References on the Administration of Testosterone Using ALZET® Osmotic Pumps

**Q7117**: C. W. Chua, et al. Differential requirements of androgen receptor in luminal progenitors during prostate regeneration and tumor initiation. Elife 2018;7( ALZET Comments: Testosterone; Ethanol; SC; Mice; 2004; 28 days; Dose (1.875 ug/hr/day); animal info (Nkx3.1); cancer (Prostate).)

ALZET Comments: Testosterone; Ethanol, PEG-400; SC; mice (transgenic); 4 weeks; animal info (CK18-CreERT2 transgenic, Nkx3.1, C57BL/6N); cancer (prostate); replacement therapy (testosterone infusion); Dose (1.875 ug/h).

**Q5712**: Q. Xie, et al. Dissecting cell-type-specific roles of androgen receptor in prostate homeostasis and regeneration through lineage tracing. Nat Commun 2017;8(14284)
ALZET Comments: Testosterone; Ethanol; PEG 400; SC; Mice; 4 weeks; animal info (male, adult, castrated); Dose (1.875 ug/hr).

ALZET Comments: Testosterone; Propylene glycol; SC; Mice; 2004; 32 days; Dose (1 mg/kg/day); Controls received mp w/ vehicle; animal info (15-16 week old Orchiectomy FVB/NJ mice); replacement therapy (orchiectomized).

ALZET Comments: Testosterone; trenbolone; Cyclodextrin, 2-hydroxypropyl-b-; SC; Rat; 2004; 8 weeks; Controls received mp w/ vehicle; animal info (male, Wistar, 12 weeks old, 300g); functionality of mp verified by plasma; pumps replaced every 4 weeks; 45% cyclodextrin used; ischemia (cardiac); post op. care (buprenorphine 10 ug/kg/day IM; enrofloxacin 5 mg/kg ip for 3 days); long-term study; Dose (2 mg/kg/day).

**Q4252**: R. E. Sorge, et al. Different immune cells mediate mechanical pain hypersensitivity in male and female mice. NATURE NEUROSCIENCE 2015;18(1081-+)
ALZET Comments: Testosterone; Polyethylene glycol; SC; Mice (nude); 2002; 14 days; animal info (naive, adult, young, 7-12 wks old, male, female, CD-1, nude CD-1).

**Q4285**: Y. Reizel, et al. Gender-specific postnatal demethylation and establishment of epigenetic memory. GENES & DEVELOPMENT 2015;29(923-933
ALZET Comments: Testosterone; SC; Mice; 2004; 3 months; Controls received mp w/ vehicle; animal info (C57BL6, 3 or 20 weeks old); pumps replaced every 28 days; replacement therapy (testosterone replacement); long-term study; pumps primed for 48 hours in 37C saline.

ALZET Comments: Testosterone propionate; Cyclodextrin, sterile; Mice; 5 days; Animal info (male, TRAMP +/- C57BL/6xFVB/N hybrid, 9 weeks old); cancer (prostate); replacement therapy (gonadectomy; testosterone replacement).

ALZET Comments: Nandrolone; testosterone; Propylene glycol; Rat; 28 days; Dose (0.75 mg/kg/week nandrolone; 2.8 mg/kg/week); Controls received mp w/ vehicle; animal info (Male Wistar rats aged 8 weeks); spinal cord injury.

ALZET Comments: Testosterone; flutamide; anastrozole; DMSO; ethanol; SC; Rat; 2ML2; 4 weeks; Control animals received mp w/ vehicle; animal info (Sprague Dawley, male, adult, 350-400 g); pumps replaced after 2 weeks; replacement therapy (castrated).

ALZET Comments: Dihydrotestosterone; methyltestosterone; NEP28; SC; Rat; 2 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 13 weeks old); dose-response (pg.110-112); neurodegenerative (Alzheimer’s disease); replacement therapy (orchidectomized; androgen therapy); dihydrotestosterone aka DHT; methyltestosterone aka MT; NEP28 is a selective androgen receptor modulator (SARM); notes the use of a 21 day pump.

ALZET Comments: Testosterone; nandrolone; Propylene glycol; SC; Rat; 2004; 56 days; Controls received mp w/ vehicle; animal info (Wistar, male); post op. care (amoxicillin); pumps replaced after 28 days; long-term study.

ALZET Comments: Testosterone; methylprednisolone; testosterone; Propylene glycol; SC; Rat; 2001; 2002; 24 hours; 7 days; Controls received mp w/ vehicle; animal info (Wistar, male); multiple pumps used (2); spinal cord injury.

ALZET Comments: Estradiol; testosterone; Ethanol, propylene glycol; PBS; SC; Mice; 1002; 1004; 2, 4 weeks; Control animals received mp w/ vehicle; animal info (LEPR-B Tyr985Leu, male, female, OVX, castrated); 10% ethanol used; replacement therapy (ovariectomy); post op. care (analgesic, carprofen).

ALZET Comments: Testosterone propionate; Polyethylene glycol; SC; Mice; 2002; 14 days; animal info (naive, adult, 6-12 wks old, male, female, CD-1); wound clips used.

ALZET Comments: Testosterone; nortestosterone, androgen 7 alpha methyl 19; SC; Rat; 2004; 4 months; Controls received mp w/ vehicle; animal info (Wistar, male, aging, 11 mo old); incorrectly listed Model 20004; pumps replaced every 4 weeks; long-term study; replacement therapy (orchidectomy).

ALZET Comments: Nandrolone; testosterone; Propylene glycol; SC; Mice; 7, 28 days; Controls received mp w/ vehicle; mixture of nandrolone and testosterone in same pump.

ALZET Comments: Testosterone propionate; DMSO; ethanol; SC; Mice; 7, 28 days; Controls received mp w/ vehicle; mixture of DMSO and ethanol in 4:1 mixture; replacement therapy (orchidectomy).

ALZET Comments: Dexamethasone; testosterone; Propylene glycol; Rat; 7 days; Controls received mp w/ vehicle; animal info (male, Wistar, 250 g.).
ALZET Comments: Testosterone; Ethanol; PEG 400; SC; Mice; 4 weeks; Animal info (adult, male, castrated, Nkx3-1CreERT2/+); replacement therapy (orchidectomy).

ALZET Comments: Testosterone propionate; SC; Rat; 3 weeks; Animal info (male, Sprague-Dawley, 6 mo old); replacement therapy (orchidectomy).

ALZET Comments: Dihydrotestosterone, 5a-; Ethanol; polypropylene glycol; SC; Mice; 1007D; 1 week; Controls received mp w/ vehicle; animal info (male, female, 5 mo old, OVX, ORDX, 129s1/sv); 0.5% ethanol used.

ALZET Comments: Testosterone; dexamethasone; Propylene glycol; Rat; 1, 7 days; Controls received mp w/ vehicle; animal info (male, Wistar, 250 g.).

P9314: I. Goncalves, et al. Transthyretin is up-regulated by sex hormones in mice liver. MOLECULAR AND CELLULAR BIOCHEMISTRY 2008;317(1-2):137-142
ALZET Comments: Estradiol, 17b-; dihydrotestosterone, 5a-; Polypropylene glycol; ethanol; SC; Mice; 1007D; 1 week; Controls received mp w/ vehicle; replacement therapy (ovariectomy, orchidectomy); animal info (male, female, 129S1/Sv, 5 months old); 0.5% EtOH.

ALZET Comments: Testosterone; SC; Replacement therapy (gonadectomy); comparison of silastic implants vs. time release pellets vs. mp; endocrinology; mp not used, just discussed as available option.

ALZET Comments: Dihydrotestosterone; ICI-182,780; estradiol, 17b-; flutamide; DMSO; PEG 300; propanediol, 1, 2-; SC; CSF/CNS (HVC); CSF/CNS (robust nucleus arcopallium); Bird (sparrow); 1007D; 1002; 14, 21 days; Controls received mp w/ vehicle; pumps replaced after 14 days; cyanoacrylate adhesive; animal info (male, Gambel's white crowned, adult); HVC is the proper name for the telencephalic song nucleus; mp placed in custom built backpack strapped to bird's back w/harness made from surgical dressing, and a microcentrifuge tube; "pilot experiments showed that this arrangement kept the pump at its proper operating temperature (37°C), and that the pump retained saline throughout the entire release period." (p. 12047); ICI-182,780 is also known as faslodex.
**P8443**: W. Banach-Petrosky, *et al.* Prolonged exposure to reduced levels of androgen accelerates prostate cancer progression in Nkx3.1; Pten mutant mice. Cancer Research 2007;67(19):9089-9096

**ALZET Comments**:
Testosterone propionate; PEG 400; SC; Mice; 2004; 7 months; Controls received mp w/ vehicle, or no treatment; replacement therapy (castration); dose-response (fig 1A); long-term study; pumps replaced every 28 days; cancer (prostate); animal info (male, Nkx3.1+/-, Pten+/-, Nkx3.1 +/-, Nkx3.1 -/-, Pten+-/-, 6 wks old).


**ALZET Comments**:
Testosterone; nortestosterone, 7alpha-methyl-19-; Cyclodextrin; SC; Mice (transgenic); 2004; 4 weeks; Replacement therapy (orchidectomy); cancer (prostate); animal info (male, transgenic, 32 grams, ORX); MENT (7-alpha-methyl-19-nor-testosterone) and testosterone dissolved in 45% cyclodextrin.

**P7581**: Y. A. Rojas-Ortiz, *et al.* Modulation of elevated plus maze behavior after chronic exposure to the anabolic steroid 17alpha-methyltestosterone in adult mice. Hormones and Behavior 2006;49(1):123-128

**ALZET Comments**:
Testosterone, 17a-methyl-; Saline; cyclodextrin, B-; SC; Mice; 2002; 17 days; Controls received mp w/ vehicle; animal info (male, C57BL/6, 90 days old); behavioral study; 30% cyclodextrin used.


**ALZET Comments**:
Nortestosterone, 7a-methyl-19-; Propandiol, 1, 2-; SC; Rat; 2004; 16 weeks; Controls received mp w/ vehicle; replacement therapy (orchidectomy); dose-response (fig. 1); long-term study; pumps replaced every 4 weeks; animal info (male, 13 month old, Wistar, 600-650 g).


**ALZET Comments**:
Estradiol, 17B-; testosterone; progesterone; pregnane-3, 20 dione, 5B-; pregnane-3a-ol, 20-one, 5a-; dehydroepiandrosterone; testosterone, 5a-dihydroxy; Ethanol; water, distilled; CSF/CNS; Rat; 2ML1; 3, 7 days; Controls received mp w/ vehicle; ALZET brain infusion kit used; 3% ethanol; animal info (Sprague-Dawley, 250-325 g).


**ALZET Comments**:
Testosterone; estradiol; dihydrotestosterone; dehydroepiandrosterone; PEG 300; SC; Rabbit; 2002; 2 weeks; Replacement therapy (ovariectomy); animal info (female, New Zealand, white, 4.5-5.0 kg, OVX).

**ALZET Comments:** SARM, s-1; SARM s-2; testosterone propionate; Ethanol; PEG 300; DMSO; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle; selective androgen receptor modulator (SARM) are flutamide and bicalutamide analogs; animal info (ORX, male, Sprague-Dawley, 187-214 g).

**P6920:** J. Aronson. The Nicolas Andry Award - Modulation of distraction osteogenesis in the aged rat by fibroblast growth factor. Clinical Orthopaedics and Related Research 2004;425):264-283

**ALZET Comments:** Fibroblast growth factor, recomb. human; dihydrotestosterone; Sodium citrate; SC; bone (tibia); Rat; 1007D; 1002; 2002; 7, 14 days; Functionality of mp verified by residual volume; comparison of injections vs. mp; post op. care (heated cage/analgesics); pumps used for systemic or targeted delivery; silastic tubing used; "The pumps were well tolerated without inflammatory reaction, infection, or pain." (p. 273); picture of pump and catheter (radiograph image) p. 277, fig 10A-B; animal info (Sprague-Dawley).


**ALZET Comments:** Testosterone propionate; acetothiolutamide; bicalutamide, R-; PEG 300; DMSO; ethanol; SC; Rat; 2002; 2 weeks; Controls received mp w/ vehicle; functionality of mp verified by residual volume; replacement therapy (orchidectomy); comparison of bolus IV injections vs. mp (p. 1327); stability verified by preliminary experiments (14 days at 37 C. of acetothiolutamide; half-life (p. 1327) acetothiolutamide (26 min); bicalutamide is a nonsteroidal androgen; acetothiolutamide is a nonsteroidal androgen receptor ligand; agents in separate pumps for separate groups.


**ALZET Comments:** Testosterone propionate; bicalutamide derivatives; hydroxyflutamide derivatives; PEG 300; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle; dose-response; multiple pumps per animal (1-2) due to limited solubility; derivatives were isomers of novel nonsteroidal androgens; functionality of mp verified by residual volume; animal info (male, Sprague-Dawley, 90-100 g, castrated).


**ALZET Comments:** Testosterone; dehydroepiandrosterone; dihydrotestosterone, 5-alpha-; androstenediol, delta 5-3B, 17B; estradiol; progesterone; PEG; SC; Rabbit; 2002; 2 weeks; Controls received mp w/ vehicle; replacement therapy (ovariectomy); multiple pumps per animal (2).


**ALZET Comments:** Testosterone; estradiol; progesterone; flutamide; Cylodextrin, 2-beta-hydroxypropl; SC; Mice (nude); 2004; 4 weeks; Replacement therapy (castration); cancer (prostate); CWR22 xenograft used; flutamide is an anti-androgen; animal info (5-6 week old, nude, ORX).


**ALZET Comments:** Growth hormone, bovine; testosterone; estradiol, 17B-; Phosphate buffer; glycerol; sodium asize; propylene glycol; SC; Rat; 2001; 7 days; Replacement therapy (gonadectomy); comparison of daily injections vs. chronic mp; peptides; GH was recomb bovine & diluted in 0.05 m phosphate buffer, ph 8.6, with 1.6% glycerol & 0.02% sodium azide; testosterone & estradiol were diluted in propylene glycol.


**ALZET Comments:** Triiodothyronine; iodide, potassium; methimazole; Estradiol, 17B-; testosterone; thiourea; Saline; IP; Fish (cod); 2ML1; 17 days; Controls received mp w/ vehicle; functionality of mp verified by residual volume; drug plasma levels taken; potassium iodide, methimazole and thiourea are thyroid inhibitors; sex hormones were in a separate study where...
the ALZET pump model was not listed; "this study demonstrates the value of osmotic pumps as effective delivery vehicles for drugs in wild demersal fish." p. 1024.

**P5405**: P. Val, et al. A 77-base pair LINE-Like sequence elicits androgen-dependent *mvdp/akr1-b7* expression in mouse vas deferens, but is dispensable for adrenal expression in rats. Endocrinology 2002;143(9):3435-3448

**ALZET Comments**: Testosterone; Dexamethasone acetate; Cyclodextrin; PEG; SC; Rat; 2001; 2002; 8; 10 days; Replacement therapy (orchidectomy); testosterone dissolved in cyclodextrin solution and delivered for 10 days via 2002 pumps; dexta was infused via 2001 pumps in PEG vehicle; animal info (adult, male, Wistar).

**P5313**: G. Shetty, et al. Inhibition of recovery of spermatogenesis in irradiated rats by different androgens. Endocrinology 2002;143(9):3385-3396

**ALZET Comments**: Testosterone; nortestosterone, 7a-methyl-19-; Molecusol (cyclodextrin); water; SC; Rat; 2004; 4 weeks; Testosterone plasma levels checked; 45% aqueous solution of Molecusol (cyclodextrin) used; nortestosterone, 7a-methyl-19- is a.k.a MENT; animal info (adult, male, 9-12 weeks old).


**ALZET Comments**: Nortestosterone, 7 a-methyl-19-; SC; Monkey; 2ML4; 195 days; Long-term study, pumps replaced every 28 days; a.k.a MENT; animal info (m, bonnet,).


**ALZET Comments**: Estradiol; testostosterone; PEG; SC; Rabbit; 2002; 14 days; Controls received mp w/ vehicle; estradiol plasma levels taken; replacement therapy (ovariectomy); multiple pumps per animal used (2) for estradiol and testosterone group; animal info (female, New Zealand, white, 3.5-4.0 kg).


**ALZET Comments**: Testosterone; PEG 400; SC; Rat; 2001; 1 week; Controls received mp w/ vehicle; replacement therapy (orchidectomy); multiple pumps per animal (2).


**ALZET Comments**: Azaline B; Testosterone, 7a-methyl-19-nor; Water; Mannitol; Cyclodextrin, hydroxypropyl (molecusol); Rat;; 2ML2; 2ML4;; 1,2,3,4,8 weeks;; replacement therapy; Azaline B is a LHRH-antagonist; agents infused together or singly; the vehicle for nortestosterone was hydroxypropyl beta-cyclodextrin (trappsol); long-term study.


**ALZET Comments**: Dihydrotestosterone;; mice (pregnant)))); 7 days;; teratology; pellets also used to administer DHT;.


**ALZET Comments**: Nortestosterone, 7a-methyl-19-; Testosterone acetate;; Cyclodextrin, B-;; SC;; monkey;; 20 weeks;; functionality of mp verified by hormone serum levels; replacement therapy (castration); dose-response (p.4213); long-term study, pumps replaced weekly during 1st treatment, bi-weekly during 2nd period, & every 4 weeks during the last 2 periods; both steroids were dissolved in 45% solution of 2-hydroxypropyl-B-cyclodextrin; MRI.
**ALZET Comments:** Nortestosterone, 7a-methyl-19-; SC; monkey; 2ML2; no duration posted; functionality of mp verified by serum MENT levels; MENT (7a-methyl-19-nortestosterone) and MENT-acetate used.

**ALZET Comments:** Testosterone; Nortestosterone, 7a-methyl-19-; Cyclodextrin; SC; hamster; 2002; no duration posted; replacement therapy (castration); dose response; long-term study, pumps replaced weekly or biweekly; 7a-methyl-19-nortestosterone is also known as MENT; 35(010) Molecusol used as vehicle.

**ALZET Comments:** Testosterone; estradiol; dexamethasone; PEG 600; PEG; SC; Rat; 2001; 1 week; Controls received mp w/ vehicle; replacement therapy (gonadectomy, adrenalectomy, orchidectomy, oophorectomy).

**ALZET Comments:** Testosterone; Propionate; Cortisol; Cortisone; Dehydroepiandrosterone; Androstenedione, 4-; Androstendiol, 5-; Testosterone; Nortestosterone, 19-; Estradiol, B-; Estrone; Estriol; Deoxycorticosterone; PEG 400; IV (lower cava); Rat; 2002; 15 days; controls received mp with PEG; no stress (see pg. 351); pumps placed into peritoneal cavity and sutured to musculature; surgical wound sprinkled with sulphathiazol.

**ALZET Comments:** Testosterone; Insulin; Insulin-like growth factor I; Acetic acid; SC; Rat; 2001; 14 days; peptides; review; medical category: bone & endocrinol.

**ALZET Comments:** Octreotide; Somatostatin; Testosterone propionate; Propylene glycol; SC; mice; 10 days; concomitant infusion of T and SMS from 2 pumps implanted simultaneously; functionality of mp verified after delivery; peptides; somatostatin analog.

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Bibliography

ALZET Comments: Aldosterone; Corticosterone; Dexamethasone phosphate; Estradiol, 17B-; Progesterone; Testosterone; PEG 400; PEG 600; IP; Rat; 1701; 2001; 3-8 days; comparison of agents effects; replacement therapy (adrenalectomy & ovariectomy); controls received mp with solvent or glass rods of mp size; no stress implied G125, weight regained; functionality of mp verified.

ALZET Comments: Testosterone; PEG; SC; mice; 2002; 13 days; replacement therapy (castration); stress/adverse reaction (infection at site of mp implantation).

ALZET Comments: Testosterone propionate; Ethanol; Propylene glycol; Saline; SC; Rat; 6 days; comparison of hCG im injec vs. testosterone mp infusion; mp delivery rate verified.

ALZET Comments: Dihydrotestosterone; PEG 300; SC; Rat; 2001; 6 days; no comment posted.

ALZET Comments: Aldosterone; Corticosterone; Deoxycorticosterone acetate; Dexamethasone acetate; Estradiol, 17B-; Hydrocortisone; Progesterone; Spironolactone; Testosterone; PEG; PEG 400; PEG 600; IP; Rat; 1701; no duration posted; 3-7 days aldosterone, 6 days PEG only; replacement therapy (adrenalectomy).