



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

Q9204: L. S. Dalboge, *et al.* Evaluation of VGF peptides as potential anti-obesity candidates in pre-clinical animal models. *Peptides* 2021;136(170444)

Agents: NERP-1; HHPD-41; TLQP-21; PGH-NH2; NERP-2; TLQP-62; Glucagon-like peptide-1 (7-37); Ghrelin **Vehicle:** Not Stated; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Dose (2 nmol/mouse/day Glucagon-like peptide-1 (7-37); 3 nmol/mouse/day Ghrelin); Controls received mp w/ vehicle; animal info (male and female C57BL/6J mice, 13 weeks old); Glucagon-like peptide-1 aka GLP-1 (7-37); peptides; Brain coordinates (-0.7 mm posterior, -1.2 mm lateral [left], and -2.0 mm ventral); dependence;

Q9829: L. Zheng, *et al.* Rhythmic light flicker rescues hippocampal low gamma and protects ischemic neurons by enhancing presynaptic plasticity. *Nature Communications* 2020;11(1):3012

Agents: GK23; GK13; Conotoxin, w-; **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1003D; **Duration:** 3 days;

ALZET Comments: Dose (2 mg/kg/day GK23, GK13; 2.28 ng/kg/day w-Conotoxin); animal info (Adult male C57Bl/6 mice (3-months-old)); behavioral testing (Open field test; Morris water maze; Y-maze test); peptides; ALZET brain infusion kit 3 used; Brain coordinates (coordinates from bregma: anterior-posterior = -0.5 mm; lateral = 1.0 mm); dental cement used; ischemia (cerebral ischemia);

Q9910: T. Yan, *et al.* FAM222A encodes a protein which accumulates in plaques in Alzheimer's disease. *Nature Communications* 2020;11(1):411

Agents: Amyloid protein, beta **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1004; **Duration:** 28 days;

ALZET Comments: Animal info (5xFAD transgenic mice); behavioral testing (Barnes maze test; Y maze test); Amyloid protein, beta aka AB; ALZET brain infusion kit 3 used; Brain coordinates (relative to bregma: ante- roposterior -0.5 mm, medial lateral 0.75 mm); cyanoacrylate adhesive; neurodegenerative (Alzheimer's disease);

Q9928: X. Xu, *et al.* Identification of a pro-elongation effect of diallyl disulfide, a major organosulfur compound in garlic oil, on microglial process. *Journal of Nutritional Biochemistry* 2020;78(108323)

Agents: LY294002 **Vehicle:** DMSO; CSF, Artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 2002; 1003D; **Duration:** 3 days;

ALZET Comments: Dose (5 µg/mL); 3% DMSO used; Controls received mp w/ vehicle; animal info (Male C57BL6/J mice (6-8 weeks)); behavioral testing (tail suspension test; forced swim test); Brain coordinates (-0.2 mm anterior and 1.0 mm lateral relative to bregma and 2.3 mm below the surface of the skull); dependence;

Q9064: K. C. Wu, *et al.* Deletion of equilibrative nucleoside transporter-2 protects against lipopolysaccharide-induced neuroinflammation and blood-brain barrier dysfunction in mice. *Brain, Behavior, and Immunity* 2020;84(59-71)

Agents: Dipyridamole **Vehicle:** Not Stated; **Route:** CSF/CNS (intracerebral) IV; **Species:** Mice; **Pump:** 2002; **Duration:** 14 days;

ALZET Comments: Dose (90.6 µg/kg); Controls received mp w/ vehicle; animal info (male Ent1 and Ent2 knockout mice, 8-10 weeks of age); ALZET brain infusion kit 3 used; Brain coordinates (A-P -0.6 mm and M-L -1.2 mm from the bregma and D-V -2 mm below the dura); neurodegenerative (Lipopolysaccharide-induced neuroinflammation; Blood-Brain Barrier dysfunction);

Q9551: G. Weselek, *et al.* Norepinephrine is a negative regulator of the adult periventricular neural stem cell niche. *Stem Cells* 2020;38(9):1188-1201

Agents: Prazosin; Propranolol **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: 0.5% ACSF used; Controls received mp w/ vehicle; animal info (C57BL/6N male mice, 8 to 12 weeks old); Prazosin aka β-AR antagonist, Propranolol aka β-AR antagonist; dependence;



Q9530: F. Wang, *et al.* Soluble (pro)renin receptor treats metabolic syndrome in mice with diet-induced obesity via interaction with PPARgamma. *JCI Insight* 2020;5(7):

Agents: Renin receptor, human recombinant soluble; PF429242 **Vehicle:** Not Stated; **Route:** IV (external jugular); **Species:** Mice; **Pump:** 1002; **Duration:** 2 weeks;

ALZET Comments: Dose (30 ug/kg/d); Controls received mp w/ vehicle; animal info (Male 36-week-old DIO C57/BL6 mice); Multiple pumps per animal (2 pumps); human recombinant soluble renin receptor aka sPRR, PF429242 aka PF; dependence;

Q8898: A. Ma, *et al.* Overexpression of Central ACE2 (Angiotensin-Converting Enzyme 2) Attenuates the Pressor Response to Chronic Central Infusion of Ang II (Angiotensin II): A Potential Role for Nrf2 (Nuclear Factor [Erythroid-Derived 2]-Like 2). *Hypertension* 2020;76(5):1514-1525

Agents: Angiotensin II; Angiotensin (1-7); A779; Sulforaphane **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days; 7 days;

ALZET Comments: Dose (100 ng/kg/min Angiotensin II; 200 ng/kg/min Angiotensin (1-7); 400 ng/kg/min A779;); Controls received mp w/ vehicle; animal info (male mice, 3 months old); Blood pressure measured via radio telemetry; 92.3 mmHg - 125.1 mmHg; Angiotensin II aka Ang II; cardiovascular;

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

Agents: Zymosan; CU-CPT22 **Vehicle:** Not Stated; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** 1007D; 1004; 1002; **Duration:** 28 days; 1 week; 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 Science 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 bregm); gene therapy;

Q8861: L. B. James-Allan, *et al.* Regulation of glucose homeostasis by small extracellular vesicles in normal pregnancy and in gestational diabetes. *FASEB Journal* 2020;34(4):5724-5739

Agents: Small extracellular vesicles, human **Vehicle:** PBS; **Route:** IV (right jugular vein); **Species:** Mice; **Pump:** 1003D; **Duration:** 4 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (Nonpregnant female C57BL/6 mice); human small extracellular vesicles aka human sEVs; diabetes;

Q8537: M. Hecker, *et al.* Immunomodulation by an Omega-6 Fatty Acid Reduced Mixed Lipid Emulsion in Murine Acute Respiratory Distress Syndrome. *Journal of Clinical Medicine* 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;



Q9230: T. Fujimura, *et al.* The pain-relieving effects of lactoferrin on oxaliplatin-induced neuropathic pain. *Journal of Veterinary Medical Science* 2020;

Agents: Lactoferrin, human recombinant **Vehicle:** PBS; **Route:** IV (external jugular); **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;

ALZET Comments: Dose (10 mg/kg/day); Controls received mp w/ vehicle; animal info (five-week-old male ICR mice); human recombinant lactoferrin aka rhLf; dependence;

Q8456: F. El Gaamouch, *et al.* VGF-derived peptide TLQP-21 modulates microglial function through C3aR1 signaling pathways and reduces neuropathology in 5xFAD mice. *Molecular Neurodegeneration* 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);

Q8472: The pain-relieving effects of lactoferrin on oxaliplatin-induced neuropathic pain. *Journal of Veterinary Medical Science* 2020;

Agents: Lactoferrin, human recombinant **Vehicle:** PBS; **Route:** IV (external jugular); **Species:** Mice; **Pump:** Not stated; **Duration:** 2 weeks;

ALZET Comments: Dose (10 mg/kg/day); Controls received mp w/ vehicle; animal info (five-week-old male ICR mice); human recombinant lactoferrin aka rhLf; dependence;

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 µg/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);

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-1α/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.

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);



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);

Q10082: H. K. Ananthula, *et al.* Preclinical pharmacokinetic evaluation to facilitate repurposing of tyrosine kinase inhibitors nilotinib and imatinib as antiviral agents. *BMC Pharmacology and Toxicology* 2018;19(1):80

Agents: Nilotinib; Imatinib **Vehicle:** Ethanol:PEG300: Cremophor EL; Sterile water; **Route:** IV injection; Gavage; **Species:** Mice; Guinea pigs; Prairie Dogs; Cynomolgus monkeys; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Nilotinib 1.5:4.5:20 (ethanol:PEG300:Cremophor) in 3.7% dextrose solution used; animal info (Mice C57BL/6, 20g both genders; Prairie dogs wild caught male black tailed, 1-2 years; Guinea pigs male hartley 450-650g); half-life (p.1,8); Resultant plasma level (Figure 1 nilotinib, Figure 2 imatinib); enzyme inhibitor (tyrosine kinase (TKI)); good methods (elimination half-lives were quite short (1-2 h). Thus, further testing of these agents in C57BL/6 mice is feasible but may require a continuous delivery system such as an Alzet® mini pump.); didn't use Alzet pmup, but recommends using it in future studies of these agents in mice or guinea pigs;