

## Saline Cathartics

Saline cathartics or purgatives are agents that quicken and increase evacuation from the bowel. Laxatives are mild cathartics. Cathartics are used:

- to ease defecation in patients with painful hemorrhoids or other rectal disorders and to avoid excessive straining and concurrent increase in abdominal pressure in patients with hernias Or
- to avoid potentially hazardous rise in B.P. during defecation in patients with hypertension, cerebral coronary or other arterial disease Or
- to relieve acute constipation Or
- to remove solid material from intestinal tract prior to certain roentgenographic studies.

Laxative should only be used for short term therapy as prolonged use may lead to loss of spontaneous bowel rhythm upon which normal evacuation depends, causing patient to become dependent on laxatives, the so called laxative effect.

Constipation is the infrequent or difficult evacuation of the feces. It may be due to a person resisting the natural urge to defecate, causing the fecal material which remains in the colon to lose fluid and to become relatively dry and hard. Constipation can also be due to intestinal atony, intestinal spasm, emotions, drugs and diet. Many a time constipation can be helped by eating food such as natural laxatives or food with large roughages. Four types of laxatives are known:

1. Stimulants
2. Bulk forming
3. Emollient
4. Saline cathartics

**Stimulants** act by local irritation on the intestinal tract which increase peristaltic activity. They include phenolphthalein, aloin, cascara extract, rhubarb extract, senna extract, podophyllin, castor oil, bisacodyl, calomel etc.

**Bulk forming laxatives** are made from cellulose, sodium carboxyl methyl cellulose and karaya gum.

The **emollient laxatives** act either as lubricants facilitating the passage of compacted fecal material or as stool softeners. E.g mineral oil, d-octyl sodium sulfosuccinate, an anionic surface active agent.

**Saline cathartics** act by increasing the osmotic load of the GIT. They are salts of poorly absorbable anions  $\text{-H}_2\text{PO}_4^-$  (biphosphate),  $\text{-HPO}_4^{2-}$  (phosphate), sulphates, tartarates, and soluble magnesium salt.

Saline cathartics are water soluble and are taken with large quantities of water. This prevents excessive loss of water from body fluids and reduces nausea vomiting if a too hypertonic solution should reach the stomach. They act in the intestine and a full cathartic dose produces a water evacuation within 3-6 hrs. Because of their quick onset of action they are given early in the morning before breakfast.

They are used for bowel evacuation before radiological, endoscopic and surgical procedures and also to expel parasite and toxic materials.

Small amounts of these drugs may be absorbed in the blood causing occasional toxicity. The absorption of magnesium may cause marked CNS depression while that of sodium worsens the existing congestive cardiac failure (CCF).

### Compounds used as Saline cathartics

**(i) Sodium Acid Phosphate** (sodium biphosphate)

$\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$  M.W. = 156.01

**I.P limit:** It contains not less than 98.0% and not more than 100.5% of  $\text{NaH}_2\text{PO}_4$  calculated with reference to the dried substance.

**Properties:** Colorless, odorless, crystalline powder with saline acidic taste. Freely soluble in water and practically insoluble in alcohol. Slightly deliquescent.

#### Preparation:

1. It is prepared by adding phosphoric acid to hot concentrated solution of disodium phosphate until liquid ceases to give precipitate with barium chloride. The solution is then concentrated to the crystallization point.
2. By reaction with phosphoric acid with calculated quantity of sodium hydroxide.

#### Test for Identification:

**For phosphate:** To neutral sample solution add silver nitrate solution, a light yellow precipitate forms, the color of which is not changed by boiling and is readily soluble in 10M ammonia and dilute  $\text{HNO}_3$ .

**For sodium:** To 2ml of solution add 2ml of 15% w/v of  $\text{K}_2\text{CO}_3$  heat to boil, no precipitate is produced. Add 3ml of potassium antimonite solution and heat to boil. Allow to cool in ice and if necessary scratch the inside of the test tube with glass rod white precipitate is produced.

**Assay:** Weigh accurately 2.5 gms dissolve in 40ml water and titrate with carbonate free 1M NaOH. Determine end point potentiometrically. Each ml of 0.5M sodium hydroxide  $\equiv$  0.0780g of  $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$

**Use:** It is used as saline cathartic and as buffer in pharmaceutical preparations. As urinary acidifier, source of phosphorous.

**(ii) Disodium Hydrogen Phosphate** (phosphor soda)

$\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$  M.W. = 358.14

**I.P limit:** It contains not less than 98.0% and not more than 101% of  $\text{NaH}_2\text{PO}_4$  calculated with reference to the dried substance.

**Properties:** Colorless, odorless, crystalline powder. Soluble in water and practically insoluble in alcohol. Very efflorescent.

**Preparation:**

1. It is prepared by reaction of orthophosphoric acid calculated quantity of sodium hydroxide.
2. From bone ashes or mineral phosphorite, which is treated with sulphuric acid

**Assay:** Weigh accurately 4gm of substance and dissolve in 25ml of water add 25ml 1N HCl and titrate potentiometrically with 1M NaOH to first inflection point of the pH curve (n1) continue titration until second inflection of curve is reached. The total volume of NaOH required is n2 ml. calculate percent content from the expression

$1420(25-n1)/w(100-d)$  d is percentage of water content.

**Use:** Widely used as saline cathartic. Orally as antihypercalcemic It is a pharmaceutical aid used as buffering agent.

**(iii) Sodium Potassium Tartarate**

**I.P limit:** It contains not less than 99.0% and not more than 102% of  $\text{C}_4\text{H}_4\text{KNaO}_6$  calculated on the anhydrous basis.

**Preparation :** It is prepared by boiling a solution of sodium carbonate and potassium bitartarate for sometime and allowing the reaction mixture to stand at 60°C. The solution is filtered, concentrated and crystallized.

**Test for Identification:**

**For potassium:** To 1ml of solution add 1ml dilute acetic acid and 1ml of 10% w/v sodium cobalt nitrite a yellow color produced.

**For sodium:** To 2ml of solution of 2ml of 15% w/v of  $\text{K}_2\text{CO}_3$  heat to boil, no precipitate is produced. Add 3ml of potassium antimonite solution and heat to boil. Allow to cool in ice and if necessary scratch the inside of the test tube with glass rod white precipitate is produced.

**For tartarate:** 1) Warm the substance with sulphuric acid charring occurs and carbon monoxide which burns with blue flame is evolved.

- 3) To 5ml of sample solution add 1% w/v solution of ferrous solution and 0.05ml of hydrogen peroxide (10 vols) a transient yellow color is produced. After color disappears add 2M NaOH intense blue color is produced.

**Assay:** Weigh accurately 2g and heat until carbonized, cool and boil the residue with 50ml of water and 0.5N sulphuric acid (50ml). It is filtered washed with water and the filtrate and washing are titrated with 0.5N NaOH using methyl orange as indicator. Each ml of 0.5M sodium hydroxide  $\equiv$  0.07056g

**Uses:** It is used as laxative, food additive, as stabilizer in cheese and meat products.

#### (iv) Magnesium Sulphate

**I.P. limit:** It contains not less than 99.0% and not more than 100.5% of magnesium sulphate calculated with reference to dried substance.

**Properties:** It forms colorless prismatic crystals. It dissolves in water, is practically insoluble in alcohol. It has cooling saline bitter taste.

#### Preparation:

- 1) It can be prepared by neutralizing hot dilute sulphuric acid with magnesium or its oxides or carbonate. The solution is filtered; the filtrate is concentrated and recrystallized.  
H<sub>2</sub>O
- 2) On commercial scale it is manufactured by reacting sulphuric with dolomite. Magnesium sulphate so formed is dissolved in the solution and the sparingly soluble calcium sulphate is deposited. The liquid is filtered the filtrate is concentrated and crystallized.

#### Test for Identification:

**For magnesium:** To solution of sample add dilute nitric acid solution a white precipitate is produced that is redissolved by adding 1ml of 2M ammonium chloride, add 0.25M disodium hydrogen phosphate a white crystalline precipitate is produced.

**For sulphate:** To 5ml of sample solution add 1ml of dilute HCl and 1ml barium chloride solution white precipitate. Add 1ml of iodine solution to the suspension, the suspension remains yellow (distinction from sulphites and dithionites) but decolorizes on adding stannous chloride (distinction from iodates).

**Assay:** Weigh accurately about 6.3gm of sample dissolve in 50ml of water, add 10ml of strong ammonia ammonium chloride solution and titrate with 0.05M disodium EDTA using 0.1gm of moderate black II mixture as indicator until blue color is obtained.

Each ml of 0.05M disodium EDTA  $\equiv$  0.00602 gm of MgSO<sub>4</sub>

**Uses:** It is used as osmotic laxative, in treatment of electrolyte deficiency, in wet dressing in boils, in treatment of cholecystitis, sea sickness, hypertension etc.

**(v) Calomel**

**I.P. limit:** It contains not less than 99.0% of HgCl

**Properties:** A dull white heavy powder, odorless, almost tasteless. Volatilizes when strongly heated. Stable in air but gradually darkens when exposed to light. It is insoluble in water, alcohol, ether and in cold dilute acids.

**Test for Identification:**

1. Blackens by contact with dilute ammonia solution or with solution of alkali hydroxide.
2. Heat the sample in hard glass tube with an equal quantity of anhydrous sodium carbonate a sublimate of metallic mercury is obtained. Dissolve the residu in dilute  $\text{HNO}_3$  and filter. To the filtrate add silver nitrate solution shake and allow to stand, a curdy white precipitate is obtained which is insoluble in  $\text{HNO}_3$  but soluble, after being well washed with water, in dilute ammonium hydroxide solution from which it is reprecipitated by addition of dilute  $\text{HNO}_3$ .

**Assay:** Weigh accurately about 0.7gm of substance and mix with 10ml water in a glass stoppered flask and add 50ml of 0.1N  $\text{I}_2$  and 5gm KI dissolved in 10ml water. Close the flask and set aside, shaking occasionally until solution is complete. Titrate the excess of  $\text{I}_2$  with 0.1N sodium thiosulphate using starch as indicator. Each ml of 0.1N  $\text{I}_2 \equiv 0.02301$  gm of HgCl

**Uses:** It is used as cathartic.

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