

16.1. ADRENERGIC ANTAGONISTS

16.1.1. Introduction

Adrenergic antagonists (or adrenergic blocking agents or anti-adrenergic drugs) inhibit the actions of adrenergic drugs. It can also be said that these drugs inhibit the responses occurring due to the activation of adrenoceptors (effects of AD, NA, and other sympathomimetic drugs). The anti-adrenergic drugs selectively block the action of sympathomimetic amines by acting either on the α - or β -receptors or on both. Hence, they produce effects opposite to those of the catecholamines, i.e., facilitated by the α - or β -receptors.

The α - and β -adrenoceptor-blocking agents are sub-divided on the basis of their receptor selectivity. The drugs in these sub-groups are the pharmacological antagonists or partial agonists, which act competitively and possess reversible actions.

16.1.2. Classification

The adrenergic antagonists are classified as follows based on the receptors with which they interact:

1) α -Adrenergic Antagonists

- i) **Non-Selective α -Adrenergic Antagonists:** Phenoxybenzamine, Ergotamine, Dihydroergotamine, Tolazoline, Phentolamine, and Chlorpromazine.
- ii) **Selective α_1 -Adrenergic Antagonists:** Prazosin, Terazosin, Doxazosin, and Tamsulosin.
- iii) **Selective α_2 -Adrenergic Antagonists:** Yohimbine.

2) β -Adrenergic Antagonists

- i) **Non-Selective β -Adrenergic Antagonists:** Propranolol, Timolol, and Pindolol.
- ii) **Selective β_1 -Adrenergic Antagonists:** Atenolol, Acebutolol, and Metoprolol.

16.1.3. Individual Compounds

The following drugs are studied in detail:

- 1) Tolazoline,
- 2) Propranolol, and
- 3) Practolol.

16.1.3.1. Tolazoline

Tolazoline is a vasodilator that mainly acts on the blood vessels. It also increases cardiac output. It is an imidazolidine derivative.

Molecular Formula: $C_{10}H_{12}N_2$

IUPAC Nomenclature: 2-benzyl-4,5-dihydro-1H-imidazole

Properties: Tolazoline occurs as a creamy white crystalline powder with a slight aromatic odour and bitter taste. It is freely soluble in water and alcohol; soluble in chloroform; and slightly soluble in ether. Its aqueous solution is acidic (pH 4.9-5.3).

Uses: Tolazoline is a vasodilator. It exhibits sympathomimetic effect, stimulates the heart, and causes mydriasis. It is used in Raynaud's disease and cerebral vascular accidents. It is also used in new-borns for treating persistent pulmonary hypertension.

Stability and Storage Conditions: Tolazoline should be protected from light, thus should be stored at room temperature 15-30°C.

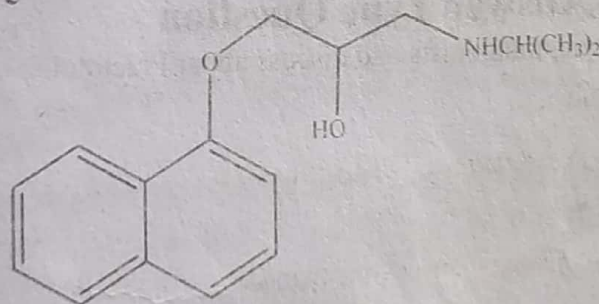
Types of Pharmaceutical Formulations: Intravenous injections and solution.

Brand Names: Artonil, Benzazoline, Dilatol Asi, Divascol, and Imidalin.

16.1.3.2. Propranolol

Propranolol is a sympatholytic non-selective β -blocker. Sympatholytics are used for the treatment of hypertension, anxiety, and panic. Propranolol is the first successfully developed β -blocker.

Chemical Structure



Propranolol

Molecular Formula: $C_{16}H_{21}NO_2$

IUPAC Nomenclature: 1-(naphthalen-1-yloxy)-3-[(propan-2-yl)amino] propan-2-ol

Properties: Propranolol occurs as a white coloured crystalline powder with no odour. It is soluble in 1 in 20 parts of water or alcohol; slightly soluble in chloroform; and insoluble in ether.

Uses: Propranolol is used for treating tremors, angina, hypertension, heart rhythm disorders, and other heart or circulatory conditions. It is also used in the treatment or for preventing heart attacks. It may reduce the severity and frequency of migraine headaches.

Stability and Storage Conditions: Propranolol remains stable only at acidic pH, and rapidly decomposes at alkaline pH. It should be stored in well-closed containers at room temperature, away from light and moisture.

Types of Pharmaceutical Formulations: Capsule, tablet, intravenous injection, and solution.

Brand Names: Betacap, Ciplar, Provanol, Betapro, and Corbeta.

16.1.3.3. Practolol

Practolol is a β_1 -adrenergic antagonist used in emergency cases for the treatment of cardiac arrhythmias.

Molecular Formula: $C_{14}H_{22}N_2O_3$

IUPAC	Nomenclature:	N-[4-[2-hydroxy-3-(propan-2-ylamino)
propoxy]phenyl]acetamide		

Properties: Practolol occurs as a white coloured, water-soluble powder.

Uses: Practolol is used in the emergency treatment of cardiac arrhythmias.