

6.1.3.6. Diloxanide Furoate

Diloxanide furoate is an anti-protozoal drug used for treating infections caused by *Entamoeba histolytica* and other protozoa.

Molecular Formula: $C_{14}H_{11}Cl_2NO_4$

IUPAC Nomenclature: [4-[(2,2-dichloroacetyl)-methylamino]phenyl] furan-2-carboxylate

Chemistry: Diloxanide furoate is a dichloroacetamide derivative in which the nitrogen is substituted with methyl group and *p*-hydroxy phenyl group. The 2-furoate ester increases the duration of action. The ester hydrolyses to set diloxanide which shows amoebicide activity.

Properties: Diloxanide furoate occurs as a white crystalline powder with no taste and odour. It is freely soluble in chloroform; slightly soluble in alcohol and ether; and very slightly soluble in water.

Uses: Diloxanide furoate is used as a primary agent for treating asymptomatic intestinal amoebiasis caused by *Entamoeba histolytica*. It can also be used along with or in sequence with other agents like nitroimidazoles (e.g., metronidazole) for treating invasive or extraintestinal forms of amoebiasis.

Stability and Storage Conditions: Diloxanide furoate is light sensitive, thus should be stored in tightly closed containers away from heat and light.

Type of Pharmaceutical Formulation: Tablets.

Brand Names: Amibactin, Tinifur, Dialox, Eldazole, Entamide, Furamide, and Flagyl-DF.

6.1.3.7. Paromomycin

Paromomycin is an oligosaccharide antibiotic and an aminoglycoside antibiotic produced by certain types of *Streptomyces*.

Molecular Formula: $C_{23}H_{45}N_5O_{14}$

IUPAC Nomenclature: (2S,3S,4R,5R,6R)-5-amino-2-(aminomethyl)-6-[(2R,3S,4R,5S)-5-[(1R,2R,3S,5R,6S)-3,5-diamino-2-[(2S,3R,4R,5S,6R)-3-amino-4,5-dihydroxy-6-(hydroxymethyl)oxan-2-yl]oxy-6-hydroxycyclohexyl]oxy-4-hydroxy-2-(hydroxymethyl)oxolan-3-yl]oxyoxane-3,4-diol

Properties: Paromomycin occurs as a creamy-white to light yellow coloured hygroscopic powder with no odour. It is very soluble in water; and insoluble in chloroform and alcohol.

Uses: Paromomycin is used for suppressing intestinal flora and for managing hepatic coma because of its antibacterial activity. It is used for treating intestinal amoebiasis (amoebic dysentery) due to its amoebicide activity. It is also used for treating leishmaniasis (kala azar). It is used in balantidiasis. Due to its anthelmintic activity it is used for treating tapeworm infestation.

Stability and Storage Conditions: Paromomycin is hygroscopic in nature, thus should be stored at a dry place in tightly-closed containers at room temperature.

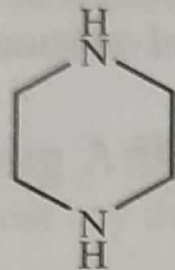
Types of Pharmaceutical Formulations: Tablets and syrups.

Brand Name: Humatin, Hamagel, and Paramicina.

6.2.3.1. Piperazine

Piperazine is a cyclic organic compound with two nitrogen atoms attached in opposite positions within a 6- membered heterocyclic ring. These nitrogen atoms are the backbone for piperazine derivatives, act as GABA receptor agonists in nematodes, and exhibit anti-helminthic activity.

Chemical Structure



Piperazine

Molecular Formula: $C_4H_{10}N_2$

IUPAC Nomenclature: Piperazine

Physical Properties: Piperazine occurs as a white crystalline powder with amine-like odour. It is soluble in water.

Chemical Properties: Piperazine produces a red colour when its aqueous solution is treated with potassium ferrocyanide solution in the presence of mercury and sodium bicarbonate.

Uses: Piperazine is used for treating ascariasis and enterobiasis caused by *Ascaris lumbricoides* (roundworm) and *Enterobius vermicularis* (pinworm), respectively. It is also used in partial intestinal obstruction, which primarily occurs in children and is caused by the common roundworm.

Stability and Storage Conditions: Piperazine is deliquescent in nature and gets affected by light, thus should be stored in tightly-closed light-resistant containers.

Types of Pharmaceutical Formulations: Powder, solution, suspension, syrup, and elixirs.

Brand Names: Anypar, Avizine, and Wormicid.

6.2.3.2. Mebendazole

Mebendazole is a benzimidazole which interferes with the metabolism of carbohydrates and inhibits the polymerisation of microtubules.

Molecular Formula: $C_{16}H_{13}N_3O_3$

IUPAC Nomenclature: methyl N-(6-benzoyl-1H-benzimidazol-2-yl)carbamate

Properties: Mebendazole occurs as a white or slightly yellow coloured amorphous powder. It is soluble in formic acid; and practically insoluble in water, ethanol, ether, and chloroform.

Uses: Mebendazole is a broad spectrum anthelmintic, used for treating whipworm infestation (trichuriasis), round worms (ascariasis) infestation, tape worms (taeniasis) infestation, threadworms (strongyloidiasis) infestation, river blindness (onchocerciasis), hookworms (uncinariasis) infestation, guinea worms (dracantiasis) infestation, and capillaria infection.

Stability and Storage Conditions: Mebendazole is stable in conditions of normal temperature, light, and moisture. It should be stored in tightly-closed containers at room temperature, away from excess heat and moisture.

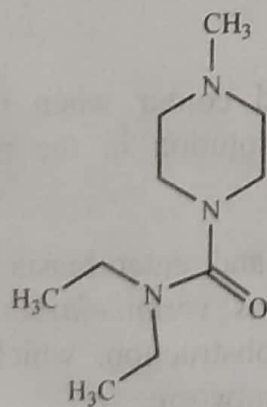
Types of Pharmaceutical Formulations: Chewable tablets.

Brand Names: Vermox, Emverm, Mebex, and Wormin.

6.2.3.3. DEC (Diethylcarbamazine)

DEC is an anthelmintic used as a citrate for treating filariasis, specifically in invasions of *Wucheria bancrofti* or *Loa loa*.

Chemical Structure



Diethylcarbamazine

Molecular Formula: $C_{16}H_{29}N_3O_2$

IUPAC Nomenclature: N,N-diethyl-4-methylpiperazine-1-carboxamide

Properties: DEC occurs as a white coloured crystalline powder with a bitter acid taste. It may or may not contain any odour. It is soluble in water; sparingly soluble in alcohol; and insoluble in acetone, benzene, chloroform, and ether.

Uses: DEC is used for treating round worm infestation (ascariasis) and filarial infections like onchocerciasis (river blindness) and lymphatic filariasis. It is also used in loiasis (infection due to *Loa loa*) and tropical eosinophilia.

Storage Conditions: DEC products should be stored at room temperatures in tightly-closed light-resistant containers.

Types of Pharmaceutical Formulations: Tablet and injections.

Brand Names: Bonocide farte, Decet, Dicar, and Hetrazen.