



EXPECTORANTS

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DEFINITION

Expectorants are the drugs used to help in the removal of sputum or secretions or exudate from the trachea, bronchi or lungs and hence they are used in the treatment of cough.

They act upon the respiratory tract in 2 ways-

By decreasing the viscosity of the bronchial secretions and enhancing their elimination

By increasing the amount of respiratory tract fluid, a demulcent action is exerted on the dry mucosal linings, thus relieving the unproductive cough.

For example, inorganic saline expectorants are ammonium salts (ammonium chloride), iodides (potassium iodide/sodium iodide), citrates and antimony potassium tartarate.

CLASSIFICATION

On the basis of their mechanism of action, expectorants are classified into 2 main categories

1. Sedative type- They are stomach irritant and produce their effect by stimulating the gastric reflexes. For example, bitter drug (ipecac, senega, indian squill), other compounds (antimony potassium tartarate, sodium citrate, ammonium chloride, potassium iodide etc.)
2. Stimulant type- They either act directly or indirectly by stimulating the secretory cell of the respiratory tract. This results in the stimulation of the secretions, producing more fluid and diluting the sputum in the respiratory tract, for example (terpenoid oil- eucalyptus, active constituents of oil- terpine hydrate etc.)

AMMONIUM CHLORIDE

Ammonium chloride should not contain not less than 99.5% of ammonium chloride, calculated with respect to the substance dried for 4hrs over silica gel.

It is slightly hygroscopic in nature.

PREPARATION

On the commercial scale, it is obtained by the reaction of ammonia gas with hydrochloric acid and by evaporating the resultant solution to dryness.



The crude salt is purified either by crystallisation or sublimation.

During sublimation process, any volatile salt is prevented from getting sublimed by mixing the salt with 5% calcium phosphate during process and sublimation is carried out in cast iron pots which are lined with fire clay.

PREPARATION

By heating ammonium sulphate with sodium chloride:



AMMONIUM CHLORIDE (PHYSICAL PROPERTIES)

Molecular formula: **NH₄Cl**

Molecular weight: 53.50

Colour: white, fine or coarse and colourless crystalline powder

Odour: odourless

Solubility: Soluble in 2.6 parts of water, 1.4 parts of boiling water and 100 parts of alcohol. It is freely soluble in water and glycerine.

Taste: Saline in taste

AMMONIUM CHLORIDE (CHEMICAL PROPERTIES)

Aqueous solution of ammonium chloride which is freshly prepared is neutral to litmus paper but rapidly becomes acidic on standing because of hydrolysis



AMMONIUM CHLORIDE

ASSAY METHOD (VOLHARD'S METHOD)

(A) Earlier it was previously assayed by precipitation titration using **Volhard's method**. This method is as follows-

1. An accurately weighed 0.2gm of ammonium chloride is dissolved in 40ml of water,
2. Then, the solution is acidified with 3ml of nitric acid.
3. The solution is shaken vigorously after adding 50ml of 0.1N silver nitrate and 5ml of nitrobenzene.
4. The excess of silver nitrate is titrated with 0.1N ammonium thiocyanate, using 2ml of ferric ammonium sulphate as an indicator.



Each ml of 0.1N $\text{AgNO}_3 = 0.005349$ gm of NH_4Cl

POTASSIUM IODIDE (PROPERTIES)

Molecular formula: KI

Molecular weight: 166.0

Colour: colourless, transparent or opaque crystals or a white granular powder

Odour: Odourless

Solubility: soluble in water, glycerine, alcohol and acetone.

Taste: Bitter

POTASSIUM IODIDE (PREPARATION)

1. Industrially it is prepared by the action of iodine on moist iron fillings to form ferro-ferric iodide (FeI_3 or $\text{FeI}_2, 2\text{FeI}_3$) which then gets decomposed with potassium carbonate.



2. It is also prepared by treating a hot solution of potassium hydroxide with iodine in slight excess to form a mixture of potassium iodide and potassium iodate.

The solution is concentrated and then treated with excess of charcoal powder followed by evaporating the mixture to dryness followed by ignition. The charcoal reduces the iodate to iodine, utilising thus the total iodine to get the potassium iodide.



POTASSIUM IODIDE USES

Potassium iodide is used internally for supplying iodine for treatment of thyroid deficiency.

It finds use as expectorant in cough mixture and also as a saline diuretic.

It has also mild antifungal activity.

In the laboratory it finds use for preparing solutions of iodine and as mild reducing agent.

It also finds use for preparing reagents containing complex iodides, like potassium-mercuric iodide, potassium-bismuth iodide etc.

POTASSIUM IODIDE STORAGE

It should be stored in a well closed container.