

Route of Administration	Drug	Trade Name	Formulation	Usual Dosage Range (adult men androgen deficiency)	\$/30 days	Comments
ORAL	Testosterone undecanoate	ANDRIOL	40mg cap	80mg AM + 40mg PM 80mg BID 40mg every other day ♀ ² <small>after meals swallow without chewing</small>	\$108 \$142 \$ 25	♦ taking after meals greatly enhances absorption ¹ ♦ no effect on liver function over 10yrs (observation) ² ♦ Storage: refrigerate in pharmacy; store at room temperature after dispensing (stable for 90 days) ³
TRANSDERMAL GEL X ⊗	Testosterone 1% Gel (5g packet delivers 50mg testosterone & approx. 10% absorbed)	ANDROGEL	2.5g, 5g packet	5g daily in AM <i>initial dose</i> ♂ 7.5g daily in AM 10g daily in AM	\$142 \$142 \$272 X ⊗	♦ applied to shoulder, abdomen or upper arms ♦ patient should wait >6hrs before showering, etc. ♦ possible transfer to partner ∴ T-shirt before hugging ♦ gel generally better tolerated than patch
TRANSDERMAL PATCH X ⊗	Testosterone (in alcohol based gel)	ANDRODERM	2.5mg, 5mg patch	2.5mg patch daily at HS 5mg patch daily at HS 7.5mg patch(s) daily at HS (Apply between 8 & 12 PM)	\$142 \$142 \$272 X ⊗	♦ produces stable – normal testosterone levels (8-12hrs after nightly application) ♦ skin irritation at site; burn-like blister >10%; if mild may use low potency topical corticosteroid ♦ apply to back, abdomen, thigh or upper arms; avoid bony areas; ROTATE site weekly ♦ contact with water does not affect patch
INJECTABLE Cost: also consider cost of additional visits to receive injections.	Testosterone cypionate Testosterone enanthate	DEPO-TESTOSTERONE DELATESTRYL [smaller injection volume advantage]	100mg/ml (10ml Vial) 200mg/ml (5ml Vial)	100mg IM q2wks 150mg IM q2-3wks 100mg IM q2wks 150mg IM q2-3wks 100mg IM q4wks ♀ ² <small>Alternating buttocks</small>	\$ 12 \$ 15 \$ 14 \$ 16 \$ 10	♦ suprathereapeutic levels during first few days; subtherapeutic levels thereafter; ∴ more prone to side effects (eg. mood disturbance, ?polycythemia) ♦ testosterone levels: 7 th day injection (mid range) ♦ range: 50mg q2wk – 200mg q2wk - 400mg q4wks

⊗ = Exception Drug Status X = non-formulary in Sask ⊗ = not covered by NIHB ♂ = male; ♀ = dose in women; {caution -data lacking!} ⁴ Dose must be individualized}. **Conversion Factor:** Testosterone ng/dL x 0.0347 = nmol/L

Major Contraindications: polycythemia, prostate cancer, prostate hypertrophy with severe urinary retention, testicular or breast cancer **Precautions:** mild prostate hypertrophy, sleep apnea

Goal of Androgen Therapy: primarily to improve symptoms of hypogonadism and to bring T levels into the normal range **Therapeutic Trial Duration:** ≥ 3-6 months

↓ **Testosterone Effect:** ^{5,6} **DRUGS:** alcohol, cimetidine, flutamide, glucocorticoids, ketoconazole, opioids, phenytoin, spironolactone; **LIFESTYLE:** smoking, stress, obesity ⁷; chronic medical conditions

MEDICAL CONDITIONS: hypothyroidism, hyperprolactinemia (drug induced or prolactinoma), Klinefelter's syndrome, pituitary adenomas or tumors affecting pituitary (e.g. meningiomas, chromophobe adenomas)

Related Conditions & Therapies: **DEPRESSION** ⇔ antidepressants, mood stabilizers; **ERECTILE DYSFUNCTION** ⇔ **VIAGRA, MUSE**, other; **OSTEOPOROSIS** ⇔ bisphosphonates, Ca⁺⁺ & Vitamin D; **HYPOTHYROIDISM** ⇔ levothyroxine; **LIBIDO** ⇔ multifactorial; **LIFESTYLE** ⇔ exercise, diet, sleep, avoid excess alcohol & caffeine, positive social support/relationships

CAUTION: Treatment safe & effective in true hypogonadism but not well established in Partial Androgen Deficiency in the Aging Male (PADAM). Trials too small & too short term for heart & prostate outcomes.

Potential BENEFITS of Androgen Therapy ^{5,8,9}

- ↓↓ body fat; ↑ lean body mass (LBM) ¹⁷
 - ↑ bone density; lack data on fracture outcomes
 - ↑ hand-grip strength; (less effect on lower body)
 - improvement in mood; mixed effects on cognition⁵
 - antidepressant effect in depressed refractory²⁴ weeks men with low testosterone levels (preliminary data) ¹⁸
 - ↑ libido; possible improvement in sexual function but **often not useful in erectile dysfunction** ¹⁵; {impotence multifactorial and testosterone often not beneficial; one study found placebo (8 wks) as effective as testosterone undecanoate in treating impotence ¹⁹}
 - HIV-AIDS patients: improved quality of life, ↑LBM ^{20,21}
- ⊗ (improvements specifically seen in men with the very low/lowest of testosterone levels)

Potential RISKS of Androgen Therapy ^{10,11,12,13,22}

- **Cardiovascular** - ↓HDL; long-term effects unknown
- **Fluid retention;** exacerbation of heart failure
- **Polycythemia** (↑Hgb; ↑Hct) – ↑stroke risk; less with oral/ transdermal forms which provide stable levels
- **Gynecomastia** (especially if hepatic/renal disease)
- **Testicular:** atrophy or infertility²²
- **Prostate:** ↑ prostate size; ↑ PSA but usually within normal range; possible acceleration of prostate cancer;
- **Difficulty with urination** - 2° to benign prostatic hypertrophy (one study found retardation in BPH ²³)
- **Sleep apnea?** – may exacerbate ^{caution in obese, smokers, COPD}
- **Other:** acne; exacerbation of aggression, hostility, inappropriate sexual behavior or psychotic illness ²⁴
{Hepatotoxicity only with anabolic 17- α -alkylated forms e.g. stanozolol}

MONITORING of Androgen Patients ^{14,15,16,22}

- **Clinical evaluation** of symptom response and side effects (from patient and/or spouse or family member)
- **Prostate assessment:** baseline & annually; some references suggest more frequent in first year ^{14,16,22}
♦ questionnaire regarding urinary/prostate symptoms
♦ digital rectal exam (DRE) & PSA (range: 0-4 ug/L)
- **Lab Tests:** Hct, Hgb, Liver Function Tests
- **CV assessment:** lipid profile, edema, weight gain
- **Testosterone** total level (normal = 6-29nmol/L SK Prov Lab)
Free Androgen Index ⇔ provides better measure of bioavailable testosterone (normal ♂ = 14.8-94.8); (accounts for effect of sex hormone binding globulin ^{SHBG})
- **Sleep** disturbance: excessive snoring; sleep apnea
- **Mood changes** **Monitor:** at baseline; for efficacy at 1-2 months; q3-6months in 1st yr; & annually thereafter.²²

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