References on the Administration of Triiodothyronine
Using ALZET® Osmotic Pumps


**ALZET Comments:** Thyroxine, 3,5,3′-triiodothyronine; NaOH, propylenglycol, PBS SC; Rat (mole); 2006; 12 weeks; Dose (90 ng/g of T4, 2 ng/g of T3); 15 mM NaOH, 50% propylenglycol and PBS containing 5% BSA used; Controls received mp w/ vehicle; animal info (Ansell’s mole rats, mean age 2.6 ± 0.92 years); post op. care (Carprofen, 5 mg/kg for at least 3 days; animals were isolated for 24–48 h for recovery then housed as family group); pumps replaced every 6 weeks; long-term study; “Osmotic pumps deliver the test agents with a constant flow rate, thus being well-suited for long-term hormone treatments” pg. 9.


**ALZET Comments:** Thyroxine; Triiodothyronine, 3,5,3′-; Propylene glycol, NaOH, BSA; SC; Rat (mole); 2006; 12 weeks; Dose (T4 at 90 ng/g; T3 at 2 ng/g); Vehicle solution (15 mM NaOH, 50% propylenglycol and PBS containing 5% BSA); Controls received mp w/ vehicle; animal info (Ansell’s mole-rats with mean age of 2.6 ± 0.92 years); post op. care (Carprofen, 5 mg/kg for at least 3 days; animals were isolated for 24–48 h for recovery then housed as family groups); pumps replaced every 6 weeks; long-term study (12 weeks); “Osmotic pumps deliver the test agents with a constant flow rate, thus being well-suited for long-term hormone treatments.”


**ALZET Comments:** Triiodothyronine; Saline; SC; Rat; 2ML4; 48 hours; Dose (6 μg/kg/day); Controls received mp w/ vehicle; animal info (adult male Wistar rats 12–15 weeks old and weighing about 300 g); triiodothyronine aka T3; cardiovascular.


**ALZET Comments:** Triiodothyronine; Saline; SC; Rat; 2002; 48 hours; Dose (6 mg/kg/day); Controls received mp w/ vehicle; animal info (adult male Wistar rats weighing 385 ± 9 g); Triiodothyronine aka T3; cardiovascular.


**ALZET Comments:** Triiodothyronine; Saline; SC; Rat; 2002; 3 days; Controls received mp w/ vehicle; animal info (male, Wistar, adult, 385+/- 9 g); functionality of mp verified by serum levels; cardiovascular; pumps removed after 3 days; Dose (6 ug/kg/day).


**ALZET Comments:** Triiodothyronine; Saline; SC; Rat; 14 days; Controls received mp w/ vehicle; animal info (male, Fischer 344 Brown Norway F1 hybrid, 7 and 27 months old); functionality of mp verified by blood levels; triiodothyronine aka T3.


**ALZET Comments:** Triiodothyronine; SC; Rat; 2002; 3 days; Controls received mp w/ saline; animal info (Wistar, 280-300g); functionality of mp verified by serum levels; cardiovascular.


**ALZET Comments:** Triiodothyronine; NaOH; saline; SC; Rat; 2ML4; 14 days; Control animals received mp w/ vehicle; animal info (7 wks old, male, Sprague Dawley).

**ALZET Comments**: Triiodothyronine; Saline; SC; Rat; 2ML4; 48 hours; Controls received mp w/ vehicle; animal info (male, Wistar, 12-15 weeks old, 310g); ischemia (cardiac); cardiovascular.


**ALZET Comments**: Triiodothyronine; thyroxine; Propylene glycol; SC; Rat (pregnant); 2ML2; Controls received mp w/ vehicle and sham surgery; animal info (250-300 g, female, Wistar); "(T3, T4 doses) were not corrected for increasing weight" pg 1714; "Instead of administering the hormones directly to the hypothyroid fetuses, they were given via subcutaneous infusion to pregnant dams." pg 1715.


**ALZET Comments**: Triiodothyronine; Saline; SC; Rat; 2004; 9 weeks; Controls received mp w/ vehicle; animal info (adult, male, Sprague-Dawley); pumps replaced at the 4th week; long-term study; myocardial infarction.


**ALZET Comments**: Triiodothyronine, 3, 5, 3'; SC; Mice; 1002; 14 days; Controls received mp w/ vehicle; no stress (see pg. 2958); animal info (10 wks old, Wistar); "none of the animals suffered any ill effects of the implants, either generally or in the area of the pumps." (pg. 2958).


**ALZET Comments**: Triiodothyronine; NaCl; SC; Mice; 2001; 3 days; Controls received mp w/ vehicle; animal info (WT, UCP3KO, 2 mo old, female); functionality of mp verified by "increase in T3 during the treatment".


**ALZET Comments**: MB07344; GC-1; triiodothyroacetic acid, 3,5,3'; triiodothyronine; Saline; BSA; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley, 300g, 10 wks old); MB07344, GC-1 are TR-beta-selective antagonists.


**ALZET Comments**: Corticosterone; triiodothyronine; DMSO; propylene glycol; SC; Bird (chicken); 2001; 72 hours; Controls received mp w/ vehicle; animal info (male, 29 days old); 50% DMSO used; 50% propylene glycol used.


**ALZET Comments**: Triiodothyronine; Saline; Na2CO3; NaOH; BSA; SC; Rat; 14 days; Controls received mp w/ vehicle; functionality of mp verified by serum T3 levels; animal info (male, Sprague-Dawley, 325-350g.); endocrinology.


**ALZET Comments**: Triiodothyronine, 2,3',5 L-; NaOH; BSA; IP; Rat; 1 week; Controls received mp w/ vehicle; functionality of mp verified by serum T3 levels; animal info (male, Fisher 344, 150-175g, bile duct ligation).
ALZET Comments: Triiodothyronine; thyroxine, L-; Saline; NaOH; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle, or no treatment; replacement therapy (thyroidectomy); animal info (Sprague-Dawley, 5 wk old, male).

ALZET Comments: Triiodothyronine; NaOH; saline; SC; Rat; 1002; 3, 12 days; Controls received mp w/ vehicle or euthyroid; functionality of mp verified by plasma levels, replacement therapy (thyroidectomy), enzyme inhibitor (deiodinase), peptides, multiple pumps per animal (2), agents are also known as T3 and T4.

ALZET Comments: Thyroxine; leptin, human analog; triiodothyronine, reverse; Saline, isotonic; SC; Rat; 2001; 3, 6 days; Controls received mp w/ vehicle, functionality of mp verified by plasma levels, replacement therapy (hypothyroidism), enzyme inhibitor (deiodinase), peptides, multiple pumps per animal (2), agents are also known as T3 and T4.

ALZET Comments: Thyroxine; Iopanoic Acid; Triiodothyronine; NACL; NAOH (sodium hydroxide); HCL; CSF/CNS; Bird (quail); 2002; 2 weeks; ALZET brain infusion kit used; placement & patency of canula verified by injecting evans blue dye.

ALZET Comments: Isoproterenol; triiodothyronine; propranolol; SC; Rat; 2ML2; 14 days; Controls received mp w/ saline; cardiovascular.

ALZET Comments: Triiodothyronine; BSA; NaOH; sodium bicarbonate; SC; Rat; 14 days; Controls received mp w/ vehicle; pump model not stated.

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.

P5155: V. Haberkorn, et al. Vitamin A modulates the effects of thyroid hormone on UDP-glucuronosyl transferase expression and activity in rat liver. MOLECULAR AND CELLULAR ENDOCRINOLOGY 2002;190(167-175
ALZET Comments: Thyroxine; Triiodothyronine; Saline; Sodium hydroxide; SC; Rat; 2002; 15 days; controls received mp w/ vehicle; replacement therapy (thyroidectomy, p. 168); functionality of mp verified by thyroxine plasma levels.

ALZET Comments: Growth hormone, recomb. human; thyroxine; triiodothyronine; SC; Rat; 2 weeks; Controls received teflon rods; replacement therapy (hypophysectomy).
ALZET Comments: Leptin; thyroxine; triiodothyronine; Saline; SC; CSF/CNS; Rat; 2001; 6 days; Controls received mp w/ vehicle; peptides.

ALZET Comments: Triiodothyronine; Saline; BSA; Sodium Hydroxide (NaOH); Sodium Carbonate; SC; Rat; 14 days; Controls received mp w/ vehicle; 5% BSA used.

ALZET Comments: Triiodothyronine; SC; Rat; 24 hours; Functionality of mp verified by T3 plasma levels by direct chemiluminescence assay; dose-response (graph p. 254); immunology.

ALZET Comments: Triiodothyronine; SC; Rat; 7 days; Functionality of mp verified by T3 plasma levels via chemiluminescent assay; cardiovascular.

ALZET Comments: Hepatocyte growth factor; Triiodothyronine; Saline; BSA; SC; Rat; 12 days; Comparison of portal vein injections vs. mp; cancer; immunology; peptides; HGH used was recombinant human.

ALZET Comments: Triiodothyronine; triiodothyroacetic acid; NaOH; saline; BSA; SC; Rat; 24 hours; Comparison of portal vein injections vs. mp; cancer; immunology; peptides; HGH used was recombinant human.

ALZET Comments: Triiodothyronine, 3,3',5 '-; Thyroxine; NaOH; Saline; IP; Rat; 2002; 10 days; Controls received mp w/ vehicle or no surgery; replacement therapy (thyroidectomy); toxicology.

ALZET Comments: Thyroxine; Triiodothyronine; NaOH; saline; IP; Rat; 2002; 10 days; Triiodothyronine (T3) & thyroxine (T4) were dissolved in 0.1M NaOH & 0.9% NaCl.

ALZET Comments: Thyroxine sulfate and Triiodothyronine sulfate, 3,3',5 '-'- Triiodothyronine sulfonate, reverse; NaOH; PBS; Serum, rat; SC; Rat; 2001; 48-96 hours; Controls received mp with saline; functionality of mp verified by serum levels.

ALZET Comments: Thyroxine; Triiodothyronine; Saline; Serum, rat; NaOH; SC; Rat; 2ML4; 28 days; Controls received sham surgery; functionality of mp verified by serum hormone levels; replacement therapy (thyroidectomy); toxicology.
ALZET Comments: Thyroxine; Triiodothyronine; ¹²⁵I tracer; Radio-isotopes; Albumin, bovine serum; NaOH; Sodium carbonate; SC; Rat; 2001; 7 days; functionality of mp verified in pilot studies; topical and im antibiotics used.

ALZET Comments: Growth hormone, human; Triiodothyronine, L-; Prolactin, ovine; Dexamethasone; SC; Rat; 7 days; controls received hypophysectomy only w/ no mp; functionality of mp verified by checking pumps after usage; replacement therapy (hypophysectomy); comparison of single sc injections of GH & T3 vs. mp; agents given alone or in combination; growth hormone via mp partly restores liver estrogen receptor concentration while same dose in 2 single injections daily has no effect.

ALZET Comments: Triiodothyronine; Corticotropin; NaOH; IP; Rat; 2002; 8-10 days; peptides.

ALZET Comments: Triiodothyronine; Thyroxine; 125I tracer; Radio-isotopes; Albumin, bovine serum; SC; Rat; 2001; 7 days; functionality of mp verified in pilot studies.

ALZET Comments: Thyroxine; Triiodothyronine; 125I tracer; Radio-isotopes; Albumin, bovine serum; Saline; Sodium hydroxide; IP; Rat; 1003D; 2002; 1 week; 24 hours; replacement therapy (MMI-perchlorate induced hypothyroidism).

ALZET Comments: Triiodothyronine; 125I tracer; Sodium carbonate; Sodium hydroxide; Radio-isotopes; Serum, rat; SC; Rat; 2001; 7 days; replacement therapy (thyroidectomy).

ALZET Comments: Triiodothyronine; IP; 7 days; replacement therapy (hypothyroidism); functionality of mp verified by measuring plasma levels of TSH.

ALZET Comments: Triiodothyronine; Sodium hydroxide; Saline; Serum, rat; IP; Rat; 2ML2; 7 days; controls received mp w/ vehicle; functionality of mp verified by plasma levels; replacement therapy (methimazole-induced hypothyroidism).

ALZET Comments: Triiodothyronine, L-; Sodium hydroxide; Serum, rat; SC; Rat; 2002; 14 days; controls received thyroidectomy but no agent treatment; functionality of mp verified by in vitro testing; replacement therapy (thyroidectomy).

ALZET Comments: Hydrocortisone; Triiodothyronine; Growth hormone; PEG; Sodium hydroxide; Saline; SC; Rat; no duration posted; peptides.

ALZET Comments: Triiodothyronine; Saline; SC; Rat; no duration posted; controls received mp w/saline; functionality of mp verified seven levels.

ALZET Comments: Thyroxine; Triiodothyronine; PBS; Serum, rat; Sodium hydroxide; Rat (pregnant); 2ML2; no duration posted; controls received mp w/ saline; functionality of mp verified by plasma levels; dose-response.

P2176: R. A. Barter, et al. UDP-glucuronosyltransferase inducers reduce thyroid hormone levels in rats by an extrathyroidal mechanism. Toxicol. Appl. Pharmacol 1992;113(36-42
ALZET Comments: Thyroxine; Triiodothyronine; Saline; Sodium hydroxide; SC; Rat; 2002; 10 days; functionality of mp verified by serum levels (p. 38); replacement therapy (thyroidectomy); good methods.

ALZET Comments: Triiodothyronine; IP; Rat; 7, 28 days; no comment posted.

ALZET Comments: Triiodothyronine; Thyroxine, l-; Butanol, n-; Propylene glycol; IP; Rat; 2001; 2002; 7,14 days; controls received no treatment or mp with vehicle; functionality of mp verified by plasma levels; replacement therapy (thyroparathyroidectomy); comparison of SC T3 injections vs. mp.

ALZET Comments: Triiodothyronine; Thyroxine; Thyrotropin-rel. factor; Saline; Sodium hydroxide; Serum, rat; SC; Rat; 6 days; controls received saline via injections or did not have drug-induced hypothyroidism; replacement therapy (propylthiouracil and methimazole-induced hypothyroidism); comparison of ip, iv & sc injections vs. mp; multiple pumps per animal (2) were used concurrently.

ALZET Comments: Triiodothyronine; sheep (fetus); 8 days; functionality of mp verified by serum levels; replacement therapy (thyroidectomy).

ALZET Comments: Thyroxine; Triiodothyronine; Albumin, bovine serum; Radio-isotopes; Saline; SC; Rat; 2001; 7 days; functionality of mp verified by serum hormone levels, measuring residual radioactivity.

ALZET Comments: Radio-isotopes; Triiodothyronine; 125I tracer; Sodium hydroxide; Serum, rat; SC; Rat; 2001; 3 days; comparison of IP injections vs. mp infusion; cancer/immunology.

**ALZET Comments**: Triiodothyronine; IP; Rat; 7 days; replacement therapy (thyroidectomy).


**ALZET Comments**: Triiodothyronine, L-; SC; rabbit; 5 days; functionality of mp verified by daily blood LT3 levels using RIA; replacement therapy (propylthiouracil diet-induced hypothyroid); various LT3 doses infused.

**P1468**: C. H. Emerson, et al. Serum thyrotropin concentrations are more highly correlated with serum triiodothyronine concentrations than with serum thyroxine concentrations in thyroid hormone-infused thyroidectomized rats. Endocrinology 1989;124(2):215-218

**ALZET Comments**: Thyroxine; Triiodothyronine; Serum, rat; Sodium hydroxide; Water; SC; Rat; 14 days; dose-response; functionality of mp verified by serum levels; replacement therapy (thyroidectomy).


**ALZET Comments**: Triiodothyronine; Butanol, n-; PEG; IP; Rat; 2001; 7 days; no comment posted.


**ALZET Comments**: Radio-isotopes; Triiodothyronine; 125I tracer; Albumin, bovine serum; Saline; SC; mice; 2001; 7 days; dose-response; functionality of mp verified by serum levels.


**ALZET Comments**: Radio-isotopes; Thyroxine; Triiodothyronine; 125I tracer; SC; Rat; 2001; 7 days; no comment posted.


**ALZET Comments**: Radio-isotopes; Thyroxine; Triiodothyronine; 125I tracer; Albumin, human serum; Sodium hydroxide; Water; SC; Rat; 2001; 14 days; dose-response (table); half-life; second and third pumps implanted at 7 days; third pump contained labelled T-4 to measure the MCR; functionality of mp verified by serum levels; pump replaced weekly; replacement therapy (thyroidectomy); stability determin.


**ALZET Comments**: Cortisol; Growth hormone, human; Triiodothyronine; Sodium hydroxide; Saline; SC; Rat; 7, 14 days; pump model not stated; male rats infused for 7 days, females for 14; agents infused separately; replacement therapy (hypophysectomy); peptides.


**ALZET Comments**: Radio-isotopes; Thyroxine; Triiodothyronine; 125I tracer; Bile; Glycerol; Propanol; Propylene glycol; intestine (duodenum); Rat; 2001; 7 days; catheter to duodenum; dose-response (text); functionality of mp verified by plasma levels.


**ALZET Comments**: Thyroid-stimulating hormone, bovine; Thyrotropin-rel. factor; Thyroxine; Triiodothyronine; Sodium hydroxide; Saline; IV (jugular); SC; Rat; 2, 6 days; pump model not stated; mp connected to catheter; dose-response; separate and simultaneous infusion of T3 and T4; NaOH is vehicle for TRH, T3, and T4; replacement therapy (hypophysectomy); peptides.

**ALZET Comments:** Triiodothyronine; Sodium hydroxide; Serum, rat; Water; IP; Rat; 2002; 14 days; dose-response (table); comparison of sc injections vs. mp infusion; functionality of mp verified.

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**P1049:** B. Lacour, et al. Chronic triiodothyronine supplementation does not improve the lipoprotein disorders of mildly uremic rats. Nephron 1987;45(129-134)

**ALZET Comments:** Triiodothyronine; IP; Rat; 2002; 35 days; pumps replaced twice; some animals received contralateral nephrectomy; long-term study.

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**P1002:** M. O. Goumaz, et al. Brain cortex reverse triiodothyronine (rT3) and triiodothyronine concentrations under steady state infusions of thyroxine and rT3. Endocrinology 1987;120(1590-1596)

**ALZET Comments:** Thyroxine; Triiodothyronine, reverse; 125I tracer; Sodium hydroxide; Saline; Serum, rat; Sodium carbonate; IP; Rat; 2001; 3/7 days; pumps primed overnight in saline; T4 of low & high specific activity (SA) infused sep; T4 of low (SA) obtained by add. of unlabeled T4; replacement ther. (thyroidectomy).

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**P1127:** L. A. Gavin, et al. Brain lipoprotein lipase is responsive to nutritional and hormonal modulation. Metabolism 1987;36(10):919-924

**ALZET Comments:** Insulin; Triiodothyronine; SC; Rat; 2001; 4, 7 days; dose-response; replacement therapy (streptozotocin induced diabetes, thyroidectomy); peptides.

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**P1009:** W. J. DeVito, et al. The pituitary TSH response to TRH is inversely related to the plasma TSH concentration and directly related to the pituitary TSH content during hypothyroidism in the rat. Acta Endocrinol 1987;114(27-36)

**ALZET Comments:** Thyroxine; Triiodothyronine; Sodium hydroxide; Saline; Serum, rat; SC; Rat; 2002; 7/14 days; pumps replaced after 7 days; dose-response; intact euthyroid control rats were left untreated; replacement therapy (thyroparathyroidectomy).

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**ALZET Comments:** Triiodothyronine; Saline; SC; Rat; 2002; no duration posted; controls received sham operation w/placebo mp; replacement therapy (thyroidectomy) pumps replaced at day 14 and day 28; long-term study.

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**ALZET Comments:** Thyroxine; Triiodothyronine, reverse; Sodium hydroxide; Saline; Serum, hypothryoid rat; Sodium carbonate; IP; Rat; 2001; 7 days; controls received mp w/vehicle; dose response data; pumps primed overnight in buffer; various doses of agents infused; functionality of mp verified by labelling agent (extensive serum level data); replacement therapy (thyroidectomy).

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**P0714:** J. O. Olubadewo, et al. Differential effects of alanine on ketogenesis and triacylglycerol formation by isolated perfused livers from euthyroid and hyperthyroid rats. Metabolism 1985;34(12):1139-1145

**ALZET Comments:** Triiodothyronine; Butanol, n-; Propylene glycol; IP; Rat; 7 days; control group received mp w/ vehicle; mp infusion of T3 to induce hyperthyroidism in rats.

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**P0727:** L. A. Gavin, et al. Modulation of adipose lipoprotein lipase by thyroid hormone and diabetes. Diabetes 1985;34(1266-1271)

**ALZET Comments:** Insulin; Triiodothyronine; SC; Rat; 2001; 72 hours; replacement therapy (thyroidectomy, streptozocin induced diabetes); peptides.

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ALZET Comments: Triiodothyronine; Sodium hydroxide; Serum, rat; SC; Rat; 3 days; 1.2 and 4.5 ug T3/100g body weight/day; dose-response data; cancer.

ALZET Comments: Triiodothyronine; SC; sheep (fetus); 8 days; replacement therapy (thyroidectomy); 25 ug/h and 50 ug/h infusions of T3.

ALZET Comments: Thyroxine; Triiodothyronine; Sodium hydroxide; Serum, rat; SC; Rat; 2002; 12 days; replacement therapy (thyroidectomy).

ALZET Comments: Dexamethasone; Radio-isotopes; Thyroxine, l-; Triiodothyronine; 125I tracer; Albumin, human serum; Sodium hydroxide; Saline; IP; SC; Rat; 2001; 2002; 5, 6, and 12 days; comparison of agents effects; replacement therapy (thyroidectomy); no stress - see p. 220; T3 and T4 used w/ and w/o 125I tracer; T4 used in 2002 pump sc, T3 in 2001 sc, Dex. in 2001 ip or sc; 3 pumps/animal.

ALZET Comments: Triiodothyronine; SC; sheep (fetus); sheep (lamb); 8 days; replacement therapy (thyroidectomy).

ALZET Comments: Triiodothyronine, 3,5,3'-; PEG 300; Water; IP; Rat; 2001; 1 week; replacement therapy (thyroidectomy).

ALZET Comments: Triiodothyronine; sheep (fetus); sheep (lamb); 8 days; replacement therapy (thyroidectomy); doses of T3 were 8 ug/h, 25 ug/h, 50 ug/h.

ALZET Comments: Glucagon; Radio-isotopes; Thyroxine; Triiodothyronine; 125I tracer; Sodium hydroxide; Saline; IP; IV (jugular); Rat; 7-9 days; glucagon ip simultaneous infusion w/T3 & T4 in vehicles iv; 2 pumps/animal.

ALZET Comments: Triiodothyronine analog (DIMIT); Thyroxine; Triiodothyronine; SC; Rat; 8 days; comparison of daily sc injection vs. infusion; organ replacement therapy (thyroidectomy).

ALZET Comments: Triiodothyronine, 3,3',5'-; Thyroxine; SC; Rat; no duration posted; 2 days T4, 5 days rT3; comparison of injections vs. infusion.

ALZET Comments: Thyroxine; Triiodothyronine; Sodium hydroxide; Propanediol, 1,2-; Serum, rat; SC; Rat; 4-6 days; organ replacement therapy (thyroidectomy).
ALZET Comments: Triiodothyronine; PEG; SC; sheep (fetus); 5 days; no comment posted.

ALZET Comments: Triiodothyronine; PEG; SC; sheep (fetus); 4-5 days; Harvard pump used to infuse NE during control period of 30-60 mins.

ALZET Comments: Triiodothyronine; Sodium hydroxide; Propanediol, 1,2-; SC; Rat; no duration posted; Intermittent injections vs. infusion; organ replacement therapy (thyroidectomy).