Spasmolythic drugs

The disorders of intestine motility (motor activity) can be caused by direct or indirect factors. The direct factors include disorders of intestinal function. The indirect factors include diseases of other organs which are accompanied by disturbances of intestinal content passage.

The following drugs act spasmolytically on the digestive tract:

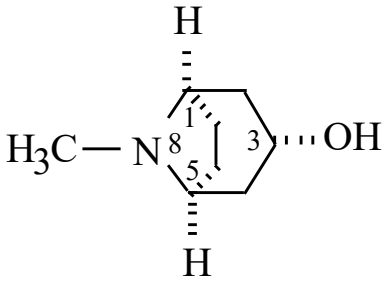
- anticholinergic drugs
- papaverine and its derivatives
- other spasmolythic drugs.

Anticholinergic drugs

The esters of tropine or scopine with tropic acid were the first compounds that were discovered to demonstrate antimuscarinic action.

Tropine is an aminoalcohol. The alcohol group has *trans* configuration in relation to the methylamine group.

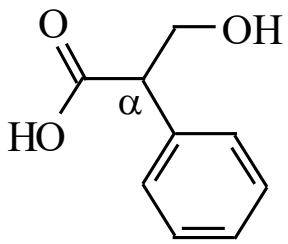
The *cis* isomer is called pseudotropine and forms a slightly active ester with tropic acid.



Tropine; 1α*H*,5α*H*-tropan-3-ol
Methyl-8-azabicyclo[3.2.1]-octan-3-ol

Tropic acid exists in levorotatory, dextrorotatory and racemic forms.

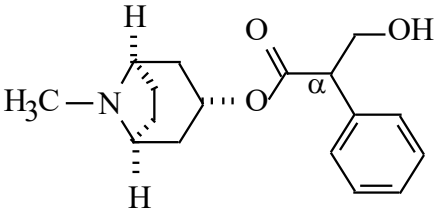
Dextrorotatory tropic acid forms esters that demonstrate low activity.



Tropic acid
α-(Hydroxymethyl)-α-phenylacetic acid

Atropine is the ester of racemic tropic acid, whereas hyoscyamine is the ester of tropine with levorotatory tropic acid.

Hyoscyamine acts more strongly than atropine.



Atropine

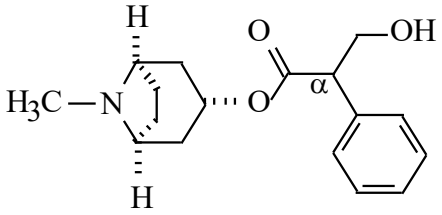
ATROPINUM SULFURICUM

N-Demethylation of atropine decreases 10-fold its activity, whereas *N*-alkylation increases its activity.

N-Alkyl derivatives of atropine are represented by atropine methylnitrate and ipratropium bromide.

Atropine *N*-methylnitrate acts 2 times more strongly than atropine.

Atropine and its alkyl derivatives are used in monotherapy (ATROPINUM SULFURICUM) or together with other drugs (TOLARGIN contains atropine methylnitrate, papaverine hydrochloride and metamizole).



Atropine acts antagonistically on muscarinic receptors. It accelerates cardiac activity by inhibiting the influence of the vagus nerve on the heart.
Atropine inhibits the secretory activity of the exocrine glands, relaxes the smooth muscles of the digestive tract, biliary duct and ureters.
It also demonstrates central activity causing excitation and visual hallucination when used in large doses.

Atropine is metabolized in the liver and excreted mainly in urine (50% of it remains unchanged).

Atropine should not be used in patients with glaucoma or prostate overgrowth.

In therapeutic doses, it can contract the sphincter of the urinary bladder and make urination difficult.

The adverse action of atropine affects mainly the heart and leads to accelerated cardiac activity, intensified ischemic heart disease and increased blood pressure.

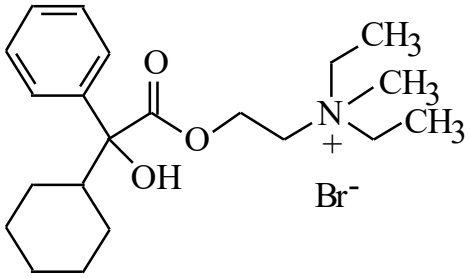
Hyoscine butylbromide (*Butylscopolamine*) blocks muscarinic and nicotinic cholinergic receptors. It acts more rapidly but not as long as atropine.

Hyoscine butylbromide removes the contraction of the digestive and biliary tracts and ureters and inhibits intestine peristalsis.
It does not act depressively on the CNS because it weakly permeates through the blood-brain barrier.

Butylscopolamine can decrease blood pressure by blocking the autonomic ganglions.

Butylscopolamine is used in monotherapy (BUSCOLYSIN, BUSCOPAN) and together with analgesic drugs (SCOPOLAN COMPOSITUM contains butylscopolamine and metamizole;
VEGANTALGIN H contains butylscopolamine and paracetamol).

Oxyphenonium bromide is a synthetic anticholinergic agent.



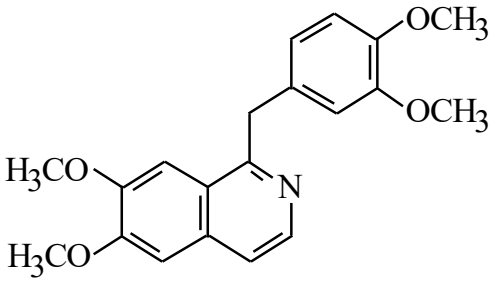
Oxyphenonium, SPASMOPHEN

It demonstrates peripheral cholinolytic activity, which is weaker than that of atropine and blocks the cholinergic ganglions, affecting mainly the function and secretion of the digestive tract.

The relaxing action of oxyphenonium reduces the secretion of mucosal glands and diminishes the tone and function of the intestine.

Oxyphenonium also accelerates the cardiac function.
The main adverse effects of oxyphenonium are xerostomia, miction difficulties, vision disturbances, tachycardia, disturbances of the digestive tract and sexual inefficiency in men.

Papaverine and its derivatives



Papaverine, PAPAVERINUM HYDROCHLORICM, SPASTICOL

1-(3,4-Dimetoxybenzylo)-6,7-dimetoxyizoquinoline

Papaverine is an isoquinoline alkaloid present in opium.

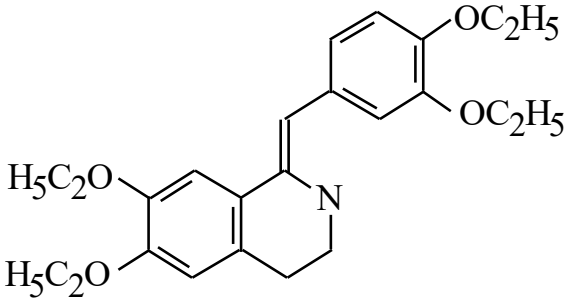
It inhibits phosphodiesterase activity, which leads to an increase in cAMP concentration and, as a result, to the relaxation of the smooth muscles.

Approximately 90% of the dose is bound with plasma proteins.

Papaverine is metabolized in the liver and excreted in urine as inactive metabolites.

When papaverine is used in large doses it can cause arrhythmia, because it lengthens refraction time and slows down stimulus transmission in the heart conduction system.

Papaverine is used in monotherapy and together with cholinolytic drugs (SPASTICOL contains a dry extract from leaves of the Atropa belladonna and papaverine hydrochloride).



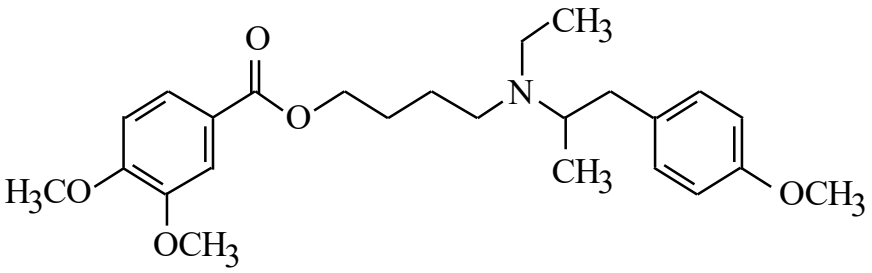
Drotaverine, DESPARIN, GALOSPA, NO-SPA

1-(3,4-Diethoxybenzylidene)-6,7-diethoxyisoquinoline

Drotaverine is a synthetic derivative of papaverine.
After oral administration it acts more strongly than papaverine, especially in in spasms of the biliary, urinary and digestive tracts.

Papaverine dilates blood vessels, including the coronary and cerebral vessels.

Other spasmolytic drugs



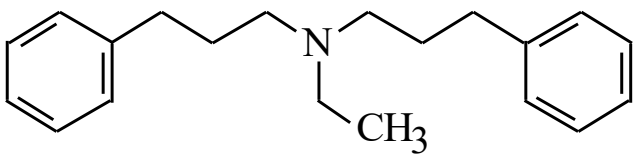
Mebeverine, DUSPATALIN

Mebeverine is a musculotropic spasmolytic, which acts directly on the smooth muscles of the digestive tract.

It removes smooth muscles spasms of the intestine without disturbing normal motility.

It does not demonstrate adverse cholinolytic action and because of that it can be used in patients with glaucoma and prostate overgrowth.

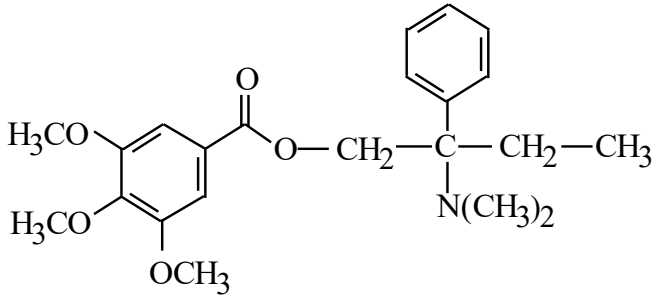
After oral administration mebeverine is rapidly and completely absorbed. It is excreted in urine as metabolites.



Alverine,

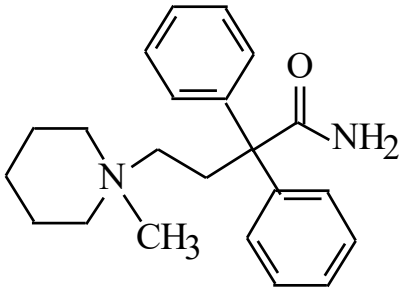
METEOSPASMYL, SPASMOLINA

The mechanism of the spasmolytic action of alverine involves blocking the calcium channels in the cells of the smooth muscles. Alverine is more effective and less toxic than papaverine.

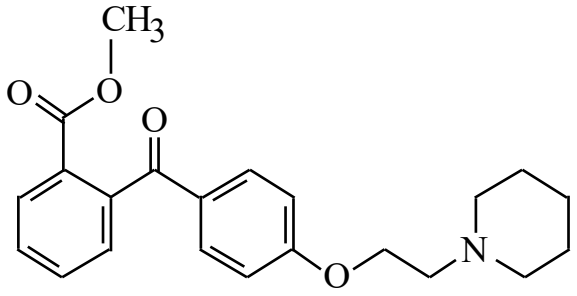


Trimebutine, DEBRIDAT, TRIBUX

Trimebutine is used in disturbances of digestive tract motility (irritable bowel syndrome, functional disturbances of the digestive tract). It is an agonist of enkephalinergic receptors and because of that it stimulates the intestine muscles in the hypokinetic state or inhibits them in the hyperkinetic state.



Fenpiverinium bromide



Pitofenone

SPASMALGON contains fenpiverinium bromide, pitofenone hydrochloride and metamizole.

This product acts spasmolytically on the smooth muscles of the digestive, biliary and urinary tracts and uterus (the action of fenpiverinium and pitofenone), antipyretically and analgesically (the action of metamizole).

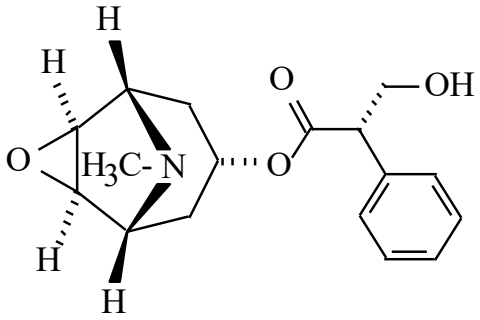
Spasmalgon is indicated in the spasms of the digestive tract, renal and liver colic, dysmenorrhea (painful menstruation), migraine attacks and after operative procedures.

Scopolamine is the ester of scopine and levorotatory tropic acid. Scopine is 6,7-epoxy-tropine (6,7-oxiranotropine).

Hyoscine hydrobromide shows central and peripheral parasympatholytic action.

It acts depressively on the CNS, particularly on the cerebral cortex and the subcortical areas.

Hyoscine demonstrates strong hypnotic and antiemetic action. *N*-Alkylation of scopolamine eliminates its action on the CNS.



Hyoscine

BUSCOLYSIN, BUSCOPAN, SCOPOLAN