



**Recent References (2018-2020) on the Intravenous Administration of Agents
Using ALZET® Osmotic Pumps**

Q8624: N. Lax, *et al.* Systemic microbial TLR2 agonists induce neurodegeneration in Alzheimer's disease mice. *J Neuroinflammation* 2020;17(1):55

Agents: Zymosan; CU-CPT22 **Vehicle:** Not stated; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1007D; 1004; 1002; **Duration:** 1 week; 28 days; 2 weeks;

ALZET Comments: Dose (25 ug zymosan; 10 ug/day CU-CPT22); animal info (male and female 5xFAD mice); CU-CPT22 aka Toll-like receptor 2 antagonist; Brain coordinates (A = 0, L = 1, H = 2.5); neurodegenerative (Alzheimer's disease);

Q8586: J. Kjell, *et al.* Defining the Adult Neural Stem Cell Niche Proteome Identifies Key Regulators of Adult Neurogenesis. *Cell Stem Cell* 2020;26(2):277-293 e8

Agents: Z-DON **Vehicle:** CSF, Artificial; DMSO; **Route:** CNS/CSF (intracerebral); IV; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Dose (100 uM); 0.4% DMSO used; Controls received mp w/ vehicle; animal info (male C57BL/6J mice, 8-10 weeks old); Z-DON aka Transglutaminase 2 inhibitor; ALZET brain infusion kit 2 used; Brain coordinates (1.2 mm laterally to and 0.5 mm posterior to the bregma (right side)); gene therapy;

Q8557: S. E. Joppe, *et al.* Genetic targeting of neurogenic precursors in the adult forebrain ventricular epithelium. *Life Sci Alliance* 2020;3(7):

Agents: Ara-C; **Vehicle:** Not stated; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male mice); ALZET brain infusion kit 3 used; Brain coordinates (0 mm AP and -0.9 mm ML to the bregma); gene therapy;

Q8544: K. Hu, *et al.* Boron agents for neutron capture therapy. *Coordination Chemistry Reviews* 2020;405(Agents: N5-2OH; BPA **Vehicle:** Not stated; **Route:** CSF/CNS (intracerebral); IV; **Species:** Rat; **Pump:** Not stated; **Duration:** Not stated;

ALZET Comments: animal info (F98 glioma-bearing rats); dependence;

Q8537: M. Hecker, *et al.* Immunomodulation by an Omega-6 Fatty Acid Reduced Mixed Lipid Emulsion in Murine Acute Respiratory Distress Syndrome. *J Clin Med* 2020;9(7):

Agents: Triglycerides, long-chain; Triglycerides, medium chain **Vehicle:** Saline; **Route:** IV (external jugular); **Species:** Mice; **Pump:** Not stated; **Duration:** 3 days;

ALZET Comments: Dose (1.5 mg/kg/day); Controls received mp w/ vehicle; animal info (13-15 week old mice, 22-24 g); long-chain Triglycerides aka LCT; medium chain Triglycerides aka SMOF; dependence;

Q8536: D. He, *et al.* Asthmatic Airway Vagal Hypertonia Involves Chloride Dyshomeostasis of Preganglionic Neurons in Rats. *Front Neurosci* 2020;14(31)

Agents: Minocycline **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Rat; **Pump:** 2002; **Duration:** 15 days;

ALZET Comments: Dose (172 ng/mL); animal info (Male Sprague-Dawley rats, seven-week-old, 170-190 g); Minocycline aka MC; ALZET brain infusion kit 2 used; Brain coordinates (0.8 mm caudal to the bregma; 1.5 mm lateral to the midline; 4 mm below the surface of the skull); dependence;

Q8517: F. Gulcu Bulmus, *et al.* Kisspeptin and RF9 prevent paroxetine-induced changes in some parameters of seminal vesicle fluid in the male rats. *Andrologia* 2020;52(4):e13538

Agents: Kisspeptin; Peptide, RFamide **Vehicle:** Saline; **Route:** CSF/CNS (intracerebral); IV; **Species:** Rat; **Pump:** Not stated; **Duration:** 10 days;

ALZET Comments: Dose (1 nmol Kisspeptin and 20 nmol RF9); Controls received mp w/ vehicle; animal info (male Sprague Dawley rats (21-day-old) weighing 40 ± 2 g); RFamide Peptide aka RF9; peptides; Brain coordinates (according to the bregma, in the anterior-posterior plane: 0.90 mm; in the lateral plane: 1.4 mm; and 4 mm on the vertical plane); dependence;



Q8507: K. P. Gomes, *et al.* Antiepileptic effects of long-term intracerebroventricular infusion of angiotensin-(1-7) in an animal model of temporal lobe epilepsy. *Clin Sci (Lond)* 2020;134(17):2263-2277

Agents: Angiotensin (1-7) **Vehicle:** Saline, Sterile; **Route:** CSF/CNS (intracerebral); IV; **Species:** Rat; **Pump:** Not stated; **Duration:** 28 days;

ALZET Comments: Dose (200 ng/kg/h); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (Wistar adult male rats, 240-280 g); Angiotensin (1-7) aka Ang-(1-7); Brain coordinates (0.8 mm posterior and 1.4 mm lateral to the bregma); neurodegenerative (Epilepsy);

Q8484: P. Garland, *et al.* Haemoglobin causes neuronal damage in vivo which is preventable by haptoglobin. *Brain Commun* 2020;2(1):fz053

Agents: Haemoglobin; Haptoglobin **Vehicle:** Saline; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Dose (20mg/ml Haemoglobin; 14mg/ml Haptoglobin); 0.9% Saline used; Controls received mp w/ vehicle; animal info (Locally bred male C57BL/6 mice, 10–12 weeks of age); post op. care (Buprenorphine); Haemoglobin aka Hb; Haptoglobin aka Hp; ALZET brain infusion kit 3 used; Brain coordinates (from bregma: anteroposterior, ±0.4 mm; lateral, 1 mm; depth, 2.5 mm.); cyanoacrylate adhesive; toxicology;

Q8457: H. Elleaume, *et al.* Radiation therapy combined with intracerebral convection-enhanced delivery of cisplatin or carboplatin for treatment of the F98 rat glioma. *J Neurooncol* 2020;149(2):193-208

Agents: Carboplatin **Vehicle:** Not stated; **Route:** CSF/CNS (intracerebral); IV; **Species:** Rat; **Pump:** Not stated; **Duration:** 7 days;

ALZET Comments: Dose (84 ug/g); animal info (Fischer rats); cancer (Glioma);

Q8456: F. El Gaamouch, *et al.* VGF-derived peptide TLQP-21 modulates microglial function through C3aR1 signaling pathways and reduces neuropathology in 5xFAD mice. *Mol Neurodegener* 2020;15(1):4

Agents: TLQP-21 **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** Not stated; **Duration:** 28 days;

ALZET Comments: Dose (15 µg/day); Controls received mp w/ vehicle; animal info (wild-type C57BL/6 J mice, 3 months); Brain coordinates (P = - 0.1, ML = ±1.0 and DV = - 3.0 from bregma (mm)); neurodegenerative (Alzheimer's disease);

Q8453: K. A. Duggan, *et al.* Vasoactive intestinal peptide infusion reverses existing renal interstitial fibrosis via a blood pressure independent mechanism in the rat. *Eur J Pharmacol* 2020;873(172979)

Agents: Vasoactive intestinal peptide **Vehicle:** Hartmann's Solution; **Route:** IV (iliac); **Species:** Rat; **Pump:** Not stated; **Duration:** 14 weeks;

ALZET Comments: Dose (5 pmol/kg/min); Controls received mp w/ vehicle; animal info (Fourteen week old spontaneous hypertensive rat); long-term study; Blood pressure measured via tail cuff plethysmography; 193 mmHg - 200 mmHg; Vasoactive intestinal peptide aka VIP; peptides; dependence;

Q8440: S. Dey, *et al.* Sex-specific brain erythropoietin regulation of mouse metabolism and hypothalamic inflammation. *JCI Insight* 2020;5(5):

Agents: Erythropoietin, recombinant human **Vehicle:** Saline; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 2006; **Duration:** 14 days;

ALZET Comments: Dose (3000 U/kg); Controls received mp w/ vehicle; animal info (Tg21 mice); recombinant human Erythropoietin aka recombinant human EPO; ALZET brain infusion kit 3 used; Brain coordinates (midline, 1.00 mm; anteroposterior, 0.34 mm; dorsoventral, 2.30 mm); dental cement used; replacement therapy (Erythropoietin);

Q8438: R. A. Desai, *et al.* Nimodipine Reduces Dysfunction and Demyelination in Models of Multiple Sclerosis. *Ann Neurol* 2020;88(1):123-136

Agents: Nimodipine **Vehicle:** PEG-400; **Route:** IV; SC; **Species:** Rat; **Pump:** Not stated; **Duration:** 12 days;

ALZET Comments: Dose (30 mg/kg); Controls received mp w/ vehicle; animal info (adult male Sprague Dawley rats); neurodegenerative (multiple sclerosis);



Q8434: A. de Boer, *et al.* Environmental enrichment during the chronic phase after experimental stroke promotes functional recovery without synergistic effects of EphA4 targeted therapy. *Hum Mol Genet* 2020;29(4):605-617
Agents: APY-d3 **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1002; **Duration:** 2 weeks;
ALZET Comments: Dose (5 mm); animal info (In-bred C57BL/6J male mice, 10–12 weeks of age); behavioral testing (accelerating rotarod; horizontal ladder task); APY-d3 aka peptide solution, β APYCVYR β ASWSC; peptides; ALZET brain infusion kit 3 used; Brain coordinates (0.1 mm caudal and 1.0 mm lateral of bregma); cyanoacrylate adhesive; gene therapy;

Q7516: W. Yin, *et al.* Protein kinase C and protein kinase A are involved in the protection of recombinant human glucagon-like peptide-1 on glomeruli and tubules in diabetic rats. *J Diabetes Investig* 2019;10(3):613-625
Agents: Peptide-1, recombinant human glucagon-like **Vehicle:** Saline; **Route:** IV; **Species:** Rat; **Pump:** 2004; **Duration:** 12 weeks;
ALZET Comments: "Dose (1.5 pmol/kg/min); Controls received mp w/ vehicle; animal info (Eight-week-old male/female Wistar rats weighing 300 – 10 g); diabetes; "

Q6890: X. Wang, *et al.* Liver-Selective MMP-9 Inhibition in the Rat Eliminates Ischemia-Reperfusion Injury and Accelerates Liver Regeneration. *Hepatology* 2019;69(1):314-328
Agents: 2-[(4-biphenylsulfonyl)amino]-3-phenyl-propionic acid **Vehicle:** Not Stated; **Route:** IV (inferior mesenteric vein); IP; **Species:** Rat (transgenic); **Pump:** 2ML1; 2001; **Duration:** 7 days;
ALZET Comments: Dose (100 μ g/h); animal info (Male Lew-Tg(CAG-EGFP)ys rats); enzyme inhibitor (Matrix metalloproteinases 2/9);

Q7500: F. Wang, *et al.* Site-1 protease-derived soluble (pro)renin receptor targets vasopressin receptor 2 to enhance urine concentrating capability. *JCI Insight* 2019;4(7):
Agents: Histidine-tagged sPRR **Vehicle:** Not stated; **Route:** IV (jugular); **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;
ALZET Comments: Dose (30 μ g/kg/day); Controls received mp w/ vehicle; animal info (experiments. Male 10- to 12-week-old C57/BL6 mice);

Q7573: R. Lin, *et al.* Systemic Factors Trigger Vasculature Cells to Drive Notch Signaling and Neurogenesis in Neural Stem Cells in the Adult Brain. *Stem Cells* 2019;37(3):395-406
Agents: Biotin, recombinant vascular endothelial growth factor 165 **Vehicle:** Saline; **Route:** IV (Femoral); **Species:** Mice; **Pump:** Not Stated; **Duration:** 3 days;
ALZET Comments: Dose (1 mg/kg); Controls received mp w/ vehicle; animal info (9-week old CD-1 mice);

Q7535: E. D. Levin, *et al.* Prolonging the Reduction of Nicotine Self-Administration in Rats by Coadministering Chronic Nicotine With Amitifadine, a Triple Monoamine Reuptake Inhibitor With CYP2B6 Inhibitory Actions. *Nicotine Tob Res* 2019;
Agents: Nicotine Ditartrate **Vehicle:** Saline; **Route:** SC, IV (jugular); **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks;
ALZET Comments: Dose (2.5 mg/kg/day); animal info (Young adult female Sprague-Dawley rats); post op. care (ketoprofen, bupivacaine); behavioral testing (dual-lever experiment);

Q6881: W. Deng, *et al.* Insulin ameliorates pulmonary edema through the upregulation of epithelial sodium channel via the PI3K/SGK1 pathway in mice with lipopolysaccharide-induced lung injury. *Mol Med Rep* 2019;
Agents: Insulin, human **Vehicle:** PBS; **Route:** IV (jugular); **Species:** Mice; **Pump:** Not Stated; **Duration:** 24 hours;
ALZET Comments: Dose (Human Insulin (.01 U/kg/day); Controls received mp w/ vehicle; animal info (C3H/HeN mice, aged 7-9 weeks); ALZET internal jugular vein catheter used; cardiovascular;

R0380: A. Clavreul, *et al.* Nanocarriers and nonviral methods for delivering antiangiogenic factors for glioblastoma therapy: the story so far. *Int J Nanomedicine* 2019;14(2497-2513
Agents: Bevacizumab; RNA, small interfering (anti-HIF-1 α /PEG); Immunotoxin, DTAT/DTATEGF; Endostatin; 17-ODYA; Miconazole; **Vehicle:** Not Stated; **Route:** CSF/CNS (intratumoral), IV; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;



ALZET Comments: enzyme inhibitor (CYP epoxygenase); cancer (glioblastoma); This review describes methods (including convection-enhanced delivery devices, implantable polymer devices, nanocarriers, and cellular vehicles) to deliver antiangiogenic factors to intracranial tumors.

Q8341: N. Aydogdu, *et al.* The Effects of Irisin on Nomega-Nitro-L-arginine Methyl Ester Hydrochloride-Induced Hypertension in Rats. *Balkan Med J* 2019;36(6):337-346

Agents: Irisin **Vehicle:** Saline; **Route:** IV; **Species:** Rat; **Pump:** 2ML2; **Duration:** 2 weeks;

ALZET Comments: Dose (50 nmol/day); Controls received mp w/ vehicle; animal info (adult male, 330-390 g, Sprague Dawley rats); Blood pressure measured via tail cuff method; replacement therapy (Irisin);

Q7367: R. A. Augustine, *et al.* Impaired hypothalamic leptin sensitivity in pseudopregnant rats treated with chronic prolactin to mimic pregnancy. *J Neuroendocrinol* 2019;e12702

Agents: Ovine prolactin **Vehicle:** CSF, artificial; **Route:** IV; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Dose (2.5 ug/uL/hr); Controls received mp w/ vehicle; animal info (10 week old, female, Sprague-Dawley); bilateral cannula used; dependence;

R0377: X. S. Zeng, *et al.* Neurotoxin-Induced Animal Models of Parkinson Disease: Pathogenic Mechanism and Assessment. *ASN Neuro* 2018;10(1759091418777438

Agents: Rotenone, MPTP **Vehicle:** Not Stated; **Route:** IV, IP; **Species:** Rat; **Pump:** Not Stated; **Duration:** 14 days, 33 days;

ALZET Comments: Dose (Rotenone (3 mg/kg/day); MPTP (46 mg/kg/day)); neurodegenerative (Parkinson's);

Q7161: X. Yu, *et al.* Zinc Metallochaperones Reactivate Mutant p53 Using an ON/OFF Switch Mechanism: A New Paradigm in Cancer Therapeutics. *Clin Cancer Res* 2018;24(18):4505-4517

Agents: Zinc metallochaperone 1 **Vehicle:** DMSO; **Route:** IV (jugular); **Species:** Mice (nude); **Pump:** 2001; **Duration:** 7, 17 days;

ALZET Comments: Dose (1 mg/kg/d); Controls received mp w/ vehicle; animal info (8-12 week old mice); pumps replaced after 1 week; comparison of IV bolus injection vs continuous pump infusion; half-life: <30 min (p. 4505); cancer (therapeutics);

Q7838: X. Wang, *et al.* Angiotensin-(1-7) prevents atrial tachycardia induced-heat shock protein 27 expression. *J Electrocardiol* 2018;51(1):117-120

Agents: angiotensin(1-7) **Vehicle:** Not Stated; **Route:** IV (jugular); **Species:** Dog; **Pump:** Not Stated; **Duration:** 2 weeks;

ALZET Comments: Dose (6 µg/kg/h); Controls did not receive mp; animal info (Mongrel, 11-15 kg); cardiovascular; Therapeutic indication (intravenously administered Ang-(1-7) may be responsible for inhibiting atrial remodeling induced by rapid atrial pacing, which in turn decreases HSP27 gene and protein expression.);

Q6901: T. Vajen, *et al.* Blocking CCL5-CXCL4 heteromerization preserves heart function after myocardial infarction by attenuating leukocyte recruitment and NETosis. *Sci Rep* 2018;8(1):10647

Agents: MKEY; MKEY, scrambled **Vehicle:** Formic acid; **Route:** IV (jugular); **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Dose (1.3 mg/kg/day); animal info (C57BL/6 mice); cardiovascular;

Q7915: A. K. E. Hornsby, *et al.* Circulating unacylated-ghrelin impairs hippocampal neurogenesis and memory in mice and is altered in human Parkinson's disease dementia. *BioRxiv* 2018;

Agents: ghrelin, unacylated- **Vehicle:** saline, sterile, heparinized, BSA buffered; **Route:** IV (jugular); **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Dose (48µg/day); sterile isotonic saline containing BSA (1mg/ml) and heparin (5U/ml) used; Controls received mp w/ vehicle; animal info (6 months, C57BL/6 and GOAT-null); UAG is considered an inactive precursor to acyl-ghrelin; neurodegenerative (Parkinson's); replacement therapy (ghrelin);

Q7818: L. Gonzalez, *et al.* Angiotensin-(1-9) reduces cardiovascular and renal inflammation in experimental renin-independent hypertension. *Biochemical Pharmacology* 2018;156(357-370

Agents: angiotensin (1-9) **Vehicle:** Not stated; **Route:** IV (jugular); **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;



ALZET Comments: Dose ((Ang(1-9) 600 ng/kg/min), (PD123319 28 ng/kg/min), (A779 100 ng/kg/min)); Controls received sham surgery and mp w/ vehicle; animal info (male, Sprague-Dawley, 150+/-10g); PD123319 is an AT2R blocker. A779 is a Mas receptor blocker; replacement therapy (Uninephrectomized); cardiovascular; vehicle used but identity not stated.; Therapeutic indication (Ang-(1-9) protects against hypertensive cardiovascular and kidney damage induced by volume overload by decreasing inflammation in the heart, aortic wall, and kidney; these effects are not mediated by the Mas or AT2 receptor.);

Q7762: C. R. Chitambar, *et al.* Gallium Maltolate Disrupts Tumor Iron Metabolism and Retards the Growth of Glioblastoma by Inhibiting Mitochondrial Function and Ribonucleotide Reductase. *Mol Cancer Ther* 2018;17(6):1240-1250

Agents: gallium, (tris-hydroxy-2-methyl-4H-pyran-4-onato) **Vehicle:** Not Stated; **Route:** IV (Jugular); **Species:** Rat; **Pump:** Not Stated; **Duration:** 10 days;

ALZET Comments: Dose (50 mg/kg/day); animal info (Male athymic rats 250g); (tris-hydroxy-2-methyl-4H-pyran-4-onato)gallium aka GaM; cancer (glioblastoma);