References on the Administration of Thyroxine Using ALZET® Osmotic Pumps


**Agents:** Thyroxine **Vehicle:** NaCl, Sterile; **Route:** SC; **Species:** Rabbit; **Pump:** Not Stated; **Duration:** 14 days;

**ALZET Comments:** Dose (50 ug/kg/day); animal info (Adult New Zealand white rabbits); dependence;


**Agents:** Thyroxine. L- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** Dose (1 uL/hr/day); animal info (Wistar, adult, female, 250-300 g); dependence;


**Agents:** Thyroxine, 3,5,3'-triiodothyronine **Vehicle:** NaOH, propylenglycol, PBS; **Route:** SC; **Species:** Rat (mole); **Pump:** 2006; **Duration:** 12 weeks;

**ALZET Comments:** 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;


**Agents:** Thyroxine **Vehicle:** Saline; Propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** Not Stated;

**ALZET Comments:** 50% propylene glycol used; animal info (9 week old male lean (265 ± 7 g), strain-control Long Evans Tokushima Otsuka rats and obese (356 ± 4 g) Otsuka Long Evans Tokushima Fatty rats); Therapeutic indication (glucose intolerance);


**Agents:** Thyroxin, L-, Adenovirus vector; Gene, green fluorescent protein; Gene, AMP-activated protein kinase **Vehicle:** Saline; **Route:** CSF/CNS (hypothalamus); **Species:** Rat; **Pump:** 1007D; **Duration:** 7, 21 days;

**ALZET Comments:** bilateral cannula used; animal info (200-250g); gene therapy; Therapeutic indication (Browning, thyroid hormones);


**Agents:** Triiodothyronine ; Thyroxine **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 2ML2; **Duration:** Not Stated;

**ALZET Comments:** 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


**Agents:** Thyroxine, L- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 2ML4; **Duration:** Not Stated;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (Wistar, P90)

Agents: Triiodothyronine; Thyroxine
Vehicle: Ethanol; Saline
Route: CSF/CNS (hippocampus)
Species: Rat
Pump: Not Stated
Duration: 24 hours
ALZET Comments: Dose (50 pmol/ul); 0.9% NaCl and 0.05% Ethanol used; Controls received mp w/ vehicle; animal info (Young adult male Sprague–Dawley rats weighing 180–200 g); Triiodothyronine aka T3, Thyroxine aka T4; Brain coordinates (bregma – 3.5 mm, lateral ± 2 mm, and depth – 2.0 mm); replacement therapy (Thyroid Hormones);


Agents: Parathyroid hormone, rat (1-84); Calcitonin, rat; Thyroxine
Vehicle: Acetate buffer
Route: SC
Species: Rat (pregnant)
Pump: 2001
Duration: 4,8 days
ALZET Comments: Teratology; peptides; animal info (Female, Wistar, 250-300 g); replacement therapy (parathyroidectomy)


Agents: Thyroxine, L-; doxycycline
Vehicle: Not Stated
Route: SC
Species: Rat
Pump: 1002
Duration: 14 days
ALZET Comments: Controls received mp w/ physiological serum; animal info (Wistar, male, 50-60 days old, 132 g);


Agents: Thyroxine
Vehicle: NaOH; Propylene glycol
Route: SC
Species: Rat
Pump: 2ML2
Duration: Not Stated
ALZET Comments: Controls received mp w/ vehicle; animal info (Wistar, male, 320-360 g); endocrinology


Agents: Thyroxine; Leptin, human analog; Triiodothyronine, reverse
Vehicle: NaOH; NaCl; NAOH (sodium hydroxide); HCL
Route: CSF/CNS
Species: Rat
Pump: 2001
Duration: 2 weeks
ALZET Comments: ALZET brain infusion kit used; placement & patency of canula verified by injecting evans blue dye


Agents: Triiodothyroine; thyroxine, L-
Vehicle: Saline; NaOH
Route: SC
Species: Rat
Pump: 2ML2
Duration: 14 days
ALZET Comments: Controls received mp w/ vehicle, or no treatment; replacement therapy (thyroidectomy); animal info (Sprague-Dawley, 5 wk old, male)


Agents: Thyroxine; Leptin, human analog; Triiodothyronine, reverse
Vehicle: Saline, isotonic
Route: SC
Species: Rat
Pump: 2001
Duration: 3, 6 days
ALZET Comments: 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


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

**Agents:** Luteinizing hormone; Thyroxine  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2ML4;  
**Duration:** 4 weeks;  

**ALZET Comments:** controls received mp w/ saline; functionality of mp verified by residual volume and plasma levels of LH & T4 via radioimmunoassay; dose-response (table, p. 1364); multiple pumps per animal (1-2): one for T4 and one for LH

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

**Agents:** Thyroxine; Triiodothyronine  
**Vehicle:** Saline; Sodium hydroxide;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** 15 days;  

**ALZET Comments:** controls received mp w/ vehicle; replacement therapy (thyroidectomy, p. 168); functionality of mp verified by thyroxine plasma levels


**Agents:** Growth hormone, recomb. human; thyroxine; triiodothyronine  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** 2 weeks;  

**ALZET Comments:** Controls received teflon rods; replacement therapy (hypophysectomy)


**Agents:** Thyroxine  
**Vehicle:** PBS; BSA; NaOH;  
**Route:** SC;  
**Species:** Rat (pregnant);  
**Pump:** Not Stated;  
**Duration:** 23 days;  

**ALZET Comments:** Controls received mp w/ vehicle; functionality of mp verified by tail bleed for TH levels; replacement therapy (thyroidectomy); teratology


**Agents:** Leptin; thyroxine; triiodothyroacetic acid  
**Vehicle:** BSA, NaOH buffered;  
**Route:** IP;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 6 days;  

**ALZET Comments:** Dose ((T4 0.5, 1.5, 4.5, 13.5 nmol/day/100g BW), (Tetrac 0, 1.5, 4.5, 13.5, 40.5 nmol /day/100g BW)); 0.05 M NaOH, 2% bovine serum albumin, 100,000 c.p.m. [125I]T4 or [125I]Tetrac used; Controls received mp w/ vehicle; animal info (male, SIVZ); enzyme inhibitor (monodeiodinase type 2); replacement therapy (); Therapeutic indication (inhibiting serum TSH concentrations); Resultant plasma level ((T4 43.1+/-2.8, 77.1+/-9.4, 129.7+/-9.5, 353.4+/-31.7 pmol/ml), (Tetrac 168+/-16, 332+/-19, 458+/-27, 406+/-57 pmol/ml)); 3,5,3',5'-tetraiodothyroacetic acid (Tetrac) is a thyroxine (T4) analogue;  


**Agents:** Angiotensin II; Thyroxine  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2004;  
**Duration:** 28 days;  

**ALZET Comments:** controls received mp w/ vehicle; cardiovascular; peptides; one group received Ang II and T4 in same pump; functionality of mp verified by plasma Ang II levels


**Agents:** Triiodothyronine, 3,3',5'-; Thyroxine  
**Vehicle:** NaOH; Saline;  
**Route:** IP;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 10 days;  

**ALZET Comments:** controls received mp w/vehicle or no surgery; replacement therapy (thyroidectomy); toxicology

**Agents:** Thyroxine; Triiodothyronine  
**Vehicle:** NaOH; saline;  
**Route:** IP;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 10 days;  
**ALZET Comments:** Triiodothyronine (T3) & thyroxine (T4) were dissolved in 0.1M NaOH & 0.9% NaCl


**Agents:** Growth hormone, recomb. human; Insulin-like growth factor I; Dexamethasone; Thyroxine, L-  
**Vehicle:** Not Stated;  
**Route:** Not Stated;  
**Species:** Rat;  
**Pump:** 2001; 2ML2;  
**Duration:** 6 days;  
**ALZET Comments:** controls received sham operation; replacement therapy (hypophysectomy); agent infusion rates given in ug/h; recomb. human IGF-I used


**Agents:** Growth hormone, rat; Thyroxine  
**Vehicle:** Not Stated;  
**Route:** SC; IP;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** 6 days;  
**ALZET Comments:** functionality of mp verified by residual volume; replacement therapy (hypophysectomy); peptides; multiple pumps per animal (2) (1 with each agent)


**Agents:** Thyroxine sulfate; Triiodothyronine sulfate, 3,3',5'-; Triiodothyronine sulfate, reverse  
**Vehicle:** NaOH; PBS; Serum, rat;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 48, 96 hours;  
**ALZET Comments:** Controls received mp with saline; functionality of mp verified by serum levels


**Agents:** Thyroxine; Triiodothyronine  
**Vehicle:** Saline; Serum, rat;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2ML4;  
**Duration:** 28 days;  
**ALZET Comments:** controls received sham surgery; functionality of mp verified by serum hormone levels; replacement therapy (thyroidectomy); toxicology


**Agents:** Thyroxine  
**Vehicle:** Not Stated;  
**Route:** SC; IP;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** 7, 13 days;  
**ALZET Comments:** controls received mp w/ saline; replacement therapy (thyroidectomy)


**Agents:** Thyroxine; Triiodothyronine  
**Vehicle:** 125I tracer; Radio-isotopes; Albumin, bovine serum; NaOH; Sodium carbonate;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 7 days;  
**ALZET Comments:** functionality of mp verified in pilot studies; topical and im antibiotics used


**Agents:** Triiodothyronine; Thyroxine  
**Vehicle:** 125I tracer; Radio-isotopes; Albumin, bovine serum;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 7 days;  
**ALZET Comments:** functionality of mp verified in pilot studies


**Agents:** Thyroxine; Triiodothyronine  
**Vehicle:** 125I tracer; 131I tracer; Radio-isotopes; Albumin, bovine serum; Saline; Sodium hydroxide;  
**Route:** IP;  
**Species:** Rat;  
**Pump:** 1003D;  
**Duration:** 1 week;  
**ALZET Comments:** replacement therapy (MMI-perchlorate induced hypothyroidism)
Agents: Thyroxine Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2002; Duration: 21, 24 days;
ALZET Comments: Replacement therapy (thyroidectomy)

Agents: Growth hormone, human; Dexamethasone; Thyroxine, l- Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2001; Duration: 5 days;
ALZET Comments: replacement therapy (hypophysectomy); peptides; GH given solely, or GH/Dex, GH/Dex/T4, or Dex/T4

Agents: Thyroxine; Triiodothyronine Vehicle: PBS; Serum, rat; Sodium hydroxide; Route: Not Stated; Species: Rat (pregnant); Pump: 2ML2; Duration: Not Stated;
ALZET Comments: 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
Agents: Thyroxine; Triiodothyronine Vehicle: Saline; Sodium hydroxide; Route: SC; Species: Rat; Pump: 2002; Duration: 10 days;
ALZET Comments: functionality of mp verified by serum levels (p. 38); replacement therapy (thyroidectomy); good methods

Agents: Triiodothyronine; Thyroxine, l- Vehicle: Butanol, n-; Propylene glycol; Route: IP; Species: Rat; Pump: 2001; 2002; Duration: 7,14 days;
ALZET Comments: 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

Agents: Triiodothyronine; Thyroxine; Thyrotropin-rel. factor Vehicle: Saline; Sodium hydroxide; Serum, rat; Route: SC; Species: Rat; Pump: Not Stated; Duration: 6 days;
ALZET Comments: 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

Agents: Thyroxine Vehicle: 125I tracer; Potassium iodide; Radio-isotopes; Route: Not Stated; Species: Rat (pregnant); Pump: Not Stated; Duration: Not Stated;
ALZET Comments: no comment posted

P1778: H. L. Katzeff. Increasing age impairs the thyroid hormone response to overfeeding. Experimental Biology and Medicine 1990;194(198-203
Agents: Thyroxine; Triiodothyronine Vehicle: Albumin, bovine serum; Radio-isotopes; Saline; Route: SC; Species: Rat; Pump: 2001; Duration: 7 days;
ALZET Comments: functionality of mp verified by serum hormone levels, measuring residual radioactivity
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):2415-2418

Agents: Thyroxine; Triiodothyronine Vehicle: Serum, rat; Sodium hydroxide; Water; Route: SC; Species: Rat; Pump: Not Stated; Duration: 14 days;

ALZET Comments: dose-response; functionality of mp verified by serum levels; replacement therapy (thyroidectomy)


Agents: Radio-isotopes; Thyroxine Vehicle: 125I tracer; 131I tracer; Route: IP; Species: Rat; Pump: 2001; Duration: 7 days;

ALZET Comments: 4 exp., only 1 used mp; nafenopin pellets administered concomitantly in food; 2 doses of agent infused with different radio-isotopes


Agents: Radio-isotopes; Thyroxine; Triiodothyronine Vehicle: 125I tracer; Route: SC; Species: Rat; Pump: 2001; Duration: 7 days;

ALZET Comments: no comment posted


Agents: Radio-isotopes; Thyroxine; Triiodothyronine Vehicle: 125I tracer; Albumin, human serum; Sodium hydroxide; Water; Route: SC; Species: Rat; Pump: 2001; Duration: 14 days;

ALZET Comments: 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


Agents: Radio-isotopes; Thyroxine Vehicle: 125I tracer; Route: IP; Species: Rat; Pump: 2002; Duration: 7, 14 days;

ALZET Comments: measured plasma clearance of T4; functionality of mp verified by serum levels; stability verified at 14 days


Agents: Radio-isotopes; Thyroxine; Triiodothyronine Vehicle: 125I tracer; Bile; Glycerol; Propanol; Propylene glycol; Route: Intestine (duodenum); Species: Rat; Pump: 2001; Duration: 7 days;

ALZET Comments: Catheter to duodenum; dose-response (text); functionality of mp verified by plasma levels


Agents: Thyroid-stimulating hormone, bovine; Thyrotropin-rel. factor; Thyroxine; Triiodothyronine Vehicle: Sodium hydroxide; Saline; Route: IV (jugular); SC; Species: Rat; Pump: Not Stated; Duration: 2, 6 days;

ALZET Comments: 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


Agents: Thyroxine Vehicle: 3H tracer; Route: IP; Species: Mice; Pump: 2001; Duration: 22 days;

ALZET Comments: Pumps replaced; replacement therapy (hemithyroidectomy); cancer
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

**Agents:** Thyroxine; Triiodothyronine, reverse

**Vehicle:** 125I tracer; Sodium hydroxide; Saline; Serum, rat; Sodium carbonate;

**Route:** IP; **Species:** Rat; **Pump:** 2001; **Duration:** 3, 7 days;

**ALZET Comments:** 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)

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. European Journal of Endocrinology 1987;114(27-36

**Agents:** Thyroxine; Triiodothyronine

**Vehicle:** Sodium hydroxide; Saline; Serum, rat;

**Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 7, 14 days;

**ALZET Comments:** pumps replaced after 7 days; dose-response; intact euthyroid control rats were left untreated; replacement therapy (thyroparathyroidectomy)


**Agents:** Thyroxine; Triiodothyronine, reverse

**Vehicle:** Sodium hydroxide; Saline; Serum, hypothyroid rat; Sodium carbonate;

**Route:** IP; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** 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)


**Agents:** MK-771; Thyroxine

**Vehicle:** Sodium hydroxide; Serum;

**Route:** CSF/CNS; SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 1 week;

**ALZET Comments:** comparison of agents effects; replacement therapy (hypophysectomy); peptides


**Agents:** ACTH (1-24); Dexamethasone disodium phosphate; Melanocyte-stimulating hormone, a-; Thyroxine, l-

**Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 6 days;

**ALZET Comments:** comparison of agents effects; replacement therapy (hypophysectomy); peptides


**Agents:** Thyroxine

**Vehicle:** Sodium hydroxide; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 1 week;

**ALZET Comments:** comparison of sc injec vs. mp infusion


**Agents:** Thyroxine; Triiodothyronine

**Vehicle:** Sodium hydroxide; Serum, rat; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 12 days;

**ALZET Comments:** 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
   **Agents:** Thyroxine  
   **Vehicle:** DMSO;  
   **Route:** SC;  
   **Species:** Guinea pig;  
   **Pump:** 2002;  
   **Duration:** 13 days;  
   **ALZET Comments:** no comment posted

   **Agents:** Glucagon; Somatostatin; Thyroxine  
   **Vehicle:** Not Stated;  
   **Route:** SC;  
   **Species:** Rat;  
   **Pump:** 2001;  
   **Duration:** 2, 3 days;  
   **ALZET Comments:** Separate pumps delivering glucagon and somatostatin were implanted simultaneously in same rat; peptides

   **Agents:** Glucagon; Radio-isotopes; Thyroxine; Triiodothyronine  
   **Vehicle:** 125I tracer; Sodium hydroxide; Saline;  
   **Route:** IP; IV (jugular);  
   **Species:** Rat;  
   **Pump:** Not Stated;  
   **Duration:** 7, 9 days;  
   **ALZET Comments:** Glucagon ip simultaneous infusion w/T3 & T4 in vehicles iv; 2 pumps/animal

   **Agents:** Triiodothyronine analog (DIMIT); Thyroxine; Triiodothyronine  
   **Vehicle:** Not Stated;  
   **Route:** SC;  
   **Species:** Rat;  
   **Pump:** Not Stated;  
   **Duration:** 8 days;  
   **ALZET Comments:** comparison of daily sc injection vs. infusion; organ replacement therapy (thyroidectomy)

   **Agents:** Thyroxine, l-  
   **Vehicle:** Not Stated;  
   **Route:** In vitro (egg); chorioallantoic membrane;  
   **Species:** Bird (chicken embryo);  
   **Pump:** 2001;  
   **Duration:** 7 days;  
   **ALZET Comments:** mp placed in small test tube filled w/ water and then sealed w/ parafilm; mp connected to catheter that bathed the chorioallantoic membrane

   **Agents:** Thyroxine  
   **Vehicle:** Sodium hydroxide;  
   **Route:** SC;  
   **Species:** Rat;  
   **Pump:** Not Stated;  
   **Duration:** 3 days;  
   **ALZET Comments:** no comment posted

   **Agents:** Insulin; Thyroxine  
   **Vehicle:** Sodium hydroxide;  
   **Route:** SC;  
   **Species:** Rat;  
   **Pump:** 2001;  
   **Duration:** 2, 4 days;  
   **ALZET Comments:** NaOH in T4 only; peptides

   **Agents:** Triiodothyronine, 3,3',5'-; Thyroxine  
   **Vehicle:** Not Stated;  
   **Route:** SC;  
   **Species:** Rat;  
   **Pump:** Not Stated;  
   **Duration:** Not Stated;  
   **ALZET Comments:** 2 days T4, 5 days rT3; comparison of injections vs. infusion

   **Agents:** Thyroxine; Triiodothyronine  
   **Vehicle:** Sodium hydroxide; Propanediol, 1,2-; Serum, rat;  
   **Route:** SC;  
   **Species:** Rat;  
   **Pump:** Not Stated;  
   **Duration:** 4, 6 days;  
   **ALZET Comments:** Organ replacement therapy (thyroidectomy)

Agents: Thyroxine  
Vehicle: Sodium hydroxide; Propanediol, 1,2-;  
Route: IP; SC;  
Species: Rat;  
Pump: Not Stated;  
Duration: 2 days;  

ALZET Comments: Comparison of oral admin. vs. infusion; organ replacement therapy (thyroidectomy)


Agents: Radio-isotopes; Thyroxine  
Vehicle: 125I tracer; Saline;  
Route: SC;  
Species: Rat;  
Pump: 1701;  
Duration: Not Stated;  

ALZET Comments: organ replacement therapy (thyroidectomy)