



Recent References on the Administration of Neurotrophic Factors
Using ALZET® Osmotic Pumps

Brain-derived Neurotrophic Factor (2014-Present)

Q10988: J. G. Rosa, *et al.* BDNF is altered in a brain-region specific manner and rescues deficits in Spinocerebellar Ataxia Type 1. *Neurobiology of Disease* 2023;178(106023

Agents: Brain-derived neurotrophic factor, recombinant **Vehicle:** CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Strain:** Atxn154Q/2Q; **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Dose (0.71 µg/day); Controls received mp w/ vehicle; animal info: 7 week old mice; Brain coordinates ((A/P 1.1 mm; M/L 0.5 mm; D/V -2.5 mm from Bregma); behavioral testing (Cognitive testing; Barnes maze; Contextual fear conditioning); neurodegenerative, Spinocerebellar ataxia type-1;

Q10399: P. Y. Bai, *et al.* Environmental eustress improves postinfarction cardiac repair via enhancing cardiac macrophage survival. *Science Advances* 2022;8(**Agents:** Brain-derived neurotrophic factor **Vehicle:** PBS; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 1002; **Duration:** **ALZET Comments:** animal info (3-4 weeks old; Male; Wild-type); ALZET brain infusion kit 3 used; dental cement used; cardiovascular; Therapeutic indication (Cardiac remodeling post myocardial infarction);

Q9457: C. Sheeler, *et al.* Post-symptomatic Delivery of Brain-Derived Neurotrophic Factor (BDNF) Ameliorates Spinocerebellar Ataxia Type 1 (SCA1) Pathogenesis. *Cerebellum* 2021;20(3):420-429

Agents: Brain-derived neurotrophic factor **Vehicle:** CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Dose (0.71 µg/day); Controls received mp w/ vehicle; animal info (Male and female wild-type mice, 12 weeks old); behavioral testing (Rotarod test); brain-derived neurotrophic factor aka BDNF; Brain coordinates (A/P, 1.1 mm; M/L, 0.5 mm; D/V, - 2.5 mm from Bregma); neurodegenerative (Spinocerebellar ataxia type 1);

R0399: S. Mitra, *et al.* A Review of Techniques for Biodelivery of Nerve Growth Factor (NGF) to the Brain in Relation to Alzheimer's Disease. *Advances in Experimental Medicine and Biology* 2021;1331(171-191

Agents: Nerve growth factor; Brain-derived neurotrophic factor; **Route:** CSF/CNS (intracerebral); **Species:** Rat; **ALZET Comments:** "Nerve growth factor aka (NGF) dependence; Different invasive strategies of NGF delivery to the brain have been reported to show that indeed NGF could be a promising therapeutic in AD, either intracerebroventricular administration (pg.194)"

Q9261: Y. Hasegawa, *et al.* The endogenous and exogenous brain-derived neurotrophic factor plays pivotal roles in the pathogenesis of stroke onset in high salt-loaded hypertensive rats. *Experimental Gerontology* 2021;147(111286

Agents: Brain-derived neurotrophic factor **Vehicle:** PBS; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2004; **Duration:** 28 days; **ALZET Comments:** Dose (2.1 µg/day); Controls received mp w/ vehicle; animal info (male spontaneously hypertensive stroke-prone rats, 224-282 g); Blood pressure measured via tail cuff method; 184 mmHg - 234 mmHg; Brain-derived neurotrophic factor aka BDNF; ALZET brain infusion kit 2 used; dependence;

Q9936: S. Y. Wu, *et al.* BDNF reverses aging-related microglial activation. *Journal of Neuroinflammation* 2020;17(1):210

Agents: Brain-derived neurotrophic factor **Vehicle:** Saline; **Route:** CNS/CSF; **Species:** Mice; **Pump:** 1004; **Duration:** 28 days; **ALZET Comments:** Dose (0.1 µl/min); 0.9% Saline used; Controls received mp w/ vehicle; animal info (18 months old); Brain-derived neurotrophic factor aka BDNF ; neurodegenerative (Microglial Activation);

Q10062: J. Savidan, *et al.* Cutaneous Inputs to Dorsal Column Nuclei in Adult Macaque Monkeys Subjected to Unilateral Lesion of the Primary Motor Cortex or of the Cervical Spinal Cord and Treatments Promoting Axonal Growth. *Neuroscience Insights* 2020;15(2633105520973991

Agents: Antibody, anti Nogo-A monoclonal 11C7; Brain-derived neurotrophic factor **Route:** CSF/CNS (spinal cord); **Species:** Monkey; **Pump:** 2ML2; **Duration:** 4 weeks;

ALZET Comments: Dose (14.8 mg anti Nogo-A monoclonal antibody 11C7; 1.4 mg Brain-derived neurotrophic factor); animal info (adult monkeys, 3.0 to 5.6 kg, 4 to 6 years old); Multiple pumps per animal (2 pumps); Brain-derived neurotrophic factor aka BDNF; spinal cord injury;



Q7420: A. M. Schiller, *et al.* Increased Brain-Derived Neurotrophic Factor in Lumbar Dorsal Root Ganglia Contributes to the Enhanced Exercise Pressor Reflex in Heart Failure. *Int J Mol Sci* 2019;20(6):

Agents: Brain-derived neurotrophic factor, Anti- **Route:** CSF/CNS; **Species:** Rat; **Pump:** 1007D; **Duration:** 1 Week;
ALZET Comments: Dose (10 µg/mL); Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats weighing 420 to 510 g); post op. care (Betadine, buprenorphine); cardiovascular;

Q7897: J. L. Fletcher, *et al.* Targeting TrkB with a Brain-Derived Neurotrophic Factor Mimetic Promotes Myelin Repair in the Brain. *J Neurosci* 2018;38(32):7088-7099

Agents: Neurotrophin brain-derived neurotrophic factor, Tricyclic-dimeric peptide-6 **Vehicle:** CSF, artificial; **Route:** CNS/CSF (right lateral ventricle); **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (C57BL/6, 8-10 week old); Tricyclic-dimeric peptide-6 aka TDP6, Neurotrophin brain-derived neurotrophic factor aka BDNF ; Brain coordinates (-0.5 mm rostral, -0.7 mm lateral of bregma to administer into right lateral ventricle); bilateral cannula used; neurodegenerative (Innate myelin regeneration);

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

Agents: Brain-derived neurotrophic factor, human recomb. **Vehicle:** Albumin, bovine serum; **Route:** CSF/CNS (magnocellular medial preoptic nucleus); **Species:** Hamster; **Pump:** 2004; **Duration:** 9 days;

ALZET Comments: Dose (6.25 µg/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);

Q6193: M. T. Nuzzo, *et al.* Huntingtin polyQ Mutation Impairs the 17beta-Estradiol/Neuroglobin Pathway Devoted to Neuron Survival. *Mol Neurobiol* 2017;54(8):6634-6646

Agents: Brain-derived neurotrophic factor **Vehicle:** PBS; BSA; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 9 weeks;
ALZET Comments: Dose (4.0 µg/day); PBS with 0.1% BSA; Controls received mp w/ vehicle;

Q6043: V. Hernandez-Torres, *et al.* BDNF effects on functional recovery across motor behaviors after cervical spinal cord injury. *J Neurophysiol* 2017;117(2):537-544

Agents: Brain-derived neurotrophic factor **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2002;
Duration: 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (280–300g); spinal cord injury; Dose (180 ng/day);

Q4857: M. Wen-Chung Liu, *et al.* Hyperbaric Oxygen Therapy Alleviates Carbon Monoxide Poisoning–Induced Delayed Memory Impairment by Preserving Brain-Derived Neurotrophic Factor–Dependent Hippocampal Neurogenesis. *Critical Care Medicine* 2016;44(1):

Agents: TrkB-Fc, recombinant human; brain-derived neurotrophic factor **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Rat;
Pump: 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Sprague Dawley, adult); animal info (male, Sprague Dawley, adult); behavioral testing (radial arm maze, memory talk); used dental cement; pumps primed in 37C saline prior to implantation; Dose (); brain coordinates;

Q5343: Sophie Dutheil, *et al.* BDNF Signaling Promotes Vestibular Compensation by Increasing Neurogenesis and Remodeling the Expression of Potassium-Chloride Cotransporter KCC2 and GABAA Receptor in the Vestibular Nuclei. *Journal of Neuroscience* 2016;36(23):6199-6212

Agents: Brain-derived neurotrophic factor, K252a **Vehicle:** Saline; CSF, artificial; **Route:** CSF/CNS (ventricles); **Species:** Cat;
Pump: 2ML4; **Duration:** 30 days;

ALZET Comments: Controls received mp w/ saline; animal info (adult, male cat, 4-5 kg); dose-response (pg 6205, 6206); behavioral testing (rotating beam experimental device test); peptides;



Q5395: T. H. Lin, *et al.* NF-kappaB decoy oligodeoxynucleotide mitigates wear particle-associated bone loss in the murine continuous infusion model. *Acta Biomaterialia* 2016;41(273-81

Agents: Ultra-high molecular weight polyethylene particles; oligodeoxynucleotide, decoy; oligodeoxynucleotide, scrambled; Endotoxin, LPS; Brain-derived neurotrophic factor; **Vehicle:** Saline; **Route:** In Vitro (cell culture); Bone (Femur); **Species:** Mice (nude); **Pump:** 2006; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (Male athymic nude mice, 10-15 weeks old); stability verified by (in vitro experiment); dose-response (pg. 277); good methods (pg. 276); tissue perfusion (bone); Dose (15 mg/ml UHMWPE, 50uM decoy, 1 ug/ml LPS); Therapeutic indication (Bone loss, chronic inflammation);

Q6165: C. K. Kandathil, *et al.* Effects of brain-derived neurotrophic factor (BDNF) on the cochlear nucleus in cats deafened as neonates. *Hear Res* 2016;342(134-143

Agents: Brain-derived neurotrophic factor, recomb. human **Vehicle:** Perilymph, artificial; **Route:** Ear (cochlea); **Species:** Cat; **Pump:** 1002, 2004; **Duration:** 10 weeks;

ALZET Comments: Dose (94 mg/ml; 0.25 ml/hr); pumps replaced after 2 and 4 weeks; BDNF stability verified by neuronal cell culture survival assay (28 days);

Q6044: N. Himi, *et al.* Exercise in the Early Stage after Stroke Enhances Hippocampal Brain-Derived Neurotrophic Factor Expression and Memory Function Recovery. *J Stroke Cerebrovasc Dis* 2016;25(12):2987-2994

Agents: Millipore; Brain-derived neurotrophic factor, human recombinant; K252a **Vehicle:** Saline; **Route:** CSF/CNS (hippocampus); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (9 weeks old; 270-290 g); dorsorostral area of the right hippocampus (-3.8 mm anterior, 2.2 mm lateral and 3.0 mm deep relative to the bregma ; Therapeutic indication (Stroke); Dose (20 ng/mL);

Q4809: J. Chen, *et al.* proBDNF Attenuates Hippocampal Neurogenesis and Induces Learning and Memory Deficits in Aged Mice. *NEUROTOXICITY RESEARCH* 2016;29):47-53

Agents: Brain-derived neurotrophic factor, pro; antibody brain-derived neurotrophic factor, anti-pro; **Vehicle:** BSA; **Route:** CSF/CNS (hippocampus); **Species:** Mice; **Pump:** 1002; **Duration:** 6 days;

ALZET Comments: Controls received mp w/ vehicle; Controls received mp w/ vehicle; neurodegenerative (Alzheimer's Disease); behavioral testing (morris water maze); Cannula placement verified postmortem;

Q4929: D. Ramekers, *et al.* Temporary Neurotrophin Treatment Prevents Deafness-Induced Auditory Nerve Degeneration and Preserves Function. *J Neurosci* 2015;35(36):12331-45

Agents: Brain-derived neurotrophic factor **Vehicle:** PBS; guinea pig serum; **Route:** CSF/CNS; **Species:** Guinea pig; **Pump:** 2004; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (female, albino, 250-350g); functionality of mp verified by histological analysis; 1% guinea pig serum used; stress/adverse reaction: (see pg. 12336); Cannula placement verified via histological analysis; pumps removed after 4 weeks; pumps primed for 40 hours in 37C saline; Dose (17 ug/28 days);

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

Agents: Brain-derived neurotrophic factor **Vehicle:** saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML2; **Duration:** 14 days;

ALZET Comments: 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));

Q4425: S. Garofalo, *et al.* Enriched environment reduces glioma growth through immune and non-immune mechanisms in mice. *Nature Communications* 2015;6(U26-U38

Agents: Interleukin-15; brain-derived neurotrophic factor **Vehicle:** PBS; **Route:** CSF/CNS (striatum); **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, C57BL6, 3 weeks or 2 months old); ALZET BIK III; cancer (glioma, U87MG human); tissue perfusion (right striatum); immunology; pumps primed in 37C saline overnight;



Q3903: B. Frias, *et al.* The Role of Brain-Derived Neurotrophic Factor (BDNF) in the Development of Neurogenic Detrusor Overactivity (NDO). *Journal of Neuroscience* 2015;35(2146-2160)

Agents: Brain-derived neurotrophic factor; TrkB-Ig2 **Vehicle:** Tris buffer; glycerol; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2001; 2004; **Duration:** 7 days; 28 days;

ALZET Comments: Controls received mp w/ saline; animal info (female, Wistar, 250-275g); 10% glycerol used; spinal cord injury; no stress (see pg. 2154); post op. care (ciprofloxacin 1 mg/kg IP injection; bladders manually emptied twice a day); used silicone catheter;

Q3598: L. M. E. Pettersson, *et al.* Injury-Associated PACAP Expression in Rat Sensory and Motor Neurons Is Induced by Endogenous BDNF. *PLoS One* 2014;9(U629-U640)

Agents: Antibody, brain-derived neurotrophic factor **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2001; **Duration:** 3 days;

ALZET Comments: Controls received mp w/ control IgG; animal info (male, Wistar, 250-300tg); post op. care (buprenorphine 0.05-0.1 mg/kg SC); peripheral nerve injury;

Ciliary Neurotrophic Factor (2011-Present)

Q6945: C. Andre, *et al.* mTORC1 pathway disruption abrogates the effects of the ciliary neurotrophic factor on energy balance and hypothalamic neuroinflammation. *Brain, Behavior, and Immunity* 2018;70(325-334)

Agents: Ciliary neurotrophic factor, recomb. human **Vehicle:** CSF, artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1002; **Duration:** Not Stated;

ALZET Comments: Dose (63 ng/ul); Controls received mp w/ vehicle; animal info (16 week old mice); Brain coordinates (anteroposterior: -0.3mm from bregma, lateral: -1mm to bregma and dorsoventral: -2.5mm below skull); delayed delivery (2 days);

Q3285: L. Baeyens, *et al.* Transient cytokine treatment induces acinar cell reprogramming and regenerates functional beta cell mass in diabetic mice. *NATURE BIOTECHNOLOGY* 2014;32(1):76-+

Agents: Epidermal growth factor, human recombinant; ciliary neurotrophic factor, human recombinant **Vehicle:** Acetic acid; **Route:** IP; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (ALX35d, 13 weeks old, hyperglycemic); diabetes; ciliary neurotrophic factor aka CNTF; Epidermal growth factor aka EGF;

Q3295: M. R. Fang, *et al.* Antineuroinflammatory and neurotrophic effects of CNTF and C16 peptide in an acute experimental autoimmune encephalomyelitis rat model. *FRONTIERS IN NEUROANATOMY* 2013;7(1):U1-U17

Agents: Ciliary neurotrophic factor, recombinant rat **Vehicle:** PBS; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Lewis, 250-300g, adult); ALZET brain infusion kit used; post op. care (temperature and humidity controlled chambers; penicillin injected IM 25000 IU); immunology; Ciliary neurotrophic factor aka CNTF; Ciliary neurotrophic factor is a cytokine; pumps primed overnight in room temp saline; cannulas sterilized overnight in 100% ethanol; used anchoring screws and dental cement;

R0305: S. Ramaswamy, *et al.* Gene therapy for Huntington's disease. *NEUROBIOLOGY OF DISEASE* 2012;48(2):243-254

Agents: Ciliary neurotrophic factor **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Not Stated; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Peptides; method of delivery with mp mentioned as efficiently reduces cell death in the AQ-treated striatum (pg.5); ALZET not mentioned often;

Q1939: M. Solymar, *et al.* A Fever-like Effect of Central Infusion of CNTF in Freely Moving Mice with Diet-Induced Obesity. *Journal of Molecular Neuroscience* 2011;45(2):212-215

Agents: Ciliary neurotrophic factor **Vehicle:** NaCl; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Animal info (male, C57BL/6); incorrectly listed Model 2001D used



Q1062: M. R. Fang, *et al.* The Neuroprotective Effects of Reg-2 Following Spinal Cord Transection Injury. *Anatomical Record-Advances in Integrative Anatomy and Evolutionary Biology* 2011;294(1):24-45

Agents: Regeneration gene protein 2; ciliary neurotrophic factor **Vehicle:** Saline; **Route:** CSF/CNS (intrathecal, subarachnoid space); **Species:** Rat; **Pump:** 2001D; 2001; **Duration:** 7 days; 24 hours;

ALZET Comments: Controls received mp w/ vehicle; animal info (adult, female, 200-250 g, Sprague Dawley); functionality of mp verified by residual volume; spinal cord injury

Glial Derived Neurotrophic Factor (2009-Present)

Q9349: H. Li, *et al.* Local continuous glial cell derived neurotrophic factor release using osmotic pump promotes parasympathetic nerve rehabilitation in an animal model of cavernous nerve injury induced erectile dysfunction. *Translational Andrology and Urology* 2021;10(1):258-271

Agents: Glial-derived neurotrophic factor **Vehicle:** Saline; **Route:** Prostate; **Species:** Rat; **Pump:** 1004; **Duration:** 28 days; **ALZET Comments:** Dose (0, 0.1, 1, or 10 µg/100 µL); animal info (Eight-week-old male Sprague-Dawley rats); behavioral testing (sexual behavior tests); Glial-derived neurotrophic factor aka GDNF; dependence;

Q0778: M. H. Voutilainen, *et al.* Chronic infusion of CDNF prevents 6-OHDA-induced deficits in a rat model of Parkinson's disease. *Experimental Neurology* 2011;228(1):99-108

Agents: Central dopamine neurotrophic factor; mesencephalic astrocyte-derived neurotrophic factor; glial-derived neurotrophic factor **Vehicle:** PBS; **Route:** CSF/CNS (striatum); **Species:** Rat; **Pump:** 2002; **Duration:** 3, 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Wistar, 250-280 g); neuroprotection

Q1447: S. B. Patil, *et al.* Neuropathic pain- and glial derived neurotrophic factor-associated regulation of cadherins in spinal circuits of the dorsal horn. *Pain* 2011;152(4):924-935

Agents: Glial-derived neurotrophic factor, recomb. human **Vehicle:** Citrate buffer; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1007D; 2002; **Duration:** 7, 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (adult, male, Sprague-Dawley, > 60 days old, 200-250 g)

Q1151: N. M. Joseph, *et al.* Enteric glia are multipotent in culture but primarily form glia in the adult rodent gut. *Journal of Clinical Investigation* 2011;121(9):3398-3411

Agents: Epidermal growth factor; Fibroblast growth factor; Glial-derived neurotrophic factor **Vehicle:** BSA; PBS; **Route:** IP; **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (P90)

Q0059: K. Ubhi, *et al.* Neurodegeneration in a Transgenic Mouse Model of Multiple System Atrophy Is Associated with Altered Expression of Oligodendroglial-Derived Neurotrophic Factors. *Journal of Neuroscience* 2010;30(18):6236-6246

Agents: Glial-derived neurotrophic factor **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Mice (transgenic); **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Animal info (MBP-h alpha syn Tg, 8 months old)

Q1685: A. Fransson, *et al.* Post-Treatment Effects of Local GDNF Administration to the Inner Ears of Deafened Guinea Pigs. *Journal of Neurotrauma* 2010;27(9):1745-1751

Agents: Glial-derived neurotrophic factor **Route:** Ear (cochlea); **Species:** Guinea pig; **Pump:** 2002; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ artificial perilymph; animal info (deafened); silicone tube used; tissue perfusion (cochlea); pump replaced after 2 weeks; post op. care (lidocaine)



P9872: S. Unezaki, *et al.* Effects of neurotrophic factors on nerve regeneration monitored by in vivo imaging in thy1-YFP transgenic mice. *Journal of Neuroscience Methods* 2009;178(2):308-315

Agents: Nerve growth factor; glial-derived neurotrophic factor **Vehicle:** Saline; **Route:** CSF/CNS (sciatic nerve); **Species:** Mice (transgenic); **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ vehicle; half-life (p. 308) "short"; animal info (10 wks old, 20 g., Thy1-YEP); image of pump pg. 309; schematic of drug delivery system with pump+silicone, fig. 1); "Because of the short biological half-life of neurotrophic factors, a delivery system that protects the protein and slowly releases it locally over a prolonged period of time is required." pg. 308; tissue perfusion (sciatic nerve)

P9515: V. Scheper, *et al.* Effects of Delayed Treatment With Combined GDNF and Continuous Electrical Stimulation on Spiral Ganglion Cell Survival in Deafened Guinea Pigs. *Journal of Neuroscience Research* 2009;87(6):1389-1399

Agents: Glial-derived neurotrophic factor **Vehicle:** Not Stated; **Route:** Ear (cochlea); **Species:** Guinea pig; **Pump:** 2002; **Duration:** 48 days;

ALZET Comments: Controls received mp w/artificial perilymph; tissue perfusion (cochlea); long-term study; pumps replaced after 13 days; good methods (pg. 1391); animal info (male, pigmented, 250-450 g.); pumps primed; image of pump and electrode cannula device used on fig. 1

Q0275: J. H. Li, *et al.* Insect GDNF:TTC fusion protein improves delivery of GDNF to mouse CNS. *Biochemical and Biophysical Research Communications* 2009;390(3):947-951

Agents: Glial-derived neurotrophic factor, recombinant, rat; glial-derived neurotrophic factor, TTC **Vehicle:** HEPES; NaCl; BSA; **Route:** CSF/CNS; **Species:** Mice; **Pump:** Not Stated; **Duration:** 1 week;

ALZET Comments: Controls received mp w/ vehicle; animal info (normal, male, C57BL6, 8-10-wks-old, 25-30 g); GDNF:TTC also known as glial-derived neurotrophic factor: tetanus toxin C-fragment fusion protein

Nerve Growth Factor (2014-Present)

R0399: S. Mitra, *et al.* A Review of Techniques for Biodelivery of Nerve Growth Factor (NGF) to the Brain in Relation to Alzheimer's Disease. *Advances in Experimental Medicine and Biology* 2021;1331(171-191)

Agents: Nerve growth factor; Brain-derived neurotropic factor **Vehicle:** Not Stated; **Route:** CSF/CNS (intracerebral); **Species:** Rat; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: "Nerve growth factor aka (NGF); dependence; Different invasive strategies of NGF delivery to the brain have been reported to show that indeed NGF could be a promising therapeutic in AD, either intracerebroventricular administration (pg.194)"

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;

Q8567: H. Kawasaki, *et al.* Nerve growth factor (NGF) has an anti-tumor effects through perivascular innervation of neovessels in HT1080 fibrosarcoma and HepG2 hepatitis tumor in nude mice. *Journal of Pharmacological Sciences* 2019;140(1):1-7

Agents: Nerve growth factor, human **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice; **Pump:** Not stated; **Duration:** 14 days;

ALZET Comments: Dose (40 or 80 ng/h); Controls received mp w/ vehicle; animal info (Five-week-old BALB/c Slc nu/nu mice); human nerve growth factor aka NGF; cancer (Tumor growth);

Q7045: N. Shimizu, *et al.* Effects of nerve growth factor neutralization on TRP channel expression in laser-captured bladder afferent neurons in mice with spinal cord injury. *Neurosci Lett* 2018;683(100-103)

Agents: Antibody, anti-Nerve growth factor **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 2 weeks;

ALZET Comments: Dose (10 µg/Kg/hour); Controls received mp w/ vehicle; animal info (9-10-week-old female C57BL/6 N mice weighing 18-22 g); spinal cord injury;



Q5675: Y. Sone, *et al.* Nerve Growth Factor Facilitates the Innervation of Perivascular Nerves in Tumor-Derived Neovasculature in the Mouse Cornea. *Pharmacology* 2017;99(1-2):57-66

Agents: Nerve growth factor **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ saline; animal info (male BALB/C Cr Slc, 5 weeks old); cancer (prostate DU145 or fibrosarcoma HT1080); cardiovascular; Dose (40 ng/h);

Q6595: A. Matsuyama, *et al.* Effect of Nerve Growth Factor on Innervation of Perivascular Nerves in Neovasculatures of Mouse Cornea. *Biological and Pharmaceutical Bulletin* 2017;40(4):396-401

Agents: Nerve growth factor **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 7 days;

ALZET Comments: Dose (48 µg/kg/d); animal info (5-7 week old Male BALB/c Cr Slc mice); comparison of pellet vs mp;

Q4917: A. Yokomizo, *et al.* Nerve growth factor facilitates redistribution of adrenergic and non-adrenergic non-cholinergic perivascular nerves injured by phenol in rat mesenteric resistance arteries. *European Journal of Pharmacology* 2016;770(110-6

Agents: Nerve growth factor **Vehicle:** Saline, sterile; **Route:** IP; **Species:** Rat; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: animal info (Wistar, 8 weeks old); Dose (20 µg/kg/day);

Q5177: P. A. Pereira, *et al.* Effects of chronic alcohol consumption, withdrawal and nerve growth factor on neuropeptide Y expression and cholinergic innervation of the rat dentate hilus. *Neurotoxicology* 2016;54(153-60

Agents: Nerve growth factor **Vehicle:** Methylene blue; BSA; CSF, artificial; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2002; **Duration:** 12 days;

ALZET Comments: animal info (male, Wistar); functionality of mp verified by residual volume; Pumps were pre-tested to confirm delivery rate; ALZET brain infusion kit used; post op. care (SC injections of 0.9% saline (2ml)); pulsed delivery; lynch coil; the cannulae were connected to methylene blue (0.01%) filled minipumps via sterile coiled PE-60 tubing. The tubing was filled with air-oil spacer at the pump end and with NGF (150 mg diluted in 150 ml of vehicle).

Q6640: P. A. Pereira, *et al.* Nerve growth factor-induced plasticity in medial prefrontal cortex interneurons of aged Wistar rats. *Experimental Gerontology* 2016;85(59-70

Agents: Nerve Growth Factor **Vehicle:** CSF, artificial; BSA; **Route:** CSF/CNS (Right ventricle); **Species:** Rat; **Pump:** 2002; **Duration:** 12 days;

ALZET Comments: Dose (10.1 ± 2.4 µg per rat); 0.1% bovine serum albumin used; animal info (Adult (6 months) and old (26–27 months) male Wistar rats); Nerve Growth Factor aka NGF; ALZET brain infusion kit used; Brain coordinates (1.1 mm posterior to the bregma, 1.7 mm lateral to the midline, and 4.0 mm below the surface of the skull);

Q4820: C. D. Luca, *et al.* Astrocytes and Microglia-Mediated Immune Response in Maladaptive Plasticity is Differently Modulated by NGF in the Ventral Horn of the Spinal Cord Following Peripheral Nerve Injury. *Cellular and Molecular Neurobiology* 2016;36):37-46

Agents: Nerve growth factor, b- **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 250-300g); Cannula placement verified via induced lower body paralysis (IT lidocaine injection); spared nerve injury; Dose (12 µg/kg/day);

Q5856: M. Goda, *et al.* Nerve growth factor facilitates perivascular innervation in neovasculatures of mice. *J Pharmacol Sci* 2016;131(4):251-8

Agents: Nerve Growth Factor **Vehicle:** Saline; **Route:** SC; IP; **Species:** Mice; **Pump:** 1003D, 1007D, 1002; **Duration:** 3 days, 7 days, 10 days, 14 days;

ALZET Comments: Controls received mp w/ vehicle; Therapeutic indication (Angiogenesis);



Q3960: J. Y. Lee, *et al.* Simultaneous Inferior Alveolar Nerve Regeneration and Osseointegration With a Nerve Growth Factor-Supplying Implant: A Preliminary Study. *Journal of Oral and Maxillofacial Surgery* 2015;73(4):410-423

Agents: Nerve growth factor, human B- **Vehicle:** PBS; **Route:** CSF/CNS (inferior alveolar nerve); **Species:** Dog (beagle); **Pump:** 2ML2; **Duration:** 6 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, beagle, 18 weeks old, 10-12 kg); good methods (picture of implant pg 413); Multiple pumps per animal (2; one pump delivered NGF other delivered PBS); used rat jugular catheter, 15 cm long; pump body placed into retromandibular area; long-term study;

Q4368: W. H. Chen, *et al.* Beta-nerve growth factor promotes neurogenesis and angiogenesis during the repair of bone defects. *Neural Regeneration Research* 2015;10(11):1159-1165

Agents: Nerve growth factor, b- **Vehicle:** PBS; Evans blue dye; **Route:** Bone (parietal); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 250-300g); 1% Evans blue used; good methods (picture of dual cannula implantation pg 1161); Multiple pumps per animal (2); pump with agent inserted into right pocket, pump with PBS inserted into left pocket; bilateral infusion;

Q3650: B. Yegla, *et al.* EFFECTS OF SUSTAINED PRONGF BLOCKADE ON ATTENTIONAL CAPACITIES IN AGED RATS WITH COMPROMISED CHOLINERGIC SYSTEM. *Neuroscience* 2014;261(1):118-132

Agents: Antibody, pro-nerve growth factor **Vehicle:** PBS; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Wistar, 23 months old); ALZET brain infusion kit used; good methods (cannula placement pg.124, fig.2); post op. care (triple antibiotic cream on wound; Baytril injected; buprenorphine); behavioral testing (sustained attention task, performance measures); Cannula placement verified via Nissl staining; used dental cement and bone screws; pumps and cannula removed after 4 weeks;

Q3207: T. Tomioka, *et al.* LIM Homeobox 8 (Lhx8) Is a Key Regulator of the Cholinergic Neuronal Function via a Tropomyosin Receptor Kinase A (TrkA)-mediated Positive Feedback Loop. *Journal of Biological Chemistry* 2014;289(2):1000-1010

Agents: Nerve growth factor, murine **Vehicle:** PBS; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2001; **Duration:** 2 weeks;

ALZET Comments: Control animals received mp w/ vehicle; animal info (adult, male, Sprague Dawley, 8 wks old); ALZET brain infusion kit 2 used

Q3742: M. Shaqura, *et al.* New insights into mechanisms of opioid inhibitory effects on capsaicin-induced TRPV1 activity during painful diabetic neuropathy. *Neuropharmacology* 2014;85(1):142-150

Agents: Nerve growth factor, beta; albumin, rat serum **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Control animals received mp w/ animal info (male, Wistar, STZ induced diabetes)

Q4739: J. C. M. Schlachetzki, *et al.* Intracerebroventricular Administration of Nerve Growth Factor Induces Gliogenesis in Sensory Ganglia, Dorsal Root, and within the Dorsal Root Entry Zone. *BioMed Research International* 2014;(1):U1-U9

Agents: Nerve growth factor, human recombinant **Vehicle:** Cytochrome C; CSF, artificial; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, Fischer 344 albino, 281.8 +/- 2g); used Plastics One cannula;

Q3749: P. A. Pereira, *et al.* Chronic alcohol consumption leads to neurochemical changes in the nucleus accumbens that are not fully reversed by withdrawal. *NEUROTOXICOLOGY AND TERATOLOGY* 2014;44(1):53-61

Agents: Nerve growth factor **Vehicle:** CSF, artificial; methylene blue; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2002; **Duration:** 12 days;

ALZET Comments: Control animals received mp w/ vehicle; animal info (male, Wistar); Lynch coil; PE60 tubing used; ALZET brain infusion kit used; "The cannulae were connected to methylene blue... filled Alzet osmotic minipumps... via sterile coiled polyethylene tubing... This tubing was filled with air-oil spacer at the pump end and with NGF." pg 54; pump functionality verified via residual volume