DEPARTMENT OF DRUG ADMINISTRATION
National Medicines Laboratory
ANALYTICAL METHOD VALIDATION COMMITTEE

Potassium Iodide, Sodium Chloride & Calcium Chloride Ophthalmic solution

Analytical Profile No.: PSCO 075/076/AP 055

Potassium Iodide, Sodium Chloride & Calcium Chloride ophthalmic solution contains not less than 95 % and not more than 105 % of the stated amount of Potassium Iodide, Sodium Chloride of Calcium Chloride.

1. Identification:

1.1 For Calcium Chloride

i) Calcium: To 1 ml of sample add 2 % w/v solution of ammonium oxalate. A white precipitate is obtained that is sparingly soluble in dilute acetic acid but soluble in hydrochloric acid.

ii) Chloride: To 1 ml of sample add 0.2 g of potassium dichromate and 1 ml of sulphuric acid. Place a filter paper moistened with 0.1 ml of diphenylcarbazide solution over the mouth of test tube. The paper turns violet red.

1.2 For Potassium Iodide

i) Potassium: To 1 ml of sample add 1 ml dilute acetic acid and 1 ml of freshly prepared 10 % w/v solution of sodium cobalt nitrite. A yellow or orange colored precipitate is formed.

ii) Iodide: Acidify 1 ml of sample with dilute nitric acid and add 0.5 ml of silver nitrate solution. A curdy pale yellow precipitate is formed which does not dissolve in 10 M ammonia solution.

1.3 For Sodium Chloride

i) Sodium: Acidify 1 ml of sample with 1 ml of acetic acid and a large excess of magnesium uranyl acetate solution. A yellow crystalline precipitate is formed.

ii) Chloride: To 1 ml of sample add 0.2 g of potassium dichromate and 1 ml of sulphuric acid. Place a filter paper moistened with 0.1 ml of diphenylcarbazide solution over the mouth of test tube. The paper turns violet red.

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Tests:

2. pH: 5.0 to 8.0

3. Particulate matter (By Light Obscuration Particle Counter)

As per Indian Pharmacopoeia (latest edition)

4. Sterility test: As per Indian Pharmacopoeia (latest edition)

5. Assay

5.1 Determination of Calcium Chloride:

Transfer 5 ml of sample in a 250 ml iodometric flask, add 50 ml of water and add 5 ml of ammonia ammonium chloride buffer pH 10 and titrate with 0.05 M EDTA solution using mordant black II as indicator.

Each ml of 0.05 M EDTA is equivalent to 0.007353 g of Calcium Chloride

Calculation:

$$= \frac{\text{B. R. x 0.007353 x Actual Molarity of EDTA x 100}}{5 \text{ x } 0.05}$$

5.2 Determination of Potassium Iodide:

Transfer 5 ml of sample in a 250 ml iodometric flask, add 10 ml of conc hydrochloric acid. Cool to room temperature, add 5 ml of chloroform and titrate with 0.05 M potassium iodate solution until the purple color of iodine disappears from the chloroform layer. Add the last portion of iodate solution dropwise while shaking the solution vigorously. Allow the mixture to stand for 5 minutes. If the chloroform layer develops a purple color, titrate further till chloroform layer remains colorless.

Each ml of 0.05 M potassium iodate is equivalent to 0.0186 g of Potassium Iodide

Calculation:

$$= \frac{\text{B. R. x 0.0166 x Actual Molarity of EDTA x 100}}{5 \text{ x } 0.05}$$

5.3 Determination of Sodium Chloride:

Transfer 5 ml of sample in a 250 ml iodometric flask, add 10 ml of water and titrate with 0.1 M silver nitrate using 1 ml of potassium chromate solution.

Calculations:

Volume in ml of silver nitrate solution consumed in the titration = X ml $AgNO_3$

Volume in ml of silver nitrate solution consumed by potassium iodide (Y ml) =

$$= \frac{\% \text{ of KI x } 0.1 \text{ x } 5}{100 \text{ x Actual Molarity of AgNO3 x } 0.0166}$$

Thus, $AgNO_3$ used by sodium chloride and calcium chloride

$$= \frac{Z \text{ ml x } 0.003545 \text{ x Actual Molarity of AgNO3 x } 100}{5 \text{ x } 0.1}$$

Now, 147.1g of calcium chloride = 70.9 g of chloride ions

i.e; 1.325 calcium chloride = 0.639 % of chloride ions

% of chloride ions due to $CaCl_2$

$$= \frac{0.639 \text{ x Actual \% of CaCl2}}{1 \text{ x } 100}$$

$$= B \text{ \% of chloride ions}$$

% chloride due to NaCl = A % of chloride ions – B % of chloride ions

$$= C \text{ \% of chloride ions}$$

% Sodium Chloride $= \dfrac{C \text{ \% x } 0.83}{0.584}$

6. Other tests: As per pharmacopoeial requirements.