cations and its intrinsic toxicity. Treatment of onchocerciasis (p.137) is currently based on continuous suppression of microfilariae by regular use of ivermectin. WHO[1] advises that suramin should only be considered for the curative treatment of individuals in areas without transmission of onchocerciasis and of individuals leaving an endemic area, and for severe hyperreactive onchodermatitis where symptoms are not adequately controlled with ivermectin. WHO[2] also recommends that it should not be used to treat onchocerciasis in the elderly or infirm, in patients with severe liver or renal disease, in totally blind patients (unless they require relief from intensely itchy lesions), or in pregnant women (who should be treated after delivery).

A total dose of 66.7 mg/kg in six incremental weekly doses is recommended.[1,2] The first (test) dose of suramin sodium 3.3 mg/kg should be given very cautiously by slow intravenous injection; this is followed at weekly intervals by incremental doses of 6.7 mg/kg, 10.0 mg/kg, 13.3 mg/kg, 16.7 mg/kg and 16.7 mg/kg.[2]

1. WHO. Onchocerciasis and its control: report of a WHO expert committee. *WHO Tech Rep Ser 852* 1995.
2. WHO. *WHO model formulary.* Geneva: WHO, 2004.

African trypanosomiasis. Suramin is used in the treatment of the early haematolymphatic phase of African trypanosomiasis (p.827) caused by *Trypanosoma brucei rhodesiense* and for *T. b. gambiense* infections which are resistant to pentamidine.[1] In some regions, suramin is used with pentamidine for *T. b. gambiense* infections but it has not been shown to be clinically superior to pentamidine alone.[2] Although suramin does not reach sufficient concentrations in the CSF to produce a cure in the meningoencephalitic phase, it is used to reduce the number of trypanosomes in the blood and lymph before treatment with melarsoprol.[1] Case reports have suggested that suramin with metronidazole[3] or eflornithine[4] could be useful in *T. b. rhodesiense* infections, although response to suramin plus eflornithine was disappointing in a study involving 6 patients.[5]

1. WHO. *WHO model formulary.* Geneva: WHO, 2004.
2. Pépin J, Khonde N. Relapses following treatment of early-stage Trypanosoma brucei gambiense sleeping sickness with a combination of pentamidine and suramin. *Trans R Soc Trop Med Hyg* 1996; **90:** 183–6.
3. Foulkes JR. Metronidazole and suramin combination in the treatment of arsenical refractory rhodesian sleeping sickness—a case study. *Trans R Soc Trop Med Hyg* 1996; **90:** 422.
4. Taelman H, *et al.* Combination treatment with suramin and eflornithine in late stage rhodesian trypanosomiasis: case report. *Trans R Soc Trop Med Hyg* 1996; **90:** 572–3.
5. Clerinx J, *et al.* Treatment of late stage rhodesiense trypanosomiasis using suramin and eflornithine: report of six cases. *Trans R Soc Trop Med Hyg* 1998; **92:** 449–50.

Preparations

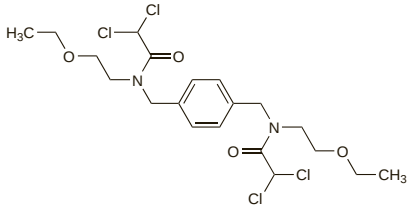
Proprietary Preparations (details are given in Part 3)
Ger.: Germanin.

Teclozan *(USAN, rINN)*

NSC-107433; Téclozan; Teclozán; Teclozanum; Win-13146. *NN′-p*-Phenylenedimethylenebis[2,2-dichloro-*N*-(2-ethoxyethyl)-acetamide].

Теклозан

$C_{20}H_{28}Cl_4N_2O_4$ = 502.3.
CAS — 5560-78-1.
ATC — P01AC04.



Profile
Teclozan, a dichloroacetamide derivative, is a luminal amoebicide with actions and uses similar to those of diloxanide furoate (p.832). It has been given orally in the treatment of intestinal amoebiasis.

Preparations

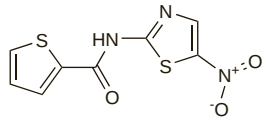
Proprietary Preparations (details are given in Part 3)
Braz.: Falmonox; ***Venez.:*** Falmonox.

Tenonitrozole *(rINN)*

TC-109; Tenonitrozol; Ténonitrozole; Tenonitrozolum; Thenitrazole. *N*-(5-Nitrothiazol-2-yl)thiophene-2-carboxamide.

Тенонитрозол

$C_8H_5N_3O_3S_2$ = 255.3.
CAS — 3810-35-3.
ATC — P01AX08.



Profile
Tenonitrozole is an antiprotozoal given in the treatment of trichomoniasis (p.827). It is given orally in a dose of 250 mg twice daily with meals, for 4 days.

Preparations

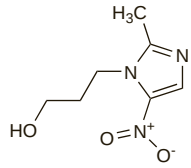
Proprietary Preparations (details are given in Part 3)
Fr.: Atrican; ***Rus.:*** Atrican (Атрикан); ***Venez.:*** Detricant†.

Ternidazole *(rINN)*

Ternidazol; Ternidazolum. 2-Methyl-5-nitroimidazole-1-propanol.

Тернидазол

$C_7H_{11}N_3O_3$ = 185.2.
CAS — 1077-93-6.



Profile
Ternidazole is a 5-nitroimidazole antiprotozoal with properties similar to those of metronidazole (p.837). It has been an ingredient of preparations used for the treatment of vaginitis.

Preparations

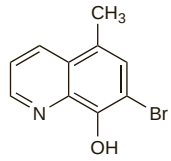
Proprietary Preparations (details are given in Part 3)
Multi-ingredient: ***Rus.:*** Tergynan (Тержинан).

Tilbroquinol *(pINN)*

Tilbroquinolum. 7-Bromo-5-methylquinolin-8-ol.

Тильброхинол

$C_{10}H_8BrNO$ = 238.1.
CAS — 7175-09-9.
ATC — P01AA05.



Profile
Tilbroquinol is a halogenated hydroxyquinoline antiprotozoal with properties similar to those of diiodohydroxyquinoline (p.832). It has been used with tiliquinol (below) in the treatment of intestinal infections including amoebiasis but less toxic drugs are preferred.

Adverse effects. A report of neurotoxicity, considered to be subacute myelo-opticoneuropathy, in a patient who had taken tilbroquinol with tiliquinol for 4 years.[1] Hepatotoxicity has also been reported[2] with this combination.

1. Soffer M, *et al.* Oxyquinoline toxicity. *Lancet* 1983; **i:** 709.
2. Caroli-Bosc F-X, *et al.* Hépatite aiguë due à l'association de tiliquinol et tilbroquinol (Intétrix). *Gastroenterol Clin Biol* 1996; **20:** 605–6.

Preparations

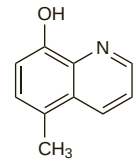
Proprietary Preparations (details are given in Part 3)
Multi-ingredient: ***Fr.:*** Intetrix; ***Rus.:*** Intetrix (Интетрикс).

Tiliquinol *(rINN)*

Tiliquinolum. 5-Methylquinolin-8-ol.

Тилихинол

$C_{10}H_9NO$ = 159.2.
CAS — 5541-67-3.



Profile
Tiliquinol has been used with tilbroquinol (above) in the treatment of intestinal infections including amoebiasis but less toxic drugs are preferred.

Preparations

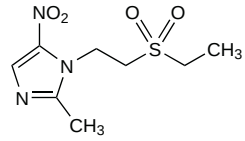
Proprietary Preparations (details are given in Part 3)
Multi-ingredient: ***Fr.:*** Intetrix; ***Rus.:*** Intetrix (Интетрикс).

Tinidazole *(BAN, USAN, rINN)*

CP-12574; Tinidatsoli; Tinidazol; Tinidazolas; Tinidazolum; Tynidazol. 1-[2-(Ethylsulphonyl)ethyl]-2-methyl-5-nitroimidazole.

Тинидазол

$C_8H_{13}N_3O_4S$ = 247.3.
CAS — 19387-91-8.
ATC — J01XD02; P01AB02.
ATC Vet — QJ01XD02; QP51AA02.



Pharmacopoeias. In *Chin.*, *Eur.* (see p.vii), *Jpn*, and *US.*
Ph. Eur. 6.2 (Tinidazole). An almost white or pale yellow, crystalline powder. Practically insoluble in water; soluble in acetone and in dichloromethane; sparingly soluble in methyl alcohol. Protect from light.
USP 31 (Tinidazole). An almost white or pale yellow crystalline powder. Practically insoluble in water; soluble in acetone and in dichloromethane; sparingly soluble in methyl alcohol. Store in airtight containers. Protect from light.

Adverse Effects and Precautions

As for Metronidazole, p.837.

Breast feeding. The American Academy of Pediatrics[1] considers that the use of tinidazole by mothers during breast feeding may be of concern, since it is mutagenic *in vitro*. After single-dose therapy, breast feeding may be stopped for 12 to 24 hours to allow excretion of the dose.

1. American Academy of Pediatrics. The transfer of drugs and other chemicals into human milk. *Pediatrics* 2001; **108:** 776–89. Correction. *ibid.*; 1029. Also available at: http://aappolicy.aappublications.org/cgi/content/full/pediatrics%3b108/3/776 (accessed 03/06/04)

Porphyria. Tinidazole is considered to be unsafe in patients with porphyria because it has been shown to be porphyrinogenic in *in-vitro* systems.

Shock. An acute severe toxic reaction, considered not to be allergic, occurred in a healthy subject shortly after the intravenous infusion of tinidazole 1.6 g over 80 minutes.[1] He fainted for about 10 seconds and low blood pressure, nausea, and tiredness persisted for several hours. Spasms in the left arm were also experienced but no generalised convulsions. Anaphylactic shock has also been reported,[2] with severe bronchospasm and subsequent development of Stevens-Johnson syndrome, in a patient who had reactions of increasing severity after 3 separate exposures to tinidazole.

1. Aase S, *et al.* Severe toxic reaction to tinidazole. *Eur J Clin Pharmacol* 1983; **24:** 425–7.
2. Singbal SS, Rataboli PV. Anaphylaxis and hypersensitivity syndrome reactions in increasing severity following repeated exposure to tinidazole. *J Postgrad Med* 2005; **51:** 243–4.

Interactions

Tinidazole may, like metronidazole (p.838), produce a disulfiram-like reaction with alcohol.

Pharmacokinetics

The pharmacokinetics of tinidazole resemble those of metronidazole although the half-life is longer.

Tinidazole is rapidly and almost completely absorbed after oral doses and, typically, a peak plasma concentration of about 40 micrograms/mL is achieved 2 hours after a single 2-g dose, falling to about 10 micrograms/mL at 24 hours and 2.5 micrograms/mL at 48 hours; concentrations above 8 micrograms/mL are maintained by daily maintenance doses of 1 g. Comparable concentrations are achieved with equivalent intravenous doses. The plasma elimination half-life of tinidazole is 12 to 14 hours.

Tinidazole is widely distributed and concentrations similar to those in plasma have been achieved in bile, breast milk, CSF, saliva, and a variety of body tissues; it crosses the placenta readily. Only 12% is reported to be bound to plasma proteins. An active hydroxy metabolite has been identified.

Unchanged drug and metabolites are excreted in the urine and, to a lesser extent, in the faeces.

◊ References.

1. Wood BA, *et al.* The pharmacokinetics, metabolism and tissue distribution of tinidazole. *J Antimicrob Chemother* 1982; **10** (suppl A): 43–57.
2. Karhunen M. Placental transfer of metronidazole and tinidazole in early human pregnancy after a single infusion. *Br J Clin Pharmacol* 1984; **18:** 254–7.
3. Evaldson GR, *et al.* Tinidazole milk excretion and pharmacokinetics in lactating women. *Br J Clin Pharmacol* 1985; **19:** 503–7.
4. Wood SG, *et al.* Pharmacokinetics and metabolism of C-tinidazole in humans. *J Antimicrob Chemother* 1986; **17:** 801–9.

Renal impairment. Single-dose studies indicate that the pharmacokinetics of tinidazole in patients with chronic renal failure are not significantly different from those in healthy subjects and that no modification of tinidazole dosage is necessary. However, tinidazole is rapidly removed by haemodialysis.[1,2]

1. Flouvat BL, *et al.* Pharmacokinetics of tinidazole in chronic renal failure and in patients on haemodialysis. *Br J Clin Pharmacol* 1983; **15:** 735–41.
2. Robson RA, *et al.* Tinidazole pharmacokinetics in severe renal failure. *Clin Pharmacokinet* 1984; **9:** 88–94.

Uses and Administration

Tinidazole is a 5-nitroimidazole derivative. It has the antimicrobial actions of metronidazole and is used similarly (see p.839) in the treatment of susceptible protozoal infections and in the treatment and prophylaxis of anaerobic bacterial infections. It has also been used in regimens for the eradication of *Helicobacter pylori* in peptic ulcer disease.

Tinidazole is usually given as a single daily oral dose with or after food; it is also given by intravenous infusion and as vaginal pessaries.

In invasive **amoebiasis**, tinidazole is usually given with a luminal amoebicide. In intestinal amoebiasis, a single daily dose of 2 g is given orally for 2 or 3 days; in hepatic amoebiasis, 1.5 to 2 g as a single daily dose may be given for 3 days or occasionally up to 6 days. Children are given 50 to 60 mg/kg daily for 3 or 5 days respectively.

A single dose of tinidazole 2 g is given orally in the treatment of **giardiasis**, **trichomoniasis**, and acute necrotising **ulcerative gingivitis**; 50 to 75 mg/kg as a single dose is given to children with giardiasis or trichomoniasis. It may sometimes be necessary to repeat this dose once. In trichomoniasis, sexual partners should also be treated.

In **bacterial vaginosis**, a single 2-g dose of tinidazole is usually given orally, although higher cure rates have been achieved with a 2-g dose on 2 successive days or 1 g daily for 5 days.

For the treatment of most **anaerobic bacterial infections**, tinidazole is given orally, usually for 5 or 6 days, in an initial dose of 2 g followed on subsequent days by 1 g daily or 500 mg twice daily. If oral therapy is not possible, tinidazole may be given intravenously, 800 mg being infused as 400 mL of a 2 mg/mL solution at a rate of 10 mL/minute; this initial dose is followed by 800 mg daily or 400 mg twice daily until oral therapy can be substituted. For the *prevention* of postoperative anaerobic bacterial infections, 2 g is given by mouth about 12 hours before surgery. Alternatively 1.6 g is given as a single intravenous infusion before surgery.

In regimens for the treatment of **peptic ulcer disease**, tinidazole 500 mg twice daily has been given with clarithromycin and omeprazole for 7 days.

◊ Reviews.

1. Manes G, Balzano A. Tinidazole: from protozoa to Helicobacter pylori—the past, present and future of a nitroimidazole with peculiarities. *Expert Rev Anti Infect Ther* 2004; **2:** 695–705.
2. Fung HB, Doan TL. Tinidazole: a nitroimidazole antiprotozoal agent. *Clin Ther* 2005; **27:** 1859–84.
3. Nailor MD, Sobel JD. Tinidazole for bacterial vaginosis. *Expert Rev Anti Infect Ther* 2007; **5:** 343–8.

Administration in renal impairment. The elimination of tinidazole is largely unchanged in patients with impaired renal function (see under Pharmacokinetics, above) and dosage adjustment is not generally considered necessary. However tinidazole is removed by haemodialysis, and patients may need additional doses to compensate.

Preparations

Proprietary Preparations (details are given in Part 3)
Arg.: Fasigyn; Gynormal; Ladylen Duo; ***Austral.:*** Fasigyn; Simplotan; ***Belg.:*** Fasigyn; ***Braz.:*** Amplium; Facyl; Fasigyn; Ginosutin; Pletil; Tinoral; Trinizol†; ***Chile:*** Fasigyn; Triconidazol†; Troxxil; ***Fr.:*** Fasigyne; ***Ger.:*** Simplotan†; ***Gr.:*** Fasigyn; ***Hong Kong:*** Fasigyn; ***India:*** Amebamagma; Enidazol; Fasigyn; Tiniba; Tinidafyl; Tinidol†; Tinifas; Tinvista; ***Indon.:*** Fasigyn; Flatin; ***Israel:*** Fasigyn; Protocide; ***Ital.:*** Fasigin; Trimonase; ***Malaysia:*** Fasigyn†; Tindol; ***Mex.:*** Amebysol; Ametricid†; Estovyn-T; Fasigyn; Induken†; Trinigyn; Triseptil; ***Neth.:*** Fasigyn†; ***NZ:*** Dyzole; ***Port.:*** Fasigyn; ***Rus.:*** Fasigyn (Фазижин); Tiniba (Тиниба); ***S.Afr.:*** Fasigyn; ***Singapore:*** Fasigyn; ***Spain:*** Tricolam; ***Swed.:*** Fasigyn; ***Switz.:*** Fasigyne; ***Thai.:*** Asiazole-TN; Fasigyn; Funida; Idazole; Sporinex; Tinazole; Tini†; Tonid; Trichonas; Tricogyn; Tricozone; Trigyn†; ***UK:*** Fasigyn; ***USA:*** Tindamax; ***Venez.:*** Cinabel†; Fasigyn; Pangamil.

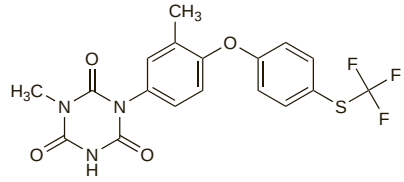
Multi-ingredient: ***Arg.:*** Aduar; Fasigyn Nistatina; Gynormal; Helmint Compuesto; Ladylen; Mebutar Compuesto; Nistinol; Tru Compuesto; ***Braz.:*** Amplium-G; Anfugine; Cartrax; Colpolase; Duozol; Facyl M; Ginec†; Gino Pletil; Ginometrim Oral†; Ginosutin M; Gynomax; Gynopac; Poliginax; Seczol; Takil; Tizonil M†; Travogyn; Trinizol M†; ***Chile:*** Doxifen; Famidal; Famidal Ad†; Ginecopast; Ginecopast Dual; Ginedazol; Ginedazol Dual; Medidos; Mizonase; ***India:*** Biocip-TZ; Bioflox-TZ; Candizole-T; Cipgen TZ; Ciplox TZ; Ciptini; Citizol; Entrolate†; Forcan TZ; Genflox TZ; Helipac; Nor T; Norflox TZ; Normax TZ; Ofler-TZ; Oflox TZ; Olfi TZ; OTC HP Kit; Parabact; Pylokit; Tinidafyl Plus; Tinvista-CF; Tinvista-NF; Wotinex; ***Indon.:*** Fasigyn-Nystatin; ***Ital.:*** Fasigin N; ***Malaysia:*** Pylobact Combi; ***Mex.:*** Afumix; Fasigyn VT; Mebeciclol; ***Rus.:*** Pylobact (Пилобакт).

Toltrazuril *(BAN, USAN, rINN)*

Bay-Vi-9142; Toltrazurilo; Toltrazurilum. 1-Methyl-3-(4-{*p*-[(trifluoromethyl)thio]phenoxy}-*m*-tolyl)-*s*-triazine-2,4,6(1*H*,3*H*,5*H*)-trione.

Толтразурил

$C_{18}H_{14}F_3N_3O_4S$ = 425.4.
CAS — 69004-03-1.
ATC Vet — QP51AJ01.



Profile

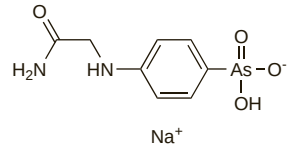
Toltrazuril is an antiprotozoal used in veterinary practice for the treatment of coccidiosis in poultry and piglets, and for the treatment of isosporiasis in piglets.

Tryparsamide *(rINN)*

Glyphenarsine; Triparsamida; Tryparsam.; Tryparsamidum; Tryparsone. Sodium hydrogen 4-(carbamoylmethylamino)-phenylarsonate hemihydrate.

Трипарсамид

$C_8H_{10}AsN_2NaO_4 \cdot H_2O$ = 305.1.
CAS — 554-72-3 (anhydrous tryparsamide); 6159-29-1 (tryparsamide hemihydrate).



(anhydrous tryparsamide)

Profile

Tryparsamide, a pentavalent arsenical compound, is a trypanocide which penetrates into the CSF and has been used with suramin in the treatment of late-stage African trypanosomiasis due to *Trypanosoma brucei gambiense*, as an alternative to melarsoprol or eflornithine (see p.827). However, because of its toxicity, especially the risk of blindness resulting from damage to the optic nerve, melarsoprol or eflornithine are preferred.

For the adverse effects of arsenic and their treatment, see Arsenic Trioxide, p.2260. Like melarsoprol, tryparsamide can cause encephalopathy.
