togel; ***Israel:*** AndroGel; Androxon; Sustanon 250; Testoviron Depot; ***Ital.:*** Andriol; Androderm†; AndroGel; Sustanon; Testim; Testo-Enant; Testogel; Testovis; ***Malaysia:*** Andriol; Jenasteron†; Nebido; ***Mex.:*** Andriol; Nebido; Primoteston Depot; Sostenon; Testoprim-D; ***Neth.:*** Andriol; AndroGel; Nebido; Striant; Sustanon 100; Sustanon 250; Testim; Testogel; Testoviron Depot†; ***Norw.:*** Andriol; Androxon†; Atmos; Nebido; Testogel; ***NZ:*** Androderm; Panteston; Primoteston Depot; Sustanon; ***Philipp.:*** Andriol; Nebido; ***Pol.:*** Nebido; Omnadren; Testosteronum Prolongatum; Undestor; ***Port.:*** Andriol; AndroGel; Intrinsa; Livensa; Nebido; Striant; Testim; Testogel; Testopatch; Testoviron Depot; Tostran; ***Rus.:*** Andriol (Андриол); AndroGel (Андрогель); Nebido (Небидо); Omnadren (Омнадрен); ***S.Afr.:*** Androxon; Depotrone; Sustanon 250; ***Singapore:*** Andriol; Sustanon 250; ***Spain:*** Androderm; Numanis; Reandron; Testex; Testim; Testogel; Testoviron Depot 250; ***Swed.:*** Atmos; Nebido; Testim; Testogel; Testoviron Depot; Tostrex; Undestor; ***Switz.:*** Andriol; Androderm; Nebido; Testoderm†; Testogel; Testoviron Depot; ***Thai.:*** Andriol; Testoviron 100†; Testoviron Depot; Virormone†; ***Turk.:*** Afro; Sustanon 250; Virigen; ***UK:*** Andropatch; Intrinsa; Nebido; Restandol; Striant; Sustanon 100; Sustanon 250; Testim; Testogel; Testosterone Implants; Tostran; Virormone; ***USA:*** Androderm; AndroGel; Delatestryl; Striant; Testim; Testoderm†; Testopel; Virilon†; ***Venez.:*** Andriol; AndroGel; Polysteron 250; Proviron Depot.

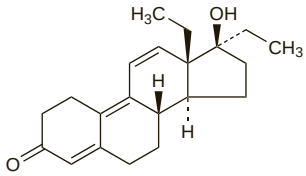
Multi-ingredient: ***Arg.:*** Supligol†; ***Braz.:*** Durateston; Estandron P; Trinestril; ***Canad.:*** Climacteron; ***Chile:*** Estandron Prolongado; ***Cz.:*** Folivirin; ***Ger.:*** Androfemon†; Testoviron Depot 100†; Testoviron Depot 50†; ***India:*** Mixogen; ***Ital.:*** Facovit; Testoviron; ***Malaysia:*** Sustanon 250; ***Mex.:*** Despamen; Sten; ***Neth.:*** Estandron Prolongatum; ***Norw.:*** Primoteston Depot; ***Port.:*** Sustenon 250; ***S.Afr.:*** Mixogen; Primodian Depot; ***Spain:*** Testoviron Depot 100; ***Thai.:*** Metharmon-F; Primodian Depot; ***Turk.:*** Estandron Prolongatum; ***USA:*** Depo-Testadiol; Depotestogen.

Tetrahydrogestrinone ⊗

THG. 18a-Homo-pregna-4,9,11-trien-17β-ol-3-one; .

$C_{21}H_{28}O_2$ = 312.4.

CAS — 618903-56-3.



NOTE. The following terms have been used as 'street names' (see p.vi) or slang names for various forms of tetrahydrogestrinone: The Clear.

Profile

Tetrahydrogestrinone is a synthetic anabolic steroid that is structurally related to gestrinone (p.2106) and trenbolone (p.2135). It has been subject to abuse in sport.

Action. Tetrahydrogestrinone had androgenic and progestogenic activity in a yeast-based *in-vitro* bioassay study.[1] The anabolic and androgenic properties of tetrahydrogestrinone have also been studied in *animals*.[2-4]

1. Death AK, *et al.* Tetrahydrogestrinone is a potent androgen and progestin. *J Clin Endocrinol Metab* 2004; **89:** 2498–2500.
2. Labrie F, *et al.* Tetrahydrogestrinone induces a genomic signature typical of a potent anabolic steroid. *J Endocrinol* 2005; **184:** 427–33.
3. Jasuja R, *et al.* Tetrahydrogestrinone is an androgenic steroid that stimulates androgen receptor-mediated, myogenic differentiation in C3H10T1/2 multipotent mesenchymal cells and promotes muscle accretion in orchidectomized male rats. *Endocrinology* 2005; **146:** 4472–8.
4. Friedel A, *et al.* Tetrahydrogestrinone is a potent but unselective binding steroid and affects glucocorticoid signalling in the liver. *Toxicol Lett* 2006; **164:** 16–23.

Tibolone *(BAN, USAN, rINN)* ⊗

7α-Methylnorethynodrel; Org-OD-14; Tibolon; Tibolona; Tiboloni; Tibolonum. 17β-Hydroxy-7α-methyl-19-nor-17α-pregn-5(10)-en-20-yn-3-one.

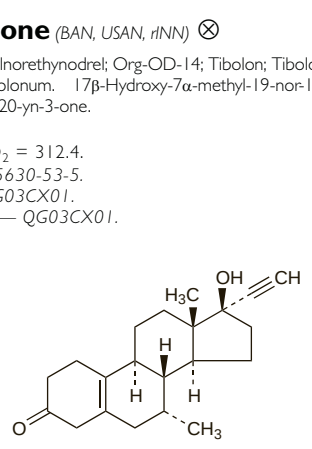
Тиболон

$C_{21}H_{28}O_2$ = 312.4.

CAS — 5630-53-5.

ATC — G03CX01.

ATC Vet — QG03CX01.



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

Ph. Eur. 6.2 (Tibolone). A white or almost white, crystalline powder or crystals. It exhibits polymorphism. Practically insoluble in water; soluble in acetone and in methyl alcohol. Store at a temperature of 2° to 8°.

Adverse Effects

Irregular vaginal bleeding or spotting may occur with tibolone, mainly during the first few months of treatment; unlike cyclical, but similar to continuous, combination HRT (p.2071), tibolone does not produce regular withdrawal bleeding. Other effects on the genital tract may include leucorrhoea, pruritus, candidiasis, and vaginitis. Other adverse effects have included breast pain, weight gain, oedema, dizziness, skin reactions, headache, migraine, visual disturbances, gastrointestinal disturbances, hypertrichosis, altered liver function, depression, and arthralgia or myalgia.

Incidence of adverse effects. In 1994, the UK CSM had received reports of 2796 suspected adverse reactions with tibolone over 3 years, out of about 666 000 prescriptions.[1] The commonest reported effects were headache, dizziness, nausea, rash, itching, and weight gain. Vaginal bleeding appeared to occur in about 8 to 9% of recipients. There had also been 52 reports of migraine, 4 of exacerbation of migraine, and 49 reports of visual disturbances, some suggestive of migraine.

1. CSM/MCA. Tibolone (Livial). *Current Problems* 1994; **20:** 14. Also available at: http://www.mhra.gov.uk/home/idcplg?IdcService=GET_FILE&dDocName=CON2015632&RevisionSelectionMethod=LatestReleased (accessed 18/08/08)

Carcinogenicity. ***BREAST.*** The large cohort Million Women study[1] examined breast cancer incidence and mortality in relation to HRT use. After an average follow-up of 2.6 years for incidence, and 4.1 years for mortality, data were available for a group of 18 186 women who had used tibolone. There were 184 cases of invasive breast cancer equating to an overall risk of 1.45 (95% confidence interval 1.25 to 1.68) relative to women who had never used HRT. This was between the relative risks calculated for oestrogen-only HRT (1.30) and combined HRT (2.00). The risk was raised for current but not past use of tibolone, and increased with total duration of use.

For comment on the risk of recurrence in women with a history of breast cancer see Malignant Neoplasms under Precautions, below.

1. Million Women Study Collaborators. Breast cancer and hormone-replacement therapy in the Million Women Study. *Lancet* 2003; **362:** 419–27. Correction. *ibid.*; 1160.

ENDOMETRIUM. Endometrial hyperplasia and endometrial carcinoma have been rarely reported after investigation of uterine bleeding in women receiving tibolone therapy,[1-3] as has exacerbation of adenomyosis.[4] Some of these women had previously received oestrogens.

A cohort and nested case-control study[5] found that tibolone might have been associated with an increased risk of endometrial cancer compared with conventional forms of combined HRT, but the data were weak and might have been affected by bias and uncontrolled confounding factors. The large cohort Million Women Study[6] of HRT included a group of 28 028 who had used tibolone for an average of about 3 years. The risk of endometrial cancer was increased to 1.79 (95% confidence interval 1.43 to 2.25) in those who had used tibolone, compared with women who had never used HRT, and the risk was higher with more than 3 years of use compared with shorter durations. In contrast, a smaller randomised study[7] comparing tibolone with combined HRT recorded no cases of endometrial hyperplasia or carcinoma in 1317 women given tibolone for up to 2 years.

1. von Dadelszen P, *et al.* Endometrial hyperplasia and adenocarcinoma during tibolone (Livial) therapy. *Br J Obstet Gynaecol* 1994; **101:** 158–61.
2. Ginsburg J, Prelevic GM. Cause of vaginal bleeding in postmenopausal women taking tibolone. *Maturitas* 1996; **24:** 107–10.
3. Yazigi R, *et al.* Carcinoma of the endometrium in patients treated with tibolone. *Gynecol Oncol* 2004; **93:** 568–70.
4. Prys Davies A, Oram D. Exacerbation of adenomyosis in a postmenopausal woman taking tibolone associated with an elevation in serum CA 125. *Br J Obstet Gynaecol* 1994; **101:** 632–3.
5. de Vries CS, *et al.* Tibolone and endometrial cancer: a cohort and nested case-control study in the UK. *Drug Safety* 2005; **28:** 241–9.
6. Million Women Study Collaborators. Endometrial cancer and hormone-replacement therapy in the Million Women Study. *Lancet* 2005; **365:** 1543–51.
7. Archer DF, *et al.* Endometrial effects of tibolone. *J Clin Endocrinol Metab* 2007; **92:** 911–18.

Effects on the cardiovascular system. A study[1,2] of tibolone in the treatment of osteoporosis in postmenopausal women found that although it reduced the risk of fracture there was an increased risk of stroke.

1. Grobbee DE. LIFT study to continue as planned. *BMJ* 2005; **331:** 843.
2. Cummings SR. LIFT study is discontinued. *BMJ* 2006; **332:** 667.

Precautions

Tibolone is contra-indicated in women with hormone-dependent tumours, cardiovascular or cerebrovascular disorders including thrombophlebitis, thromboembolic processes, or a history of these conditions, undiagnosed vaginal bleeding, untreated endometrial hyperplasia, porphyria, and severe liver disorders. It should not be given to pregnant women and is not intended for use in premenopausal women, except those being treated with a gonadorelin analogue. Use of tibolone within 12 months of a natural menopause is also not recommended because irregular vaginal bleeding is likely. In postmenopausal women, vaginal bleeding starting after 3 months or more of treatment, or recurrent or persistent bleeding, should be investigated.

Care should be taken when giving tibolone to patients with uterine fibroids, endometriosis, liver disease, disorders that may be exacerbated by fluid retention such as cardiac or renal dysfunction, hypertension, epilepsy, or migraine, or with a history of these conditions. It should also be given with caution to patients with dyslipidaemia or diabetes mellitus. Tibolone should be stopped if there are signs of thromboembolism, a significant increase in blood pressure, new onset of migraine-type headache, or if abnormal liver function tests or cholestatic jaundice occur. Consideration should be given to stopping tibolone 4 to 6 weeks before elective surgery when prolonged immobilisation after surgery is likely.

Malignant neoplasms. Licensed product information for tibolone advises that it is contra-indicated in women with a history of hormone-dependent tumours. However, the risk of cancer recurrence associated with tibolone has not been determined and there have been a few reports of its use for menopausal symptoms in such patients. An observational study[1] and a case-control study[2] of women who had been treated for breast cancer found no evidence that tumour recurrence was higher in those subsequently given tibolone than in those who were not. Case-control studies have also suggested that tibolone does not increase the risk of recurrence of treated endometrial[3] or ovarian[4] cancers. Although promising, these data are limited and further studies are needed to confirm the safety of tibolone in these groups of patients, particularly as there is some evidence[5] that in UK general practice it may have been prescribed preferentially to women at increased risk of breast and endometrial cancers, including women with a history of breast cancer.

For reports of the incidence of breast and endometrial cancers in women given tibolone, see Carcinogenicity, above.

1. Dimitrakakis C, *et al.* Clinical effects of tibolone in postmenopausal women after 5 years of tamoxifen therapy for breast cancer. *Climacteric* 2005; **8:** 342–51.
2. Goutzioulis M, *et al.* Tibolone therapy in breast cancer survivors: a retrospective study. *J Obstet Gynaecol Res* 2007; **33:** 68–73.
3. Lee K-B, *et al.* Endometrial cancer patients and tibolone: a matched case-control study. *Maturitas* 2006; **55:** 264–9.
4. Lee K-B, *et al.* The safety of tibolone in epithelial ovarian cancer patients. *Maturitas* 2006; **55:** 156–61.
5. Velthuis-te Wierik EJM, *et al.* Preferential prescribing of tibolone and combined estrogen plus progestogen therapy in postmenopausal women. *Menopause* 2007; **14:** 518–27.

Interactions

Compounds that induce liver enzymes, such as phenytoin, carbamazepine, and rifampicin, might theoretically enhance the metabolism of tibolone and thus reduce its activity.

For reference to the effect of tibolone on the activity of oral anticoagulants, see Sex Hormones under Warfarin, p.1431.

Pharmacokinetics

Tibolone is rapidly and extensively absorbed after oral doses and quickly metabolised into three active metabolites, two of which have mainly oestrogenic activity while the third, like the parent compound, has progestogenic and androgenic activity. Peak concentrations of tibolone and its metabolites occur after about 1 to 1.5 hours, and the two main metabolites have an elimination half-life of about 7 hours. Metabolites are excreted in the bile and eliminated in the faeces. About 30% of a dose is excreted in the urine.

◊ References.

1. Timmer CJ, Doorstam DP. Effect of renal impairment on the pharmacokinetics of a single oral dose of tibolone 2.5 mg in early postmenopausal women. *Pharmacotherapy* 2002; **22:** 148–53.
2. Timmer CJ, Huisman JA. Effect of a standardized meal on the bioavailability of a single oral dose of tibolone 2.5 mg in healthy postmenopausal women. *Pharmacotherapy* 2002; **22:** 310–15.
3. Timmer CJ, *et al.* Pharmacokinetics of tibolone in early and late postmenopausal women. *Br J Clin Pharmacol* 2002; **54:** 101–6.
4. Verheul HAM, *et al.* Pharmacokinetic parameters of sulfated tibolone metabolites in postmenopausal women after single and multiple doses of tibolone. *Clin Pharmacol Ther* 2007; **81:** 573–9.