



ALZET® Osmotic Pump References from 2013 – 2018: The Rate-Controlled Modulation of Hormone Levels

This collection of references illustrates techniques by which the physiological effects of a controlled hormone infusion are determined in the absence of endogenous hormone production. In this manner, the effects that hormones have at different concentrations can be determined independent of temporal fluctuations in hormone levels. The technical notes following each reference detail the substance(s) infused, the route of administration, the animal model studied, the vehicle for infusion, the model of pump used, the duration of infusion, and notable technical achievements or results obtained.

This list does not contain references in this category from before 2013. To obtain a complete list of citations since 1975, please contact ALZET Technical Services at (800) 692-2990 (U.S. & Canada), or (408) 367-4036. You may also contact us via e-mail at alzet@direct.com.

The inverse of this technique, or the study of the differential effects of varying regimens of pulsatile hormone administration, can be accessed through the sub-bibliography entitled "References on Pulsed Administration of Agents by ALZET Osmotic Pumps". To obtain a copy of this sub-bibliography call ALZET Technical Services at the numbers listed above.

For a more complete discussion of the capabilities of these techniques consult the following reference:

Urquhart, J., Fara, J., and Willis, K.L. (1984). Rate-controlled delivery systems in drug and hormone research. Ann. Rev. Pharmacol. Toxicol. 24, 199-236.



**Recent References (2013-2018): The Rate-Controlled Modulation of Hormone Levels
Using ALZET® Osmotic Pumps**

Q7086: J. C. Bague, *et al.* BDNF infusion into the MPN mag is sufficient to restore copulatory behavior in the castrated Syrian hamster. *Horm Behav* 2018;102(69-75)

ALZET Comments: Brain-derived neurotrophic factor, human recomb.; Albumin, bovine serum; CSF/CNS (magnocellular medial preoptic nucleus); Hamster; 2004; 9 days; Dose (6.25 ug/ml/day); Controls received mp w/ vehicle; animal info (Male, Mesocricetus auratus, 5–6 months old); behavioral testing (Sex behavior test); Brain coordinates (ML=+0.85mm, DV=-7.4); replacement therapy (testosterone);

Q5727: Y. Zhu, *et al.* Protective Effect of 17beta-Estradiol Upon Hippocampal Spine Density and Cognitive Function in an Animal Model of Vascular Dementia. *Sci Rep* 2017;7(42660)

ALZET Comments: Estradiol, 17b-; SC; Rat; 2006; Controls received mp w/ 20% cyclodextrin; animal info (male, Sprague Dawley, 250-300g, adult); functionality of mp verified by serum levels; behavioral testing (Morris water maze); replacement therapy (estradiol infusion); long-term study; cardiovascular; Dose (0.05 ug/h); “exogenous E2 replacement produced E2 levels of 25-33pg/ml” (pg 2);

Q5925: C. Xu, *et al.* (Pro)Renin receptor regulates potassium homeostasis through a local mechanism. *Am J Physiol Renal Physiol* 2017;313(3):F641-F656

ALZET Comments: PRO020; Saline; Intrarenal (cortex); Rat; 1007D; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 250-300g); replacement therapy (uniphrectomy, bilateral adrenalectomy); cardiovascular; peptides; Used PE-10 catheter, inserted 2mm into cortex; vet bond; Dose (700 ug/kg/day); PRO20 is a decoy peptide antagonist of (Pro)renin receptor (PRR).

Q5923: Q. Xie, *et al.* Transcriptional regulation of the Nkx3.1 gene in prostate luminal stem cell specification and cancer initiation via its 3' genomic region. *J Biol Chem* 2017;292(33):13521-13530

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);

Q5909: L. Wang, *et al.* Sodium butyrate suppresses angiotensin II-induced hypertension by inhibition of renal (pro)renin receptor and intrarenal renin-angiotensin system. *J Hypertens* 2017;35(9):1899-1908

ALZET Comments: Angiotensin II; sodium butyrate; SC; Intrarenal (medulla); Rat; 2002; 14 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 250-300g); Multiple pumps per animal (2); replacement therapy (uniphrectomy); tissue perfusion (renal medulla); cardiovascular; antihypertensive; peptides; Bp measured using radio telemetry (DSI); Dose (Ang II 200 ng/kg/min; NaBu 1 ug/kg/min); good bp comparison curve (pg4);

Q6521: S. Ucer, *et al.* The Effects of Aging and Sex Steroid Deficiency on the Murine Skeleton Are Independent and Mechanistically Distinct. *J Bone Miner Res* 2017;32(3):560-574

ALZET Comments: Estradiol; Mice; 2006; 6 weeks; Dose (6 ug/d); animal info (5-month-old C57BL/6 male mice); replacement therapy (orchietomy);

Q5894: S. Thammacharoen, *et al.* Effects of Hindbrain Infusion of an Estrogen Receptor Antagonist on Estrogenic Modulation of Eating Behavior. *Neurophysiology* 2017;49(1):72-77

ALZET Comments: ICI 182,780; DMSO; Saline; CSF/CNS (fourth ventricle); Rat; 1002; animal info (female, Wistar, 250-300g, OVX); 1% DMSO used; post op. care (enrofloxacin IV 2.5-5 mg/kg, ibuprofen PO 15 mg/kg); replacement therapy (estradiol infusion); tissue perfusion (fourth ventricle); Cannula placement verified via injection of Evans Blue dye; Used PlasticsOne cannula;

Q6763: A. L. Russell, *et al.* The interaction of dietary isoflavones and estradiol replacement on behavior and brain-derived neurotrophic factor in the ovariectomized rat. *Neurosci Lett* 2017;640(53-59)



ALZET Comments: Estradiol, 17b-; Cyclodextrin, 2-hydroxypropyl-b-; water; SC; Rat; 2002; 14 days; Dose (0.25 mg/kg body weight); 27% hydroxypropyl-β-cyclodextrin used; animal info (ovariectomized (OVX) female Sprague Dawley rats, weighing between 200–225 g,); replacement therapy (estradiol);.

Q6232: S. F. Rosen, *et al.* T-Cell Mediation of Pregnancy Analgesia Affecting Chronic Pain in Mice. *J Neurosci* 2017;37(41):9819-9827

ALZET Comments: Estradiol, 17b-; Progesterone sulfate; SC; Mice; 2002; 14 days; Dose (17b-estradiol : 0.1 mg/kg/d, progesterone sulfate: 0.25 mg/kg/d, 0.1 mg/kg/d estradiol + 0.25 mg/kg/d progesterone); Controls received mp w/ vehicle; animal info (7-12 week old female C57BL/6J mice); replacement therapy (estradiol, ovariectomy); Therapeutic indication.

Q6204: S. McIlvride, *et al.* A progesterone-brown fat axis is involved in regulating fetal growth. *Sci Rep* 2017;7(1):10671

ALZET Comments: Progesterone; Prolactin; Cyclodextrin, 2-hydroxypropyl-b; SC; Mice; 2002; 14 days; Dose (progesterone 250 µg/day; prolactin 7 µg/day); 20% (w/v) 2-hydroxypropyl-beta-cyclodextrin used; Controls received mp w/ vehicle; animal info (7–8 week old female mice with bilateral oophorectomy); replacement therapy (oophorectomy);.

Q6077: D. E. Livingstone, *et al.* Metabolic dysfunction in female mice with disruption of 5alpha-reductase 1. *J Endocrinol* 2017;232(1):29-36

ALZET Comments: Corticosterone; DMSO; Propylene glycol; Mice; Dose (100 ug/day); 50% DMSO, 50% Propylene glycol used; animal info (Female 3-4 month old 5αR1-KO and wild-type mice); replacement therapy (glucocorticoid);.

Q6143: S. Laouafa, *et al.* Estradiol Protects Against Cardiorespiratory Dysfunctions and Oxidative Stress in Intermittent Hypoxia. *Sleep* 2017;40(8):

ALZET Comments: Estradiol; SC; Rat; 2ML4; 28 days; Dose (0.5 mg/kg/d); Controls received mp w/ vehicle; animal info (Sprague-Dawley female rats weighing 230–250 g); post op. care (3.5 mg/kg bupevacaine and 7 mg/kg lidocaine SC injections for 48 hours after); functionality of mp verified by measuring residual volume at the end of the study; replacement therapy (estradiol);.

Q6449: Y. Kato, *et al.* Natriuretic peptide receptor guanylyl cyclase-A pathway counteracts glomerular injury evoked by aldosterone through p38 mitogen-activated protein kinase inhibition. *Sci Rep* 2017;7(46624)

ALZET Comments: Aldosterone; SC; Mice (knockout); 2004; Dose (0.2 µ g/kg body weight per minute); Controls received mp w/ vehicle; animal info (Male systemic GC-A KO mice and wild-type); replacement therapy (left uninephrectomy);.

Q6452: C. Jin, *et al.* Inhibition of SLC7A11 by Sulfasalazine Enhances Osteogenic Differentiation of Mesenchymal Stem Cells by Modulating BMP2/4 Expression and Suppresses Bone Loss in Ovariectomized Mice. *J Bone Miner Res* 2017;32(3):508-521

ALZET Comments: Sulfasalazine; SC; Mice; 2004; 4 weeks; Dose (80 mg); animal info (3 month old Female BALB/C mice weighing 25-30g); replacement therapy (ovariectomy);.

Q6244: S. C. Hewitt, *et al.* Role of ERalpha in Mediating Female Uterine Transcriptional Responses to IGF1. *Endocrinology* 2017;158(8):2427-2435

ALZET Comments: Insulin-like growth factor 1; Acetic acid; Mice (knockout); 1003D; 24 hours; Dose (0.5 mg IGF1/mL); 0.1N acetic acid used; animal info (Eight weeks or older female Ex3aERKO or ERαUtcKO mice); replacement therapy (ooverectomy);.

Q6462: J. B. Henningsen, *et al.* Roles of RFRP-3 in the Daily and Seasonal Regulation of Reproductive Activity in Female Syrian Hamsters. *Endocrinology* 2017;158(3):652-663

ALZET Comments: RFRP-3, Syrian hamster; CSF, artificial; CSF/CNS; Hamster; 2006; 5.5 weeks; Dose (12 ug/d); Controls received mp w/ vehicle; animal info (Adult sexually mature female Syrian hamsters); ALZET brain infusion kit 1 used; replacement therapy (ovariectomy);.

Q5809: H. H. Farman, *et al.* Extra-nuclear effects of estrogen on cortical bone in males require ERalphaAF-1. *J Mol Endocrinol* 2017;58(2):105-111



ALZET Comments: Estradiol; DMSO, PBS, Ethanol; IP; mice; 1004; 3.5 weeks; Controls received mp w/ vehicle; animal info (5 months old) (15% EtOH, 43% DMSO, 42% PBS) replacement therapy (Estradiol); Therapeutic indication (Estrogen); Dose (6 ug/day);.

Q6413: B. B. Braden, *et al.* A comparison of progestins within three classes: Differential effects on learning and memory in the aging surgically menopausal rat. *Behav Brain Res* 2017;322(Pt B):258-268

ALZET Comments: NETA, progestin; Propylene glycol; Rat; 2006; Dose (20µg/day); Controls received mp w/ vehicle; animal info (twelve month old Fisher-344 female rats); post op. care (Rimadyl (5 mg/mL/kg) for pain and saline (2 mL) to prevent dehydration); replacement therapy (oophorectomy);.

Q6419: J. P. Ball, *et al.* Role and Regulation of MicroRNAs in Aldosterone-Mediated Cardiac Injury and Dysfunction in Male Rats. *Endocrinology* 2017;158(6):1859-1874

ALZET Comments: Aldosterone; PEG 300; SC; Rat; 2004; 8 weeks; Dose (0.75 mg/h); Controls received mp w/ vehicle; animal info (Eight-week old male Sprague–Dawley rats); replacement therapy (uninephrectomy); cardiovascular;.

Q6429: H. M. Abuhashish, *et al.* Angiotensin (1-7) ameliorates the structural and biochemical alterations of ovariectomy-induced osteoporosis in rats via activation of ACE-2/Mas receptor axis. *Sci Rep* 2017;7(1):2293

ALZET Comments: Angiotensin (1-7); A-779; SC; Rat; 2006; 6 weeks; Dose (Ang 1-7: 200 ng/kg/min; A-779: 400 ng/kg/min); animal info (female Wistar rats weighting approximately 220–250 g); replacement therapy (ooverectomy);.

Q5471: M. Valero-Munoz, *et al.* Dual Endothelin-A/Endothelin-B Receptor Blockade and Cardiac Remodeling in Heart Failure With Preserved Ejection Fraction. *Circ Heart Fail* 2016;9(11):

ALZET Comments: Aldosterone, D-; Mice; 4 weeks; Controls received mp w/ saline; animal info (Male, C57BL6J, 8 weeks old, 20-25g); no stress (see pg. 3); replacement therapy (uniphrectomy); cardiovascular; Dose (30 ug/h);.

Q5081: A. E. Tschiffely, *et al.* A comparative evaluation of treatments with 17beta-estradiol and its brain-selective prodrug in a double-transgenic mouse model of Alzheimer's disease. *Horm Behav* 2016;83(39-44)

ALZET Comments: DHED; estradiol, 17B-; Propylene glycol; SC; Mice (transgenic); 2004; 8 weeks; Controls received mp w/ vehicle; animal info (female, APPswe/PS1dE9, 6 months old); functionality of mp verified by plasma levels (see figure S1 - E2 only; no assay for DHED); pumps replaced every 4 weeks; neurodegenerative (Alzheimer's); replacement therapy (estradiol infusion); DHED aka 10β,17β-dihydroxyestra-1,4-dien-3-one; Dose (2 ug/day); Industry authored (AgyPharma LLC);.

Q5689: R. Thakkar, *et al.* NLRP3 Inflammasome Activation in the Brain after Global Cerebral Ischemia and Regulation by 17beta-Estradiol. *Oxid Med Cell Longev* 2016;2016(8309031)

ALZET Comments: Estradiol, 17B-; Cyclodextrin, B-; SC; Rat; Mice; 2002; 14 days; animal info (Rats female, Sprague Dawley, 3 months old, OVX; Mice C27BL/6 PELP1, young adult, OVX); 20% Cyclodextrin used; ischemia (cerebral); replacement therapy (estradiol infusion); immunology; Resultant plasma level (10-15 pg/mL);.

Q5686: A. Tanino, *et al.* Interleukin-18 deficiency protects against renal interstitial fibrosis in aldosterone/salt-treated mice. *Clin Sci (Lond)* 2016;130(19):1727-39

ALZET Comments: Aldosterone; Water; ethanol; propylene glycol; SC; mice; 2004; 4 weeks; 28 days; Controls received mp w/ vehicle; animal info (male, C57BL6 or IL-18 KO, 8 weeks old); 9% ethanol used; 86.5% propylene glycol used; replacement therapy (uniphrectomy); immunology; Bp measured using indirect tail cuff; Dose (0.15 ug/h);.

Q4896: P. S. L. María Valero-Muñoz, BS; Richard M. Wilson, BS; Maarten Hulsmans, PhD; *et al.* Heart Failure With Preserved Ejection Fraction Induces Beiging in Adipose Tissue. *Circ Heart Fail* 2016;9(1-10)

ALZET Comments: Aldosterone, D-; Saline; SC; Mice; 4 weeks; Controls received mp w/ saline; animal info (C57BL6, 8 weeks old, 20-25g, uninephrectomy); replacement therapy (uninephrectomy); cardiovascular; bp measured using tail cuff; Dose (0.3 ug/h);.

Q4860: E. Maggioli, *et al.* Estrogen protects the blood–brain barrier from inflammation-induced disruption and increased lymphocyte trafficking. *Brain Behav. Immun* 2016;51(212-222)



ALZET Comments: Estradiol; Cyclodextrin, B-; SC; Mice; 2002; 14 days; Controls received mp w/ vehicle; animal info (C57BL6 or AnxA1 -/-, 2 months old, OVX); replacement therapy (estradiol infusion); immunology; dose: 100nM.

Q5414: D. Madularu, *et al.* High estrogen and chronic haloperidol lead to greater amphetamine-induced BOLD activation in awake, amphetamine-sensitized female rats. *Horm Behav* 2016;82(56-63

ALZET Comments: Haloperidol; Saline; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle; Animal info (OVX Sprague Dawley rats, 200-250 g, 2 months old); post op. care (Anafen analgesic 0.1 mL/rat, and local antibiotic ointment); replacement therapy (estrogen replacement); MRI compatible PEEK tubing used; Dose (0.25 mg/kg/day); Therapeutic indication (Schizophrenia);.

Q4842: A. Kimura, *et al.* Exaggerated arsenic nephrotoxicity in female mice through estrogen-dependent impairments in the autophagic flux. *Toxicology* 2016;339(9-18

ALZET Comments: Estrogen-17B; Ethanol; PBS; Mice; 1002; 1 week; Controls received no mp; Controls received no mp; Controls received no mp; replacement therapy (estrogen infusion); Dose (0.2 mg/kg/day);.

Q6568: T. Kaniyas, *et al.* Testosterone-dependent sex differences in red blood cell hemolysis in storage, stress, and disease. *Transfusion* 2016;56(10):2571-2583

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);.

Q5653: H. Kaneko, *et al.* Growth and fertilization of porcine fetal oocytes grafted under the renal capsules of nude mice. *Theriogenology* 2016;86(7):1740-8

ALZET Comments: Follicle stimulating hormone, porcine; mice; 2004; 13 days; Controls were non-grafted; replacement therapy (Estradiol); Therapeutic indication (Follicular development, oocyte maturation, fertilization); Dose (62.5 U/mL);.

Q6567: Y. Kakizoe, *et al.* A serine protease inhibitor attenuates aldosterone-induced kidney injuries via the suppression of plasmin activity. *J Pharmacol Sci* 2016;132(2):145-153

ALZET Comments: Aldosterone; DMSO; Saline; SC; Rat; 2004; animal info (9 week old male SpragueDawley rats); replacement therapy (left uninephrectomy);.

Q5316: Jeremie Boucher, *et al.* Differential Roles of Insulin and IGF-1 Receptors in Adipose Tissue Development and Function. *Diabetes* 2016;66(2201-2213

ALZET Comments: Leptin; Saline; SC; Mice; 1002; 14 days; Controls received mp w/ vehicle; animal info (Fat-specific IR, IGF1R, and IR/IGF1R knockout mice; 3 month old); functionality of mp verified by blood glucose levels; dose-response (pg 2204-2206); behavioral testing (cold-resistance testing); replacement therapy (leptin); Lipoatrophic diabetes; Dose (10 ug/mouse/d);.

Q4788: Jeffrey A. Blair, *et al.* Luteinizing hormone downregulation but not estrogen replacement improves ovariectomy-associated cognition and spine density loss independently of treatment onset timing. *Horm. Behav* 2016;78(60-66

ALZET Comments: Estradiol, 17b; leuprolide acetate; Saline; SC; Mice; 1004; 2 months; Controls received mp w/ vehicle; animal info (C57BL6J, 9 months old, OVX); pumps replaced every month; behavioral testing (morris water maze); replacement therapy (estradiol infusion); Dose (E2 1.1 ng/day; leuprolide 3.6 ug/day);.

Q6530: Bin Wang, *et al.* Role of FOXO1 in aldosterone-induced autophagy: A compensatory protective mechanism related to podocyte injury. *ONCOTARGET* 2016;7(29):45331-45351

ALZET Comments: Aldosterone; SC; Rat; 2004; 28 days; Dose (0.75 µg/kg/min); animal info (5-6 week old male Sprague-Dawley rats weighing 190 g); replacement therapy (uniphrectomy);.

Q5299: F. Zhang, *et al.* Effects of sexually dimorphic growth hormone secretory patterns on arachidonic acid metabolizing enzymes in rodent heart. *Toxicol Appl Pharmacol* 2015;289(3):495-506



ALZET Comments: Growth hormone, recombinant; SC; mice; 1007D; 7 days; Controls received sham operation; animal info (C57/B6, male and female, 8-10 wks, 18-25 g); functionality of mp verified by cardiac mRNA levels; replacement therapy (growth hormone); Cardiac mRNA; Dose (0.4 ug/h);.

Q4159: B. Wang, *et al.* Rapamycin Attenuates Aldosterone-Induced Tubulointerstitial Inflammation and Fibrosis. *CELLULAR PHYSIOLOGY AND BIOCHEMISTRY* 2015;35(116-125

ALZET Comments: Aldosterone; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (Sprague Dawley); replacement therapy (uninephrectomized); cardiovascular;.

Q4574: H. Sawada, *et al.* Iron restriction inhibits renal injury in aldosterone/salt-induced hypertensive mice. *HYPERTENSION RESEARCH* 2015;38(317-322

ALZET Comments: Aldosterone; SC; Mice; 4 weeks; Controls received mp w/ vehicle; animal info (male, C57BL6J, 8 weeks old, 20-23g); replacement therapy (uninephrectomy); cardiovascular; bp measured using tail cuff;.

P6007: M. Sarvari, *et al.* Hippocampal Gene Expression Is Highly Responsive to Estradiol Replacement in Middle-Aged Female Rats. *Endocrinology* 2015;156(7):2632-45

ALZET Comments: Estradiol, 17b-; Propylene glycol; SC; Rat; 2004; 29 days; Dose (0.33 mg/mL); animal info (Female Harlan-Wistar rats; 9 months old); replacement therapy (Estradiol);.

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;.

Q5248: S. Parsi, *et al.* Preclinical Evaluation of miR-15/107 Family Members as Multifactorial Drug Targets for Alzheimer's Disease. *Mol Ther Nucleic Acids* 2015;4(e256

ALZET Comments: miR-16 mimic; Saline; CSF/CNS (ventricle); mice; 1007D; 7 days; Controls received mp w/ vehicle; animal info (Wild-type mice (C57BL/6, female, 2 months old)); ALZET brain infusion kit 2 used; dose-response (pg. 2); neurodegenerative (Alzheimer's); post op. care (Anafen); replacement therapy (miRNA replacement therapy); brain tissue distribution; delayed delivery (12 hours delivery/day); potent inhibitor of amyloid precursor protein (APP) and BACE1 expression, A β peptide production, and Tau phosphorylation in cells; Dose (4.2 μ g/ μ l); Brain coordinates; ventricle A/P = -0.22 M/L = 0.5 D/v = 3.5).

Q4536: T. I. Montoya, *et al.* Effect of Vaginal or Systemic Estrogen on Dynamics of Collagen Assembly in the Rat Vaginal Wall. *BIOLOGY OF REPRODUCTION* 2015;92(U115-U123

ALZET Comments: Estradiol; SC; Rat; 4 weeks; Animal info (female, Sprague Dawley, 12 weeks old); replacement therapy (estradiol infusion);.

Q5234: P. Meschin, *et al.* p11 modulates calcium handling through 5-HT(4)R pathway in rat ventricular cardiomyocytes. *Cell Calcium* 2015;58(6):549-57

ALZET Comments: Brain-derived neurotrophic factor; saline; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; animal info (200–224 g male Wistar rats); functionality of mp verified by ECG (electrocardiograms); post op. care (lidocaine, heating pad); replacement therapy (neurotrophin); Dose (180 ng/day));.

Q4530: S. E. Mennenga, *et al.* Understanding the cognitive impact of the contraceptive estrogen Ethinyl Estradiol: Tonic and cyclic administration impairs memory, and performance correlates with basal forebrain cholinergic system integrity. *PSYCHONEUROENDOCRINOLOGY* 2015;54(1-13

ALZET Comments: Estradiol, ethinyl; Propylene glycol; SC; Rat; 2006; 6 weeks; Controls received mp w/ vehicle; animal info (female, Fischer-344, OVX, 3 months old); functionality of mp verified by serum levels; dose-response (pg8); behavioral testing (water radial-arm maze, morris water maze, visible platform task); replacement therapy (estradiol infusion); long-term study;.



Q5222: J. Y. Li, *et al.* IL-17A Is Increased in Humans with Primary Hyperparathyroidism and Mediates PTH-Induced Bone Loss in Mice. *Cell Metab* 2015;22(5):799-810

ALZET Comments: Parathyroid hormone, human (1-34); SC; mice; 1002; 2 weeks; Controls received mp w/ vehicle; animal info: 16-week-old female mice, C57BL/6 WT; functionality of mp verified by flow cytometry; dose-response (pg 808); replacement therapy (human parathyroid hormone); immunology; peptides; Dose: 80 mg/kg/day.

Q4487: V. Lam, *et al.* The Vitamin D, Ionised Calcium and Parathyroid Hormone Axis of Cerebral Capillary Function: Therapeutic Considerations for Vascular-Based Neurodegenerative Disorders. *PLoS One* 2015;10(U4547-U4566)

ALZET Comments: Parathyroid hormone (1-34); Saline, isosmotic; cysteine; SC; Rat; 6 weeks; 12 weeks; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, 7 weeks old); functionality of mp verified by residual volume and serum levels; 2% cysteine used; replacement therapy (parathyroid replacement); used wound clips; used 2ML size pumps; pumps primed; long-term study;.

R0354: D. Han, *et al.* Attenuation of mitochondrial and nuclear p38alpha signaling: a novel mechanism of estrogen neuroprotection in cerebral ischemia. *Mol Cell Endocrinol* 2015;400(21-31)

ALZET Comments: Estradiol, 17b-; Cyclodextrin, B-; SC; Rat; 1002; 14 days; Controls received mp w/ vehicle; animal info (3-month old female Sprague–Dawley rats); 20% beta cyclodextrin ; replacement therapy (estradiol); This dose of E2 (0.017 mg) was used to mimic low, physiological E2 levels produced during Diestrus I (10–15 pg/mL serum E2);.

Q4406: G. J. Dong, *et al.* 17beta-Estradiol enhances the activation of IFN-alpha signaling in B cells by down-regulating the expression of let-7e-5p, miR-98-5p and miR-145a-5p that target IKKepsilon. *BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR BASIS OF DISEASE* 2015;1852(1585-1598)

ALZET Comments: Estradiol, 17b-; Ethanol; propylene glycol; SC; Mice; 1004; 4 weeks; Controls received mp w/ vehicle; animal info (female, C57BL6, 4 weeks old, OVX); 0.5% ethanol used; 99.5% polypropylene glycol used; replacement therapy (estradiol infusion);.

Q4507: W. Ding, *et al.* Rotenone Attenuates Renal Injury in Aldosterone-Infused Rats by Inhibiting Oxidative Stress, Mitochondrial Dysfunction, and Inflammasome Activation. *MEDICAL SCIENCE MONITOR* 2015;21(U1-U8)

ALZET Comments: Aldosterone; Ethanol; SC; Rat; 2004; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 220-250g); 0.5% ethanol used; replacement therapy (uninephrectomy); cardiovascular; immunology;.

Q4230: J. Zhang, *et al.* Soy protein isolate down-regulates caveolin-1 expression to suppress osteoblastic cell senescence pathways. *FASEB Journal* 2014;28(3134-3145)

ALZET Comments: Estradiol, b-; PEG 400; SC; Rat (pregnant); 2004; 14 days; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, GD4); replacement therapy (ovarectomized);.

Q4200: Y. Yang, *et al.* Sestrin2 Decreases Renal Oxidative Stress, Lowers Blood Pressure, and Mediates Dopamine D(2) Receptor-Induced Inhibition of Reactive Oxygen Species Production. *Hypertension* 2014;64(825-+)

ALZET Comments: RNA, small interfering (sestrin2); Kidney (renal subcapsule); Mice; 1007D; 7 days; Controls received mp w/ control RNA; animal info (C57BL6J); good methods (supplement, pg 2); post op. care (buprenorphine); replacement therapy (uninephrectomy); used ALZET PE tubing; bp measured using catheter;.

Q4192: B. J. Xue, *et al.* Estrogen regulation of the brain renin-angiotensin system in protection against angiotensin II-induced sensitization of hypertension. *American Journal of Physiology-Heart and Circulatory Physiology* 2014;307(H191-H198)

ALZET Comments: Angiotensin II; estradiol, 17b-; angiotensin (1-7); A-779; Saline; DMSO; SC; CSF/CNS; Rat; 2001; 2002; 1 week; 2 weeks; Animal info (Sprague Dawley, 10-12 weeks old); ALZET brain infusion kit used; Multiple pumps per animal (2); replacement therapy (ovarectomized, estradiol infusion); cardiovascular; antihypertensive; peptides; bp measured using radiotelemetry (DSI);.



Q4158: L. Wan, *et al.* Dietary Tomato and Lycopene Impact Androgen Signaling- and Carcinogenesis-Related Gene Expression during Early TRAMP Prostate Carcinogenesis. *Cancer Prevention Research* 2014;7(12):1228-1239

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);.

Q4157: M. Walser, *et al.* Different modes of GH administration influence gene expression in the male rat brain. *Journal of Endocrinology* 2014;222(1):181-190

ALZET Comments: Growth hormone, recombinant bovine; PBS; glycerol; sodium azide; SC; Rat; 2004; 7 days; Animal info (male, Sprague Dawley, hypophysectomized); 0.02% sodium azide used; 1.6% glycerol used; comparison of injection vs mp; replacement therapy (hypophysectomy);.

Q4138: A. L. B. Terzian, *et al.* Cannabinoid receptor type 1 receptors on GABAergic vs. glutamatergic neurons differentially gate sex-dependent social interest in mice. *European Journal of Neuroscience* 2014;40(12):2293-2298

ALZET Comments: Estradiol, b-; Ethanol; propylene glycol; Mice; 1002; 1 week; Animal info (male, CB1 KO, 8-12 weeks old, OVX); 0.5% ethanol used; behavioral testing (social interaction test; three-chamber social investigation test); replacement therapy (ovariectomized, estradiol infusion);.

Q4096: A. Shah, *et al.* Influence of acute or chronic administration of ovarian hormones on the effects of desipramine in the forced swim test in female rats. *Psychopharmacology* 2014;231(12):3685-3694

ALZET Comments: Desipramine hydrochloride; Water, distilled; IP; Rat; 2ML4; 18 days; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, 250-350g, ovariectomized); functionality of mp verified by serum levels; comparison of injection vs mp; dose-response (pg 3690); post op. care (penicillin and saline injection; atipamezol 1 mg/kg); behavioral testing (forced swimming test; locomotor activity); replacement therapy (estradiol pellets); solutions filtered through 0.9 um nitrocellulose filters; pumps primed at room temperature saline; used sutures;.

Q4091: E. L. Scott, *et al.* Surgical menopause enhances hippocampal amyloidogenesis following global cerebral ischemia. *JOURNAL OF SPORT AND HEALTH SCIENCE* 2014;3(2):206-216

ALZET Comments: Estradiol, 17b-; Cyclodextrin, B-; SC; Rat; 2002; 1 week; Controls received mp w/ vehicle; animal info (female, ovariectomized); 20% cyclodextrin used; ischemia (cerebral); replacement therapy (estradiol infusion); cardiovascular;.

Q3621: M. Sarvari, *et al.* Ovariectomy and Subsequent Treatment with Estrogen Receptor Agonists Tune the Innate Immune System of the Hippocampus in Middle-Aged Female Rats. *PLoS One* 2014;9(2):U411-U422

ALZET Comments: Estradiol, 17b-; agonist, estrogen receptor 16-alpha-lactone; Propylene glycol; SC; Rat; 2004; 29 days; Controls received mp w/ vehicle or sham operation; animal info (female, Harlan-Wistar, OVX, 13 months old); replacement therapy (ovariectomized; estradiol infusion); immunology; 16-alpha-lactone estrogen agonist aka L2;.

Q4084: M. Sarvari, *et al.* Estradiol and isotype-selective estrogen receptor agonists modulate the mesocortical dopaminergic system in gonadectomized female rats. *Brain Research* 2014;1583(1):1-11

ALZET Comments: Estradiol; Rat; 2004; Animal info (female, Harlan-Wistar 2 months old, ovariectomized); replacement therapy (estradiol infusion); mentions use of "silicone capsules", but only mentions pumps once;.

Q3352: B. S. Nelson, *et al.* Antagonism of brain insulin-like growth factor-1 receptors blocks estradiol effects on memory and levels of hippocampal synaptic proteins in ovariectomized rats. *Psychopharmacology* 2014;231(5):899-907

ALZET Comments: JB1; CSF, artificial; CSF/CNS; Rat; 2006; 3 weeks; Controls received mp w/ vehicle; animal info (female, Long Evans, 2 months old); ALZET brain infusion kit used; stress/adverse reaction: (see pg. 901); behavioral testing (radial maze); replacement therapy (ovarectomized); peptides; Cannula placement verified via Cresyl violet staining; cannula anchored to skull with screws and dental acrylic; JB1 is a IGF-1 receptor antagonist.

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(12):2694-2706



ALZET Comments: Parathormone (1-84), rat; calcitonin, rat; Acetate buffer; SC; Rat; 2001; 22 days; Animal info (female, Wistar, E0); replacement therapy (thyroidectomy); teratology;.

Q3573: A. D. Mueller, *et al.* The inhibitory effect of sleep deprivation on cell proliferation in the hippocampus of adult mice is eliminated by corticosterone clamp combined with interleukin-1 receptor 1 knockout. *BRAIN BEHAVIOR AND IMMUNITY* 2014;35(;):182-188

ALZET Comments: Corticosterone; PEG 400; ethanol; SC; Mice; 1002; Animal info (male, homozygous IL1RI null, 7-8 weeks old); 5% ethanol used; post op. care (buprenorphine 0.1 mg/kg, metacam 1 mg/kg SQ, ADX rats given saline in water bottles); replacement therapy (adrenalectomy); immunology; sleep deprivation study;.

Q4468: D. J. Morris, *et al.* An alternative explanation of hypertension associated with 17alpha-hydroxylase deficiency syndrome. *Steroids* 2014;79(44-8

ALZET Comments: corticosterone; progesterone, hydroxy-; Propylene glycol; sc; Rat; 14 days; Controls received mp w/ vehicle; animal info: adrenally intact rats; functionality of mp verified by measuring systolic blood pressure pg 46; replacement therapy (the agents infused); Dose: 5 ug/hr of both agents.

Q3996: H. Matsui, *et al.* Pharmacologic profiles of investigational kisspeptin/metastatin analogues, TAK-448 and TAK-683, in adult male rats in comparison to the GnRH analogue leuprolide. *European Journal of Pharmacology* 2014;735(77-85

ALZET Comments: TAK-448; TAK-683; leuprolide; DMSO; water, distilled; SC; Rat; 2001; 2004; 7 days; 28 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 9 weeks old, 318-368g, ORX); functionality of mp verified by plasma concentration; 50% DMSO used; cancer (prostate); dose-response (pg 80); replacement therapy (bilateral orchietomy);.

Q3306: D. Madularu, *et al.* Estrogen potentiates the behavioral and nucleus accumbens dopamine response to continuous haloperidol treatment in female rats. *European Journal of Neuroscience* 2014;39(2):257-265

ALZET Comments: Haloperidol; Saline; SC; Rat; 2002; 12 days; Animal info (female, Sprague Dawley, ovariectomized); behavioral testing (motor activity); replacement therapy (ovariectomized); pump removed after 12 days;.

Q3520: H. Ji, *et al.* Central cholinergic activation of a vagus nerve-to-spleen circuit alleviates experimental colitis. *Mucosal Immunology* 2014;7(2):335-347

ALZET Comments: McN-A-343; MTT; Saline; Mice; Controls received mp w/ vehicle; animal info (male, C57BL6, 7-9 weeks old); replacement therapy (vagotomy; splenic neuroectomy; splenectomy); immunology; McN-A-343 is an M1 mAChR antagonist; MTT is an M2 mAChR antagonist;.

Q3214: T. Hattori, *et al.* Effects of salt status and blockade of mineralocorticoid receptors on aldosterone-induced cardiac injury. *HYPERTENSION RESEARCH* 2014;37(2):125-133

ALZET Comments: Aldosterone, d-; Saline; ethanol; SC; Rat; 2004; 4 weeks; Animal info (Sprague Dawley, uninephrectomized, 6 wks old, male, inbred); replacement therapy (uninephrectomy); 0.5% ethanol used.

Q3501: R. Hatano, *et al.* Glucocorticoid mediates the transcription of OAT-PG, a kidney-specific prostaglandin transporter. *PFLUGERS ARCHIV-EUROPEAN JOURNAL OF PHYSIOLOGY* 2014;466(925-935

ALZET Comments: Dexamethasone; SC; Rat; 2002; 7 days; Controls received mp w/ saline; animal info (Sprague Dawley Rats, 180-250g); replacement therapy (adrenalectomy);.

Q3498: S. I. Han, *et al.* Estrogen Receptor Ligands Ameliorate Fatty Liver Through a Nonclassical Estrogen Receptor/Liver X Receptor Pathway in Mice. *Hepatology* 2014;59(1791-1802

ALZET Comments: Estradiol, 17B-; phloretin; Mice (transgenic); 2004; 4 weeks; Animal info (female, C57BL6 or ERa flox/flox, 5 weeks old); replacement therapy (ovariectomized); phloretin is a phytoestrogen;.

Q3459: T. Doi, *et al.* Mizoribine Ameliorates Renal Injury and Hypertension along with the Attenuation of Renal Caspase-1 Expression in Aldosterone-Salt-Treated Rats. *PLoS One* 2014;9(U875-U881



ALZET Comments: Aldosterone; SC; Rat; 6 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 220-250g, 6 weeks old); functionality of mp verified by increased bp; replacement therapy (uninephrectomy); immunology; bp measured using tail cuff; long-term study;

Q3818: M. Bozic, *et al.* High phosphate diet increases arterial blood pressure via a parathyroid hormone mediated increase of renin. *Journal of Hypertension* 2014;32(1822-1832

ALZET Comments: Parathyroid hormone (1-34), recombinant rat; SC; Rat; 2002; 4 weeks; Animal info (Sprague Dawley, 200-225g); functionality of mp verified by calcium serum levels; replacement therapy (parathyroidectomy); cardiovascular;

Q3228: Q. G. Zhang, *et al.* Hypersensitivity of the hippocampal CA3 region to stress-induced neurodegeneration and amyloidogenesis in a rat model of surgical menopause. *Brain* 2013;136(14):1432-1445

ALZET Comments: Estradiol, 17 β -; SC; Rat; 21 days; Controls received mp w/ placebo; animal info (female, 3 months old, Sprague Dawley, ovariectomized); neurodegenerative (Alzheimer's disease); behavioral testing (Morris Water Maze); replacement therapy (17 β estradiol after ovariectomy);

Q3653: B. J. Xue, *et al.* Central endogenous angiotensin-(1-7) protects against aldosterone/NaCl-induced hypertension in female rats. *American Journal of Physiology-Heart and Circulatory Physiology* 2013;305(5):H699-H705

ALZET Comments: Angiotensin (1-7), D-alanine; A-779; CSF/CNS; SC; Rat; 2004; 28 days; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, 10-12 weeks old, OVX); ALZET brain infusion kit used; replacement therapy (ovariectomy); cardiovascular; peptides; antihypertensive; A-779 is an angiotensin (1-7) receptor antagonist; bp measured using radiotelemetry;

Q3227: C. Weigt, *et al.* Molecular effects of ER alpha- and beta-selective agonists on regulation of energy homeostasis in obese female Wistar rats. *MOLECULAR AND CELLULAR ENDOCRINOLOGY* 2013;377(1-2):147-158

ALZET Comments: Estradiol; agonist, estradiol receptor alpha-selective 16-alpha-VE2; agonist, estradiol receptor beta-selective 8-beta-VE2; DMSO; water; SC; Rat; 10 weeks; Controls received sham surgery; animal info (Female, Wistar, 120-150g, 6 weeks old); replacement therapy (ovariectomy, estradiol infusion); long-term study; immunology;

Q3159: S. A. Salyer, *et al.* Aldosterone regulates Na⁺, K⁺ ATPase activity in human renal proximal tubule cells through mineralocorticoid receptor. *BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR CELL RESEARCH* 2013;1833(10):2143-2152

ALZET Comments: Aldosterone; Rat; 14 days; Controls received mp with vehicle or sham operated; animal info (male, Sprague Dawley, 100-150g); replacement therapy (adrenalectomy); immunology;

Q3581: W. Pichaiwong, *et al.* Reversibility of Structural and Functional Damage in a Model of Advanced Diabetic Nephropathy. *Journal of the American Society of Nephrology* 2013;24(7):1088-1102

ALZET Comments: Leptin; Saline; SC; Mice; 2004; 2006; 4 weeks; 6 weeks; Controls received mp w/ vehicle; animal info (BTBR ob/ob, 18 weeks old); functionality of mp verified by leptin serum levels; replacement therapy (leptin replacement); diabetes; bp measured using tail cuff;

Q3594: D. Panigrahy, *et al.* Epoxyeicosanoids promote organ and tissue regeneration. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 2013;110(33):13528-13533

ALZET Comments: Epoxyeicosatrienoic acid, 14,15-; epoxyeicosatrienoic acid, 11,12-; IP; Mice; 4 days; Controls received mp w/ vehicle; animal info (male, Tie2-CYP2C8-Tr, Tie2-CYP2J2-Tr, sEH-null, 6 months old); replacement therapy (partial hepatectomy); tissue and organ regeneration.

Q3465: J. Fang, *et al.* Meta-Modeling of Methylprednisolone Effects on Glucose Regulation in Rats. *PLoS One* 2013;8(12):U923-U940

ALZET Comments: Methylprednisolone; Rat; 2ML4; 2001; 21 days; 10 days; 7 days; Controls received mp w/ vehicle; animal info (Wistar); functionality of mp verified by plasma levels; dose-response (pg. 11, figure 5); replacement therapy (adrenalectomy); diabetes;



Q2816: J. R. Chen, *et al.* Testosterone modulation of dendritic spines of somatosensory cortical pyramidal neurons. *Brain Structure & Function* 2013;218(6):1407-1417

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).

Q2748: M. E. Basha, *et al.* Effect of Estrogen on Molecular and Functional Characteristics of the Rodent Vaginal Muscularis. *Journal of Sexual Medicine* 2013;10(5):1219-1230

ALZET Comments: Estradiol, 17-; Cyclodextrin; SC; Rat; 2002; 2 weeks; Control animals received mp w/ saline; animal info (Sprague Dawley, female, 3-4 mo old, 250-300 g); replacement therapy (ovariectomy).

Q2622: S. M. Bartell, *et al.* Non-Nuclear-Initiated Actions of the Estrogen Receptor Protect Cortical Bone Mass. *MOLECULAR ENDOCRINOLOGY* 2013;27(4):649-656

ALZET Comments: Estradiol; dendrimer, empty estradiol; IP; Mice; 2006; 6 weeks; Control animals received mp w/ vehicle; animal info (C57BL/6, female, 15 wks old); replacement therapy (ovariectomy);.

Q2817: S. Balgobin, *et al.* Estrogen Alters Remodeling of the Vaginal Wall after Surgical Injury in Guinea Pigs. *Biology of Reproduction* 2013;89(6):U91-U100

ALZET Comments: Estradiol; Polyethylene glycol; SC; Guinea pig; 2006; 21 days; Control animals received mp w/ vehicle; animal info (virginal, female, adult, Hartley, 12 wks old); replacement therapy (bilateral oophrectomy).

Q2606: R. K. Babbs, *et al.* 2-Hydroxyestradiol enhances binge onset in female rats and reduces prefrontal cortical dopamine in male rats. *Hormones and Behavior* 2013;63(1):88-96

ALZET Comments: Estradiol, hydroxy 2-; PEG 400; SC; Rat; 2ML4; 4 weeks; Control animals received mp w/ vehicle; animal info (Sprague Dawley, female); replacement therapy (ovariectomy); wound clips used; half-life (pg.89).

Q3401: K. Akita, *et al.* A novel selective androgen receptor modulator, NEP28, is efficacious in muscle and brain without serious side effects on prostate. *European Journal of Pharmacology* 2013;720(1-3):107-114

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;.