

8.1.3.1. Undecylenic Acid

Undecylenic acid (or undecylenate) is an unsaturated fatty acid having a terminal double bond that is produced from castor oil. It is also naturally found in human sweat.

Molecular Formula: $C_{11}H_{20}O_2$

IUPAC Nomenclature: Undec-10-enoic acid

Properties: Undecylenic acid occurs as a colourless to pale yellow coloured liquid with a characteristic odour. It is insoluble in water; and miscible in organic solvents.

Uses: The salts of undecylenic acid are used for treating fungal infections. It has no therapeutic use of its own.

Stability and Storage Conditions: Undecylenic acid should be stored in tightly-closed containers away from heat.

Types of Pharmaceutical Formulations: Emulsions, lotions, ointments, and capsules.

Brand Name: Zella

8.1.3.2. Tolnaftate

Tolnaftate is a synthetic thiocarbamate derivative having either fungicidal or fungistatic properties. It selectively, non-competitively, and reversibly inhibits membrane bound squalene-23-epoxidase enzyme involved in the biosynthesis of ergosterol.

Molecular Formula: $C_{19}H_{17}NOS$

IUPAC Nomenclature: O-naphthalen-2-yl N-methyl-N-(3-methylphenyl)carbamothioate

Properties: Tolnaftate occurs as a fine, white to creamy white coloured crystalline powder with no odour. It is insoluble in water; and soluble in 1 in 4000 of ethanol, 1 in 9 of carbon tetrachloride, 1 in 1.5 of chloroform, 1 in 7 of acetone, and 1 in 55 of ether.

Uses: Tolnaftate is topically used for treating skin infections like athlete's foot, jock itch, and ringworm infections. It is used in combination with other antifungals to treat infections of nails, scalp, palms, and soles of feet. Its powder and powder aerosol can be used for preventing athlete's foot.

Stability and Storage Conditions: Tolnaftate should be stored in tightly-closed containers at room temperature.

Types of Pharmaceutical Formulations: Cream and solutions.

Brand Name: Quadriderm, Quiss, and Tinaderm.

8.1.3.3. Nystatin

Nystatin is a polyene antifungal drug which acts against many moulds and yeasts such as *Candida spp.* It is toxic if administered intravenously, but it does not get absorbed across intact skin or mucous membranes. It is thought to be a safer drug in treating oral or gastrointestinal fungal infections.

Molecular Formula: $C_{47}H_{75}NO_{17}$

IUPAC Nomenclature: (1S,3R,4R,7R,9R,11R,15S,16R,17R,18S,19E,21E,25E,27E,29E,31E,33R,35S,36R,37S)-33-[(3-amino-3,6-dideoxy-β-L-mannopyranosyl)oxy]-1,3,4,7,9,11,17,37-octahydroxy-15,16,18-trimethyl-13-oxo-14,39-dioxabicyclo[33.3.1]nonatriaconta-19,21,25,27,29,31-hexaene-36-carboxylic acid

Properties: Nystatin occurs as light yellow to tan coloured powder, with odour similar to cereals. It is soluble in water, alcohol, chloroform, carbontetrachloride, acetone, toluene, and benzene; and insoluble in ether.

Uses: Nystatin is used to treat prophylaxis and candidiasis of skin and mucous membrane. Its tablets are used for treating intestinal and oesophageal candidiasis. Its lozenges are used in candidiasis of mouth. In pessaries or vaginal cream form it is used to treat candidiasis of vagina.

Stability and Storage Conditions: Nystatin absorbs moisture and gets affected by room temperature, air, and light. Therefore, it should be stored in tightly-closed light-resistant containers below 5°C temperatures. It should be stored at room temperature in a cool (15-30°C) and dry place, away from light.

Types of Pharmaceutical Formulations: Tablets, suspensions, powder, creams, ointments, lotions, eye drops, and pessaries.

Brand Names: Kenacomb, Nistin-C, Tinaderm-M, Zovate-GN, Nystan, and Nystaform.

8.1.3.4. Amphotericin

Amphotericin is a polyene macrolide containing seven conjugate double bonds, a free carbonyl group, an internal ester, and a glycoside side chain with primary amino group.

Molecular Formula: $C_{47}H_{73}NO_{17}$

IUPAC Nomenclature

(1S,3R,4E,6E,8E,10E,12E,14E,16E,18S,19R,20R,21S,25R,27R,30R,31R,33S,35R,37S,38R)-3-[(2R,3S,4S,5S,6R)-4-amino-3,5-dihydroxy-6-methyloxan-2-yl]oxy-19,25,27,30,31,33,35,37-octahydroxy-18,20,21-trimethyl-23-oxo-22,39-dioxabicyclo[33.3.1]nonatriaconta-4,6,8,10,12,14,16-heptaene-38-carboxylic acid

Properties: Amphotericin occurs as a yellow to orange coloured powder with no odour and taste. It is soluble in dimethyl sulphoxide and propylene glycol; and insoluble in water, anhydrous alcohol, benzene, ether, and toluene.

Uses: Amphotericin is used for treating many serious fungal infections. It exhibits a broad spectrum antifungal activity. It is useful in severe mycotic infections such as candidiasis, blastomycosis, aspergillosis, coccidioidomycosis, sporotrichosis and phycomycosis (algae like fungi).

It is used for treating mucocutaneous and cutaneous leishmaniasis and candidiasis, primary amoebic meningoencephalitis, and *Cryptococcal* meningitis in combination with flucytosine. It is also used for suppressing oral or intestinal candidiasis.

Stability and Storage Conditions: Amphotericin should be stored away from light, in a refrigerator. Its reconstituted solution should be stored in a dark place at room temperature for a day or in a refrigerator for a week with minimal clarity and potency loss. It gets affected by light, air, and room temperature too, therefore should be stored in tightly-closed, light-resistant containers between 2-10°C temperature.

Types of Pharmaceutical Formulations: Injections, gel, creams, lotions, lozenges, ointments, and mixtures.

Brand Names: Amfocan, Amphocil, Fungisome, and Fungilin.

8.1.3.5. Hamycin

Hamycin is a polyene antibiotic obtained from *Streptomyces pimprina*. It is chemically similar to amphotericin B but is also different from it as it can be tolerated and on oral administration it can achieve prolong antifungal concentrations in blood.

Molecular Formula: $C_{58}H_{86}N_2O_{19}$

IUPAC Nomenclature: (4E,6E,8E,10E,12E,14E,16E)-3-[(2S,3R,4R,5R,6S)-4-amino-3,5-dihydroxy-6-methyloxan-2-yl]oxy-19-[7-(4-aminophenyl)-5-hydroxy-7-oxoheptan-2-yl]-23,25,27,29,31,33,35,37-octahydroxy-18-methyl-21-oxo-20,39-dioxabicyclo[33.3.1]nonatriaconta-4,6,8,10,12,14,16-heptaene-38-carboxylic acid

Properties: Hamycin occurs as yellow coloured, amphoteric, and amorphous powder. It is soluble in pyridine; and insoluble in water and chloroform.

Uses: Hamycin is used for treating, preventing, controlling, and improving vaginal infections, inflammation of vagina and vulva, and yeast and fungal infections of mouth and skin.

Stability and Storage Conditions: Hamycin is air and light sensitive, thus should be stored at room temperature away from heat and light.

Types of Pharmaceutical Formulations: Solutions, suspensions, and pessaries.

Brand Name: Hamycin.