Cytidine 5'-(trihydrogen diphosphate), P'-[2-(trimethylammonio)ethyl] ester, inner salt, monosodium salt;
 CDP-choline (sodium) CAS RN®: 33818-15-4.

DEFINITION

Citicoline Sodium contains NLT 98.0% and NMT 102.0% of citicoline sodium ($C_{14}H_{25}N_4NaO_{11}P_2$), calculated on the anhydrous basis.

IDENTIFICATION

- **A. SPECTROSCOPIC IDENTIFICATION TESTS (197), Infrared Spectroscopy:** 197K
- **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

Mobile phase: 10 mM [tetrabutylammonium hydroxide](#) and 15 mM [dibasic sodium phosphate, anhydrous](#), adjusted with 20% [phosphoric acid](#) to a pH of 6.0

Standard solution: 24 µg/mL of [USP Citicoline Sodium RS](#) in [water](#)

Sample solution: 24 µg/mL of Citicoline Sodium in [water](#)

Chromatographic system

(See [Chromatography \(621\), System Suitability](#).)

Mode: LC

Detector: UV 262 nm

Column: 4.0-mm × 25-cm; 5-µm packing [L1](#)

Column temperature: 40°

Flow rate: 1.0 mL/min

Injection volume: 15 µL

System suitability

Sample: *Standard solution*

Suitability requirements

Column efficiency: NLT 5000 theoretical plates

Tailing factor: NMT 2.0

Relative standard deviation: NMT 2.0%

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of citicoline sodium ($C_{14}H_{25}N_4NaO_{11}P_2$) in the portion of Citicoline Sodium 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 Citicoline Sodium RS](#) in the *Standard solution* (mg/mL)

C_u = concentration of Citicoline Sodium in the *Sample solution* (mg/mL)

Acceptance criteria: 98.0%–102.0% on the anhydrous basis

IMPURITIES

• [CHLORIDE AND SULFATE \(221\), Chloride](#)

Standard solution: 0.10 mL of 0.020 N [hydrochloric acid](#)

Sample: 0.47 g of Citicoline Sodium

Acceptance criteria: NMT 0.015%

• [CHLORIDE AND SULFATE \(221\), Sulfate](#)

Standard solution: 0.10 mL of 0.020 M [sulfuric acid](#)

Sample: 0.94 g of Citicoline Sodium

Acceptance criteria: NMT 0.020%

Change to read:

• **RELATED COMPOUNDS**

Solution A: 10 mM [tetrabutylammonium hydroxide](#) and 15 mM [dibasic sodium phosphate, anhydrous](#), adjusted with 20% [phosphoric acid](#) to a pH of 6.0

Solution B: [Methanol](#)

Mobile phase: See [Table 1](#).

Table 1

Time (min)	Solution A (%)	Solution B (%)
0	100	0
5	100	0
15	85	15
20	85	15
21	100	0
35	100	0

System suitability solution: 24 µg/mL of [USP Citicoline Sodium RS](#) and 48 µg/mL of [USP 5'-Cytidylic Acid RS](#) in [water](#)

Standard solution: 2.4 µg/mL of [USP Citicoline Sodium RS](#) in [water](#)

5'-Cytidylic acid standard solution: 4.8 µg/mL of [USP 5'-Cytidylic Acid RS](#) in [water](#)

Sample solution: 2.4 mg/mL of Citicoline Sodium in [water](#)

Chromatographic system: Proceed as directed in the Assay.

System suitability

Sample: *System suitability solution*

[NOTE—The relative retention times for citicoline and 5'-cytidylic acid are 1.00 and 2.2, respectively.]

Suitability requirements

Resolution: NLT 12 between citicoline and 5'-cytidylic acid

Column efficiency: NLT 5000 theoretical plates for the citicoline peak

Analysis

Samples: *Standard solution*, *5'-Cytidylic acid standard solution*, and *Sample solution*

Calculate the percentage of 5'-cytidylic acid in the portion of Citicoline Sodium taken:

$$\text{Result} = (r_u/r_s) \times (C_s/C_u) \times 100$$

r_u = peak response of 5'-cytidylic acid from the *Sample solution*