

## PRODUCT INFORMATION

# Andriol<sup>®</sup> Testocaps<sup>®</sup>

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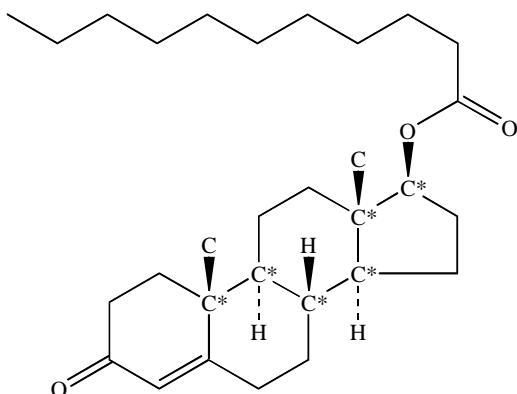
### NAME OF THE MEDICINE: Testosterone undecanoate

Testosterone undecanoate, the active ingredient of Andriol Testocaps, is a white to creamy-white crystalline powder. It is practically insoluble in water, soluble in 2% (w/v) dioxane and in ethanol (96%) and has a melting point of 60-65°C. It is a fatty acid ester of the naturally occurring androgen testosterone:

#### Chemical name

3-oxo-androst-4-en-17β-yl undecanoate

The structural formula of testosterone undecanoate is:



#### Molecular Formula

C<sub>30</sub>H<sub>48</sub>O<sub>3</sub>

#### Molecular Weight

456.7

CAS Number: 5949-44-0

#### History and development

Testosterone given orally is known to be mostly deactivated by the liver before reaching the circulation. Thus it was thought that esterification of testosterone to a lipophilic ester might overcome the problem. Such a testosterone ester would be absorbed with lipids into the lymphatic system and pass to the peripheral circulation thus bypassing the liver. Esterification of testosterone with undecanoic acid was chosen.

## DESCRIPTION

Soft oval glossy, transparent orange coloured capsules, containing a clear yellow oil fill. The capsules are encoded with a white imprint marked DV3 ORG.

#### Composition

Capsule content: Active ingredient: testosterone undecanoate and the non-active substance, castor oil- hydrogenated and propylene glycol monolaurate.

The soft capsule shell contains the non active substances: gelatin, glycerol, medium chain triglycerides, lecithin, sunset yellow FCF CI15985 and printed with Opacode WB monogramming ink NSP-78-18022 White (ARTG Proprietary Ingredient number 3883).

# PHARMACOLOGY

## Pharmacological actions

Testosterone undecanoate (TU) is able to by-pass the liver via the lymphatic system and is therefore orally bioavailable. TU is intended as a replacement therapy for those who have abnormally low levels of natural testosterone. TU may induce a fall in LH and FSH levels to just above normal in hypergonadotrophic hypogonadal patients and may decrease hyper-reactivity to gonadorelin stimulation. However, there are also reports where there have been no changes or changes in the opposite direction. It does not change the LH and FSH plasma levels in normal patients. Restoration of testosterone levels towards normal is associated with a significant improvement in feelings of well being.

TU has been shown to induce sexual maturation in agonadal boys.

Some increase in plasma oestriol is observed. In patients with a sub-normal prolactin response to thyrotrophin releasing hormone (TRH), response is normalised during TU therapy. TU does not change the response of the pituitary to luteinising hormone releasing hormone (LHRH) or to TRH; nor does it cause any abnormal effects on haematological, blood biochemical or urinary parameters or on the size and consistency of the prostate gland. Normal prolactin levels are not affected by TU administration.

## Pharmacokinetics

Following oral administration of Andriol Testocaps, an important part of the active substance testosterone undecanoate is co-absorbed with the lipophilic solvent from the intestine into the lymphatic system, thus circumventing the first-pass inactivation by the liver. During absorption testosterone undecanoate is partly reduced to dihydrotestosterone undecanoate. From the lymphatic system it is released into the plasma. In plasma and tissues both testosterone undecanoate and dihydrotestosterone undecanoate are hydrolyzed to yield the natural male androgens testosterone and dihydrotestosterone.

Single administration of 80-160 mg Andriol Testocaps leads to a clinically significant increase of total plasma testosterone with peak levels of approximately 40nmol/L ( $C_{max}$ ), reached approximately 4-5 hours ( $t_{max}$ ) after administration. Plasma testosterone levels remain elevated for at least 8 hours.

Testosterone and dihydrotestosterone are metabolised via the normal pathways. Excretion mainly takes place via the urine as conjugates of etiocholanolone and androsterone.

Because of the new Andriol Testocaps presentation a new bioequivalence study was conducted. An open-label, replicate, four period, cross-over trial was performed in 28 healthy postmenopausal women aged 45-65 years, with a body mass index between 18 and 30 kg/m<sup>2</sup> and testosterone levels  $\leq 0.87$  ng/mL. This study was designed to assess bioequivalence between TU administration in the Andriol Testocaps and Andriol formulation, by comparing the AUC and  $C_{max}$  of serum testosterone after administration of both formulations.

The geometric least-squares mean values (CV%) of the pharmacokinetic parameters for testosterone and baseline-corrected testosterone and the results of average bioequivalence testing are summarized in Table 1. Based on  $C_{max}$  and AUC of testosterone and baseline corrected testosterone, average bioequivalence between TU in Andriol Testocaps and Andriol is concluded.

Table 1: Bioequivalence testing between Andriol® Testocaps® and Andriol®

Parameter (units)	Andriol Testocaps Mean* (CV**) (n=27)	Andriol Mean* (CV**) (n=27)	Ratio AT/A	90% confidence interval	Acceptance Range	Conclusion
Bioequivalence testing based on serum testosterone						
$C_{max}$ (ng/mL)	5.67 (27.25)	5.29 (40.50)	1.07	0.97 – 1.18	0.70 - 1.43	Bioequivalent
$AUC_{0-t_{last}}$ (ng•h/mL)	26.73 (25.68)	28.00 (30.23)	0.95	0.92 – 1.00	0.80 - 1.25	Bioequivalent
Bioequivalence testing based on baseline corrected serum testosterone						
$C_{max}$ (ng/mL)	5.43 (28.25)	5.06 (41.75)	1.07	0.97 – 1.19	0.70 – 1.43	Bioequivalent
$AUC_{0-t_{last}}$ (ng•h/mL)	21.42 (28.72)	22.93 (32.26)	0.93	0.89 - 0.98	0.80 – 1.25	Bioequivalent

\* geometric least-squares means; \*\* coefficients of variation derived from SD of log-transformed values; AT: Andriol Testocaps; A: Andriol; bioequivalent: 90% C.I. contained within the acceptance range.

## Food Effect

An open label, single-center, two-way cross-over, food interaction study with Andriol Testocaps was performed in 16 healthy postmenopausal women aged 45-65 years, with a body mass index between 18 and 30 kg/m<sup>2</sup> and testosterone levels  $\leq 1.0$  ng/mL. This study was designed to assess the effect of food on the bioavailability of testosterone (as measured by  $C_{max}$  and AUC) after a single administration of Andriol Testocaps.

Following administration of Andriol Testocaps in the fasted state a poor bioavailability of testosterone was observed, which was considerably increased when Andriol Testocaps was taken with food (see Figure 1). Food-effect testing based on  $C_{max}$  and  $AUC_{0-t_{last}}$  of testosterone as well as baseline-corrected testosterone confirmed the presence of a food effect (see Table 2). This leads to the conclusion that Andriol Testocaps must be taken with a meal.

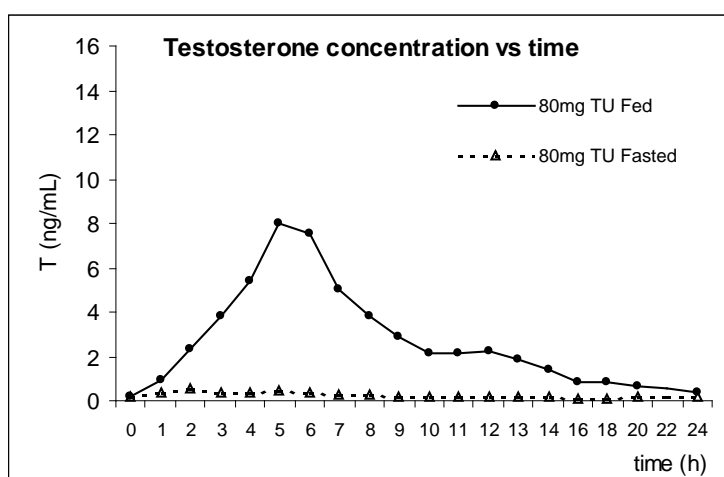


Figure 1: Mean Testosterone Concentration-Versus-Time Curve .

**Table 2: Summary of food-effect testing**

Compound	Parameter (unit)	Mean Fed (n=16)	Mean Fasted (n=16)	Ratio Fed/Fasted	90 % CI	Conclusion
T	C <sub>max</sub> (ng/mL)	10.32	0.5095	20.26	15.47-26.54	Food-effect present
	AUC <sub>0-t<sub>last</sub></sub> (ng·h/mL)	53.14	4.227	12.57	9.05-17.46	Food-effect present
Baseline-corrected T	C <sub>max</sub> (ng/mL)	10.15	0.2876	35.30	24.00-51.91	Food-effect present
	AUC <sub>0-t<sub>last</sub></sub> (ng·h/mL)	49.00	0.9402	52.11	30.94-87.76	Food-effect present

Means are geometric least-squares means; T: testosterone

Food-effect present: 90% C.I. outside acceptance range 0.80-1.25

## INDICATIONS

Androgen replacement therapy for confirmed testosterone deficiency in males.

## CONTRAINDICATIONS

Like any androgen therapy testosterone undecanoate is contraindicated in male patients with known or suspected carcinoma of the prostate gland or breast. Patients with nephrosis or nephrotic phase of nephritis. Andriol Testocaps should not be used in case of known hypersensitivity to the active substance or any of the excipients.

## PRECAUTIONS

The following precautions are common to all testosterone containing preparations:

1. Patients with myocardial or renal dysfunction, hypertension, migraine, diabetes mellitus or epilepsy (or a history of these conditions) should be observed carefully, since androgen therapy may cause fluid retention.
2. Conditions which may be aggravated by the possible fluid retention or oedema caused by Andriol Testocaps.
3. Androgen use in prepubertal boys should be cautious and monitored carefully to avoid the possibility of premature epiphyseal fusion, or precocious sexual development. Skeletal maturation should be monitored regularly.
4. Patients with psychological disturbances should be cautiously treated since suicide due to treatment-aggravated depression has been reported.
5. The size and consistency of the prostate should be monitored periodically.

Andriol Testocaps contains Sunset Yellow FCF (E110, FD&C Yellow No. 6) which may cause allergic reactions.

### Carcinogenicity/ Mutagenicity

The potential carcinogenicity of testosterone has been tested by subcutaneous injection and implantation in mice and rats. In mice, the implant induced cervical uterine tumours, which metastasized in some cases. There is suggestive evidence that injection of testosterone in some strains of female mice increases their susceptibility to hepatoma. Testosterone is also known to act as a tumour promoter and has been shown to increase the number of tumours and decrease the degree of differentiation of chemically induced carcinomas in the liver of rats. There are rare reports of hepatocellular carcinoma in patients receiving long term therapy with androgens, particularly the 17- $\alpha$ -alkyl-androgens, in high doses. Withdrawal of the drugs did not lead to regression of the tumours in all cases. Whether there is a causal relationship or a connection between testosterone administration and formation of tumours occurring by chance remains unclarified. Chronic and

androgen deficiency, however, is a protective factor for prostatic disease and hypogonadal men receiving androgen replacement therapy require surveillance for prostate disease similar to that recommended for eugonadal men of comparable age. Geriatric patients treated with androgens may be at an increased risk for the development of prostatic hyperplasia and prostatic cancer. However, there is no clear understanding of the formation and progression of prostatic carcinoma nor of the role of androgens.

#### **Use in Pregnancy (Category D)**

This drug is not intended for use in female patients and is contraindicated in pregnancy. Androgenic substances may have a virilising effect on the female foetus and should be avoided during pregnancy.

#### **Use during Lactation**

This drug is not intended for use in female patients.

## **INTERACTIONS WITH OTHER MEDICINES**

Enzyme inducing agents such as barbiturates, may exert increasing or decreasing effects on testosterone levels. Therefore adjustment of the dose of Andriol may be necessary. Andriol may potentiate the effects of cyclosporin and increase the risk of nephrotoxicity.

Androgens may improve glucose tolerance and thereby in diabetic patients decrease the need for insulin or other antidiabetic drugs.

Andriol may interfere with a number of clinical laboratory tests e.g. those for glucose tolerance and thyroid function, suppression of clotting factors II, V, VII and X.

## **ADVERSE EFFECTS**

Andriol is generally well tolerated. Very few side effects have been associated with the clinical use of testosterone undecanoate.

**Gastrointestinal complaints** *Common:* (1 to 10%) oily stools. However, these side effects were attributed to the oily solvent and were not considered serious; *Uncommon:* (0.1 to 1%) nausea.

**Genitourinary Disorders** *Rare:* (< 0.1%) priapism, epididymitis, bladder irritability, gynaecomastia, impotence, inhibition of testicular function and testicular atrophy. It is possible that prolonged administration of testosterone undecanoate may induce oligospermia, or decreased ejaculatory volume, which are reversible upon cessation of the drug.

**Blood Disorders** *Rare:* (< 0.1%) **leukocytosis**, polycythemia and Serum cholesterol concentration may increase during androgen therapy. It is possible that prolonged administration of testosterone undecanoate may induce sodium and water retention.

**Neurological Disorders:** *Rare:* (<0.1%) generalised paraesthesia, insomnia, excitation, headache, anxiety, mental depression (see **PRECAUTIONS**).

**Hypersensitivity and Skin Disorders** *Uncommon:* (0.1 to 1.0%) chills, maculopapular rash, acne, flushing of skin.

These symptoms are remedied by a pause in treatment after which therapy should be resumed at a lower dosage.

In a few patients diarrhoea and abdominal pain / discomfort have been reported during use of Andriol Testocaps.

## **DOSAGE AND ADMINISTRATION**

Andriol Testocaps must be taken orally with the morning and evening meal. The capsules should be taken with some fluid and swallowed whole without chewing. If an uneven number of capsules are to be taken, the greater dose should be taken in the morning. The dosage of Andriol Testocaps should be determined by the physician according to the severity of the symptoms. The initial dose is usually 120-160 mg/day for 2-3 weeks. Subsequent dosage (40-120 mg/day) should be based on the clinical effect obtained in the first weeks of therapy. Responses to dosage should be more closely monitored in those patients referred to under the heading **PRECAUTIONS**.

## OVERDOSAGE

The acute oral toxicity of testosterone undecanoate is very low. High dosages of Andriol Testocaps may cause gastrointestinal complaints due to the oily solvent contained in the capsule. Treatment may consist of emptying the stomach and supportive measures.

Contact the Poisons Information Centre for advice regarding management of overdose.

## PRESENTATION AND STORAGE CONDITIONS

Andriol Testocaps testosterone undecanoate 40mg = testosterone 25mg (orange, soft gelatin, marked DV3 ORG): 30's\*, 60's, 120's\*.

*\* Some pack sizes may not be currently marketed.*

### Storage and Shelf Life

Three years, store below 30°C. Do not refrigerate.  
Keep the blister in the outer carton to protect from light.

## POISONS SCHEDULE OF THE MEDICINE

Schedule 4 – Prescription Medicine

## NAME AND ADDRESS OF THE SPONSOR IN AUSTRALIA

Merck Sharp & Dohme (Australia) Pty Limited  
54-68 Ferndell Street  
South Granville NSW 2142  
Australia

## NAME AND ADDRESS OF THE SPONSOR IN NEW ZEALAND

Merck Sharp & Dohme (New Zealand) Ltd  
P O Box 99 851  
Newmarket  
Auckland 1149  
New Zealand

AUST R 92904

Date of first inclusion in the Australian Register of Therapeutic Goods (the ARTG): 14 July 2003

Date of most recent amendment: 04 August 2011

(RA 1410 OS S6 ref 4.0; June 2011)