



Recent References (2017-Present) Where ALZET® Osmotic Pump Functionality Was Documented

Q10994: D. Selvakumar, *et al.* Delivery of Cardioactive Therapeutics in a Porcine Myocardial Infarction Model. *Journal of Visual Experiment* 2023;192:

Agents: Platelet-derived growth factor-AB, human **Vehicle:** Saline; **Route:** IV (jugular); **Species:** Pig; **Strain:** Not Stated; **Pump:** 2ML1; 2ML2; 2ML4; **Duration:** 7 days;

ALZET Comments: Dose: Controls received mp w/ vehicle; animal info: Pre-pubescent large white x landrace gilts, 18-20 kg, post op. care: 0.2 mg/kg of meloxicam SC; comparison of injections (thoracotomy, transepical, percutaneous transendocardial) vs mp; functionality of mp verified by recomb protein serum concentration (ELISA); cardiovascular (myocardial infarction); good methods p. 8, 13 fig. 2; no stress; "Jugular vein minipump insertion provides a safe and reliable method of PDGF delivery over a 7 day time period." p. 13

Q10991: P. G. Saletti, *et al.* Tau Phosphorylation Patterns in the Rat Cerebral Cortex After Traumatic Brain Injury and Sodium Selenate Effects: An Epibios4rx Project 2 Study. *Journal of Neurotrauma* 2023;

Agents: Sodium selenate **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: Dose (1mg/kg/d); dose-response; 0.9% sterile saline used; Controls received mp w/ vehicle; animal info: Adult male; functionality of mp verified by plasma levels (Table 3); traumatic brain injury

Q10984: G. Rached, *et al.* TRPC3 Regulates Islet Beta-Cell Insulin Secretion. *Advanced Science* 2023;10(6):e2204846

Agents: GSK1702934A **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** Trpc3-/-; **Pump:** Not Stated; **Duration:** 4 weeks;

ALZET Comments: Dose (0.1 mg/kg/day); animal info: WT mice; GSK 1702934A is a small molecule, potent and selective TRPC3/6 activator; functionality of mp verified by plasma insulin levels; diabetes;

Q10978: R. Patel, *et al.* Signaling through the IL-6-STAT3 Pathway Promotes Proteolytically-Active Macrophage Accumulation Necessary for Development of Small AAA. *Vascular and Endovascular Surgery* 2023;57(5):433-444

Agents: Interleukin-6 **Vehicle:** Saline, sterile; **Route:** IP; **Species:** Mice; **Strain:** C57BL/6; IL-6KO; **Pump:** 1004 **Duration:** 21 days

ALZET Comments: Dose: (4.36 µg/kg/day); Controls received mp w/ vehicle; animal info: wild-type mice; post op. care (subcutaneous injection of 0.05 mg/kg buprenorphine); functionality of mp verified by IL-6 plasma levels; cardiovascular; abdominal aortic aneurysm; immunology

Q10970: A. Nenmar, *et al.* Assessment of the Hepatotoxicity of Intratracheally Instilled Silver Nanoparticles in Hypertensive Mice. *Hamdan Medical Journal* 2023;

Agents: Angiotensin II **Vehicle:** Saline; PEG; **Route:** SC; **Species:** Mice; **Strain:** BALB/c; **Pump:** 2006; **Duration:** Not Stated;

ALZET Comments: Dose (0.75 Mg/kg/day); Controls received mp w/ vehicle; animal info: Eight to 10-week-old mice both genders weighing 20–25 g; functionality of mp verified by Ang II plasma concentration; Blood pressure measured via: computer-based tail-cuff manometry system; 136 ± 2 mmHg - 81 ± 1 mmHg pg.4 (result); cardiovascular; (hypertension)

Q11061: A. Nemmar, *et al.* Impact of Intratracheal Administration of Polyethylene Glycol-Coated Silver Nanoparticles on the Heart of Normotensive and Hypertensive Mice. *International Journal of Molecular Sciences* 2023;24(10):

Agents: Angiotensin II **Vehicle:** Saline; **Route:** CSF/CNS; **Species:** Mice **Strain:** BALB/c; **Pump:** 2006; **Duration:** 28 days;

ALZET Comments: Dose (0.75 mg/kg/day); 0.15 mol/L NaCl and 0.01-N acetic acid used; controls received mp w/ vehicle; animal info: both sexes, aged 8 to 10 weeks, 20 to 25 g; blood pressure measured via tail cuff; blood pressure measurement results (p.4) Fig. 2; functionality of mp verified by plasma levels; cardiovascular (hypertension)

Q11060: A. Nakamoto, *et al.* O-linked N-acetylglucosamine modification is essential for physiological adipose expansion induced by high-fat feeding. *American Journal of Physiology Endocrinology and Metabolism* 2023;325(1):E46-E61

Agents: Leptin **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Ogt-FKO; **Pump:** 2002; **Duration:** 14 days;

ALZET Comments: Dose (10 µg/day); controls received mp w/ vehicle; animal info: 8 wk, HFD; functionality of mp verified by plasma levels; obesity, insulin resistance



Q10963: S. Minamiyama, *et al.* Efficacy of oligodendrocyte precursor cells as delivery vehicles for single-chain variable fragment to misfolded SOD1 in ALS rat model. *Molecular Therapy: Methods and Clinical Development* 2023;28(312-329)
Agents: D3-1 antibody, mouse **Vehicle:** PBS; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Strain:** SOD1H46R; **Pump:** 2ML4; **Duration:** 4 weeks;

ALZET Comments: Dose (1 mg/mL); Controls received mp w/ vehicle; animal info: 1- to 2-day-old Sprague-Dawley rats; behavioral testing (Hindfoot reflex test; Inclined plate test; Grip test); functionality of mp verified by D3-1 concentrations with ELISA; neurodegenerative: Amyotrophic lateral sclerosis; good methods p. 14

Q11044: B. A. Karamian, *et al.* Varenicline mitigates the increased risk of pseudarthrosis associated with nicotine. *The Spine Journal* 2023;23(8):1212-1222

Agents: Nicotine; varenicline **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML4; **Duration:** 8 weeks;

ALZET Comments: Dose: Nicotine 15mg/kg/day, 22.5mg/kg/day, 30mg/kg/day; Varenicline 1mg/kg/day, 2mg/kg/day; animal info: eight-week-old male Sprague-Dawley rats ~300 grams; post op. care: skin closed with running sub-cuticular 4-0 Vicrylsuture, incision was dressed with triple antibiotic ointment; pumps replaced after 4 weeks; functionality of mp verified by serum levels; good methods (pump replacement) p. 2-3; therapeutic indication: (Pseudarthrosis, spinal fusion)

Q11041: K. M. Jansen, *et al.* Impact of GLP-1 receptor agonist versus omega-3 fatty acids supplement on obesity-induced alterations of mitochondrial respiration. *Frontiers in Endocrinology* 2023;14(1098391)

Agents: Exenatide **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6JOLaHSD; **Pump:** 1004; **Duration:** 8 weeks;

ALZET Comments: Dose (10 µg/kg/day); animal info: six-week-old female; post op. care: Temgesic analgesia (0.1 mg/kg) was given 8 and 20 hours postoperatively; functionality of mp verified by weight gain; peptides; obesity

Q11079: A. Huang, *et al.* Modulation of foraging-like behaviors by cholesterol-FGF19 axis. *Cell & Bioscience* 2023;13(1):20

Agents: Fibroblast growth factor 19 **Vehicle:** CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Strain:** C57BL/6; **Pump:** 2006; **Duration:** 2 weeks;

ALZET Comments: Dose: FGF19 (15 ng/0.5 µl/h); Controls received mp w/ vehicle; animal info (Male; 5 months old); peptides; pumps replaced twice; functionality of mp verified by measuring residual volume; Brain coordinates: (Anteroposterior -0.3 mm to bregma, lateral 1 mm to bregma, -2.5 mm below skull); vinyl tubing used; behavioral testing (Open field);

Q11078: A. Gurdita, *et al.* Development of a new surgical technique to infuse kynurenic acid to optic nerves in chickens for studying loss of myelination. *Heliyon* 2023;9(3):e14361

Agents: Kynurenic acid **Vehicle:** PBS; NaOH; **Route:** CSF/CNS (optic nerve); **Species:** Bird (chicken); **Strain:** **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: animal info (Chicks; 7 days old); post op. care: meloxicam, polysporine; functionality of mp verified by India ink (non-toxic dye); receptor antagonist (Glutamate); intrathecal catheter used;

Q11074: K. Fukuyama, *et al.* Opposing effects of clozapine and brexpiprazole on beta-aminoisobutyric acid: Pathophysiology of antipsychotics-induced weight gain. *Schizophrenia* 2023;9(1):8

Agents: Vigabatrin **Vehicle:** Clozapine; brexpiprazole; vigabatrin; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML1; **Duration:** 14 days;

ALZET Comments: Dose: (clozapine 5 mg/kg/day, brexpiprazole 10 mg/kg/day, vigabatrin 75 mg/kg/day); Controls received mp w/ vehicle; animal info (Male; 6-7 weeks old); functionality of mp verified by plasma concentration p. 4 fig. 1; schizophrenia

Q10721: Y. Wada, *et al.* Compromised Blood Flow in the Optic Nerve Head after Systemic Administration of Aldosterone in Rats: A Possible Rat Model of Retinal Ganglion Cell Loss. *Current Eye Research* 2022;47(5):777-785

Agents: Aldosterone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 4 weeks;

ALZET Comments: Dose (80 µg/kg/d); Controls received mp w/ vehicle; animal info (Male; Pigmented Brown Norway; 20 weeks old); Blood pressure measured via automic sphygmomanometer; functionality of mp verified by plasma levels;



Q10473: K. A. R. Estrela, *et al.* Blocking Metabotropic Glutamate Receptor Subtype 7 via the Venus Flytrap Domain Promotes a Chronic Stress-Resilient Phenotype in Mice. *Cells* 2022;11(11):

Agents: XAP044 **Vehicle:** DMSO; Ringer's solution; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 1004; **Duration:** 26 days;
ALZET Comments: Dose response (100 uM, 10 uM, 1 uM); 5% DMSO used; Controls received mp w/ vehicle; animal info (Male; C57BL/6, 19-22 g); behavioral testing (Chronic Subordinate Colony Housing Paradigm; Light/Dark Box Test; Stress-Induced Hyperthermia Test); functionality of mp verified by aspirating residual volume; ALZET brain infusion kit 3 used; gene therapy; Therapeutic indication (Chronic stress-related pathology);

Q9505: T. Troiano, *et al.* Inhibition of NOX1 mitigates blood pressure increases in elastin insufficiency. *American Physiological Society* 2021;

Agents: Apocynin **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 56 days;
ALZET Comments: Dose (3 mg/kg/day); 50% DMSO used; Controls received mp w/ vehicle; animal info (4-6 wk of age, male Eln+/+ and Eln+/- mice); functionality of mp verified by volume of solution; pumps replaced every 28 days; Blood pressure measured via angiocatheter; cardiovascular;

Q10066: R. A. Smith, *et al.* Development of a molecular therapy for the SOD1 familial variant of ALS. *Neurotherapeutics in the Era of Translational Medicine* 2021;1-18

Agents: Oligonucleotides; Methylene blue **Vehicle:** Not Stated; **Route:** CSF/CNS (right lateral ventricle); **Species:** Rat; **Pump:** Not Stated; **Duration:** 14 days;
ALZET Comments: Animal info (G93A SOD1 transgenic rats, 2-3 months of age); functionality of mp verified by pump weight; neurodegenerative (ALS);

Q9452: D. R. Seeger, *et al.* Cyclooxygenase inhibition attenuates brain angiogenesis and independently decreases mouse survival under hypoxia. *Journal of Neurochemistry* 2021;158(2):246-261

Agents: Ketorolac **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 10 days;
ALZET Comments: Dose (0.64, 1.28, 6.4 mg/kg/hr); dose-response (); Controls received mp w/ vehicle; functionality of mp verified by ketorolac and prostaglandin levels in plasma and brain; enzyme inhibitor (non-specific cyclooxygenase (COX)); hypoxia and normoxia

Q10053: J. Pajarinen, *et al.* Interleukin-4 repairs wear particle induced osteolysis by modulating macrophage polarization and bone turnover. *Journal of Biomedical Material Research Part A* 2021;109(8):1512-1520

Agents: Polyethylene, ultra high molecular mass weight; Interleukin-4, mouse recombinant **Vehicle:** BSA; PBS; **Route:** SC; **Species:** Mice; **Pump:** 2006; **Duration:** 8 weeks;
ALZET Comments: Dose (15 mg/ml ultra high molecular mass weight polyethylene; 10 ug/ml Interleukin-4); 1% BSA-PBS used; Controls received mp w/ vehicle; animal info (male BALB/cByJ mice, 10-12 weeks); post op. care (buprenorphine); functionality of mp verified by residual volume; pumps replaced every 4 weeks; ultra high molecular mass weight polyethylene aka UHMWPE; mouse recombinant interleukin-4 aka IL-4; dependence;

Q9155: A. Benitez, *et al.* Nerve Growth Factor: A Dual Activator of Noradrenergic and Cholinergic Systems of the Rat Ovary. *Frontiers in Endocrinology* 2021;12(636600)

Agents: Nerve growth factor **Vehicle:** Saline; **Route:** Intraovarian; **Species:** Rat; **Pump:** 2004; **Duration:** 28 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (adult female rats, 3.5 months old); functionality of mp verified by position; Nerve growth factor aka NGF; peptides; dependence;

Q9781: Development of a huBLT Mouse Model to Study HCMV Latency, Reactivation, and Immune Response. *Methods in Molecular Biology* 2021;

Agents: Granulocyte-colony stimulating factor **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Pump:** 1000;
ALZET Comments: Animal info (Adult NOD.Cg-Prkdcscid IL2rgtm1Wjil/SxJ (NSG) mice); functionality of mp verified by weight; Granulocyte-colony stimulating factor aka G-CSF; dependence;



- Q10058:** F. Portillo, *et al.* Nitric oxide controls excitatory/inhibitory balance in the hypoglossal nucleus during early postnatal development. *Brain Structure and Function* 2020;225(9):2871-2884
Agents: L-NAME; D-NAME **Vehicle:** Saline, sterile **Route:** CSF/CNS (fourth ventricle) **Species:** Rat **Pump:** 1002 **Duration:** 2 wks
ALZET Comments: Dose (180 mg/kg/day); Controls received mp w/ vehicle; animal info (Wistar rat); post op. care (penicillin); functionality of mp verified by pump weight; ALZET brain infusion kit 3 used; dependence;
- 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 **Vehicle:** Not Stated **Route:** SC **Species:** Rat **Pump:** 2006 **Duration:** 6 wk
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;
- Q8663:** M. Methawasin, *et al.* Phosphodiesterase 9a Inhibition in Mouse Models of Diastolic Dysfunction. *Circulation Heart Failure* 2020;13(5):e006609
Agents: PF-4449613 **Vehicle:** Not stated; **Route:** SC; **Species:** Mice; **Pump:** 2004; **Duration:** 28 days;
ALZET Comments: Dose (1, 5, or 8 mg/kg per day); Controls received mp w/ vehicle; animal info (Male Leprdb/db mice at ≈3.5 months of age); functionality of mp verified by plasma measuring; PF-4449613 aka phosphodiesterases 9a inhibitor; cardiovascular;
- Q8646:** S. K. Mamta, *et al.* Controlled release of sex steroids through osmotic pump alters brain GnRH1 and catecholaminergic system dimorphically in the catfish, *Clarias gariepinus*. *Brain Research Bulletin* 2020;164(325-333)
Agents: Estradiol, 17B-; Testosterone, 17a-methyl **Vehicle:** Ethanol; Saline; **Route:** IP; **Species:** Fish; **Pump:** 1007D; **Duration:** 21 days;
ALZET Comments: Dose (0.48 ug/day); Controls received mp w/ vehicle; animal info (male and female catfish); functionality of mp verified by residual volume; 17B-estradiol aka E2, 17a-methyltestosterone aka MT; replacement therapy (testosterone; estradiol);
- Q8857:** C. T. Huang, *et al.* Glycemic control with insulin attenuates sepsis-associated encephalopathy by inhibiting glial activation via the suppression of the nuclear factor kappa B and mitogen-activated protein kinase signaling pathways in septic rats. *Brain Research* 2020;1738(146822)
Agents: Dextrose; Fluorocitrate; Minocycline; SB203580; PD98059 **Vehicle:** DMSO; **Route:** CSF/CNS (intracerebral); IV (jugular); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;
ALZET Comments: 1% DMSO used; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley rats (weight, 200–250 g)); behavioral testing (Von Frey filament test, Plantar test); functionality of mp verified by residual volume; SB203580 aka p38 MAPK inhibitor, PD98059 aka extracellular signal-regulated kinase inhibitor; Brain coordinates (0.8 mm posterior and 1.3 mm lateral to the bregma, and 4.0 mm ventral to the skull surface); dependence;
- Q8409:** Y. M. Chao, *et al.* Anomalous AMPK-regulated angiotensin AT1R expression and SIRT1-mediated mitochondrial biogenesis at RVLM in hypertension programming of offspring to maternal high fructose exposure. *Journal of Biomedical Science* 2020;27(1):68
Agents: Losartan **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (cistern magna); **Species:** Rat; **Pump:** 1007D; **Duration:** 4 weeks;
ALZET Comments: Dose (3 µg·µL⁻¹·h⁻¹); Controls received mp w/ vehicle; animal info (Sprague-Dawley rats at age of 10 weeks); functionality of mp verified by drainage of cerebrospinal fluid; Blood pressure measured via tail-cuff method; 130 mmHg - 160 mmHg; cardiovascular;
- Q9103:** A. Willmore, *et al.* Effect of chronic administration of a gonadotropin-releasing agonist on luteal function and pregnancy rates in dairy cattle. *Animal Science Journal* 2019;90(11):1432-1443
Agents: Deslorelin **Vehicle:** Saline; **Route:** SC; **Species:** Cow; **Pump:** 2ML1; **Duration:** 7 days;
ALZET Comments: Dose (10.0 ul/h); functionality of mp verified by residual volume; Resultant plasma level (4 ng/mL); dependence;



Q7357: Wenjing Zhou, *et al.* Fetuin B aggravates liver X receptor-mediated hepatic steatosis through AMPK in HepG2 cells and mice. *American Journal of Translational Research* 2019;11(1498-1509

Agents: Fetuin B, recomb. mouse **Vehicle:** Tris-HCL; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 10 Days;

ALZET Comments: 20 mM Tris-HCL used; functionality of mp verified by measurement of serum fetuin B levels using an enzyme-linked immunosorbent assay; Fetuin B is a new hepatokine and endogenous inhibitor of the insulin receptor tyrosine kinase; Therapeutic indication (hepatic steatosis);

Q7617: A. Kostin, *et al.* Chronic Suppression of Hypothalamic Cell Proliferation and Neurogenesis Induces Aging-Like Changes in Sleep-Wake Organization in Young Mice. *Neuroscience* 2019;404(541-556

Agents: Arabinofuranoside, cytosine-beta-D-; deoxyuridine, 5-bromo-2'- **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Dose (AraC 15 mg/ml, 2.69 µl/day), (BrdU 4 mg/ml); Controls received mp w/ vehicle and BrdU; animal info (3-4 or 23-24 months, C57BL/6J); functionality of mp verified by residual volume and BrdU staining; cytosine beta-D-arabinofuranoside (AraC) is an antimitotic agent previously shown to suppress hypothalamic proliferation and neurogenesis; Brain coordinates (2 mm dorsal to the lateral ventricle (LV: anterior-posterior, -0.3 mm; dorsal-ventral, 2.5 mm; and lateral, 1.0 mm from the bregma)); Cannula placement verified via photomicrograph of histological section; "We used micro-osmotic pump and ICV administration for chronic delivery of aCSF or AraC, which provided good control of drug concentration and continuous delivery without disturbing animals. This method also reduced the likelihood that treatment effects on sleep-wake function could be due to stress of daily or multiple IP injections or mechanical or inflammatory responses of the sites examined in this study due to local manipulation." pg.552; "We also noted that, unlike the control group, the AraC+BrdU-treated mice did not maintain their nests well." p.545;

Q8316: D. Knappe, *et al.* Continuous Subcutaneous Delivery of Proline-Rich Antimicrobial Peptide Api137 Provides Superior Efficacy to Intravenous Administration in a Mouse Infection Model. *Front Microbiol* 2019;10(2283

Agents: Api137 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2001D; **Duration:** 48 hours;

ALZET Comments: Dose (6.4, 12.8, and 19.2 mg/kg/h); dose-response (tolerance study); 0.9% saline used; animal info (Female CD-1 mice, 18-26 g.); functionality of mp verified by residual volume; pumps replaced after 48 hours; peptides;

Q7599: Z. Huang, *et al.* Antibody neutralization of microbiota-derived circulating peptidoglycan dampens inflammation and ameliorates autoimmunity. *Nat Microbiol* 2019;4(5):766-773

Agents: glutamine, muramyl-l-alanyl-d-iso- **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 2004; **Duration:** 24 days;

ALZET Comments: Dose (200µl of 1, 2.5, 5mg/ml MDP); Controls received mp w/ vehicle; animal info (8-10 weeks, male, DBA/1J); functionality of mp verified by icELISA of collected serum; muramyl-l-alanyl-d-iso-glutamine (MDP) is a conserved and minimal immunostimulatory structure of bacterial peptidoglycan; immunology; 1 and 5 mg/ml solutions used to assess the effect of stably elevated MDP levels on arthritis while 2.5 and 5 mg/ml solutions used to reach and maintain elevated levels of circulating PGN over an extended period for disease development;

Q7792: P. J. Cocker, *et al.* The beta-adrenoceptor blocker propranolol ameliorates compulsive-like gambling behaviour in a rodent slot machine task: implications for iatrogenic gambling disorder. *European Journal of Neuroscience* 2019;50(3):2401-2414

Agents: Ropinirole hydrochloride **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 28 days;

ALZET Comments: Dose (5 mg/kg/day); functionality of mp verified by ; Controls received mp w/ vehicle; animal info (275-300 g, Male, Long Evans); post op. care (buprenorphine); behavioral testing (Rodent slot machine task Test, Forelimb Adjusting Step Tet); dependence;

Q7968: K. J. Clemens, *et al.* Pre-quit nicotine decreases nicotine self-administration and attenuates cue- and drug-induced reinstatement. *J Psychopharmacol* 2019;33(3):364-371

Agents: Nicotine, (-) hydrogen tartrate salt **Vehicle:** Saline, heparin buffered; **Route:** SC; **Species:** Rat; **Pump:** 2ML2; **Duration:** 14 days;

ALZET Comments: Dose (2.1 mg/kg/day); saline (pH 7.4 with sodium hydroxide) with 25IU heparin used; Controls received sham surgery; animal info (male, Sprague-Dawley and Long Evans, 175-200g and 200-250g); post op. care (betadine ointment and recovery on a heating pad); behavioral testing (cue-reinstatement test); functionality of mp verified by weight after mp removal; dependence; pumps removed and reinstated on days 7 and 13. procedure listed on p.366;



Q7160: Y. W. Yu, *et al.* Glucose-Dependent Insulinotropic Polypeptide Mitigates 6-OHDA-Induced Behavioral Impairments in Parkinsonian Rats. *Int J Mol Sci* 2018;19(4):

Agents: Glucose-dependent insulinotropic polypeptide **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 wks
ALZET Comments: Dose (7.8 or 15 nmol/kg/day); Controls received mp w/ vehicle; behavioral testing (Open field test); functionality of mp verified by plasma levels; Resultant plasma level (GIP administration at 15 nmol/kg/day resulted in total GIP plasma levels of 203.9 pmol/L); neurodegenerative (Parkinson's);

Q7936: M. U. Wagenhauser, *et al.* Chronic Nicotine Exposure Induces Murine Aortic Remodeling and Stiffness Segmentation-Implications for Abdominal Aortic Aneurysm Susceptibility. *Frontiers in Physiology* 2018;9(1459)

Agents: Nicotine **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 10, 40 days;
ALZET Comments: Dose (20, 25 mg/kg/day); Controls received mp w/ vehicle; animal info (10 weeks, male, C57BL/6, 24-26g); functionality of mp verified by cotinine level measurement; cardiovascular; pump model not stated. Abstract lists 20 mg/kg/day while methods states 25 mg/kg/day used.;

Q7301: C. P. Schaefer, *et al.* Chronic morphine exposure potentiates p-glycoprotein trafficking from nuclear reservoirs in cortical rat brain microvessels. *PLoS One* 2018;13(2):e0192340

Agents: Morphine sulfate **Vehicle:** saline; **Route:** SC; **Species:** Rat; **Pump:** pump model not stated; **Duration:** 6 days;
ALZET Comments: Dose (5 mg/kg/day); 0.9% saline used; Controls received mp w/ vehicle; animal info (female, Sprague-Dawley, 175–200 g); behavioral testing (von Frey test, Hargreaves method); functionality of mp verified by weighing (empty, after filling, after priming, after removal); dependence;

Q7259: I. G. Rajapaksha, *et al.* The small molecule drug diminazene aceturate inhibits liver injury and biliary fibrosis in mice. *Sci Rep* 2018;8(1):10175

Agents: Diminazene aceturate **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;
ALZET Comments: Dose (10mg/kg/day); animal info (6–8 weeks old, male C57BL/6 mice); functionality of mp verified by residual volume; Multiple pumps per animal (2 pumps); Diminazene aceturate aka 4-[2-(4-carbamimidoylphenyl)iminohy-drazinyl]benzenecarboximidamide;

Q7011: Koduru SV, *et al.* The contribution of cross-talk between the cell-surface proteins CD36 and CD47-TSP-1 in osteoclast formation and function. *The Journal of Biological Chemistry* 2018;293(39):15055-15069

Agents: Parathyroid hormone (1-34), human **Vehicle:** Acetic acid; mouse serum; **Route:** SC; **Species:** Mice; **Duration:** 5 days;
ALZET Comments: Dose (0.67 pmol/g of body weight/h); 10 mM acetic acid containing 2% heat inactivated mouse serum used; Controls received mp w/ vehicle; functionality of mp verified by hypercalcemia;

Q6958: C. L. Montgomery, *et al.* Mechanisms Underlying Early-Stage Changes in Visual Performance and Retina Function After Experimental Induction of Sustained Dyslipidemia. *Neurochem Res* 2018;43(8):1500-1510

Agents: Poloxamer 407 **Vehicle:** Saline; **Route:** SC; IP; **Species:** Mice; **Pump:** 2004; **Duration:** 1 month;
ALZET Comments: Controls received mp w/ vehicle; animal info (C57BL/6CrI mice); IP delivery via a cannula connected to SC pump; functionality of mp verified by total cholesterol and true triglyceride plasma concentrations; "To more easily maintain a sustained atherogenic plasma lipid profile without the increased stress and risk of animal loss associated with repeated intraperitoneal injections, we employed implantable osmotic pumps to continuously deliver P-407 at a defined rate to mice for 1 month." pg. 1502; Therapeutic indication (Diabetic retinopathy);

Q7019: R. M. Jha, *et al.* Glibenclamide Produces Region-Dependent Effects on Cerebral Edema in a Combined Injury Model of Traumatic Brain Injury and Hemorrhagic Shock in Mice. *J Neurotrauma* 2018;35(17):2125-2135

Agents: Glibenclamide **Vehicle:** Saline, DMSO; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 1, 3, or 4 days;
ALZET Comments: Dose (0.4 ug/h); animal info (C57/BL6 male mice, 12–15 weeks of age, weighing 25–30 g); functionality of mp verified by glibenclamide levels by ultra performance liquid chromatography-mass spectrometer; Therapeutic indication (traumatic brain injury);



Q7022: T. R. Harris, *et al.* Celecoxib Does Not Protect against Fibrosis and Inflammation in a Carbon Tetrachloride-Induced Model of Liver Injury. *Mol Pharmacol* 2018;94(2):834-841

Agents: Celecoxib, PTUPB **Vehicle:** PEG 400, DMSO; **Route:** SC; **Species:** Mice; **Pump:** 2006; **Duration:** 45 days;
ALZET Comments: Dose (10mg/kg/d); 50% PEG400 and 50% DMSO used; animal info (Male C57BL/6NCrl mice (~25 g)); functionality of mp verified by plasma levels; celecoxib is a cyclooxygenase-2 (COX-2) selective inhibitor; enzyme inhibitor (cyclooxygenase-2, soluble epoxide hydrolase);

Q7023: W. Q. Han, *et al.* Membrane rafts-redox signaling pathway contributes to renal fibrosis via modulation of the renal tubular epithelial-mesenchymal transition. *J Physiol* 2018;596(16):3603-3616

Agents: Angiotensin II **Vehicle:** Not Stated; **Route:** IP; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
ALZET Comments: Dose (200 ng/kg/min); animal info (280 gram, Male Sprague-Dawley rats); functionality of mp verified by measurement of systolic blood pressure by tail-cuff method;

Q7128: L. Detti, *et al.* Xenotransplantation of pre-pubertal ovarian cortex and prevention of follicle depletion with anti-Müllerian hormone (AMH). *J Assist Reprod Genet* 2018;35(10):1831-1841

Agents: anti-Müllerian hormone, recomb. **Vehicle:** Saline; **Route:** IP; **Species:** Mice (nude); **Pump:** 1002; **Duration:** 2 weeks;
ALZET Comments: Dose (1.23 ug/d); Controls received mp w/ vehicle; animal info (10-week-old NU/J mice, or nude mice.); functionality of mp verified by residual volume;

Q7127: Z. Dargaei, *et al.* Restoring GABAergic inhibition rescues memory deficits in a Huntington's disease mouse model. *Proc Natl Acad Sci U S A* 2018;115(7):E1618-E1626

Agents: Bumetanide **Vehicle:** DMSO, ethanol, saline; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1002; **Duration:** 2 weeks;

ALZET Comments: Dose (6 mg/mL); 50% DMSO and 15% ethanol used; Controls received mp w/ vehicle; animal info (Males, females, R6/2); behavioral testing (Novel object recognition test, Novel object location test); functionality of mp verified by (incorrectly) weighing the pump; functionality of mp verified by (incorrectly) weighing the pump; Cannula placement and patency were confirmed by injection of luxol fast green dye followed by dissection of the brain while; neurodegenerative (Huntington's disease); Bumetanide was administered directly to the lateral ventricle since previous studies reported that brain penetration may not be optimal following systemic administration due to its pharmacokinetic properties;

Q6939: A. J. Charboneau, *et al.* Fucoidans inhibit the formation of post-operative abdominal adhesions in a rat model. *PLoS One* 2018;13(11):e0207797

Agents: Sigma Fucoidan Crude **Vehicle:** Water; **Route:** IP; **Species:** Rat; **Pump:** 2ML1; **Duration:** 1 week;
ALZET Comments: Dose (4.3 mg/day, 8.3 mg/day, and 17.2 mg/day); animal info (female Sprague-Dawley rats); functionality of mp verified by compressing the outer casing with pliers and then reweighing the pump; good methods (pg 3); Pump was implanted SC with catheter into abdominal cavity;

Q7745: R. Corona, *et al.* Disruption of adult olfactory neurogenesis induces deficits in maternal behavior in sheep. *Behavioural Brain Research* 2018;347(124-131

Agents: Ara-C **Vehicle:** Serum, Physiological **Route:** CSF/CNS (lateral ventricle) **Species:** Sheep **Pump:** 2ML4 **Duration:** 4 wks
ALZET Comments: 4% Physiological Serum used; Controls received mp w/ vehicle; animal info (primiparous parturient Ile de France ewes (2-3 years old)); post op. care (amoxicillin, diurizone, finadyne, morphine); functionality of mp verified; Brain coordinates (rostrocaudal plane, 36 mm; mediolateral plane, 4.3 ± 0.7mm from the middle of the third ventricle; and depth, 16.6 ± 1mm from the cortex surface); bilateral cannula used;

Q5940: Y. Zou, *et al.* Prenatal levonorgestrel exposure induces autism-like behavior in offspring through ERbeta suppression in the amygdala. *Mol Autism* 2017;8(46

Agents: Lentivirus, ER beta **Vehicle:** CSF, artificial; **Route:** CSF/CNS (amygdala); **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
ALZET Comments: Controls received mp w/ empty lentivirus; animal info (male, Sprague Dawley, 8 weeks old); functionality of mp verified by India ink injection; behavioral testing (marbles burying test, social interaction, elevated plus maze, open-field test); gene therapy; Used Plastics One cannula;



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)

Agents: Estradiol, 17b- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** Not Stated;

ALZET Comments: 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);

Q5692: H. Z. Toklu, *et al.* Intracerebroventricular tempol administration in older rats reduces oxidative stress in the hypothalamus but does not change STAT3 signaling or SIRT1/AMPK pathway. *Applied Microbiology and Biotechnology* 2017;42(1):59-67

Agents: Tempol **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Fischer 344 x Brown Norway, 3 months or 23 months old); functionality of mp verified by ; Vehicle pumps replaced after one week; Dose (300 ug/h);

Q5997: K. M. Thrailkill, *et al.* The impact of SGLT2 inhibitors, compared with insulin, on diabetic bone disease in a mouse model of type 1 diabetes. *Bone* 2017;94(141-151)

Agents: Insulin (Humulin R) **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 9 weeks;

ALZET Comments: Controls were untreated diabetic mice; animal info (12 weeks); functionality of mp verified by insulin serum levels using a mouse ultrasensitive insulin ELISA; Does not indicate replacement; diabetes; 145Therapeutic indication (Diabetes); Dose (0.125 units/day);

Q6181: R. Simeoli, *et al.* Exosomal cargo including microRNA regulates sensory neuron to macrophage communication after nerve trauma. *Nat Commun* 2017;8(1):1778

Agents: miR-21-5p antagomir **Vehicle:** in vivo transfection reagent; **Route:** SC; CSF/CNS (intrathecal); **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Dose (12 pmol/day); Controls received mp w/ vehicle and scrambled oligomer; functionality of mp verified (Catheter and pump were checked at the end of treatment to ascertain efficient delivery) ; spinal cord injury;

Q6180: A. Sike, *et al.* Improved method for cannula fixation for long-term intracerebral brain infusion. *J Neurosci Methods* 2017;290(145-150)

Agents: Black Ink **Vehicle:** PBS; **Route:** CSF/CNS (ventricle); **Species:** Mice; **Pump:** 2006; **Duration:** 50 days;

ALZET Comments: Dose (PBS with 1:100 black ink); animal info (50-day old male C57BL/6J mice); functionality of mp verified by in vitro priming visualization; ALZET brain infusion kit 3 used; cyanoacrylate adhesive; no stress: The implanted pump and the cannula caused minimal discomfort to the animals and it had no effect on the moving ability (see pg.5); good methods; This report describes an improved method for better fixation of cannula during long-term brain infusion experiments using a non-toxic, soft and elastic silicone spacer.

Q6124: B. M. Seitz, *et al.* 5-HT causes splanchnic venodilation. *American Journal of Physiology Heart and Circulatory Physiology* 2017;313(3):H676-H686

Agents: Hydroxytryptamine, 5- **Vehicle:** Saline, ascorbate (1%); **Route:** SC; **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: Dose (25 µg•kg/min); Controls received mp w/ vehicle; animal info (Male Sprague-Dawley rats); functionality of mp (incorrectly) verified by weighing before and after the experiment (Contact Durect Tech Support for correct measure of functionality); Serotonin [5-hydroxytryptamine] aka 5-HT; "Pumps were weighed before and after the experiments as a validation of pump function."

Q5970: J. M. Resch, *et al.* Aldosterone-Sensing Neurons in the NTS Exhibit State-Dependent Pacemaker Activity and Drive Sodium Appetite via Synergy with Angiotensin II Signaling. *Neuron* 2017;96(1):190-206 e7

Agents: Aldosterone **Vehicle:** Ethanol; **Route:** IP; **Species:** Mice; **Pump:** 1002; **Duration:** 8-12 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (4-5 week old); functionality of mp verified by plasma aldosterone levels; 5% ethanol used; Dose (900 ug/mL);



Q6189: G. M. Orlowski, *et al.* Frontline Science: Multiple cathepsins promote inflammasome-independent, particle-induced cell death during NLRP3-dependent IL-1 β activation. *J Leukoc Biol* 2017;102(1):7-17

Agents: K777 **Vehicle:** PEG 300; glycofurol; cremophor ELP; ethanol; propylene glycol; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 1 week;

ALZET Comments: Dose (125 mg/kg); 25% PEG-300, 25% glycofurol, 25% cremophor ELP, 15% ethanol, 10% propylene glycol; Controls received mp w/ vehicle; functionality of mp verified by K777 plasma levels; Resultant plasma level (0.75 μ M); K777 is a cathepsin inhibitor;

Q6346: J. Nissinen, *et al.* Disease-modifying effect of atipamezole in a model of post-traumatic epilepsy. *Epilepsy Research* 2017;136(18-34)

Agents: Atipamezole **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML1; 2ML4; **Duration:** 9 weeks;

ALZET Comments: Dose (100 μ g /kg/h); Controls received mp w/ vehicle; animal info (12 week old male Sprague-Dawley rats); behavioral testing (neuroscore, beam-walking tests, Morris water-maze, spatial learning and memory test); functionality of mp verified by measuring the volume of the remaining solution after pump removal ; Therapeutic indication (traumatic brain injury);

Q6363: J. Lukas, *et al.* Glucosylsphingosine Causes Hematological and Visceral Changes in Mice-Evidence for a Pathophysiological Role in Gaucher Disease. *Int J Mol Sci* 2017;18(10):

Agents: Glucosylsphingosine **Vehicle:** DMSO; Propylene glycol; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 12 weeks;

ALZET Comments: Dose (10 mg/kg/day); 50% DMSO:50% propylene glycol used; Controls received mp w/ vehicle; animal info (Male C57BL/6J mice); functionality of mp verified by plasma levels; pumps replaced every 4 weeks; long-term study (12 weeks); Resultant plasma level (between 700 and 900 ng/mL); no stress: The pumps were well tolerated and no mortalities were observed (see pg. 11); good methods (p.10); Lyso-Gb1 levels were strongly elevated after four, eight and 12 weeks (levels ranging between 700 and 900 ng/mL). This represented a >500-fold increase compared with vehicle-treated mice

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

Agents: Estradiol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 28 days;

ALZET Comments: 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 bupivacaine 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);

Q5050: E. M. R. Lake, *et al.* Modulation of the peri-infarct neuroglial function by delayed COX-1 inhibition. *J Magn Reson Imaging* 2017;46(2):505-517

Agents: FR122047 **Vehicle:** Saline; **Route:** CSF/CNS (ventricle); **Species:** Rat; **Pump:** 2ML2; **Duration:** 12 days;

ALZET Comments: Dose (400 μ g/kg/day); Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats weighing 297 + 23 g); post op. care (0.2 mg/kg lidocaine sc); functionality of mp (incorrectly) verified by weighing pumps before and after; enzyme inhibitor (Cyclooxygenase-1); Brain coordinates (2-mm posterior of lambda and 2-mm right of the midline); stress/adverse reaction: (see pg.);

Q5840: Y. Kawata, *et al.* A novel and selective melanin-concentrating hormone receptor 1 antagonist ameliorates obesity and hepatic steatosis in diet-induced obese rodent models. *European Journal of Pharmacology* 2017;796(45-53)

Agents: Melanin-concentrating hormone **Vehicle:** Water, distilled; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1002; **Duration:** 2 weeks, 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (11 weeks-14 weeks); functionality of mp verified by measuring blood plasma parameters; Therapeutic indication (Obesity, non-alcoholic fatty liver disease); Dose (2.5 μ g/mouse/day);

Q5049: G. Karpel-Massler, *et al.* Induction of synthetic lethality in IDH1-mutated gliomas through inhibition of Bcl-xL. *Nat Commun* 2017;8(1):1067

Agents: hydroxyglutarate, 2-R-2- **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Dose (10mM); functionality of mp verified by adding 1% Gadolinium to the pumps and performing MRIs after removal;



Q5842: M. Kano. AMH/MIS as a contraceptive that protects the ovarian reserve during chemotherapy. Proceedings of the National Academy of Sciences 2017;114(9):E1688-E1697

Agents: Mullerian inhibiting substance, recombinant human **Vehicle:** Saline; **Route:** IP; **Species:** Mice; **Pump:** 1007D; **Duration:** 15 days;

ALZET Comments: Controls received mp w/ vehicle/animal info (6-7 weeks old) ; functionality of mp verified by rhMIS activity; pumps replaced every 5 or 7 days; cancer; half-life is ~ 4 hours (p. E1689); post op. care (carprofen analgesic (2.5 mg/mL) by oral gavage (100 µL)); stability verified by bioassay ("rhMIS activity was remarkably stable, with the material recovered from pumps that had been implanted in mice for 1 wk conserving full biological activity in the rat urogenital ridge bioassay"); "To test the efficacy of rhMIS protein for the preservation of ovarian reserve, we elected to use osmotic pumps implanted i.p. in C57BL/6N female mice to allow very precise delivery of MIS" pg. E1691; Therapeutic indication (Oncofertility, cancer); Dose (1200 ug/mL);

Q5745: K. Gong, *et al.* Sustained Morphine Administration Induces TRPM8-Dependent Cold Hyperalgesia. J Pain 2017;18(2):212-221

Agents: Morphine **Vehicle:** Saline; **Route:** SC; **Species:** Rat, Mice; **Pump:** 2ML1, 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (180-200 g) ; functionality of mp verified by residual volume; behavioral testing (Cold plate assay); Therapeutic indication (Analgesic, Opioid); Dose (15 mg/mL);

Q7806: Y. Erden, *et al.* Effect of Intracerebroventricular Administration of Apelin-13 on the Hypothalamus–Pituitary–Thyroid Axis and Peripheral Uncoupling Proteins. International Journal of Peptide Research and Therapeutics 2017;24(4):511-517

Agents: Apelin-13 **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: Dose (1, 10 nmol at 10 µL/h); Controls received mp w/ vehicle; animal info (male, Sprague-Dawley); functionality of mp verified by residual volume measurement; apelin is a peptide hormone and a ligand for the G protein-coupled APJ receptor; ALZET brain infusion kit 1 used; Brain coordinates (1.40 mm medial and 0.8 mm posterior from the bregma); Cannula placement verified via stereotaxic device and Paxinos and Watson rat brain atlas; Therapeutic indication (exhibits a decreasing effect on energy consumption in the peripheral arms of the HPT axis.);

Q6029: A. Dey, *et al.* Glucocorticoid-mediated activation of GSK3β promotes tau phosphorylation and impairs memory in type 2 diabetes. Neurobiol Aging 2017;57(75-83

Agents: Corticosterone; 2-hydroxypropyl-β-cyclodextrin; TDZD-8/TDZD-8, **Vehicle:** Saline; **Route:** CSF/CNS (hippocampus);

Species: Mice; **Pump:** Not Stated; **Duration:** 2 weeks;

ALZET Comments: animal info (5 weeks); functionality of mp verified by ELISA; bilateral cannula; behavioral testing (Y-maze, novel object preference task); TDZD-8 is a non-ATP-competitive selective inhibitor of GSK3β; Dose (2 µM/day);