Status: Currently Official on 16-Feb-2025
Official Date: Official as of 01-May-2018
Document Type: USP Monographs
DocId: GUID-BBE1E8E9-6AF5-498D-859C-615051F75818_3_en-US
DOI: https://doi.org/10.31003/USPNF_M73150_03_01
DOI Ref: cl6ch

Oral Rehydration Salts

DEFINITION

Oral Rehydration Salts is a dry mixture of Sodium Chloride, Potassium Chloride, Sodium Bicarbonate, and Dextrose (anhydrous). Alternatively, it may contain Sodium Citrate (anhydrous or dihydrate) instead of Sodium Bicarbonate. It may contain Dextrose (monohydrate) instead of Dextrose (anhydrous), provided that the Sodium Bicarbonate or Sodium Citrate is packaged in a separate, accompanying container. It contains the equivalent of NLT 90.0% and NMT 110.0% of the amounts of sodium (Na), potassium (K), chloride (Cl), and bicarbonate (HCO_3) or citrate ($C_6H_5O_7$) calculated from the labeled amounts of Sodium Chloride, Potassium Chloride, and Sodium Bicarbonate [or Sodium Citrate (anhydrous or dihydrate)]. It contains NLT 90.0% and NMT 110.0% of the labeled amounts of anhydrous dextrose ($C_6H_{12}O_6$) or dextrose monohydrate ($C_6H_{12}O_6 \cdot H_2O$). It may contain suitable flavors.

IDENTIFICATION

• **A. Sodium:** The sample imparts an intense yellow color to a nonluminous flame.

• **B. Potassium:** The sample imparts a violet color to a nonluminous flame. Since the presence of small quantities of sodium masks the color, screen out the yellow color produced by sodium by viewing through a blue filter that blocks the emission at 589 nm (sodium), but is transparent to emission at 404 nm (potassium). [Note—Traditionally, cobalt glass has been used, but other suitable filters are commercially available.]

• **C. Identification Tests—General ⟨191⟩, *Chloride*:** Meets the requirements

• **D. Identification Tests—General ⟨191⟩, *Bicarbonate***

Analysis: Collect the gas that evolves upon dissolution.

Acceptance criteria: Where it contains Sodium Bicarbonate, it dissolves with effervescence, and the collected gas so obtained meets the requirements in test *A*.

• **E. Identification Tests—General ⟨191⟩, *Citrate***

Sample solution: Constitute the Oral Rehydration Salts as directed in the labeling.

Analysis: Add 3–5 drops of the *Sample solution* to 20 mL of the mixture of pyridine and acetic anhydride.

Acceptance criteria: Where it contains Sodium Citrate, it meets the requirements.

• **F.**

Sample solution: Constitute the Oral Rehydration Salts as directed in the labeling.

Analysis: Add a few drops of the *Sample solution* to 5 mL of hot alkaline cupric tartrate TS.

Acceptance criteria: Where it contains Dextrose, a copious red precipitate of cuprous oxide is formed (presence of dextrose).

ASSAY

• **Dextrose**

Sample stock solution: Nominally 200 mg/mL of dextrose from Oral Rehydration Salts prepared as follows. Transfer the contents of 1 or more unit-dose containers of Oral Rehydration Salts, or a portion of the contents of 1 multiple-unit container equivalent to 20 g of dextrose, to a 100-mL volumetric flask. Dilute with water to volume.

Sample solution: Nominally 100 mg/mL of dextrose from the *Sample stock solution* prepared as follows. Transfer 50.0 mL of the *Sample stock solution* to a 100-mL volumetric flask. Add 0.2 mL of 6 N ammonium hydroxide, and dilute with water to volume. [Note—Reserve the remaining *Sample stock solution* for the *Assay* procedures for *Sodium and Potassium*, *Chloride*, *Bicarbonate*, and *Citrate*.]

Analysis: Determine the angular rotation in a suitable polarimeter tube (see *Optical Rotation ⟨781A⟩, Angular Rotation*).

Sample: *Sample solution*

Where Oral Rehydration Salts is labeled to contain anhydrous dextrose, calculate the observed concentration (g/100 mL) of anhydrous dextrose ($C_6H_{12}O_6$) in the portion of Oral Rehydration Salts taken:

$$\text{Result} = (100 \times a)/(l \times \alpha)$$

a = observed angular rotation of the *Sample solution* (°)

l = length of the polarimeter tube (dm)

α = midpoint of the specific rotation range for anhydrous dextrose, 52.9°

Where Oral Rehydration Salts is labeled to contain dextrose monohydrate, calculate the observed concentration (g/100 mL) of dextrose monohydrate ($C_6H_{12}O_6 \cdot H_2O$) in the portion of Oral Rehydration Salts taken:

$$\text{Result} = [(100 \times a)/(l \times \alpha)] \times (M_{r1}/M_{r2})$$

a = observed angular rotation of the *Sample solution* (°)

l = length of the polarimeter tube (dm)

α = midpoint of the specific rotation range for anhydrous dextrose, 52.9°

M_{r1} = molecular weight of dextrose monohydrate, 198.17

M_{r2} = molecular weight of anhydrous dextrose, 180.16

Calculate the percentage of the labeled amount of anhydrous dextrose ($C_6H_{12}O_6$) or dextrose monohydrate ($C_6H_{12}O_6 \cdot H_2O$) in the portion of Oral Rehydration Salts taken:

$$\text{Result} = (C_{U1}/C_{U2}) \times 100$$

C_{U1} = observed concentration of the *Sample solution* (g/100 mL)

C_{U2} = nominal concentration of the *Sample solution* (g/100 mL)

Acceptance criteria: 90.0%–110.0%

- **Sodium and Potassium**

Sodium stock solution: 58.44 mg/mL of sodium chloride prepared as follows. Transfer 14.61 g of sodium chloride, previously dried at 105° for 2 h, to a 250-mL volumetric flask, and dilute with water to volume.

Potassium stock solution: 74.56 mg/mL of potassium chloride prepared as follows. Transfer 18.64 g of potassium chloride, previously dried at 105° for 2 h, to a 250-mL volumetric flask, and dilute with water to volume.

Diluent: 1.04 mg/mL of lithium nitrate prepared as follows. Transfer 1.04 g of lithium nitrate to a 1000-mL volumetric flask. Add a suitable nonionic surfactant, then add water to volume.

Standard stock solution: 0.5844 mg/mL of sodium chloride and 0.7456 mg/mL of potassium chloride in water from the *Sodium stock solution* and the *Potassium stock solution*, respectively

Standard solution: 0.01150 mg/mL of sodium and 0.01955 mg/mL of potassium from the *Standard stock solution* in *Diluent*

Sample stock solution A: Nominally 0.23 mg/mL of sodium from the *Sample stock solution* remaining from the *Assay* for *Dextrose* in water

Sample solution A: Nominally 0.0115 mg/mL of sodium from *Sample stock solution A* in *Diluent*

Sample stock solution B: Nominally 0.39 mg/mL of potassium from the *Sample stock solution* remaining from the *Assay* for *Dextrose* in water

Sample solution B: Nominally 0.01955 mg/mL of potassium from *Sample stock solution B* in *Diluent*

Instrumental conditions

Mode: Flame photometer

Analytical wavelengths

Potassium: 766 nm

Sodium: 589 nm

Blank: *Diluent*

Analysis

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

Use the *Blank* to zero the instrument. Measure the emission responses for the *Standard solution*, *Sample solution A*, and *Sample solution B*.

Calculate the percentage of the labeled amount of sodium (Na) in the unit-dose container or containers taken or in the portion of Oral Rehydration Salts taken from the multiple-unit container:

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

r_U = photometer reading of sodium from *Sample solution A*

r_S = photometer reading of sodium from the *Standard solution*

C_S = concentration of sodium in the *Standard solution* (mg/mL)

C_U = nominal concentration of sodium in *Sample solution A* (mg/mL)

Calculate the percentage of the labeled amount of potassium (K) in the unit-dose container or containers taken or in the portion of Oral Rehydration Salts taken from the multiple-unit container:

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

r_U = photometer reading of potassium from *Sample solution B*

r_S = photometer reading of potassium from the *Standard solution*

C_S = concentration of potassium in the *Standard solution* (mg/mL)

C_U = nominal concentration of potassium in *Sample solution B* (mg/mL)

Acceptance criteria

Potassium: 90.0%–110.0%

Sodium: 90.0%–110.0%

- **Chloride**

Sample solution: Transfer a volume of the *Sample stock solution* remaining from the *Assay* for *Dextrose*, containing nominally 55 mg of chloride (Cl), to a suitable container.

Titrimetric system

Mode: Direct titration

Titrant: 0.1 N silver nitrate VS

Endpoint detection: Visual

Analysis

Sample: *Sample solution*

Titrate with *Titrant* until the silver chloride flocculates and the mixture acquires a faint pink color, using potassium chromate TS as the indicator.

Calculate the percentage of the labeled amount of chloride (Cl) in the unit-dose container or containers taken or in the portion of Oral Rehydration Salts taken from the multiple-unit container:

$$\text{Result} = V \times N \times (F/W) \times 100$$

V = volume of *Titrant* consumed (mL)

N = normality of *Titrant* (mEq/mL)

F = equivalent weight of chloride, 35.45 mg/mEq

W = nominal amount of chloride in the *Sample solution* (mg)

Acceptance criteria: 90.0%–110.0%

- **Bicarbonate** (if present)

Sample solution: Transfer a volume of the *Sample stock solution* remaining from the *Assay* for *Dextrose*, containing nominally 100 mg of bicarbonate, to a suitable beaker.

Titrimetric system

Mode: Direct titration

Titrant: 0.1 N hydrochloric acid VS

Endpoint detection: Visual

Analysis

Sample: *Sample solution*

Add 25 mL of water and 3 drops of methyl orange TS to the *Sample solution*. Titrate the resulting solution with *Titrant*.

Calculate the percentage of the labeled amount of bicarbonate (HCO_3) in the unit-dose container or containers taken or in the portion of Oral Rehydration Salts taken from the multiple-unit container:

$$\text{Result} = V \times N \times (F/W) \times 100$$

V = volume of *Titrant* consumed (mL)

N = normality of *Titrant* (mEq/mL)

F = equivalent weight of bicarbonate, 61.02 mg/mEq

W = nominal amount of bicarbonate in the *Sample solution* (mg)

Acceptance criteria: 90.0%–110.0%

• **Citrate** (if present)

Mobile phase, Standard solution 1, and **Chromatographic system:** Proceed as directed in *Assay for Citric Acid/Citrate and Phosphate ⟨345⟩*.

Sample solution: Transfer a volume of the *Sample stock solution* remaining from the *Assay* for *Dextrose*, containing nominally 180 mg of citrate, to a suitable volumetric flask, and proceed as directed in *Assay for Citric Acid/Citrate and Phosphate ⟨345⟩, Procedure.*

Analysis

Samples: *Standard solution 1* and *Sample solution*

Proceed as directed in *Assay for Citric Acid/Citrate and Phosphate ⟨345⟩, Procedure*.

Calculate the percentage of the labeled amount of citrate ($C_6H_5O_7$) in the portion of Oral Rehydration Salts taken:

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

r_U = peak response of citrate from the *Sample solution*

r_S = peak response of citrate from *Standard solution 1*

C_S = concentration of citrate in *Standard solution 1* (µg/mL)

C_U = nominal concentration of citrate in the *Sample solution* (µg/mL)

Acceptance criteria: 90.0%–110.0%

PERFORMANCE TESTS

• **Minimum Fill ⟨755⟩:** Proceed as directed, except the average net weight of the contents of the 10 containers is NLT the labeled amount, and the net weight of the contents of any single container is NLT 95% and NMT 105% of the labeled amount. If the contents of NMT 1 container are less than 95% but NLT 90% of the labeled amount, or more than 105% but NMT 110% of the labeled amount, determine the net weight of the contents of 20 additional containers. The average net weight of the contents of 30 containers is NLT the labeled amount, and the net weight of the contents of NMT 1 of the 30 containers is less than 95% but NLT 90% of the labeled amount, or more than 105% but NMT 110% of the labeled amount.

[Note—In performing the *Assay* procedures for *Sodium and Potassium*, *Chloride*, and *Bicarbonate* or *Citrate*, calculate from the labeled amounts of sodium chloride, potassium chloride, and sodium bicarbonate or sodium citrate the total equivalent amounts of sodium (Na), potassium (K), chloride (Cl), and bicarbonate (HCO_3) or citrate ($C_6H_5O_7$) contained therein (see *Table 1*).]

Table 1. mg Equivalent of Each g of Component

Component	Na	K	Cl	HCO_3	$C_6H_5O_7$
Sodium chloride	393.4	—	606.6	—	—
Potassium chloride	—	524.4	475.6	—	—
Sodium bicarbonate	273.6	—	—	726.4	—
Anhydrous sodium citrate	267.2	—	—	—	732.8
Sodium citrate dihydrate	234.5	—	—	—	643.0

SPECIFIC TESTS

• **pH** ⟨791⟩

Sample solution: Constitute the Oral Rehydration Salts as directed in the labeling.

Acceptance criteria: 7.0–8.8

• **Loss on Drying** ⟨731⟩

Analysis: Dry at 50° to constant weight.

Acceptance criteria: NMT 1.0%

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in tight containers, and avoid exposure to temperatures in excess of 30°. The Sodium Bicarbonate or Sodium Citrate component may be omitted from the mixture and packaged in a separate, accompanying container.

• **Labeling:** The label indicates prominently whether Sodium Bicarbonate or Sodium Citrate is a component by the placement of the word "Bicarbonate" or "Citrate", as appropriate, in juxtaposition to the official title. The label states the name and quantity, in g, of each component in each unit-dose container, or in a stated quantity, in g, of Oral Rehydration Salts in a multiple-unit container. The label states the net weight in each container and provides directions for constitution. Where packaged in individual unit-dose pouches, the label instructs the user not to open the pouch until the time of use. The label also states that any solution that remains unused 24 h after constitution is to be discarded.

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

Topic/Question	Contact	Expert Committee
ORAL REHYDRATION SALTS	Documentary Standards Support	SM52020 Small Molecules 5
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM52020 Small Molecules 5

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
Pharmacopeial Forum: Volume No. PF 41(4)

Current DocID: GUID-BBE1E8E9-6AF5-498D-859C-615051F75818_3_en-US
Previous DocID: GUID-BBE1E8E9-6AF5-498D-859C-615051F75818_1_en-US
DOI: https://doi.org/10.31003/USPNF_M73150_03_01
DOI ref: cl6ch