



## References on the Administration of Calcitonin and Calcitriol Using ALZET® Osmotic Pumps

### Calcitonin

**Q10486:** X. Gao, *et al.* Nociceptive nerves regulate haematopoietic stem cell mobilization. *Nature* 2021;589(7843):591-596

**Agents:** Peptide, calcitonin gene related; Substance P; Isoproterenol **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 1 week;

**ALZET Comments:** "Dose: CGRP (14 ug/day, 2.4 µg/day); Substance P (5 ug/day); Isoproterenol (40 µg per day); Controls received mp w/ vehicle; animal info: C57BL/6 CD45.1 and CD45.2 congenic mice  
8–10-week-old mice of both gender; Calcitonin gene-related peptide also (CGRP); Isoproterenol aka (ISO)

**Q9413:** E. Persoons, *et al.* Mimicking Sampson's Retrograde Menstrual Theory in Rats: A New Rat Model for Ongoing Endometriosis-Associated Pain. *International Journal of Molecular Sciences* 2020;21(7):

**Agents:** Calcitonin gene-related peptide; Substance P **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** 6 weeks;

**ALZET Comments:** Dose (50 ug/kg/day); animal info (Sprague Dawley Rats, 8 to 10 weeks old); behavioral testing (Advanced Dynamic Weight Bearing Assessment, Open Field Assessment); functionality of mp verified by increased plasma levels; Calcitonin gene-related peptide aka CGRP, Substance P aka SP; peptides; dependence;

**Q8894:** H. M. Luo, *et al.* Calcitonin gene-related peptide inhibits angiotensin II-induced NADPH oxidase-dependent ROS via the Src/STAT3 signalling pathway. *Journal of Cellular and Molecular Medicine* 2020;24(11):6426-6437

**Agents:** Angiotensin II; Calcitonin gene-related peptide **Vehicle:** PMC7294141; **Route:** Saline; **Species:** Mice; Rat; **Pump:** 1004; **Duration:** 14 days;

**ALZET Comments:** Dose (750 ug/kg/d Angiotensin II; 300 ng/kg/h Angiotensin II plus Calcitonin gene-related peptide); Controls received mp w/ vehicle; animal info (Two-month-old male C57BL/6J mice, weighing 18-25 g; male Sprague-Dawley rats, 80-100 g); Blood pressure measured via tail cuff; Angiotensin II aka Ang II; Calcitonin gene-related peptide aka CGRP; cardiovascular;

**Q9109:** D. Yan, *et al.* The establishment of a mouse model of deep endometriosis. *Human Reproduction* 2019;34(2):235-247  
**Agents:** Substance P; Calcitonin gene-related peptide **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 3, 4 weeks;

**ALZET Comments:** Dose (SP- 100 ug/kg/day, CGRP-100 ug/kg/day or both); Controls received mp w/ vehicle; animal info (Balb/C, 6 weeks old, 16-18 g); Substance P aka SP, Calcitonin gene-related peptide aka CGRP; dependence;

**Q9769:** A. Kumar, *et al.* Alpha-calcitonin gene-related peptide prevents pressure-overload induced heart failure: role of apoptosis and oxidative stress. *Physiological Reports* 2019;7(21):e14269

**Agents:** Alpha-calcitonin gene-related peptide **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 28 days;

**ALZET Comments:** Dose (4 mg/kg b.w/day per mouse); animal info (Eight-week-old male C57/BL6 mice); pumps replaced every 7 days; Alpha-calcitonin gene-related peptide aka a-CGRP; cardiovascular;

**Q8989:** L. Zhai, *et al.* Endogenous calcitonin gene-related peptide suppresses ischemic brain injuries and progression of cognitive decline. *Journal of Hypertension* 2018;36(4):876-891

**Agents:** Peptide, human alpha calcitonin gene-related **Vehicle:** Saline, Sterile Physiological; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 28 days;

**ALZET Comments:** Dose (1 µmol/l at 0.5µl/h); Controls received mp w/ vehicle; animal info (8 weeks, male, C57BL/6); CGRP is a 37-amino acid peptide produced as a consequence of alternative RNA processing of the calcitonin gene; ischemia (cerebral ischemia); only WT mice were used for mp experiments; Therapeutic indication (Calcitonin gene-related peptide administration promotes cerebral blood flow recovery, suppresses astrocyte activation and increases angiogenesis after cerebral ischemia);



**Q7040:** S. P. Yoon, *et al.* Exogenous CGRP upregulates profibrogenic growth factors through PKC/JNK signaling pathway in kidney proximal tubular cells. *Cell Biology and Toxicology* 2018;34(4):251-262

**Agents:** Calcitonin gene-related peptide, SP600125, chelerythrine, CGRP8-37 receptor antagonist **Vehicle:** Saline; DMSO; **Route:** IP, Kidney (cortical region); **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;

**ALZET Comments:** Dose (30 ng/kg/d); 10% DMSO used; Controls received mp w/ vehicle; animal info (Male C57BL/6 mice aged 8 to 10 weeks); CGRP is a 37-amino acid neuropeptide; enzyme inhibitor (SP600125 is a c-Jun Nterminal protein kinase (JNK), and chelerythrine is a specific protein kinase C (PKC) inhibitor); CGRP infused to the cortical region of the denervated kidney via an ALZET intrathecal catheter. The catheter was anchored to the obstructed ureter, and osmotic pump placed SC; some mice were given CGRP8-37 (120 µg/kg/d), SP600125 (30 mg/kg/d), chelerythrine (5 mg/kg/d) or vehicle (0.9% saline or 10% DMSO in 0.9% saline) via IP pump.

**Q7052:** I. Rossetti, *et al.* Calcitonin gene-related peptide decreases IL-1beta, IL-6 as well as Ym1, Arg1, CD163 expression in a brain tissue context-dependent manner while ameliorating experimental autoimmune encephalomyelitis. *J Neuroimmunol* 2018;323(94-104

**Agents:** Calcitonin gene-related peptide **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intrathecal); **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (7-8 week old C57BL/6 female mice); peptides;

**Q6434:** N. Kawashima-Takeda, *et al.* RAMP1 suppresses mucosal injury from dextran sodium sulfate-induced colitis in mice. *J Gastroenterol Hepatol* 2017;32(4):809-818

**Agents:** Calcitonin gene-related peptide antagonist (8-37) **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Duration:** 7 days;

**ALZET Comments:** animal info (Nine-week-old male C57BL/6 mice as wild type mice);

**Q6507:** E. Tavares, *et al.* Potential Role of Aminoprocaltinin in the Pathogenesis of Alzheimer Disease. *American Journal of Pathology* 2016;186(10):2723-35

**Agents:** Neuroendocrine peptide aminoprocaltinin, anti- **Vehicle:** PBS; **Species:** Mice (transgenic); **Pump:** 1004; **Duration:** 28 days;

**ALZET Comments:** Dose (500 ug/kg/day); animal info (Adult male C57BL/6 and APP/PS1 mice); neurodegenerative (Alzheimer Disease);

**Q4655:** J. G. Yan, *et al.* CALCITONIN PUMP IMPROVES NERVE REGENERATION AFTER TRANSECTION INJURY AND REPAIR. *MUSCLE & NERVE* 2015;51(229-234

**Agents:** Calcitonin **Vehicle:** Water, distilled sterile; **Route:** CSF/CNS (sciatic nerve); **Species:** Rat; **Pump:** 2006; **Duration:** 12 weeks;

**ALZET Comments:** Animal info (Sprague Dawley, 250-300g, 3 months old); half-life (p.233); long-term study; "To achieve a continuous and gradual mode of delivery, a mini-osmotic pump was implanted to deliver medication at a constant 0.15 ul/h" pg 233; "Calcitonin has short absorption and elimination half-lives of 10–15 minutes and 50–80 minutes, respectively; however, using an osmotic pump allows for gradual and prolonged release." pg233; pg230 diagram of pump implantation;

**Q4618:** Y. Toriyama, *et al.* Pathophysiological Function of Endogenous Calcitonin Gene-Related Peptide in Ocular Vascular Diseases. *American Journal of Pathology* 2015;185(1783-1794

**Agents:** Calcitonin gene-related peptide, alpha; calcitonin gene-related peptide (8-37), alpha **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days; 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (CGRP -/-); immunology;

**Q4547:** F. R. Nieto, *et al.* Calcitonin Gene-Related Peptide-Expressing Sensory Neurons and Spinal Microglial Reactivity Contribute to Pain States in Collagen-Induced Arthritis. *Arthritis & Rheumatology* 2015;67(1668-1677

**Agents:** Calcitonin gene-related peptide (8-37); **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (female, Lewis, 180-200g); behavioral testing (Von Frey filaments; Plantar test); immunology; peptides;



**Q4135:** E. Tavares, *et al.* Immunoneutralization of Endogenous Aminoprocaltitonin Attenuates Sepsis-Induced Acute Lung Injury and Mortality in Rats. *American Journal of Pathology* 2014;184(3069-3083

**Agents:** Antibody, anti-aminoprocaltitonin **Vehicle:** Saline; **Route:** IP; **Species:** Rat; **Pump:** 2001D; **Duration:** 18 hours;

**ALZET Comments:** Controls received mp w/ control antibody; animal info (male, Wistar, 280-300g); tissue perfusion (peritoneum); immunology; peptides; Catheter used to cannulate peritoneum;

**Q5430:** C. Sardi, *et al.* Involvement of calcitonin gene-related peptide and receptor component protein in experimental autoimmune encephalomyelitis. *J Neuroimmunol* 2014;271(1-2):18-29

**Agents:** Calcitonin gene-related peptide **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intrathecal); **Species:** Mice; **Pump:** 2002; **Duration:** 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; good methods (pg. 20); stress/adverse reaction: animal death (2/31 total) (see pg. 20); ALZET mouse intrathecal catheter used; encephalomyelitis model; Dose (50 pmol/hour CGRP);

**Q4065:** C. E. Riera, *et al.* TRPV1 Pain Receptors Regulate Longevity and Metabolism by Neuropeptide Signaling. *Cell* 2014;157(1023-1036

**Agents:** Calcitonin gene related peptide (8-37) **Species:** Mice; **Duration:** 6 weeks;

**ALZET Comments:** Animal info (male, C57BL6J, 22 months old); functionality of mp verified by serum levels; peptides; diabetes;

**Q4016:** D. Navarro, *et al.* Late Maternal Hypothyroidism Alters the Expression of Camk4 in Neocortical Subplate Neurons: A Comparison with Nurr1 Labeling. *Cerebral Cortex* 2014;24(2694-2706

**Agents:** Parathormone (1-84), rat; calcitonin, rat **Vehicle:** Acetate buffer; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 22 days;

**ALZET Comments:** Animal info (female, Wistar, E0); replacement therapy (thyroidectomy); teratology;

**Q3125:** J. G. Yan, *et al.* The effect of calcium modulating agents on peripheral nerve recovery after crush. *Journal of Neuroscience Methods* 2013;217(1-2):54-62

**Agents:** Nifedipine; calcitonin **Route:** CSF/CNS (sciatic nerve); **Species:** Rat; **Pump:** 2006; **Duration:** 4 weeks;

**ALZET Comments:** Controls received mp w/ saline or sham only; animal info (3 month old, male, Sprague-Dawley 250-300g); functionality of mp verified by decrease in calcium levels; peptides; Picture of MP p56, Fig1A. MP Pump setup p56, Fig1B;

**Q2170:** L. Li, *et al.* Preimplantation antagonism of adrenomedullin action compromises fetoplacental development and reduces litter size. *Theriogenology* 2012;77(9):1846-1853

**Agents:** hADM22-52; calcitonin gene-related peptide (8-37) **Vehicle:** Saline; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 1003D; **Duration:** 3 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (Sprague Dawley, female, mature, 12-13 wks old); hADM22-52 is a ADM receptor blocker; hCALCA8-37 is a CALCA receptor antagonist

**Q2997:** D. Brown, *et al.* New insights into the dynamic regulation of water and acid-base balance by renal epithelial cells. *American Journal of Physiology Cell Physiology* 2012;302(10):C1421-C1433

**Agents:** Calcitonin **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Pump:** Not Stated; **Duration:** 4, 12, 24 hours;

**ALZET Comments:** Animal info (Brattleboro rats); functionality of mp verified by measuring urine output and concentration; ALZET osmotic pumps used to infuse calcitonin to increase trafficking of aquaporin 2 vesicles in collecting duct. Effect is short lived, despite continued calcitonin delivery; might need dose adjustment; diabetes;

**Q1310:** S. J. Sample, *et al.* Role of Calcitonin Gene-Related Peptide in Bone Repair after Cyclic Fatigue Loading. *PLoS One* 2011;6(6):U98-U107

**Agents:** Calcitonin gene related peptide; calcitonin gene related peptide (8-37) **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 10 days;

**ALZET Comments:** Controls received mp w/ saline; animal info (Sprague Dawley, male, 292-305 g, 67 days); CGRP (8-37) is a CGRP1 receptor antagonist; peptides



**Q1449:** R. Bouley, *et al.* Calcitonin Has a Vasopressin-like Effect on Aquaporin-2 Trafficking and Urinary Concentration. *Journal of the American Society of Nephrology* 2011;22(1):59-72

**Agents:** Calcitonin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days;

**ALZET Comments:** Controls received mp w/ vehicle; pumps removed and new pump implanted after 10 days; animal info (Brattleboro, VP-deficient, adult, male)

**Q0079:** B. Morte, *et al.* Thyroid Hormone Regulation of Gene Expression in the Developing Rat Fetal Cerebral Cortex: Prominent Role of the Ca<sup>2+</sup>/Calmodulin-Dependent Protein Kinase IV Pathway. *Endocrinology* 2010;151(2):810-820

**Agents:** Parathyroid hormone (1-84); Calcitonin, rat **Vehicle:** Acetate buffer; **Route:** SC; **Species:** Rat; **Pump:** 2001;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (female, Wistar, adult, 250-300 g); replacement therapy (parathyroidectomy)

**Q0003:** P. Berbel, *et al.* Role of Late Maternal Thyroid Hormones in Cerebral Cortex Development: An Experimental Model for Human Prematurity. *Cerebral Cortex* 2010;20(6):1462-1475

**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)

**P9799:** B. R. Becklund, *et al.* Enhancement of 1,25-dihydroxyvitamin D<sub>3</sub>-mediated suppression of experimental autoimmune encephalomyelitis by calcitonin. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 2009;106(13):5276-5281

**Agents:** Calcitonin, salmon **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; functionality of mp verified by residual volume; dose-response (Fig. 2); animal info (female, C57BL/6, 6 wks old)

**P8805:** S. S. Glaser, *et al.* Knockout of alpha-calcitonin gene-related peptide reduces cholangiocyte proliferation in bile duct ligated mice. *Laboratory Investigation* 2007;87(9):914-926

**Agents:** Calcitonin gene-related peptide (8-37); **Route:** IP; **Species:** Mice; **Duration:** 3, 7 days;

**ALZET Comments:** Controls received mp w/ saline; animal info (male, C57BL/6, wt, a-CGRP, -/-, 20-25g., Bile duct ligation); peptides

**P7608:** C. F. Xia, *et al.* Postischemic infusion of adrenomedullin protects against ischemic stroke by inhibiting apoptosis and promoting angiogenesis. *Experimental Neurology* 2006;197(2):521-530

**Agents:** Adrenomedullin, human; Calcitonin gene-related peptide (8-37) **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Duration:** 7, 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; cardiovascular; peptides; ischemia (cerebral); animal info (male, Sprague-Dawley 220 g); "continuous and long-term infusion of AM starting at day 1 after I/; MCAO

**P6828:** B. Z. Yuan, *et al.* Evidence for abnormal translational regulation of renal 25-hydroxyvitamin D-1alpha-hydroxylase activity in the Hyp-mouse. *Endocrinology* 2004;145(8):3804-3812

**Agents:** Parathyroid hormone, bovine 1-34; calcitonin, salmon **Vehicle:** Saline, physiological; cysteine hydrochloride; **Route:** SC; **Species:** Mice; **Pump:** 1003D; 2001; **Duration:** 12 hours;

**ALZET Comments:** Controls received mp w/ vehicle

**P6472:** H. Yin, *et al.* Adrenomedullin protects against myocardial apoptosis after ischemia/reperfusion through activation of Akt-GSK signaling. *Hypertension* 2004;43(1):109-116

**Agents:** Calcitonin gene-related peptide (8-37) **Vehicle:** Not Stated; **Route:** IP; **Species:** Rat; **Pump:** Not Stated;

**ALZET Comments:** Cardiovascular; peptides; ischemia (cardiac)



**P5794:** X. Qing, *et al.* Specific N-terminal CGRP fragments mitigate chronic hypoxic pulmonary hypertension in rats. *REGULATORY PEPTIDES* 2003;110(2):93-99

**Agents:** Calcitonin gene-related peptide (1-8), alpha-Rat; Calcitonin gene-related peptide (1-13), alpha-Rat; Calcitonin gene-related peptide (1-14), alpha-Rat **Vehicle:** Saline; Bacitracin; **Route:** IV (jugular); **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; antihypertensive; peptides; N-terminal rat alpha-CGRP (calcitonin gene-related peptide) was dissolved in saline with 1 mg/ml of Bacitracin & infused in either a 2002 (lower doses) or a 2ML2 (higher doses)

**P5359:** W. Wang, *et al.* Role of calcitonin in the rapid minute-to-minute regulation of plasma Ca<sup>2+</sup> homeostasis in the rat. *European Journal of Clinical Investigation* 2002;32(9):674-681

**Agents:** Calcitonin, salmon **Vehicle:** Acetic acid; Sodium acetic; Sodium chloride; water, distilled; **Route:** SC; **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days; 24 hours;

**ALZET Comments:** Functionality of mp verified by calcitonin plasma levels

**P5485:** Y. Imai, *et al.* Resistance to neointimal hyperplasia and fatty streak formation in mice with adrenomedullin overexpression. *Arteriosclerosis, Thrombosis, and Vascular Biology* 2002;22(8):1310-1315

**Agents:** Calcitonin gene-related peptide (8-37) **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice; **Pump:** 1002; **Duration:** 28 days;

**ALZET Comments:** Paper incorrectly states the release rate and duration of Model 1002 which delivers at 0.25 ul/hr for 14 days; CGRP is an adrenomedullin receptor antagonist; peptides

**P6141:** P. R. R. Gangula, *et al.* Sex steroid hormones enhance hypotensive effects of calcitonin gene-related peptide in aged female rats. *Biology of Reproduction* 2002;67(6):1881-1887

**Agents:** Calcitonin gene-related peptide **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML1; **Duration:** 4 days;

**ALZET Comments:** Blood pressure taken; peptides

**P5575:** P. R. R. Gangula, *et al.* Infusion of pregnant rats with calcitonin gene-related peptide (CGRP) (8-37), a CGRP receptor antagonist, increases blood pressure and fetal mortality and decreases fetal growth. *Biology of Reproduction* 2002;67(2):624-629

**Agents:** Calcitonin gene-related peptide (8-37) **Vehicle:** saline; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 2ML2;

**ALZET Comments:** controls received mp with saline; stability verified by mass spectrometry for 14 days (p. 625); peptides; agent is a potent vasodilator

**P6319:** B. A. Dani, *et al.* Skeletal Effects of Parathyroid Hormone (1-34) in Ovariectomized Rats With or Without Concurrent Administration of Salmon Calcitonin. *Pharmsci* 2001;3(4):1-7

**Agents:** Parathyroid hormone, human 1-34; calcitonin, salmon **Vehicle:** Acetate buffer; saline; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 28 days;

**ALZET Comments:** Controls received mp w/ vehicle or sham ovx + mp w/ vehicle; functionality of mp verified by serum levels; replacement therapy (ovariectomy); comparison of daily PTH sc injections vs. mp; peptides

**P4895:** D. Q. Chu, *et al.* The calcitonin gene-related peptide (CGRP) antagonist CGRP(8-37) blocks vasodilatation in inflamed rat skin: involvement of adrenomedullin in addition to CGRP. *Neuroscience Letters* 2001;310(169-172

**Agents:** Calcitonin gene-related peptide (8-37) **Vehicle:** Saline; BSA; **Route:** SC; **Species:** Rat;

**ALZET Comments:** controls received mp w/ vehicle; cardiovascular; peptides; CGRP (8-37) is a calcitonin gene related peptide antagonist. BSA was .01% in saline to prevent adsorption.

**P4930:** M. Buffelli, *et al.* In vivo acetylcholine receptor expression induced by calcitonin gene-related peptide in rat soleus muscle. *Neuroscience* 2001;104(2):561-567

**Agents:** Calcitonin gene-related peptide **Vehicle:** Saline; **Route:** Intramuscular (soleus); **Species:** Rat; **Pump:** 2002;

**ALZET Comments:** controls received mp w/ vehicle; tissue perfusion (soleus muscle extra junctional surface); peptides





**P4828:** M. Buffelli, *et al.* The use of in vivo direct drug application to assess neural regulation of muscle properties. *Journal of Neuroscience Methods* 2001;106(113-120

**Agents:** Tetrodotoxin; potassium chloride; calcitonin gene-related peptide **Vehicle:** Saline; Dye, methylene blue; **Route:** Intramuscular (soleus); **Species:** Rat; **Pump:** 2001; 2002; **Duration:** 3,8 days;

**ALZET Comments:** Controls received mp w/ vehicle; tissue perfusion (soleus muscle); detailed methods for catheter construction and surgical procedures (p. 114 - 115); Lynch coil technique used; pump filled w/ saline and agents loaded in modified PE-100 tubing; solutions separated by oil drop; pumps w/ various flow rates were tested but model 2002 was chosen because its small flow rate permits to avoid excessive fluid accumulation on muscle surface; diagram of pump-catheter assembly and location (p. 114); peptides

**P4623:** S. J. Wimalawansa, *et al.* Pre-eclamptic toxemia: potential new therapy based on animal studies. *Ceylon Medical Journal* 1998;43(138-144

**Agents:** L-NAME; Calcitonin gene-related peptide **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 2ML1; **Duration:** 1 week;

**ALZET Comments:** Controls received mp w/ vehicle; peptides; CGRP and L-NAME or vehicle delivered from separate pumps concomitantly.

**P3929:** M. G. Tordoff, *et al.* Calcium intake by rats: influence of parathyroid hormone, calcitonin, and 1,25-dihydroxyvitamin D. *American Journal of Physiology Regulatory, Integrative, and Comparable Physiology* 1998;274(43):R214-R231

**Agents:** Parathyroid hormone; Calcitonin; Vitamin D, 1,25-dihydroxy- **Vehicle:** NaCl; HCl; Cysteine; Saline, isotonic; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 13 days;

**ALZET Comments:** controls received sham tubing; functionality of mp verified by hormone assays; replacement therapy (thyroidectomy, thyroparathyroidectomy); dose-response; stress/adverse reaction: high doses led to animal death; peptides; agents given singly and in combination

**P4110:** M. Reinshagen, *et al.* Calcitonin gene-related peptide mediates the protective effect of sensory nerves in a model of colonic injury. *J. Pharmacol. Exp. Ther* 1998;286(2):657-661

**Agents:** Calcitonin gene-related peptide (8-37) **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** controls received mp w/vehicle; CGRP (8-37) is a calcitonin receptor antagonist; peptides

**P3917:** J. M. Hutson, *et al.* Congenital undescended testes in neonatal pigs and the effect of exogenous calcitonin gene-related peptide. *J. Urol* 1998;159(1025-1028

**Agents:** Calcitonin gene-related peptide; **Route:** Scrotal; **Species:** Pig (neonate); **Pump:** 2002; **Duration:** 2 weeks;

**ALZET Comments:** Controls received mp w/PBS; tissue perfusion (undescended testes); replacement therapy (cryptorchidism); dose-response; peptides; "Injection of excess CGRP into the scrotum may delay descent...the pig model has overcome some of these difficulties as the o

**P3547:** P. R. R. Gangula, *et al.* Progesterone up-regulates vasodilator effects of calcitonin gene-related peptide in NG-nitro-L-arginine methyl ester-induced hypertension. *American Journal of Obstetrics & Gynecology* 1997;176(894-900

**Agents:** L-NAME; Calcitonin gene-related peptide **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 2ML2;

**ALZET Comments:** Controls received mp w/ saline; peptides; agents given singly and concomitantly in the same pump; cardiovascular

**P4223:** M. Li, *et al.* A comparison of the skeletal effects of intermittent and continuous administration of calcitonin in ovariectomized rats. *Bone* 1996;18(4):375-380

**Agents:** Calcitonin, salmon **Vehicle:** Saline; Benzyl alcohol; Gelatin; **Species:** Rat; **Duration:** 6 weeks;

**ALZET Comments:** controls received mp w/vehicle; functionality of mp verified by calcitonin plasma levels by radioimmunoassay; comparison of s.c. injections vs. mp; pumps replaced after 3 weeks; peptides

**P3194:** C. Hemmingsen, *et al.* Regulation of renal calbindin-D28K: the role of calcitonin. *Calcified Tissue International* 1995;56(372-375

**Agents:** Calcitonin, salmon **Vehicle:** Aminocaproic acid; HCl; **Route:** Not Stated; **Species:** Rat; **Pump:** 2ML1; **Duration:** 4 days;

**ALZET Comments:** controls received mp with vehicle



**P2283:** G. Golomb, *et al.* A new route of drug administration: intrauterine delivery of insulin and calcitonin. *Pharmaceut. Res* 1993;10(6):828-833

**Agents:** Calcitonin, human **Vehicle:** Not Stated; **Route:** Intrauterine; SC; **Species:** Rat; **Pump:** 2001; **Duration:** 14 days;  
**ALZET Comments:** Tissue perfusion (uterus); dose-response (graph, p.832); comparison of polyurethane matrices vs mp

**P1714:** A. J. Yates, *et al.* A noncyclical analog of salmon calcitonin (N-a-propionyl di-Ala1,7,des-Leu19 sCT) retains full potency without inducing anorexia in rats. *Endocrinology* 1990;126(6):2845-2849

**Agents:** Calcitonin analog; Calcitonin, synthetic salmon **Vehicle:** Gelatin; Saline; **Route:** SC; **Species:** Mice; **Pump:** 2001;  
**Duration:** 48 hours;  
**ALZET Comments:** Pumps were reimplanted in a second animal; analog is RG-12851

**Q5639:** G. Davidai. Normal Regulation of Calcitriol Production in Gy Mice. *Journal of Clinical Investigation* 1990;85(2):334-9

**Agents:** Parathyroid hormone, bovine; calcitonin **Vehicle:** Saline, cysteine hydrochloride; **Route:** SC; **Species:** mice; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (4-5 wk old); Dose: calcitonin (2 IU/ul), PTH (1 IU/ul);

**Q5594:** T. Nesbitt. Calcitonin Stimulation of Renal 25-Hydroxyvitamin D-1a-Hydroxylase Activity in Hypophosphatemic Mice. *Journal of Clinical Investigation* 1987;79(15-19

**Agents:** Calcitonin, Parathyroid hormone **Vehicle:** Saline, Physiologic; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 3, 6, 12, 18, 24, 48 and 72 hrs;  
**ALZET Comments:** Controls received mp w/ vehicle; dose-response (0.1, 0.375, 0.5, 0.75, 1.0, or 1.25 IU/h); Multiple pumps per animal (2); Animals receiving both hormones were implanted through separate skin incisions with two pumps. "To control the uniformity of the applied stimulus, we used surgically implantable Alzet osmotic minipumps... for continuous subcutaneous infusion of calcitonin." pg 15; Dose (0.5 IU/hr);

**P1087:** Z. Bouizar, *et al.* Down-regulation of rat kidney calcitonin receptors by salmon calcitonin infusion evidenced by autoradiography. *Proc. Natl. Acad. Sci* 1987;84(5):5125-5128

**Agents:** Calcitonin, salmon **Vehicle:** Aminocaproic acid; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 1, 4, 7 days;  
**ALZET Comments:** controls received mp w/vehicle; dose-response; mp primed w/saline 12 hours before implantation; stability; peptides

**P0863:** P. Jaeger, *et al.* Evidence that calcitonin stimulates 1,25-dihydroxyvitamin D production and intestinal absorption of calcium in vivo. *J. Clin. Invest* 1986;78(4):56-61

**Agents:** Calcitonin **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 6, 12 days;  
**ALZET Comments:** Controls received sham implantation; replacement therapy (thyroparathyroidectomy); peptides

**P1252:** C. Rebut-Bonneton, *et al.* Effect of calcitonin in pregnant rats on bone resorption in fetuses. *J. Endocrinol* 1983;99(3):347-353

**Agents:** Calcitonin, salmon **Vehicle:** Albumin, bovine serum; PBS; **Route:** SC; **Species:** Rat (pregnant); **Duration:** 5 days;  
**ALZET Comments:** pump model not stated; replacement therapy (thyroparathyroidectomy); peptides

**P0031:** J. F. Obie, *et al.* Loss of calcemic effects of calcitonin and parathyroid hormone infused continuously into rats using the ALZET osmotic minipump. *Journal of Pharmacology and Experimental Therapeutics* 1979;209(3):422-428

**Agents:** Calcitonin; Parathyroid hormone, bovine **Vehicle:** Cysteine HCl; HCl; Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days;  
**ALZET Comments:** Organ replacement therapy (thyroparathyroidectomy); peptides

**P0272:** J. W. Bastian, *et al.* (Calcitonin: consideration of its dosage and other aspects). In 'Calcitonin: Nuove Acquisizioni e Prospettive,' G. De Bastiani, A. Pecile, V. Pietrogrande, and C. Sirtori (eds. ), Fondazione Carlo Erba, Milano (Italian) 1979;

**Agents:** Calcitonin, salmon **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 1, 14 days;  
**ALZET Comments:** Comparison of human vs. animal data; intermittent vs. mp infusion; peptides



### Calcitriol

**Q11011:** M. E. Turner, *et al.* Vascular calcification maladaptively participates in acute phosphate homeostasis. *Cardiovascular Research* 2023;119(4):1077-1091

**Agents:** Calcitriol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML1; **Duration:** 8 days;  
**ALZET Comments:** Dose ( 0.5 µg/kg/day); animal info: (15–16 weeks); cardiovascular; nephrology (chronic kidney disease, phosphate homeostasis)

**Q10633:** B. M. Oliveira, *et al.* Calcitriol Reduces the Inflammation, Endothelial Damage and Oxidative Stress in AKI Caused by Cisplatin. *International Journal of Molecular Science* 2022;23(24):

**Agents:** Calcitriol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 5 days;  
**ALZET Comments:** Dose (6 ng/day),(0.9% NaCl) used; Controls received mp w/ vehicle; animal info (male Hannover rats (200–300 g)immunology;

**Q9290:** Y. Ito, *et al.* Vitamin D improves pulmonary function in a rat model for congenital diaphragmatic hernia. *Archives of Biochemistry and Biophysics* 2021;700(108769

**Agents:** Calcitriol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 12 days;  
**ALZET Comments:** Dose (0.03 ug/kg/day); animal info (pregnant Sprague Dawley rats); dependence;

**Q9565:** M. L. Xu, *et al.* Calcitriol ameliorated autonomic dysfunction and hypertension by down-regulating inflammation and oxidative stress in the paraventricular nucleus of SHR. *Toxicology and Applied Pharmacology* 2020;394(114950

**Agents:** Calcitriol **Vehicle:** Propylene glycol; Ethanol; **Route:** CSF/CNS (hypothalamic paraventricular nucleus); **Species:** Rat; **Pump:** 1004; **Duration:** 4 weeks;  
**ALZET Comments:** Dose (40 ng/day); 50% Ethanol, 50% Propylene Glycol used; Controls received mp w/ vehicle; animal info (Twelve-week-old male spontaneously hypertensive rats and Wistar Kyoto rats); Blood pressure measured via radiotelemetry transmitters;140 mmHg - 180 mmHg; Resultant plasma level (700 pg/ml norepinephrine); cardiovascular;

**Q8436:** A. L. Deluque, *et al.* Effect of Calcitriol on the Renal Microvasculature Differentiation Disturbances Induced by AT1 Blockade During Nephrogenesis in Rats. *Frontiers in Medicine* 2020;7(23

**Agents:** Calcitriol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 4 week;  
**ALZET Comments:** Dose (6 ng/day); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (Female and male Wistar rats); Blood pressure measured via tail cuff method;120.6 mmHg - 132.9 mmHg;cardiovascular;

**Q8825:** N. G. Reis, *et al.* Protective effect of calcitriol on rhabdomyolysis-induced acute kidney injury in rats. *Scientific Reports* 2019;9(1):7090

**Agents:** Calcitriol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 7 days;  
**ALZET Comments:** Dose (6 ng/day); 0.9% Saline used; Controls received mp w/ vehicle; animal info (Male, Wistar Hannover, 180-200 g); immunology;

**Q4377:** C. L. Chou, *et al.* Beneficial Effects of Calcitriol on Hypertension, Glucose Intolerance, Impairment of Endothelium-Dependent Vascular Relaxation, and Visceral Adiposity in Fructose-Fed Hypertensive Rats. *PLoS One* 2015;10(U2028-U2046

**Agents:** Calcitriol **Vehicle:** PEG; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 4 weeks;  
**ALZET Comments:** Animal info (male, Wistar-Kyoto, 200-230g); functionality of mp verified by residual volume; pumps replaced every 2 weeks; post op. care (penicillin SC injection 5000 U/kg); bp measured using tail cuff;

**Q3664:** T. Takenaka, *et al.* Calcitriol Supplementation Improves Endothelium-Dependent Vasodilation in Rat Hypertensive Renal Injury. *KIDNEY & BLOOD PRESSURE RESEARCH* 2014;39(17-27

**Agents:** Calcitriol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 6 weeks;  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Spontaneously hypertensive rats, stroke-prone, 8 weeks old); cardiovascular; long-term study;





**Q3219:** R. Goyal, *et al.* Characterization of an animal model of pregnancy-induced vitamin D deficiency due to metabolic gene dysregulation. *American Journal of Physiology Endocrinology and Metabolism* 2014;306(3):E256-E266

**Agents:** Calcitriol **Vehicle:** Ethanol; propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** Not Stated;  
**ALZET Comments:** Control animals received mp w/ vehicle; animal info (Sprague Dawley, P9); 50% ethanol used; 50% propylene glycol used

**Q5540:** G. Duque, *et al.* Pharmacological inhibition of PPARgamma increases osteoblastogenesis and bone mass in male C57BL/6 mice. *J Bone Miner Res* 2013;28(3):639-48

**Agents:** Calcitriol **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 6 weeks;  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (9 month old); 15% DMSO used; Dose (18pm/d); Therapeutic indication (osteoporosis);

**P8449:** K. D. Goodwin, *et al.* Preventing oxidative stress in rats with aldosteronism by calcitriol and dietary calcium and magnesium supplements. *American Journal of the Medical Sciences* 2006;332(2):73-78

**Agents:** Aldosterone; Calcitriol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2004; 2ML4; **Duration:** 4 weeks;  
**ALZET Comments:** Controls received no treatment; replacement therapy (uninephrectomy); cardiovascular; animal info (male, Sprague-Dawley, 8 wks old)

**P4473:** A. Szabo, *et al.* Physiological doses of calcium regulatory hormones do not normalize bone cells in uraemic rats. *European Journal of Clinical Investigation* 1999;29(5):529-535

**Agents:** Parathyroid hormone (1-34); Calcitriol **Vehicle:** Cysteine; Propylene glycol; Saline; **Route:** Not Stated; **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;  
**ALZET Comments:** Controls received mp w/vehicle; replacement therapy (parathyroidectomy; nephrectomy); peptides

**P3236:** J. F. Long, *et al.* Comparative effects of calcitriol and parathyroid hormone on serum aluminum in vitamin D-depleted rabbits fed an aluminum-supplemented diet. *Res. Commun. Chem. Pathol. Pharmacol* 1994;83(1):3-14

**Agents:** Calcitriol; Parathyroid hormone (1-34) **Vehicle:** Cysteine; HCl; Saline; **Species:** Rabbit; **Duration:** 7 days;  
**ALZET Comments:** Functionality of mp verified by serum levels; peptides

**P2142:** T. Shimomura, *et al.* Enhancement of vasoconstrictor response by a noncalcemic analogue of vitamin D3. *Hypertension* 1993;21(2):253-258

**Agents:** Oxacalcitriol, 22-; Vitamin D3, 24,25-dihydroxy-; Vitamin D3, 1,25-dihydroxy- **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;  
**ALZET Comments:** no comment posted

**P2664:** A. J. Brown, *et al.* The mechanism for the disparate actions of calcitriol and 22-oxacalcitriol in the intestine. *Endocrinology* 1993;133(3):1158-1164

**Agents:** Oxacalcitriol, 22-; Vitamin D3, 1,25-dihydroxy- **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 3 days;

**ALZET Comments:** controls received mp w/ vehicle; comparison of ip injections vs. mp; agent is 1,25-(OH)2D3

**P2356:** J. F. Long, *et al.* Effect of calcitriol infusions on serum aluminum in vitamin D-depleted rabbits fed an aluminum-supplemented ration. *Res. Commun. Chem. Pathol. Pharmacol* 1991;74(1):89-104

**Agents:** Calcitriol **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rabbit; **Pump:** Not Stated; **Duration:** 7, 28 days;  
**ALZET Comments:** Functionality of mp verified by plasma levels; toxicology

**P1502:** S. N. Popoff, *et al.* Treatment of congenital osteopetrosis in the rabbit with high-dose 1,25-dihydroxyvitamin D. *J. Bone and Min. Res* 1989;4(1):57-67

**Agents:** Calcitriol **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rabbit; **Pump:** Not Stated; **Duration:** 2 weeks;  
**ALZET Comments:** Dose-response; functionality of mp verified by serum levels



**P1656:** S. Patel, *et al.* Effect of vitamin D metabolites on calcitriol metabolism in experimental renal failure. *Kidney Int* 1989;36(234-239

**Agents:** Calcitriol; Vitamin D3, 1,25-dihydroxy- **Vehicle:** Ethanol; Propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 1 week;

**ALZET Comments:** functionality of mp verified by measuring residual volume

**P1654:** J. F. Long, *et al.* Serum calcitriol and parathyroid hormone levels following prolonged infusion of calcitriol in vitamin D replete and depleted rabbits. *Res. Commun. Chem. Pathol. Pharmacol* 1989;64(2):273-286

**Agents:** Calcitriol **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rabbit; **Pump:** 2ML1; 2ML4; **Duration:** 7, 28 days;

**ALZET Comments:** Functionality of mp verified by serum calcitriol levels; dose-response (graphs); 3 doses of calcitriol infused

**P0508:** A. M. Parfitt, *et al.* Calcitriol but no other metabolite of vitamin D is essential for normal bone growth and development in the rat. *J. Clin. Invest* 1984;73(576-586

**Agents:** Calcitriol **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 40 days;

**ALZET Comments:** comparison of calcitriol or OHD2 po 3x/wk vs. mp infusion; intermittent oral dosing; mp replaced every 2 weeks; no stress implied by the normal growth of the animals