Oxeladin Citrate *(BANM, rINNM)*

Citrato de oxeladina; Okseladiinivetysitraatti; Okseladino-vandenilio citratas; Oxeladin-citrát; Oxéladine, Citrate d'; Oxéladine, hydrogénocitrate d'; Oxeladini Citras; Oxeladini hydrogenocitras; Oxeladinvätecitrat. 2-(2-Diethylaminoethoxy)ethyl 2-ethyl-2-phenylbutyrate dihydrogen citrate.

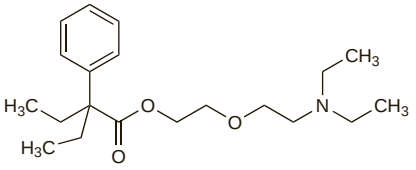
Окселадина Цитрат

$C_{20}H_{33}NO_3,C_6H_8O_7$ = 527.6.

CAS — 468-61-1 (oxeladin); 52432-72-1 (oxeladin citrate).

ATC — R05DB09.

ATC Vet — QR05DB09.



(oxeladin)

Pharmacopoeias. In *Eur.* (see p.vii).

Ph. Eur. 6.2 (Oxeladin Hydrogen Citrate). A white or almost white, crystalline powder. It exhibits polymorphism. Freely soluble in water; slightly to very slightly soluble in ethyl acetate.

Profile

Oxeladin citrate has been given orally as a centrally acting cough suppressant for non-productive cough (p.1547). Up to 50 mg daily in divided doses has been given orally. Higher doses of up to 120 mg daily have been given as a modified-release preparation.

Preparations

Proprietary Preparations (details are given in Part 3)
Arg.: Elitos; Frenotos; Nadetos; Plardox; ***Fr.:*** Paxeladine.

Multi-ingredient: ***Arg.:*** Aseptobron Bromexina; Aseptobron C; Frenotos Muc; Pectoral Lafedar; ***Braz.:*** Novotussan†; Tossivitan†; Tripulmin†; ***Mex.:*** Fluxedan; TheraFlu Tenalif.

Oxolamine *(rINN)*

683-M; Oksolamiini; Oksolamin; Oxolamin; Oxolamina; Oxolaminum. 5-[2-(Diethylamino)ethyl]-3-phenyl-1,2,4-oxadiazole.

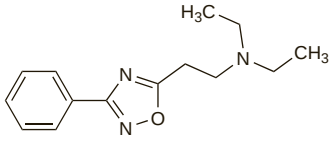
Оксоламин

$C_{14}H_{19}N_3O$ = 245.3.

CAS — 959-14-8.

ATC — R05DB07.

ATC Vet — QR05DB07.



Oxolamine Citrate *(rINNM)*

AF-438; Citrato de oxolamina; Oxolamine, Citrate d'; Oxolamini Citras; SKF-9976.

Оксоламина Цитрат

$C_{14}H_{19}N_3O,C_6H_8O_7$ = 437.4.

CAS — 1949-20-8.

ATC — R05DB07.

ATC Vet — QR05DB07.

Oxolamine Phosphate *(rINNM)*

Fosfato de oxolamina; Oxolamine, Phosphate d'; Oxolamini Phosphas.

Оксоламина Фосфат

CAS — 1949-19-5.

ATC — R05DB07.

ATC Vet — QR05DB07.

Profile

Oxolamine is a cough suppressant with a mainly peripheral action that has been used for non-productive cough (p.1547). It has been given as the citrate in usual oral doses of 100 to 200 mg three times daily. The phosphate has been used similarly. It has also been given as the tannate.

Hallucinations in children have been reported after oxolamine use.

◊ References.

1. McEwen J, *et al.* Hallucinations in children caused by oxolamine citrate. *Med J Aust* 1989; **150:** 449–52.

Interactions. ***ANTICOAGULANTS.*** For mention of a possible interaction between oxolamine and *warfarin*, see Cough Suppressants, p.1430.

Preparations

Proprietary Preparations (details are given in Part 3)
Chile: Numosol; Perebron; Respibron; Tulox; ***Israel:*** Symphocal; ***Ital.:*** Gantrimex†; Perebron; Tussibron; ***Mex.:*** Aledron; Bredon; Contuxin; Eumol; Expecmin; Fartoxol†; Kentosanil†; Oxathos; Oxobron; Oxomar; Oxomifer; Oxotus; Oxotusin; Toxal†; Tukson†; ***Turk.:*** Kalamin; Oksabron; Perbrons; Perebron; Sekodin; Subitol; ***Venez.:*** Broxol; Cafox; Calcimonio; Citralamina; Exeton†; Lexo; Opilina; Oxalcor; Oxolam†; Oxotil; Perebron; Toxolen†.

Multi-ingredient: ***Ital.:*** Uniplus; ***Mex.:*** Caltusine; Caobe; ***Turk.:*** Forza; Katarin; Katarin Forte; Oledro; ***Venez.:*** Broxamel†; Opilina Compuesta; Oxolavin Compuesto; Perebron con Miel†.

Oxymetazoline Hydrochloride

(BANM, USAN, rINNM) ⊗

H-990; Hidrocloruro de oximetazolina; Oksimetatsoliinihydrokloridi; Oksimetazolin Hidroklorür; Oksimetazolino hidrochloridas; Oximetazolin-hidroklorid; Oximetazolinhydroklorid; Oxymetazolin hydrochlorid; Oxymétazoline, chlorhydrate d'; Oxymetazolini hydrochloridum; Sch-9384.

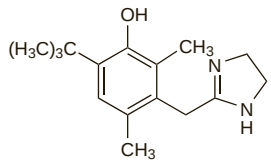
Оксиметазолина Гидрохлорид

$C_{16}H_{24}N_2O,HCl$ = 296.8.

CAS — 2315-02-8.

ATC — R01AA05; R01AB07; S01GA04.

ATC Vet — QR01AA05; QR01AB07; QS01GA04.



(oxymetazoline)

Pharmacopoeias. In *Eur.* (see p.vii) and *US.*

Ph. Eur. 6.2 (Oxymetazoline Hydrochloride). A white or almost white, crystalline powder. Freely soluble in water and in alcohol.

USP 31 (Oxymetazoline Hydrochloride). A white to practically white, fine, hygroscopic, crystalline powder. Soluble 1 in 6.7 of water, 1 in 3.6 of alcohol, and 1 in 862 of chloroform; practically insoluble in ether and in benzene. pH of a 5% solution in water is between 4.0 and 6.5. Store in airtight containers.

Adverse Effects and Precautions

As for Naphazoline, p.1565.

Porphyria. Oxymetazoline has been associated with acute attacks of porphyria and is considered unsafe in porphyric patients.

Interactions

Since oxymetazoline is absorbed through the mucosa interactions may follow topical application. The *BNF* considers that all sympathomimetic nasal decongestants may cause a hypertensive crisis if used during treatment with an MAOI. For the interactions of sympathomimetics in general, see p.1407.

Uses and Administration

Oxymetazoline is a direct-acting sympathomimetic (p.1408) with marked alpha-adrenergic activity. It is a vasoconstrictor and reduces swelling and congestion when applied to mucous membranes. It acts within a few minutes and the effect lasts for up to 12 hours. It is used as the hydrochloride for the symptomatic relief of nasal congestion (p.1548). In adults and children over 6 years, a 0.05% solution of oxymetazoline hydrochloride is applied topically as nasal drops or a spray, usually 2 or 3 times daily to each nostril as required. Over-the-counter cough and cold preparations containing sympathomimetic decongestants (including oxymetazoline) should be used with caution in children and generally avoided in those under 2 years of age (see p.1547).

A 0.025% solution of oxymetazoline hydrochloride may be instilled into the eye every 6 hours when necessary as a conjunctival decongestant in adults and children over 6 years (see Conjunctivitis, p.564).

Preparations

USP 31: Oxymetazoline Hydrochloride Nasal Solution; Oxymetazoline Hydrochloride Ophthalmic Solution.

Proprietary Preparations (details are given in Part 3)
Arg.: Apracur Nasal; Dristan Nasal†; Isly†; Lidil; Newclar; Rinox VX; Vick Sinex†; Visine D; Yusin; ***Austral.:*** Chemists Own Decongestant Nasal Spray†; Dimetapp 12 Hour Nasal; Drixine Nasal; Logicin Rapid Relief; Ordov Sinudec†; ***Austria:*** Nasivin; ***Belg.:*** Nesivine; Rhino Humex; Vicks Sinex; ***Braz.:*** Afrin; Aturgyl; Desfrin; Freenal; Nasivin; ***Canad.:*** Claritin Allergic Congestion Relief; Claritin Eye Allergy Relief; Decongestant Nasal Mist; Dristan; Drixoral; Long Lasting Nasal Mist; Nafrine†; Vicks Sinex; Visine Workplace; ***Chile:*** Facimin; Iliadin; Isly†; Oxilin; ***Cz.:*** Iversal†; Nasivin; Oxamet; ***Denm.:*** Drixin; Iliadin; ***Fin.:*** Vicks Sinex; ***Fr.:*** Aturgyl; ***Ger.:*** Em-medical Mono†; Nasivin; Nasivin gegen Schnupfen†; Nasivin Sanft; Nasivinetten gegen Schnupfen†; Vistoxyn; Wick Sinex; ***Gr.:*** Narol; Ronal; ***Hong Kong:*** Afrin; Duration; Iliadin; Logicin Rapid Relief; Long Lasting Decongestant Nasal Mist; Nezeril†; Oxylin†; ***Hung.:*** Afrin; Nasivin; ***India:*** Naselin; Nasivion; Sinarest; Sinarest-PD; ***Indon.:*** Afrin; Iliadin; Visine LR; ***Irl.:*** Dristan†; ***Israel:*** Af-Tipa; Alrin; Nasivin†; Rhinoclir; Sinulen; ***Ital.:*** Actifed Nasale; Coricidin†; Oxilin; Rino Calyptol; ***Jpn:*** Nasivin; ***Malaysia:*** Afrin; Iliadin; Oxynase†; ***Mex.:*** Afrin; Fracidin†; Iliadin; Naztril; Ocuclear†; Oxylin; Sinex; Visine AD; ***Neth.:*** Nasivin; Oxylin; Vicks Sinex; ***Norw.:*** Iliadin; Rhinox; ***NZ:*** At-Eze; Dimetapp 12 Hour Nasal; Drixine†; ***Philipp.:*** Drixine; Nasivin; ***Pol.:*** Acatar; Afrin; Nasivin; Nosox; Oxalin; Resoxym; ***Port.:*** Alerjon; Bisolspray; Nasarox; Nasex; Nasorhinathiol; Neozine†; Oxylin; Rinerge; Sinexsensi; Vicks Vapospray; ***Rus.:*** Nasivin (Називин); Nazol (Назол); Sanorinchik (Саноринчик); ***S.Afr.:*** Dristan; Drixine; Iliadin; Merck-P Nasal†; Oxylin; Sparkling White Eye Drops; Vicks Decongestant; ***Singapore:*** Afrin; Iliadin; Nazolin; Oxy-Nase; Utabon; ***Spain:*** Alerfrin; Antirrinum; Corilisina; Couldespir; Idasal Nebulizador†; Ilvinax; Nasolina; Nebulicina; Oftinal; Respibien; Respir; Serranasal; Utabon; ***Swed.:*** Iliadin; Nasin; Nezeril; Zolin†; ***Switz.:*** Nasivine; Nasivinettes†; Vistoxyn†; ***Thai.:*** Iliadin; Oxymet; ***Turk.:*** Iliadin; Oksinazal; ***UAE:*** Nasivin; ***UK:*** Afrazine; Nasivin; Vicks Sinex; ***USA:*** 4-Way Long Lasting; Afrin; Allerest 12 Hour Nasal; Chlorphed-LA; Dristan 12-hr Nasal Decongestant Spray; Dristan Long Lasting; Duramist Plus; Duration; Genasal; Nasal Relief; Nasal Spray; Neo-Synephrine 12 Hour; Nostrilla; NTZ Long Acting Nasal; Ocuclear†; Twice-A-Day; Vicks Sinex 12-Hour; Visine LR; ***Venez.:*** Afrin; Airfen; Clarix; Drixine; Nasin; Solarsal†.

Multi-ingredient: ***Arg.:*** Panoxi; ***Austral.:*** Nasex; Vasylox†; Vicks Sinex; ***Austria:*** Wick Sinex; ***Fr.:*** Deturgylone; ***Hong Kong:*** Bonjedex; ***Hung.:*** Nasopax; ***Israel:*** Sinaf; ***Ital.:*** Triaminic; Vicks Sinex; ***Mex.:*** Grimal; Hyalox; ***NZ:*** Vicks Sinex; ***Rus.:*** Nazol Advance (Назол Адванс); ***S.Afr.:*** Nazene Z; ***Spain:*** Egarone†; Seniospray; Vicks Spray; ***Switz.:*** Vicks Sinex.

Pentoxyverine *(BAN, rINN)*

Carbetapentane; Pentoksiveriini; Pentoxiverin; Pentoxiverina; Pentoxyvérine; Pentoxyverinum. 2-[2-(Diethylamino)ethoxy]ethyl 1-phenylcyclopentanecarboxylate.

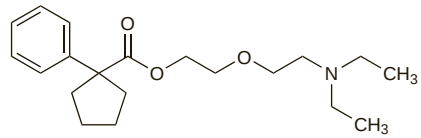
Пентоксиверин

$C_{20}H_{31}NO_3$ = 333.5.

CAS — 77-23-6.

ATC — R05DB05.

ATC Vet — QR05DB05.



Pentoxyverine Citrate *(BANM, rINNM)*

Carbetapentane Citrate; Citrato de pentoxiverina; Pentoksiveriinivetysitraatti; Pentoksiverino-vandenilio citratas; Pentoxiverin-hidrogén-citrát; Pentoxiverinvätecitrat; Pentoxyverin-citrát; Pentoxyvérine, Citrate de; Pentoxyverine Hydrogen Citrate; Pentoxyvérine, hydrogénocitrate de; Pentoxyverini Citras; Pentoxyverini hydrogenocitras; UCB-2543.

Пентоксиверина Цитрат

$C_{20}H_{31}NO_3,C_6H_8O_7$ = 525.6.

CAS — 23142-01-0.

ATC — R05DB05.

ATC Vet — QR05DB05.

Pharmacopoeias. In *Chin., Eur.* (see p.vii), and *Jpn.*

Ph. Eur. 6.2 (Pentoxyverine Hydrogen Citrate; Pentoxyverine Citrate BP 2008). A white or almost white crystalline powder. M.p. about 93°. Freely soluble in water and in methyl alcohol; soluble in alcohol and in dichloromethane; very soluble in glacial acetic acid. A 10% solution in water has a pH of 3.3 to 3.7. Protect from light.

Pentoxyverine Hydrochloride *(BANM)*

Pentoksiverin Hidroklorür; Pentoxiverina, hidrocloruro de.

Пентоксиверина Гидрохлорид

$C_{20}H_{31}NO_3,HCl$ = 369.9.

CAS — 1045-21-2.

ATC — R05DB05.

ATC Vet — QR05DB05.

Profile

Pentoxyverine is a centrally acting cough suppressant used for non-productive cough (p.1547). Usual doses of up to 180 mg daily of the citrate or hydrochloride have been given orally in divided doses. The tannate is also given orally and the base has been given rectally.

Preparations

Proprietary Preparations (details are given in Part 3)

Austral.: Nyal Dry Cough†; ***Austria:*** Atenos; Sedotussin; ***Belg.:*** Balsoclase Antitussivum; Tuclase; ***Cz.:*** Sedotussin†; ***Denm.:*** Toclase†; ***Fin.:*** Toclase; ***Fr.:*** Pectosan Toux Seche; Toclase Toux Seche; Vicks Pectoral; ***Ger.:*** Pertix-Solo-N, Pertix-T, Pertix-Z, and Pertix-L†; Sedotussin; ***Gr.:*** Tuclase; ***Hong Kong:*** Toclase; ***Hung.:*** Sedotussin; ***Ital.:*** Tuclase; ***Neth.:*** Balsoclase; Tuclase; ***Norw.:*** Toclase; ***Philipp.:*** Toclase; ***Swed.:*** Toclase; ***Thai.:*** Toclase; ***Turk.:*** Toclase; ***USA:*** Solotuss; ***Venez.:*** Carbin†.

Multi-ingredient: ***Arg.:*** Bio Grip Plus; Rynatus†; Wilpan Antigripal; Wilpan C†; ***Austral.:*** Vicks Cough Syrup; ***Austria:*** Tussoretardin; ***Belg.:*** Balsoclase Expectorans; ***Braz.:*** Alergo Glucalbet†; Coldrin; Gegrip†; Resprin; ***Fin.:*** Toclase Expectorant; ***Ger.:*** Sedotussin plus†; ***Hong Kong:*** Coci-Fedra; Marflu-X; Vida Cough; ***Neth.:*** Balsoclase Compositum; Balsoclase-E; ***S.Afr.:*** Vicks Acta Plus; ***Switz.:*** Sedotussin†; ***Turk.:*** Gayaben; ***USA:*** AMBI 1000/5; Aridex; BetaVent; C-Tanna 12D; Carb Pseudo-Tan; Carbatab; Diphen Tann/ PE Tann/ CT Tann; Duratuss CS; Dynex VR; Dytan-AT; Dytan-CD; Dytan-CS; Exratuss; Extendryl GCP; Levall; Levall 12; Oratuss; Pyrlex CB; Re-Tann; Rentamine Pediatric; Respi-Tann G; Ry-Tuss†; Rynatuss; Tannic-12; Tri-Tannate Plus Pediatric; Tuss-Tan; Tussi-12; Tussi-12 D; Tussi-12D S; Tussizone; Vazotan; XiraTuss; Xpect-AT; ***Venez.:*** Resprin; Tolmex; Yerba Santa.

Phenylephrine *(BAN, rINN)*

Fenilefrin; Fenilefrina; Fenilefrinas; Fenylefrin; Fenyyliefriini; Phényléphrine; Phenylephrinum; *m*-Synephrine. (1*R*)-1-(3-Hydroxyphenyl)-2-methylaminoethanol.

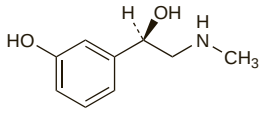
Фенилэфрин

$C_9H_{13}NO_2$ = 167.2.

CAS — 59-42-7.

ATC — C01CA06; R01AA04; R01AB01; R01BA03; S01FB01; S01GA05.

ATC Vet — QC01CA06; QR01AA04; QR01AB01; QR01BA03; QS01FB01; QS01GA05.



NOTE. Synephrine has been used as a synonym for oxedrine (p.1364). Care should be taken to avoid confusion with phenylephrine (*m*-synephrine).

Pharmacopoeias. In *Eur.* (see p.vii).

Ph. Eur. 6.2 (Phenylephrine). A white or almost white crystalline powder. Slightly soluble in water and in alcohol; sparingly soluble in methyl alcohol. It dissolves in dilute mineral acids and in solutions of alkali hydroxides. Store in airtight containers. Protect from light.

Phenylephrine Acid Tartrate

Phenylephrine Bitartrate *(rINNM)*; Bitartrato de fenilefrina; Phényléphrine, Bitartrate de; Phenylephrine Tartrate *(BANM)*; Phenylephrini Bitartras; Tartrato ácido de fenilefrina.

Фенилэфрина Битартрат

$C_9H_{13}NO_2.C_4H_6O_6$ = 317.3.

CAS — 13998-27-1.

ATC — C01CA06; R01AA04; R01AB01; R01BA03; S01FB01; S01GA05.

ATC Vet — QC01CA06; QR01AA04; QR01AB01; QR01BA03; QS01FB01; QS01GA05.

Pharmacopoeias. In *US.*

USP 31 (Phenylephrine Bitartrate). A white or almost white powder or colourless crystals. Freely soluble in water. pH of a 10% solution in water is between 3.0 and 4.0. Store in airtight containers. Protect from light.

Phenylephrine Hydrochloride *(BANM, rINNM)*

Fenilefrin Hidroklorür; Fenilefrin-hidroklorid; Fenilefrino hidrochloridas; Fenylefrin hydrochlorid; Fenylefrinhydroklorid; Fenylefryny chlorowodorek; Fenyyliefriinihydrokloridi; Hidrocloruro de fenilefrina; Mesatonum; Metaoxedrini Chloridum; Phényléphrine, chlorhydrate de; Phenylephrini hydrochloridum.

Фенилэфрина Гидрохлорид

$C_9H_{13}NO_2.HCl$ = 203.7.

CAS — 61-76-7.

ATC — C01CA06; R01AA04; R01AB01; R01BA03; S01FB01; S01GA05.

ATC Vet — QC01CA06; QR01AA04; QR01AB01; QR01BA03; QS01FB01; QS01GA05.

NOTE. PHNL is a code approved by the BP 2008 for use on single unit doses of eye drops containing phenylephrine hydrochloride where the individual container may be too small to bear all the appropriate labelling information. PHNCYC is a similar code approved for eye drops containing phenylephrine hydrochloride and cyclopentolate hydrochloride.

Pharmacopoeias. In *Chin., Eur.* (see p.vii), *Jpn*, and *US.*

Ph. Eur. 6.2 (Phenylephrine Hydrochloride). A white or almost white, crystalline powder. Freely soluble in water and in alcohol.

USP 31 (Phenylephrine Hydrochloride). White or practically white, odourless, crystals. Freely soluble in water and in alcohol. Store in airtight containers at a temperature of 25°, excursions permitted between 15° and 30°. Protect from light.

Incompatibility. Phenylephrine is stated to be incompatible with the local anaesthetic butacaine.

Adverse Effects and Precautions

As for Sympathomimetics, p.1407; phenylephrine has mainly alpha-agonist effects. It has a longer duration of action than noradrenaline and an excessive vasopressor response may cause a prolonged rise in blood pressure. It induces tachycardia or reflex bradycardia and should therefore be avoided in severe hyperthyroidism and used with caution in severe ischaemic heart disease. Patients with diabetes mellitus or prostatic hyperplasia should also avoid phenylephrine.

Since phenylephrine is absorbed through the mucosa systemic effects may follow application to the eyes or the nasal mucosa. In particular, phenylephrine 10% eye drops can have powerful systemic effects. They should be avoided or only used with extreme caution in infants, the elderly, and in patients with cardiac disease, significant hypertension, or advanced arteriosclerosis. Fatalities have been reported in patients with pre-existing cardiovascular disease.

Use of phenylephrine in the eye may liberate pigment granules from the iris, especially when given in high doses to elderly patients. Ophthalmic solutions of phenylephrine are contra-indicated in patients with angle-closure glaucoma. Corneal clouding may occur if corneal epithelium has been denuded or damaged.

Excessive or prolonged use of phenylephrine nasal drops can lead to rebound congestion.

Phenylephrine hydrochloride is irritant and may cause local discomfort at the site of application; extravasation of the injection may even cause local tissue necrosis.

Effects on the cardiovascular system. Systemic adverse effects have occurred after the use of phenylephrine as eye drops (particularly at a strength of 10%), or nasal drops.

Hypertension[1] and hypertension with pulmonary oedema[2] have been described in infants and children after the use of phenylephrine 10% eye drops. Hypertension with arrhythmias has also been reported in an 8-year-old child[3] and in an adult[4] after phenylephrine 10% eye drops had been used. Details have also been published on a series of 32 patients who had systemic cardiovascular reactions, including fatal myocardial infarctions, after the use of phenylephrine 10% solutions in the eye.[5] Severe cardiovascular adverse reactions have also been reported to the use of phenylephrine as topical 10% ocular[6] or 0.25% nasal[7] pledgets.

Although the incidence of such reactions seems low,[8] the use of lower concentrations[1,5] and caution in susceptible patients such as those with cardiovascular disorders or the elderly,[5] have been advocated. A reduction in the eye-drop volume has been found to produce adequate mydriasis and may reduce systemic absorption and the risk of adverse cardiovascular effects.[9,10]

1. Borromeo-McGrail V, *et al.* Systemic hypertension following ocular administration of 10% phenylephrine in the neonate. *Pediatrics* 1973; **51:** 1032–6.
2. Baldwin FJ, Morley AP. Intraoperative pulmonary oedema in a child following systemic absorption of phenylephrine eyedrops. *Br J Anaesth* 2002; **88:** 440–2.
3. Vaughan RW. Ventricular arrhythmias after topical vasoconstrictors. *Anesth Analg* 1973; **52:** 161–5.
4. Lai Y-K. Adverse effect of intraoperative phenylephrine 10%: case report. *Br J Ophthalmol* 1989; **73:** 468–9.
5. Fraunfelder FT, Scafidi AF. Possible adverse effects from topical ocular 10% phenylephrine. *Am J Ophthalmol* 1978; **85:** 447–53.
6. Fraunfelder FW, *et al.* Adverse systemic effects from pledgets of topical ocular phenylephrine 10%. *Am J Ophthalmol* 2002; **134:** 624–5.
7. Hecker RB, *et al.* Myocardial ischemia and stunning induced by topical intranasal phenylephrine pledgets. *Mil Med* 1997; **162:** 832–5.
8. Brown MM, *et al.* Lack of side effects from topically administered 10% phenylephrine eyedrops: a controlled study. *Arch Ophthalmol* 1980; **98:** 487–9.
9. Craig EW, Griffiths PG. Effect on mydriasis of modifying the volume of phenylephrine drops. *Br J Ophthalmol* 1991; **75:** 222–3.
10. Wheatcroft S, *et al.* Reduction in mydriatic drop size in premature infants. *Br J Ophthalmol* 1993; **77:** 364–5.

Effects on the eyes. Acute and chronic conjunctivitis has been reported[1] after use of over-the-counter ophthalmic decongestant preparations of phenylephrine, naphazoline, or tetryzoline. The conjunctival inflammation took several weeks to resolve in some cases. Dermatoconjunctivitis[2] has also been reported after use of phenylephrine eye drops.

1. Soparkar CN, *et al.* Acute and chronic conjunctivitis due to over-the-counter ophthalmic decongestants. *Arch Ophthalmol* 1997; **115:** 34–8.
2. Moreno-Ancillo A, *et al.* Allergic contact reactions due to phenylephrine hydrochloride in eyedrops. *Ann Allergy Asthma Immunol* 1997; **78:** 569–72.

Effects on mental function. Hallucinations and paranoid delusions have been reported[1] in a patient after excessive use of a nasal spray containing phenylephrine 0.5%. Mania has also followed the use of large oral doses.[2]

1. Snow SS, *et al.* Nasal spray 'addiction' and psychosis: a case report. *Br J Psychiatry* 1980; **136:** 297–9.
2. Waters BGH, Lapierre YD. Secondary mania associated with sympathomimetic drug use. *Am J Psychiatry* 1981; **138:** 837–40.

Hypersensitivity. Cross-sensitivity to phenylephrine has been reported in a patient hypersensitive to pseudoephedrine.[1] See also Effects on the Eyes, above.

1. Buzo-Sanchez G, *et al.* Stereoisomeric cutaneous hypersensitivity. *Ann Pharmacother* 1997; **31:** 1091.

Interactions

As for Sympathomimetics, p.1407. Phenylephrine has mainly direct alpha-agonist properties and is less liable than adrenaline or noradrenaline to induce ventricular fibrillation if used as a pressor agent during anaesthesia with inhalational anaesthetics such as cyclopropane and halothane; nevertheless, caution is necessary. Since phenylephrine is absorbed through the mucosa, interactions may also follow topical application, particularly in patients receiving an MAOI (including a RIMA). See also under Phenelzine (p.418) and Moclobemide (p.411).

Cardiovascular drugs. Hypertensive reactions have been reported in a patient stabilised on *debrisoquine* when given phenylephrine orally,[1] in patients receiving *reserpine* or *guanethidine* when given phenylephrine eye drops,[2] and a fatal reaction occurred in a patient receiving *propranolol* and *hydrochlorothiazide* also after the instillation of phenylephrine eye drops.[3]

1. Aminu J, *et al.* Interaction between debrisoquine and phenylephrine. *Lancet* 1970; **ii:** 935–6.
2. Kim JM, *et al.* Hypertensive reactions to phenylephrine eyedrops in patients with sympathetic denervation. *Am J Ophthalmol* 1978; **85:** 862–8.
3. Cass E, *et al.* Hazards of phenylephrine topical medication in persons taking propranolol. *Can Med Assoc J* 1979; **120:** 1261–2.

Pharmacokinetics

Phenylephrine has low oral bioavailability owing to irregular absorption and first-pass metabolism by monoamine oxidase in the gut and liver. When injected subcutaneously or intramuscularly it takes 10 to 15 minutes to act; subcutaneous and intramuscular injections are effective for up to about 1 hour and up to about 2 hours, respectively. Intravenous injections are effective for about 20 minutes.

Systemic absorption follows topical application.

Uses and Administration

Phenylephrine hydrochloride is a sympathomimetic (p.1408) with mainly direct effects on adrenergic receptors. It has mainly alpha-adrenergic activity and is without significant stimulating effects on the CNS at usual doses. Its pressor activity is weaker than that of noradrenaline (p.1360) but of longer duration. After injection it produces peripheral vasoconstriction and increased arterial pressure; it also causes reflex bradycardia. It reduces blood flow to the skin and to the kidneys.

Phenylephrine and its salts are most commonly used, either topically or by mouth, for the symptomatic relief of **nasal congestion** (p.1548). They are frequently included in preparations intended for the relief of cough and cold symptoms. For nasal congestion, a 0.25 to 1% solution may be instilled as nasal drops or a spray into each nostril every 4 hours as required, or phenylephrine hydrochloride may be given in usual oral doses of 10 mg every four hours (up to a maximum of 60 mg daily) or 12 mg up to four times daily.

In ophthalmology, phenylephrine hydrochloride is used as a **mydriatic** (p.1874) in concentrations of up to 10%; generally solutions containing 2.5 or 10% are used but systemic absorption can occur (see Effects on the Cardiovascular System, above) and the 10% strength, in particular, should be used with caution. The