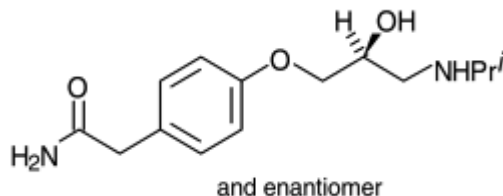


APO-ATENOLOL TABLETS**NAME OF THE MEDICINE**

Atenolol.

Chemical Name: 2-[4-[(2*RS*)-2-hydroxy-3-[(1-methylethyl)amino]propoxy]phenyl]acetamide



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

Molecular Weight: 266.3

CAS Registry Number: 29122-68-7

DESCRIPTION

Atenolol is a white or almost white powder, sparingly soluble in water, soluble in ethanol, slightly soluble in methylene chloride and practically insoluble in ether.

PHARMACOLOGY**Pharmacokinetics**

Although absorption of atenolol is variable and incomplete (40 to 60%), the virtual lack of hepatic/liver metabolism results in relatively consistent systemic bioavailability compared to other beta-blockers. Blood levels in humans peak two to four hours after a single 100 mg oral dose and are of the order of 0.4 to 0.9 $\mu\text{g/mL}$. Blood levels are consistent and the levels after chronic oral administration are in good agreement with those predicted from single dose results. The drug is distributed throughout the body tissues and less than 10% of the dose is metabolised, the minor urinary metabolite identified being a hydroxylated derivative. The main route of elimination is renal excretion. The plasma half-life, measured by blood level decay or urinary build-up is approximately 7 to 9 hours. In patients with impaired renal function, there is a progressive prolongation of the half-life. In patients with normal renal function, the therapeutic effect (i.e. control of raised blood pressure) lasts for at least 24 hours following a 50 mg oral dose.

Pharmacodynamics

Atenolol is a beta-adrenoceptor blocking agent structurally related to propranolol and differing from it by substitution on the aromatic ring. It acts preferentially on beta-receptors in the heart. Selectively decreases with increasing dose. It has little intrinsic sympathomimetic activity and no membrane stabilising activity. Atenolol is a racemic mixture and its activity resides in the S (-) enantiomer. It reduces raised blood pressure by an unknown mechanism and also inhibits exercise induced tachycardia and decreases plasma renin concentration. It causes slight airways obstruction but less than that seen with non-selective beta-blockers. The inhibition of exercise induced tachycardia is correlated with blood levels but there is no correlation between plasma concentrations and antihypertensive effect. Atenolol is effective and well tolerated in most ethnic populations although the response may be less in Afro-Caribbean black patients.

The possible mechanism of the anti-anginal activity of atenolol appears to be due to a reduction in left ventricular work and oxygen utilisation resulting (mainly) from the decrease in heart rate and contractility.

The anti-arrhythmic effect of atenolol is apparently due to its anti-sympathetic effect. There is no evidence that membrane stabilising activity or intrinsic sympathomimetic activity are necessary for anti-arrhythmic efficacy. By its anti-sympathetic effect, atenolol depresses sinus node function, atrioventricular node function and prolongs atrial refractory periods. It has no direct effect on electrophysiological properties of the HIS-purkinje system.

Because of their negative inotropic effects, beta-adrenoreceptor blocking agents should be avoided in uncontrolled heart failure.

INDICATIONS

- All grades of hypertension, including hypertension of renal origin.
- Frequent disabling angina without evidence of cardiac failure.
- Cardiac arrhythmias (maintenance treatment of supraventricular and ventricular arrhythmias which have been controlled with other intravenous agents, including those associated with acute myocardial infarction).
- Myocardial infarction: late intervention (beta-blockers class effect greater than 12 hours after onset of chest pain).

CONTRAINDICATIONS

- Bronchospasm. Beta-adrenergic blockade of the smooth muscle of bronchi and bronchioles may result in an increased airways resistance. These drugs also reduce the effectiveness of asthma treatment. This may be dangerous in susceptible patients. Therefore, beta-blockers are contraindicated in any patient with a history of airways obstruction or tendency to bronchospasm. Use of cardioselective beta-blockers can also result in severe bronchospasm. If such therapy must be used, great caution should be exercised. Alternative therapy should be considered.
- Congestive heart failure.
- Allergic disorders (including allergic rhinitis) which may suggest a predisposition to bronchospasm.
- Right ventricular failure secondary to pulmonary hypertension.
- Significant right ventricular hypertrophy.
- Sinus bradycardia (less than 45 to 50 beats/minute).

- Sick sinus syndrome.
- Second and third degree atrioventricular block.
- Shock (including cardiogenic and hypovolaemic shock).
- Hypotension.
- Metabolic acidosis.
- Severe peripheral arterial circulatory disturbances.
- Untreated phaeochromocytoma.
- Anaesthesia with agents that produce myocardial depression (e.g. ether, chloroform, cyclopropane).
- Pregnancy and lactation (see PRECAUTIONS, Use in Pregnancy and Use in Lactation).
- Hypersensitivity to the drug.

PRECAUTIONS

Cardiac Failure

Beta-blockade depresses myocardial contractility and may precipitate cardiac failure in some patients with a history of cardiac failure, chronic myocardial insufficiency or unsuspected cardiomyopathy as may occur in chronic alcoholism. In patients without a history of cardiac failure, continuing depression of the myocardium may lead to cardiac failure. If signs of cardiac failure are present, the patient should be fully digitalised and/or given an ACE inhibitor or vasodilators with or without a diuretic and carefully monitored. If cardiac failure persists, the beta-blocker should be withdrawn (see **Abrupt Withdrawal of Therapy**, below).

Note: Although congestive heart failure has been considered to be a contraindication to the use of beta-blockers, there is growing literature on the experimental use of beta-adrenergic blocking drugs in heart failure. As further trials are needed to identify which patients are most likely to respond to which drugs, beta-blockers should not normally be prescribed for heart failure outside of specialist centres.

Abrupt Withdrawal of Therapy

Care should be taken if beta-blockers have to be discontinued abruptly in patients with coronary artery disease. Severe exacerbation of angina and precipitation of myocardial infarction and ventricular arrhythmias have occurred following abrupt discontinuation of beta-blockade in patients with ischaemic heart disease. Therefore, it is recommended that the dosage be reduced gradually over a period of about 8 to 14 days during which time the patient's progress should be reassessed. The drug may be reinstituted temporarily if the angina worsens. If the drug must be withdrawn abruptly, close observation is required. In the peri-operative period, beta-blockers should not be withdrawn unless indicated.

History of Anaphylactic Reaction

While taking beta-adrenoreceptor blocking drugs, patients with a history of anaphylactic reaction to a variety of allergens may have a more severe reaction on repeated challenge. Such patients may be unresponsive to the usual doses of adrenaline used to treat the allergic reactions.

First Degree Heart Block

Due to its negative effect on conduction time, caution must be exercised if atenolol is given to patient with first degree heart block.

Peripheral Circulation

Beta-blockade may impair the peripheral circulation and exacerbate the symptoms of peripheral vascular disease.

Prinzmetal Angina

There is a risk of exacerbating coronary artery spasm if patients with Prinzmetal or variant angina are treated with a beta-blocker. If this treatment is essential, it should only be undertaken in a coronary or intensive care unit.

Euthyroid Hyperthyroxinaemia

The effects of beta-blockers on thyroid hormone metabolism may result in elevations of serum free thyroxine (T₄) levels. In the absence of any signs or symptoms of hyperthyroidism, additional investigation is necessary before a diagnosis of thyrotoxicosis can be made.

Use in Acute Myocardial Infarction

In addition to the contraindications listed (see **CONTRAINDICATIONS**), patients with the following conditions are not suitable for treatment with atenolol:

- (a) Systolic blood pressure less than 120 mmHg (systolic blood pressure less than 120 mmHg in combination with a heart rate greater than 90 beats/min has a particularly poor prognosis).
- (b) First degree atrioventricular block. There is an increased incidence of cardiogenic shock (and need for inotropes), complete heart block and cardiovascular death in these patients, following atenolol.

Patients with atrial fibrillation following myocardial infarction, who were treated with atenolol, also had increased cardiovascular mortality compared with those not treated with atenolol. It is suggested that such patients be digitalised before atenolol therapy is commenced.

Bradycardia

If a treated patient develops symptoms which may be attributable to a slow heart rate, the dose may be reduced.

Anaesthesia and the Peri-Operative Period

Beta-blockade may have beneficial effects in decreasing the incidence of arrhythmias and myocardial ischaemia during anaesthesia and the post-operative period. It is currently recommended that maintenance beta-blockade be continued peri-operatively. The anaesthetist must be made aware of beta-blockade because of the potential for interactions with other drugs, resulting in severe bradyarrhythmias and hypotension, the decreased reflex ability to compensate for blood loss, hypovolaemia and regional sympathetic blockade, and the increased propensity for vagal-induced bradycardia. Incidents of protracted severe hypotension or difficulty restoring normal cardiac rhythm during anaesthesia have been reported. Modern inhalational anaesthetic agents are generally well tolerated, although older agents (ether, cyclopropane, methoxyflurane, trichlorethylene) were sometimes associated with severe circulatory depression in the presence of beta-blockade.

Diabetes

Beta-blockers affect glucose metabolism and may mask some important premonitory signs of acute hypoglycaemia, such as tachycardia.

In patients with insulin or non-insulin dependent diabetes, especially labile diabetes, or with a history of spontaneous hypoglycaemia, beta-blockade may result in the loss of diabetic control and delayed recovery from hypoglycaemia. The dose of insulin or oral hypoglycaemic agent may need adjustment.

Other Metabolic Effects

Beta-adrenoreceptors are involved in the regulation of lipid as well as carbohydrate metabolism. Some drugs affect the lipid profile adversely although the long-term clinical significance of this change is unknown and the effect appears to be less for drugs with intrinsic sympathomimetic activity.

Phaeochromocytoma

In patients with this condition, an alpha-blocking drug (e.g. phentolamine/phenoxybenzamine) should be administered before the beta-blocker to avoid exacerbation of hypertension.

Eye and Skin Reactions

Various skin rashes and conjunctival xerosis have been reported with beta-blockers. Cross-reactions may occur between beta-blockers, therefore substitutions within the group may not necessarily preclude occurrence of symptoms.

During long-term treatment with the beta-blocking drug, practolol, a specific rash bearing a superficial resemblance to psoriasis was occasionally described. In a number of patients affected, this rash was accompanied by adverse effects on the eye (xerophthalmia and/or keratoconjunctivitis) of varying severity. This condition is called the oculomucocutaneous syndrome or practolol syndrome. In a few patients, these eye changes occurred independently of a skin rash. On rare occasions, serous otitis media, sclerosing peritonitis, pericarditis and pleurisy have been reported. Although the practolol syndrome has not been observed in patients taking other beta-blockers, the possibility of such side effects occurring should be borne in mind.

More recently an association between Peyronie's disease (a fibrosing induration of the penis) and various beta-blockers has been suggested but is not proven.

Allergic Conditions

These may be exaggerated by beta-blockade (e.g. allergic rhinitis during the pollen season and allergic reactions to bee and wasp stings). Beta-blockers should be avoided if there is a risk of bronchospasm.

Hyperthyroidism

Because beta-blockers may mask the clinical signs of developing or continuing hyperthyroidism, resulting in symptomatic improvement without any change in thyroid hormone status, special care should be exercised in those patients who are hyperthyroid and are also receiving beta-blockers.

Renal Disease

In patients with severe renal disease, haemodynamic changes following beta-blockade may impair renal function further. Beta-blockers which are excreted mainly by the kidney, may require dose adjustment in patients with renal failure.

Significant Cardiomegaly**Use in Pregnancy (Category C)**

Category C – Definition: Drugs which, owing to their pharmacological effects, have caused or may be suspected of causing, harmful effects on the human foetus or neonate without causing malformations. These effects may be reversible. Accompanying texts should be consulted for further details.

Neonates born to mothers who are receiving atenolol at parturition or breast-feeding may be at risk of hypoglycaemia and bradycardia. Therefore, during the later stages of pregnancy and parturition, this drug should only be given after weighing the needs of the mother against the risk to the foetus.

Atenolol crosses the placental barrier in pregnant women, and under steady state conditions, maternal and foetal blood levels of atenolol are approximately equal.

No studies have been performed on the use of atenolol in the first trimester and the possibility of foetal injury cannot be excluded. Atenolol has been used under close supervision for the treatment of hypertension in the third trimester. Administration of atenolol for longer periods to pregnant women in the management of mild to moderate hypertension has been associated with intrauterine growth retardation. The use of atenolol in women who are, or may become, pregnant requires that the anticipated benefit be weighed against the possible risks, particularly in the first and second trimesters.

Atenolol has been shown to produce a dose related increase in embryo/foetal resorptions in rats at doses equal to or greater than 50 mg/kg. Although similar effects were not seen in rabbits, the compound was not evaluated in rabbits at doses above 25 mg/kg.

Use in Lactation

There is significant accumulation of atenolol in breast milk. Neonates born to mothers who are receiving atenolol at parturition or breast-feeding may be at risk of hypoglycaemia and bradycardia. Caution should be exercised when atenolol is administered to breastfeeding women and the infant should be regularly assessed for signs of beta-blockade.

Interactions with Other Medicines

Concomitant Therapy with Calcium Antagonists

The concomitant use of beta-blockers and calcium antagonists with myocardial depressant and sinus node activity, e.g. verapamil and to a lesser extent diltiazem, may cause hypotension, bradycardia and asystole, particularly in patients with impaired ventricular function and/or sinoatrial or atrioventricular conduction abnormalities. Extreme caution is required if these drugs have to be used together.

The dihydropyridine calcium antagonists (e.g. nifedipine) have a weaker myocardial depressant effect and can be administered cautiously with beta-blockers. If excessive hypotension develops, the calcium antagonist should be stopped or the dosage reduced.

Antiarrhythmic Drugs

Care should be taken when prescribing beta-blockers with antiarrhythmic drugs. Class IA antiarrhythmic drugs (eg disopyramide) and the Class III agent, amiodarone may have a potentiating effect on arterial conduction time and induce negative inotropic effect; this is seen less frequently with quinidine; class IB agents, tocainide, mexiletine and lignocaine; class IC agents, flecainide and propafenone (not available in Australia) and the class IV antiarrhythmic agents.

Use of Catecholamine Depleting Agents

Concomitant use of drugs such as reserpine and guanethidine requires careful monitoring since the added effect of beta-blockade may produce an excessive reduction of the resting sympathetic nervous tone.

Clonidine

Concurrent use of beta-blockers and clonidine should be avoided because of the risk of adverse interaction and severe withdrawal symptoms. If administered concomitantly, the clonidine should not be discontinued until several days after the withdrawal of the beta-blocker.

Insulin and Oral Hypoglycaemics

See **PRECAUTIONS** – Diabetes.

Anaesthetics

Anaesthetics, such as ether, chloroform, cyclopropane and methoxyflurane, are contraindicated with atenolol (see **PRECAUTIONS**, Anaesthesia and the Peri-Operative Period).

Digitalis / Digitalis Glycosides

Digitalis/digitalis glycosides and beta-blockers are commonly used together, although there have been reports of excessive bradycardia when beta-blockers are used to treat digitalis intoxication.

Sympathomimetic Agents

Concomitant use of sympathomimetic agents, e.g. adrenaline, may counteract the effects of beta-blockers.

Prostaglandin Synthetase Inhibitors

Concomitant use of prostaglandin synthetase inhibiting drugs, e.g. ibuprofen and indomethacin may decrease the hypotensive effects of beta-blockers.

ADVERSE EFFECTS

Adverse effects reported in clinical trials of atenolol are mainly attributable to pharmacological actions. The adverse effects listed below have been observed in patients in clinical trials who have received dosages of about 100 mg/day. It is not possible to give percentage incidences for each reaction, but if all mild and transient reactions are included as well as more serious ones, up to 10% of patients may experience some form of adverse reaction.

More Common Reactions

Gastrointestinal

Disturbances including indigestion, constipation, dry mouth.

Nervous System

Fatigue, dizziness.

Respiratory

Wheezing, bronchospasm (see **CONTRAINDICATIONS**).

Less Common Reactions

Biochemical Abnormalities

Increases in AST, blood urea and serum creatine have been reported.

Cardiovascular

Bradycardia, left ventricular insufficiency, postural hypotension (which may be associated with syncope), Raynaud's phenomenon, cold extremities, deterioration in heart failure, heart block. Intermittent claudication may occur if already present.

Dermatological

Rash, alopecia, psoriasiform skin reaction, exacerbation of psoriasis.

Gastrointestinal

Diarrhoea.

Hepatic

Elevations of transaminase levels have been seen infrequently; rare cases of hepatic toxicity including intrahepatic cholestasis have been reported.

Genitourinary

Impotence.

Musculoskeletal

Ataxia.

Nervous System

Vivid dreams, paraesthesia, tinnitus, vertigo, malaise, headache, insomnia, mood changes, nightmares, confusion.

Ocular

Dry eyes, visual disturbances.

Psychiatric

Hallucinations, depression, psychoses.

Respiratory

Asthma, dyspnoea, nasal congestion.

Haematological

Thrombocytopenia, purpura. An increase in ANA (Antinuclear Antibodies) has been observed, however, the clinical relevance of this is not clear.

Severe or Life-Threatening Reactions

Myocardial insufficiency may require treatment with digitalis and diuretics. Bradycardia may respond to atropine. Bronchospasm may be reversed with a β_2 -stimulant. Hypotension, if severe, may require use of a vasopressor.

DOSAGE AND ADMINISTRATION**Adults**Hypertension

Therapy should be initiated with atenolol 50 mg daily. This may be increased each week in daily doses of 50 mg up to a maximum of 200 mg. Where patients are controlled on daily doses of 50 to 100 mg this may be given once daily. Doses above 100 mg daily should be given on a divided basis. Where necessary, a further reduction in blood pressure may be achieved by combining atenolol with other antihypertensive agents.

Patients can be transferred to atenolol from other antihypertensive treatments with the exception of clonidine (see **PRECAUTIONS**, Clonidine).

Angina Pectoris

Therapy should be initiated with atenolol 50 mg daily. This may be increased if required to 100 mg daily given as a single or divided dose. It is unlikely that additional benefit will be gained by increasing the dose.

Cardiac Dysrhythmias

50 mg to 100 mg daily (for controlled cardiac dysrhythmias).

Acute Myocardial Infarction – Late Intervention (> 12 hours from onset of chest pain).

Atenolol has been shown to reduce infarct size, reduce the incidence of ventricular arrhythmias, reduce the need for opiate analgesics and reduce mortality in the first 7 post-infarction days, most of the benefit being in the first 48 hours.

Data from other beta-blocker trials suggest that there is a significant reduction in mortality and a reduced incidence of non-fatal reinfarction if the beta-blocker is continued for one to three years. Hence, maintenance oral therapy of atenolol 50 mg daily is recommended for one to three years following myocardial infarction, beginning after early intervention with other agents, or immediately in those patients who present more than 12 hours after suffering an acute myocardial infarction.

Impaired Renal Function

Since atenolol is excreted via the kidneys, dosage should be adjusted in cases of severe impairment of renal function. No significant accumulation of atenolol occurs at a creatine clearance greater than 35 mL/min/1.73m² (normal range is 100 to 150 mL/min/1.73m²). For patients with a creatine clearance of 15 to 35 mL/min/1.73m² (equivalent to serum creatinine of 300 to 600 µmol/L), the oral dose should be 50 mg daily or 100 mg on alternate days.

For patients with a creatinine clearance less than 15 mL/min/1.73m² (equivalent to serum creatinine greater than 600 µmol/L). The oral dose should be 50 mg on alternate days or 100 mg every fourth day.

Patients on haemodialysis should be given 50 mg orally after each dialysis: this should be done under hospital supervision as marked falls in blood pressure can occur.

Elderly

Similarly, dosage requirements in the elderly may need to be reduced, especially in patients with impaired renal function.

Children

There is no experience with atenolol in children.

OVERDOSAGE

Symptoms

Overdosage has not been reported with atenolol but in overdosage with other beta-blocking agents, severe bradycardia and hypotension are commonly found. Acute heart failure and bronchospasm may also occur.

Treatment

Severe Bradycardia

Atropine 1 to 2 mg intravenously may be used to induce vagal blockade. If bradycardia persists, intravenous isoprenaline (25 microgram initially) or orciprenaline (0.5 mg given by slow intravenous injection) may be given. In refractory cases, the use of a cardiac pacemaker may be considered.

Hypotension

Severe hypotension should respond to a sympathomimetic amine such as noradrenaline. In refractory cases, the use of glucagon hydrochloride should be considered.

Bronchospasm

Therapy with a beta₂-stimulant such as salbutamol or terbutaline or therapy with aminophylline may be considered.

Acute Cardiac Failure

Conventional therapy with digitalis, diuretics and oxygen should be instituted immediately. In refractory cases, the use of intravenous isoprenaline, followed if necessary by glucagon hydrochloride or intravenous aminophylline, should be considered.

Contact the Poison Information Centre on 13 11 26 (Australia) for advice on the management of overdosage.

PRESENTATION AND STORAGE CONDITIONS

Apo-Atenolol 50mg tablets are white, round flat-faced tablets, bevelled edge with 'APO' on one side and 'ATE' over score '50' on the reverse side.

AUST R 129861 (blister) – blister pack of 30 tablets. (Not marketed)

AUST R 129862 (bottle) – bottle of 30 tablets. (Not marketed)

Apo-Atenolol 50mg tablets are intended for oral administration. Each tablet contains atenolol 50mg.

In addition, each tablet contains the following inactive ingredients: microcrystalline cellulose, crospovidone, magnesium stearate and colloidal anhydrous silica.

Store below 25°C. Store in original package.

NAME AND ADDRESS OF THE SPONSOR

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POISON SCHEDULE OF THE MEDICINE

S4: Prescription Only Medicine.

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