

**Recent References (2017-Present) on Spinal Cord Injury Research Using ALZET® Osmotic Pumps**

**Q10640:** J. L. Palacios, *et al.* Continuous Administration of Leuprolide Acetate Improves Urinary Function in Male Rats With Severe Thoracic Spinal Cord Injury. Life Sciences 2022;310(121113
**Agents:** Leuprolide acetate **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
**ALZET Comments:** Dose (10 µg/kg/day); 70 % ethanol used; animal info (Wistar male rats (250–350 g); Leuprolide acetate aka (LA); spinal cord injury; behavioral testing: (Micturition, hind-limb nociception and locomotor behaviors)Therapeutic indication (Urinary function);

**Q10627:** J. Ni, *et al.* Nerve growth factor-mediated Na(+) channel plasticity of bladder afferent neurons in mice with spinal cord injury. Life Sciences 2022;298(120524
**Agents:** Antibody, anti-NGF **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;
**ALZET Comments:** Dose (10 µg/kg/h); animal info (Female C57BL/6; 36 total; 8-10 weeks old; Weighed 18-22 g); spinal cord injury;

**Q10550:** Y. Ikeda, *et al.* Targeting Neurotrophin And Nitric Oxide Signaling To Treat Spinal Cord Injury And Associated Neurogenic Bladder Overactivity. Continence 2022;1(**Agents:** LM22B-10 **Vehicle:** DMSO; Saline; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 4 weeks;
**ALZET Comments:** Dose (5 mg/kg/day); 50% DMSO and 50% saline used; Controls received mp w/ vehicle; animal info (Female; Male; C57BL/6; 8-12 weeks old); LMB22B-10 is a TrkB/C selective agonist; spinal cord injury;

**Q10547:** S. M. Hosseini, *et al.* Suppressing CSPG/LAR/PTPsigma Axis Facilitates Neuronal Replacement and Synaptogenesis by Human Neural Precursor Grafts and Improves Recovery after Spinal Cord Injury. Journal of Neuroscience 2022;42(15):3096-3121
**Agents:** ILP; ISP **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** 6 weeks;
**ALZET Comments:** Dose (20 ug/d); Controls received mp w/ vehicle; animal info (Female; 250-300 g; 50 total); behavioral testing (BBB Open Field Locomotor Score; Grid-walking analysis; Assessment of pain response after SCI); peptides; spinal cord injury; Therapeutic indication (Neuronal replacement; Synaptic re-connectivity; Neurologic recovery;

**Q10384:** A. Geyik, *et al.* Effect of decorin protein administration on rat sciatic nerve injury: an experimental study. Neurological Research 2022;44(3):252-261
**Agents:** Decorin **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** 1004; **Duration:** Not Stated;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (24 total; Male; 12 weeks old; 350-400 g); behavioral testing (Open field maze test; Rotarod test); spinal cord injury;

**Q10563:** B. Cao, *et al.* Spinal Cord Retinoic Acid Receptor Signaling Gates Mechanical Hypersensitivity in Neuropathic Pain. Neuron 2022;110(24):4108-4124 e6
**Agents:** Ro41-5253 **Vehicle:** DMSO; **Route:** CSF/CNS (subarachnoid space); **Species:** Mice; **Pump:** 1007D; 1004; **Duration:** 7 days; 4 weeks;
**ALZET Comments:** Dose (1.25 ug/hr); animal info (P34-P42); Controls received mp w/ vehicle; catheter; spinal cord injury; behavioral testing (Open field test; Elevated plus maze; Y-maze test; Hargreaves test; Cold plantar assay; Formalin test; Von Frey withdrawal threshold test); pain (neuropathic)

**Q9843:** H. Zhang, *et al.* Sonic Hedgehog modulates the inflammatory response and improves functional recovery after spinal cord injury in a thoracic contusion-compression model. European Spine Journal 2021;30(6):1509-1520
**Agents:** recombinant mouse Shh (Sonic Hedgehog) **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 1007D; **Duration:** 7 days;
**ALZET Comments:** 0.9% NaCl used; Controls received mp w/ vehicle; animal info (female Wistar rats, 160 g); spinal cord injury;

**Q9919:** H. Yamanaka*, et al.* Aberrant Axo-Axonic Synaptic Reorganization in the Phosphorylated L1-CAM/Calcium Channel Subunit alpha2delta-1-Containing Central Terminals of Injured c-Fibers in the Spinal Cord of a Neuropathic Pain Model. eNeuro 2021;8(2):
**Agents:** Pregabalin **Vehicle:** Saline; **Route:** Saline; **Species:** Rat; **Pump:** 2001; **Duration:** 14 days;
**ALZET Comments:** Dose (30 or 300 ug/day); Controls received mp w/ vehicle; animal info (male Sprague Dawley rats, 200–250 g); spinal cord injury;

**Q9501:** I. K. Timotius*, et al.* Combination of Defined CatWalk Gait Parameters for Predictive Locomotion Recovery in Experimental Spinal Cord Injury Rat Models. eNeuro 2021;8(2):
**Agents:** Not stated **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (adult female Wistar rats, 220–250 g); behavioral testing (Open Field Test); spinal cord injury;

**Q10329:** N. Shahsavani*, et al.* Availability of neuregulin-1beta1 protects neurons in spinal cord injury and against glutamate toxicity through caspase dependent and independent mechanisms. Experimental Neurology 2021;345(113817
**Agents:** Neuregulin-1-beta-1 **Vehicle:** BSA; Saline; **Route:** CSF/CNS (subarachnoid space); **Species:** Rat; **Pump:** 1003D; 2001; **Duration:** 3 days; 7 days;
**ALZET Comments:** Dose: (1 µg/day); 0.1% BSA; 0.9% Saline vehicle used; Controls received mp w/ vehicle; animal info: adult female Sprague-Dawley (SD) rats (8–10 weeks, 250 g); Neuregulin-1beta 1 aka (Nrg-1β1); spinal cord injury; dependence;

**Q9454:** K. Sessler*, et al.* Spinal cord fractalkine (CX3CL1) signaling is critical for neuronal sensitization in experimental nonspecific, myofascial low back pain. Journal of Neurophysiology 2021;125(5):1598-1611
**Agents:** Fractalkine; Anti-fractalkine antibody **Vehicle:** CSF, artificial; **Route:** CSF/CNS (spinal cord); **Species:** Rat; **Pump:** 2002; **Duration:** 5 days;
**ALZET Comments:** Dose (20 or 200 ng/mL); Controls received mp w/ vehicle; animal info (Adult male Sprague-Dawley rats, 300-460 g); spinal cord injury;

**Q10645:** Y. Peng*, et al.* Administration of High-Dose Methylprednisolone Worsens Bone Loss after Acute Spinal Cord Injury in Rats. Neurotrauma Rep 2021;2(1):592-602
**Agents:** Methylprednisolone **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 24 hrs;
**ALZET Comments:** Dose (5.4 mg/kg/h); Controls received mp w/ vehicle; animal info (9 weeks old, Wistar rat); spinal cord injury;

**Q10632:** S. H. Oh*, et al.* Sec-O-Glucosylhamaudol Mitigates Inflammatory Processes and Autophagy Via p38/JNK MAPK Signaling in a Rat Neuropathic Pain Model. Korean Journal of Pain 2021;34(4):405-416
**Agents:** Sec-O-glucosylhamaudol **Vehicle:** DMSO; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1002; **Duration:** 2 weeks;
**ALZET Comments:** Dose (96 ug/day); Controls received mp w/ vehicle; 70% DMSO used; animal info (Male Sprague Dawley; Pathogen-free; 100-120 g); behavioral testing (Paw withdrawal threshold using von Frey filament; Naloxone challenge test);

**Q9393:** M. L. O'Reilly*, et al.* Pharmacological Inhibition of Soluble Tumor Necrosis Factor-Alpha Two Weeks after High Thoracic Spinal Cord Injury Does Not Affect Sympathetic Hyperreflexia. Journal of Neurotrauma 2021;38(15):2186-2191
**Agents:** XPro1595 **Vehicle:** Saline; **Route:** CSF/CNS (spinal cord); **Species:** Rat; **Pump:** 2006; **Duration:** 42 days;
**ALZET Comments:** Dose (60 ug/day); Controls received mp w/ vehicle; animal info (Adult, female Wistar rats, 225–250g);

**Q10620:** A. Nakano*, et al.* Intrathecal Infusion of Diosgenin during the Chronic Phase of Spinal Cord Injury Ameliorates Motor Function and Axonal Density. Neurochemical Journal 2021;15(4):454-461
**Agents:** Diosgenin **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intrathecal); **Species:** Mice; **Pump:** 1004; **Duration:** 56 days;
**ALZET Comments:** Dose: (0.1 µM)ethanol was 0.1% vehicle used Controls received mp w/ vehicle; animal info: Eight-week-old female ddY mice; post op. care: During and after surgery, the mice were placed on a heating pad to maintain their body temperature; behavioral testing: Climbing performance; spinal cord injury; mouse intrathecal catheter used; pumps replaced after 28 days

**Q10247:** R. Lu, *et al.* Astrocytic c-Jun N-terminal kinase-histone deacetylase-2 cascade contributes to glutamate transporter-1 decrease and mechanical allodynia following peripheral nerve injury in rats. Brain Research Bulletin 2021;175(213-223
**Agents:** MS-275; Suberoylanilide hydroxamic acid; SP600125; Etanercept; Minocycline **Vehicle:** DMSO; Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 10 days;
**ALZET Comments:** Dose: (1 µl/h) all drugs. The final concentrations of the drugs were as follows: MS-275: 20 ng/µl, SAHA: 500 ng/µl, SP600125: 5 µg/µl, etanercept: 5 ng/µl, minocycline:10 µg/µl; 5% DMSO vehicle used; Controls received mp w/ vehicle; animal info: Male Sprague-Dawley (SD) rats (220–250 g); behavioral testing: Pain behavior test; suberoylanilide hydroxamic acid aka (SAHA); SP600215 is a JNK inhibitor anthra; Etanercept is a neutralizing anti-TNF-alpha binding protein; Minocycline is a microglia inhibitor; spinal cord injury;

**Q10235:** Z. W. Li, *et al.* Blocking the EGFR/p38/NF-kappaB signaling pathway alleviates disruption of BSCB and subsequent inflammation after spinal cord injury. Neurochemistry International 2021;150(105190
**Agents:** PD168393 **Vehicle:** DMSO; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 14 days;
**ALZET Comments:** 5% DMSO vehicle used; Controls received mp w/ vehicle; animal info: Adult female Sprague-Dawley rats (weight 220–250 g); PD168393 (an EGFR inhibitor); spinal cord injury;

**Q9293:** I. Jakovcevski, *et al.* Impact of Depletion of Microglia/Macrophages on Regeneration after Spinal Cord Injury. Neuroscience 2021;459(129-141
**Agents:** Ganciclovir **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 28 days;
**ALZET Comments:** Dose (50 mg/ml); animal info (three-month-old female TK mice); spinal cord injury;

**Q10378:** O. Echeverria-Rodriguez, *et al.* Participation of angiotensin-(1-7) in exercise-induced analgesia in rats with neuropathic pain. Peptides 2021;146(170670
**Agents:** Angiotensin 1-7; A779 **Vehicle:** Water, deionized; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 14 days;
**ALZET Comments:** Dose (Ang 1-7 0.1 and 1 mg/kg; A779 24 ug/kg/h); animal info (Male; Weigh 120-150 g); behavioral testing (Swimming); peptides; spinal cord injury;

**Q9759:** Z. Ding, *et al.* Neuregulin-1 converts reactive astrocytes toward oligodendrocyte lineage cells via upregulating the PI3K-AKT-mTOR pathway to repair spinal cord injury. Biomedicine & Pharmacotherapy 2021;134(111168
**Agents:** Nrg1 **Vehicle:** Not stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** Not Stated;
**ALZET Comments:** Dose (0.3 ug/day); animal info (Female, 200-230 g); spinal cord injury;

**Q10371:** S. Chang, *et al.* The ROCK inhibitor Y-27632 ameliorates blood-spinal cord barrier disruption by reducing tight junction protein degradation via the MYPT1-MLC2 pathway after spinal cord injury in rats. Brain Research 2021;1773(147684
**Agents:** Y-27632 **Vehicle:** PBS; **Route:** Not Stated; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
**ALZET Comments:** Dose (20 mM/200 uL); Controls received mp w/ vehicle; animal info (Male; Weigh 280-320 g; 11 weeks old); spinal cord injury;

**Q10122:** A. S. Brown, *et al.* Intrauterine Growth Restriction Causes Abnormal Embryonic Dentate Gyrus Neurogenesis in Mouse Offspring That Leads to Adult Learning and Memory Deficits. eNeuro 2021;8(5):
**Agents:** U-46 619 **Vehicle:** Ethanol; **Route:** Not Stated; **Species:** Mice; **Pump:** 1007D; **Duration:** Not Stated;
**ALZET Comments:** Dose: (4000 ng/ml); 0.5% ethanol vehicle used; Controls received mp w/ vehicle; animal info: wild-type C57BL/6J mice; U-46619 is a thromboxane A2-analog; spinal cord injury;

**Q10113:** P. Bonilla, *et al.* Human-Induced Neural and Mesenchymal Stem Cell Therapy Combined with a Curcumin Nanoconjugate as a Spinal Cord Injury Treatment. International Journal of Molecular Sciences 2021;22(11):
**Agents:** Polyacetal-curcumin nanoconjugate **Vehicle:** Saline; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1007D; **Duration:** 7 days;
**ALZET Comments:** Saline 0.9% vehicle used; Controls received mp w/ vehicle; animal info: Female Sprague–Dawley weighing 300g; post op. care: buprenorphine; behavioral testing: open-field BBB locomotor scale and video-based system for automated gait analysis; PA-C aka polyacetal-curcumin nonconjugate; spinal cord injury

**Q9822:** Z. Zhou, *et al.* miR-384-5p promotes spinal cord injury recovery in rats through suppressing of autophagy and endoplasmic reticulum stress. Neuroscience Letters 2020;727(134937
**Agents:** miR-384-5p Agomir **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 days;
**ALZET Comments:** Dose (14 nmol); animal info (Seven to eight week-old female Sprague-Dawley rats); post op. care (cefazolin); spinal cord injury;

**Q9130:** W. Zhong, *et al.* Blockade of peripheral nociceptive signal input relieves the formation of spinal central sensitization and retains morphine efficacy in a neuropathic pain rat model. Neuroscience Letters 2020;716(134643
**Agents:** Ropivacaine **Vehicle:** Saline; **Route:** CSF/CNS (sciatic nerve); **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;
**ALZET Comments:** Dose (10 µl/hour); 0.9% NaCl used; animal info (male Sprague-Dawley rats, 200–250 g, aged 6–8 weeks); spinal cord injury;

**Q9885:** A. Younsi, *et al.* Treadmill training improves survival and differentiation of transplanted neural precursor cells after cervical spinal cord injury. Stem Cell Research 2020;45(101812
**Agents:** Platelet-derived growth factor, human recombinant; Epidermal Growth Factor; Basic fibroblast growth factor, recombinant human; **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 1007D; **Duration:** 7 days;
**ALZET Comments:** Dose (1 ug/100uL Platelet-derived growth factor, human recombinant; 3 ug/100uLEpidermal Growth Factor; 3 ug/100mL Basic fibroblast growth factor, recombinant human); Controls received mp w/ vehicle; animal info (female Wistar rats, 250 g); behavioral testing (Basso-Beattie- Bresnahan locomotor rating scale); Platelet-derived growth factor, human recombinant aka PDGF-AA; Epidermal Growth Factor aka EGF; Basic fibroblast growth factor, recombinant human aka bFGF; spinal cord injury;

**Q9884:** A. Younsi, *et al.* Three Growth Factors Induce Proliferation and Differentiation of Neural Precursor Cells In Vitro and Support Cell-Transplantation after Spinal Cord Injury In Vivo. Stem Cells International 2020;2020(5674921
**Agents:** Platelet-derived growth factor, human recombinant; Epidermal Growth Factor; Basic fibroblast growth factor, recombinant human; **Vehicle:** Not Stated; **Route:** CSF/CNS (spinal cord); **Species:** Rat; **Pump:** Not Stated; **Duration:** 10.1155/2020/5674921;
**ALZET Comments:** Dose (1 ug/ml Platelet-derived growth factor, human recombinant; 30 ug/ml Epidermal Growth Factor; 30 ug/ml Basic fibroblast growth factor, recombinant human); Controls received mp w/ vehicle; animal info (female Wistar rats (250 g); Platelet-derived growth factor, human recombinant aka PDGF-AA; Epidermal Growth Factor aka EGF; Basic fibroblast growth factor, recombinant human aka bFGF; spinal cord injury;

**Q9538:** X. Wang, *et al.* Nogo receptor decoy promotes recovery and corticospinal growth in non-human primate spinal cord injury. Brain 2020;143(6):1697-1713
**Agents:** NgR1(310)–Fc **Vehicle:** Not Stated; **Route:** CSF/CNS (spinal cord); **Species:** Monkey; **Pump:** 2ML4; **Duration:** 4 months;
**ALZET Comments:** Dose (0.10-0.17 mg/kg/day); Controls received mp w/ vehicle; animal info (Adult African green monkeys (vervets, female, baseline body weight 4.2–7.2 kg)); pumps replaced every month; long-term study; NgR1(310)–Fc aka Nogo receptor decoy protein; spinal cord injury;

**Q9498:** Y. Tanie, *et al.* GRP78-Mediated Signaling Contributes to Axonal Growth Resulting in Motor Function Recovery in Spinal Cord-Injured Mice. Frontiers in Pharmacology 2020;11(789
**Agents:** Neuroleukin; GRP78; Immunoglobulin **Vehicle:** CSF, artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1004; **Duration:** 21 days;
**ALZET Comments:** Dose (100 mg/ml); Controls received mp w/ vehicle; animal info (Eight-week-old female ddY mice); Immunoglobulin aka IgG, GRP78 aka 78-kDa glucose regulated protein; ALZET brain infusion kit 3 used; Brain coordinates (bregma −0.22 mm, lateral to the left +1 mm and −2.5 mm depth); spinal cord injury;



**Q9482:** P. Song, *et al.* The role of hepatocyte growth factor in mesenchymal stem cell-induced recovery in spinal cord injured rats. Stem Cell Research & Therapy 2020;11(1):178
**Agents:** Bone marrow conditioned medium; **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 1007D; **Duration:** 1 week;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (Adult (6–8 weeks) female Wistar rats (weight, 200 to 250 g)); behavioral testing (Open Field Test); Bone marrow conditioned medium aka BMSC; spinal cord injury;

**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 **Vehicle:** Not stated; **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;

**Q8916:** R. L. O'Hare Doig, *et al.* Acute Cellular and Functional Changes With a Combinatorial Treatment of Ion Channel Inhibitors Following Spinal Cord Injury. Frontiers in Molecular Neuroscience 2020;13(85
**Agents:** Lomerizine; YM872; oxATP **Vehicle:** PBS; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
**ALZET Comments:** Dose (); Controls received mp w/ vehicle; animal info (Female Fischer rats, 150-200 g, 12-15 weeks old); post op. care (Buprenorphine); behavioral testing (open field locomotion assessment); Lomerizine aka Lom; ALZET brain infusion kit 3 used; spinal cord injury;

**Q8633:** X. Li, *et al.* Exercise training modulates glutamic acid decarboxylase-65/67 expression through TrkB signaling to ameliorate neuropathic pain in rats with spinal cord injury. Molecular Pain 2020;16(1744806920924511
**Agents:** Immunoglobulin G, TrkB **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;
**ALZET Comments:** Animal info (adult female Sprague–Dawley rats); behavioral testing (Mechanical withdrawal thresholds assessment); TrkB Immunoglobulin G aka TrkB-IgG; spinal cord injury;

**Q8644:** J. Li, *et al.* Prolonged Use of NMDAR Antagonist Develops Analgesic Tolerance in Neuropathic Pain via Nitric Oxide Reduction-Induced GABAergic Disinhibition. Neurotherapeutics 2020;17(3):1016-1030
**Agents:** MK801; TrkB-Fc **Vehicle:** Saline; **Route:** CSF/CNS (Intrathecal); **Species:** Mice; Rat; **Pump:** 1004; 2ML4; **Duration:** 11 days;
**ALZET Comments:** Dose (5 ug/day MK801; 0.2 ug/day TrkB-Fc); Controls received mp w/ vehicle; animal info (Adult male Sprague-Dawley rats, 250-300 g; Adult male mice, 6 to 7 weeks old); behavioral testing (Mechanical Nociception Assays; Themal Nociceptioin Assays); MK801 aka N-methyl-D-aspartate receptor antagonist; spinal cord injury;

**Q10003:** J. M. Kwiecien, *et al.* Neurologica and Histologic Tests Used to Measure Neuroprotective Effectiveness of Virus-Derived Immune-Modulating Proteins. Methods in Molecular Biology 2020;
**Agents:** Serp-1 **Vehicle:** Not stated; **Route:** IP; **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;
**ALZET Comments:** Dose (0.2 mg/rat); animal info (male Long-Evans rats, 16 weeks old, 370-420 g); behavioral testing (Locomotor test; Toe-pinch withdrawal test); spinal cord injury;

**Q8617:** J. M. Kwiecien, *et al.* Neuroprotective Effect of Subdural Infusion of Serp-1 in Spinal Cord Trauma. Biomedicines 2020;8(10):
**Agents:** Serp-1 **Vehicle:** Saline; **Route:** CSF/CNS (spinal cord); **Species:** Rat; **Pump:** 2ML1; 2ML4; **Duration:** 7 days; 14 days; 28 days; 56 days;
**ALZET Comments:** Dose (0.008 mg, 0.04, mg, 0.2 mg, 0.2 mg/week,); dose-response (p. 3); animal info (male, 16 weeks old Long Evan rats, 370-410 g); spinal cord injury;

**Q10009:** T. Kikuchi, *et al.* Recovery of motor function of chronic spinal cord injury by extracellular pyruvate kinase isoform M2 and the underlying mechanism. Scientific Reports 2020;10(1):19475
**Agents:** Pyruvate Kinase Isoform M2; CB-5083 **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1004; **Duration:** 28 days;
**ALZET Comments:** Dose (1 ng/ml Pyruvate Kinase Isoform M2; 100 nM CB-5083); Controls received mp w/ vehicle; animal info (eight-week-old female ddY mice); behavioral testing (Basso Mouse Scale, Toyama Mouse Score, vertical cage test); Pyruvate Kinase Isoform M2 aka PKM2; CB-5083 aka valosin-containing protein inhibitor; ALZET brain infusion kit 3 used; Brain coordinates (bregma−0.22 mm, lateral to the lef+1 mm and −2.5 mm depth); spinal cord injury;

**Q10025:** S. Ilari, *et al.* Natural Antioxidant Control of Neuropathic Pain-Exploring the Role of Mitochondrial SIRT3 Pathway. Antioxidants (Basel) 2020;9(11):
**Agents:** Bergamot Polyphenolic fraction; Pregabalin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Duration:** 21 days;
**ALZET Comments:** Dose (25, 50, 75 mg/kg Bergamot Polyphenolic fraction; 10 mg/kg Pregabalin); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (8 week old male Sprague Dawley rats, 225-250 g); behavioral testing (Mechanical allodynia, Mechanical hyperalgesia, Thermal hyperalgesia); Bergamot Polyphenolic fraction aka BPF; spinal cord injury;

**Q8526:** K. Hamamura, *et al.* Behavioral Effects of Continuously Administered Bergamot Essential Oil on Mice With Partial Sciatic Nerve Ligation. Frontiers in Pharmacology 2020;11(1310
**Agents:** Naloxone HCl **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 1 week;
**ALZET Comments:** Dose (1 mg/100 uL); 0.9% NaCl used; animal info (four-week-old male ddY-strain mice, 24 g); behavioral testing (double activity monitoring system; Von Frey Test); spinal cord injury;

**Q9186:** Y. Cheong, *et al.* Effect of two-week continuous epidural administration of 2% lidocaine on mechanical allodynia induced by spinal nerve ligation in rats. Anesthesia & Pain Medicine 2020;15(3):334-343
**Agents:** Lidocaine **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML1; **Duration:** 14 days;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats, 200-250 g); behavioral testing (Von Frey test; Motor function assessment); spinal cord injury; Therapeutic indication (neuropathic disorders);

**Q7641:** P. Yan, *et al.* A Causal Relationship in Spinal Cord Injury Rat Model Between Microglia Activation and EGFR/MAPK Detected by Overexpression of MicroRNA-325-3p. J Mol Neurosci 2019;68(2):181-190
**Agents:** agomir-325-3p **Vehicle:** Saline; **Route:** CSF/CNS (spinal cord); **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days;
**ALZET Comments:** Dose (60 nmol/mL at 1 µL/h); Controls received mp w/ vehicle; animal info (male, Sprague-Dawley, 225-260g); post op. care (IM injection of 30,000-U penicillin twice/day, manual urination and defecation 1–2 times/day); behavioral testing (BBB scale); agomir-325-3p is an oligonucleotide based on miR-325-3p mimics with more stable expressions of miR-325-3p; spinal cord injury; agomir-325-3p sequence is 5′-UACAG GUUAGAUUAUGUACU-3′; Therapeutic indication ("overexpression of miR-325-3p inhibited microglial activation and the release of inflammatory cytokines by inhibition of EGFR/MAPK signaling to alleviate the secondary injury after SCI." p189);

**Q7660:** M. P. Schneider, *et al.* Anti-Nogo-A Antibodies As a Potential Causal Therapy for Lower Urinary Tract Dysfunction after Spinal Cord Injury. J Neurosci 2019;39(21):4066-4076
**Agents:** Antibody, anti-Nogo-A **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2ML2; **Duration:** 14 days;
**ALZET Comments:** Dose (5 µl/h, 3 mg of antibody/ml); Controls received mp w/ inactive control antibody; animal info (4+/-1 months, female, Lewis, 210+/-20g); spinal cord injury; Pump and catheter were removed 15–16 d after implantation under 5% isoflurane; Therapeutic indication (reduction of the impairment of several key urodynamic functions such as recovery of the physiological EUS function during voiding after induced SCI);

**Q8359:** K. Pajer, *et al.* Neuroectodermal Stem Cells Grafted into the Injured Spinal Cord Induce Both Axonal Regeneration and Morphological Restoration via Multiple Mechanisms. J Neurotrauma 2019;36(21):2977-2990
**Agents:** Function-blocking antibodies against GDNF, IL-6, MIP-Ia, IL-10; **Route:** SC; **Species:** Rat; **Pump:** 1002; **Duration:** 2 weeks;
**ALZET Comments:** animal info (Sprague Dawley, Female, 180-220 g); behavioral testing (Catwalk Analysis); spinal cord injury;

**Q8292:** H. Nakagawa*, et al.* Treatment With the Neutralizing Antibody Against Repulsive Guidance Molecule-a Promotes Recovery From Impaired Manual Dexterity in a Primate Model of Spinal Cord Injury. Cereb Cortex 2019;29(2):561-572
**Agents:** Angti-RGMa antibody **Vehicle:** Saline; **Route:** CNS/CSF; **Species:** Monkey; **Pump:** 2ML4; **Duration:** 4 weeks;
**ALZET Comments:** Dose (50 ug/kg/day); animal info (Rhesus, 3-5 years old, 2.8-5.4 kg); spinal cord injury;

**Q7560:** K. P. Melo*, et al.* Mild Exercise Differently Affects Proteostasis and Oxidative Stress on Motor Areas During Neurodegeneration: A Comparative Study of Three Treadmill Running Protocols. Neurotox Res 2019;35(2):410-420
**Agents:** Rotenone **Vehicle:** DMSO, Polyethylene glycol; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks; 8 weeks;
**ALZET Comments:** Dose (1 mg/kg/day); 50% DMSO:50% PEG used; Controls received mp w/ vehicle; animal info (Male, Lewis, 8 or 9 months old); pumps replaced every 4 weeks; spinal cord injury; neurodegenerative (Motorcortex);

**Q7679:** P. Liu*, et al.* Inhibitory effect of hyaluronidase-4 in a rat spinal cord hemisection model. Cancer Translational Medicine 2019;5(1):10-16
**Agents:** Antibody, anti-Hyal-4; IgG **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1004; **Duration:** 4 weeks;
**ALZET Comments:** animal info (Female Sprague–Dawley (SD) rats); spinal cord injury;

**Q8234:** A. F. Kullmann*, et al.* Acute spinal cord injury is associated with mitochondrial dysfunction in mouse urothelium. Neurourol Urodyn 2019;38(6):1551-1559
**Agents:** MitoTempo **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 3 days;
**ALZET Comments:** Dose (1 mg/kg/day); 0.9% Saline used; animal info (Female, C57BL/6, 15-20 g, 5-8 weeks old); MitoTempo aka mitochondrially targeted antioxidant ; spinal cord injury;

**Q8006:** M. J. Gerald*, et al.* Continuous infusion of an agonist of the tumor necrosis factor receptor 2 in the spinal cord improves recovery after traumatic contusive injury. CNS Neurosci Ther 2019;25(8):884-893
**Agents:** EHD2-sc-mTNFR2; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 1004, 1002, 1003D; **Duration:** 28 days, 14 days, or 3 days;
**ALZET Comments:** Dose (10 mg/ml- 28 days, 4.4 mg/ml-14 days, 1.1 mg/ml-3 days); animal info (Adult, Female, C57Bl/6, 3 months old); post op. care (buprenorphine); Agonisitic specific for TNFR2 aka EHD2-sc-mTNFR2 ; ALZET brain infusion kit 3 used; bilateral cannula used; spinal cord injury;

**Q7472:** K. Farrell*, et al.* Systemic Inhibition of Soluble Tumor Necrosis Factor with XPro1595 Exacerbates a Post-Spinal Cord Injury Depressive Phenotype in Female Rats. J Neurotrauma 2019;
**Agents:** XPro1595 **Vehicle:** Saline; **Route:** CSF/CNS (left lateral ventricle); **Species:** Rat; **Pump:** 2004; **Duration:** 28 days;
**ALZET Comments:** Dose (10 mg/kg); Controls received mp w/ vehicle; animal info (Female, Sprague Dawley, 223-250 g); post op. care (); behavioral testing (Sucrose Preference, Novel Object Recognition, Open Field, Social Exploration, Modified forced swim test, Basso Beattie Bresnahan open field, Automated von Frey, Hargreaves' Thermal Testing, ); ALZET brain infusion kit 2 used; Brain coordinates (AP: -1.0 ML, +2.0, DV: -4.0- to -3.5); bilateral cannula used; cyanoacrylate adhesive; spinal cord injury;

**Q7987:** S. Dyck*, et al.* LAR and PTPsigma receptors are negative regulators of oligodendrogenesis and oligodendrocyte integrity in spinal cord injury. Glia 2019;67(1):125-145
**Agents:** peptide, intracellular LAR; peptide, intracellular sigma **Vehicle:** saline, BSA buffered; **Route:** CSF/CNS (intrathecal);
**Species:** Rat; **Pump:** 2001D, 1003D, 2001, 2002, and 2004; **Duration:** 1, 3, 5, 7, 14, 28 days;
**ALZET Comments:** Dose ((ILP 10 µg/day), (ISP 10 µg/day)); 0.1% BSA in saline used; Controls received mp w/ vehicle; animal info (female, SD, 250g); ILP (NH2-GRKKRRQRRRCDLADNIERLKANDGLKFSQEYESI-NH2) and ISP (NH2-GRKKRRQRRRCDMAEHMERLKANDSLKLSQEYESI-NH2) are peptides against LAR and PTPsigma; peptides; spinal cord injury; Therapeutic indication (inhibition of PTPsigma and LAR receptors promotes oligodendrogenesis by endogenous precursor cells, attenuates caspase 3-mediated cell death in mature oligodendrocytes, and preserves myelin);

**Q7270:** L. S. Almeida*, et al.* Amylin, a peptide expressed by nociceptors, modulates chronic neuropathic pain. Eur J Pain 2019;23(4):784-799
**Agents:** Amylin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;
**ALZET Comments:** Dose (2 ug/kg/hr); Controls received mp w/ vehicle; animal info (male Wistar rats, 175 and 225 g); behavioral testing (von Frey, pinprick and acetone tests); spinal cord injury;

**Q7542:** Q. Wu, *et al.* Human menstrual blood-derived stem cells promote functional recovery in a rat spinal cord hemisection model. Cell Death & Disease 2018;9(9):882
**Agents:** TrKB-IgG; immunoglobulin G, human **Vehicle:** PBS; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2002; **Duration:** 4 weeks;
**ALZET Comments:** Dose (3 µg/day); Controls received mp w/ vehicle; animal info (adult, female, Sprague-Dawley, 220-250g); behavioral testing (BBB locomotion scale); pumps replaced at 3 weeks; enzyme inhibitor (BDNF-TrkB signaling); spinal cord injury;

**Q8773:** Z. Q. Wang, *et al.* Overexpression of Neuregulin-1 (NRG-1) Gene Contributes to Surgical Repair of Brachial Plexus Injury After Contralateral C7 Nerve Root Transfer in Rats. Medical Science Monitor 2018;24(5779-5787
**Agents:** Plasmid; Recombinant Neuregulin-1; Lipofectamine 2000 **Vehicle:** PBS; **Route:** CSF/CNS (spinal cord); **Species:** Rat; **Pump:** 2004; **Duration:** 4 weeks;
**ALZET Comments:** Dose ((plasmid 5 µg), (Lipofectamine 15 uL)); Controls received sham surgery and mp w/ blank plasmid and vehicle; animal info (male, Sprague-Dawley, 160-180g); post op. care (bladders were pressed for urination every morning and every night until the rats recovered automatic urination.); NRG-1 plays a basic role in developing the peripheral nervous system and in nerve repair. Lipofectamine is a transfection reagent; spinal cord injury; gene therapy; plasmids mixed with Lipofectamine at a 1:3 ratio. pcDNA4/myc/A-NRG-1 plasmid constructed to overexpress NRG-1 protein; Therapeutic indication (NRG-1 promotes the recovery of nerve function in brachial plexus injury after contralateral C7 nerve root transfer in a rat model,);

**Q7243:** N. Tanabe, *et al.* Matrine Directly Activates Extracellular Heat Shock Protein 90, Resulting in Axonal Growth and Functional Recovery in Spinal Cord Injured-Mice. Front Pharmacol 2018;9(446
**Agents:** Anti-HSP90a/b monoclonal antibody, mouse IgG **Vehicle:** CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Pump:** 1004; **Duration:** 14 days;
**ALZET Comments:** Dose (164 ng/mL-HSP90, IgG); aCSF: 148.3mM NaCl, 3mM KCl, 1.4mM CaCl2, 0.8mM MgCl2, 0.75mMNa2HPO4, and 0.195mMNaH2PO4 used; animal info (8 weeks old, 28-33 g, female, ddY); weeks old, 28-33 g, female, ddY); ALZET brain infusion kit 3 used; Brain coordinates (anteroposterior: −0.22mm, mediolateral: +1mm, dorsoventricular:−2.5mm); bilateral cannula used; cyanoacrylate adhesive; spinal cord injury;

**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;

**Q7264:** C. Rivat, *et al.* Inhibition of neuronal FLT3 receptor tyrosine kinase alleviates peripheral neuropathic pain in mice. Nat Commun 2018;9(1):1042
**Agents:** RNA, small interfering (Flt3, scrambled) **Vehicle:** Not Stated; **Route:** CSF/CNS(Intrathecal); **Species:** Mice; **Pump:** 1002; **Duration:** 6 days;
**ALZET Comments:** Dose (12.53 ng/ml); animal info (C57BL/6 naive mice, Flt3KO mice 25–30 g.); behavioral testing (reflexive tail flick); spinal cord injury; stress/adverse reaction: (see pg. 10);

**Q7263:** L. Riemann, *et al.* Transplantation of Neural Precursor Cells Attenuates Chronic Immune Environment in Cervical Spinal Cord Injury. Front Neurol 2018;9(428
**Agents:** Platelet-Derived Growth Factor, Epidermal Growth Factor, Basic Fibroblast Growth Factor **Vehicle:** Platelet-Derived Growth Factor, Epidermal Growth Factor, Basic Fibroblast Growth Factor; **Route:** CSF/CNS(Intrathecal); **Species:** Rat; **Pump:** 1007D; **Duration:** 7 days;
**ALZET Comments:** Dose (PDGF-AA, 1 µg/100 µL; EGF, 3 µg/100 µL; bFGF, 3 µg/100mL;); 0.1% rat serum albumin used; animal info (female Wistar rats 250 g;); post op. care (moxifloxacin, buprenorphine); spinal cord injury;



**Q8765:** G. Osterstock, *et al.* Axoglial synapses are formed onto pioneer oligodendrocyte precursor cells at the onset of spinal cord gliogenesis. Glia 2018;66(8):1678-1694
**Agents:** Nicotine **Vehicle:** Saline; **Route:** SC; **Species:** Not Stated; **Pump:** Not Stated; **Duration:** Not Stated;
**ALZET Comments:** Dose (10 mg/day/kg); 0.9% Saline used; Controls received mp w/ vehicle; animal info (8-12 weeks old, C57BL/6); spinal cord injury;

**Q7205:** L. Madaro, *et al.* Denervation-activated STAT3-IL-6 signalling in fibro-adipogenic progenitors promotes myofibres atrophy and fibrosis. Nat Cell Biol 2018;20(8):917-927
**Agents:** Interleukin-6 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 15 days;
**ALZET Comments:** Dose (1.0 mg/ml); Dose (1.0 mg/ml); Interleukin-6 aka IL-6; spinal cord injury;

**Q7202:** W. Liu, *et al.* Dextran-based biodegradable nanoparticles: an alternative and convenient strategy for treatment of traumatic spinal cord injury. Int J Nanomedicine 2018;13(4121-4132
**Agents:** Taxol **Vehicle:** Cremophor EL; **Route:** CSF/CNS (Intrathecal); **Species:** Rat; **Pump:** 2004; **Duration:** 7 days;
**ALZET Comments:** Dose (256 ng/day); animal info (Sprague Dawley rats); behavioral testing (Locomotor capacity, BBB open field 21 point scale); ALZET rat intrathecal catheter used; spinal cord injury; stress/adverse reaction: (see pg. 4130 );

**Q7216:** G. Li, *et al.* MiR-103 alleviates autophagy and apoptosis by regulating SOX2 in LPS-injured PC12 cells and SCI rats. Iran J Basic Med Sci 2018;21(3):292-300
**Agents:** miR-103 agomir **Vehicle:** Saline; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1003D; **Duration:** 3 days;
**ALZET Comments:** Dose (1 ul/hr/day); Controls received mp w/ vehicle; animal info (Male, Sprague-Dawley, 180-220 g); post op. care (Penicillin G); spinal cord injury;

**Q7892:** K. Kanekiyo, *et al.* Effects of Intrathecal Injection of the Conditioned Medium from Bone Marrow Stromal Cells on Spinal Cord Injury in Rats. J Neurotrauma 2018;35(3):521-532
**Agents:** Bone marrow Stromal Cells **Vehicle:** Saline; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** Not Stated;
**Duration:** 2 weeks;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (Sprague Dawley, Female, 8 week old); Bone marrow stromal cells aka BMSCs; Brain coordinates (3mm caudal to bregma and 2mm to the left of midline); bilateral cannula used; spinal cord injury;

**Q7813:** T. Fuhrmann, *et al.* Combined delivery of chondroitinase ABC and human induced pluripotent stem cell-derived neuroepithelial cells promote tissue repair in an animal model of spinal cord injury. Biomedical Research 2018;13(2):024103
**Agents:** Cyclosporin A **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML1; 2ML4; **Duration:** 2 weeks; 8 weeks;
**ALZET Comments:** Dose (10 mg/kg/day); animal info (female, Sprague-Dawley, 300g); post op. care (Buprenorphine (0.05 mg/kg) every 12 h for 48 h); behavioral testing (BBB locomotor rating scale, ladder walk test); pumps replaced every 4 weeks; spinal cord injury; mp used to deliver cyclosporin A to aid transplant survival, implanted one day prior to cell transplantation.;

**Q7131:** S. Dyck, *et al.* Perturbing chondroitin sulfate proteoglycan signaling through LAR and PTPsigma receptors promotes a beneficial inflammatory response following spinal cord injury. J Neuroinflammation 2018;15(1):90
**Agents:** Intracellular leukocyte common antigen-related peptide (ILP), Intracellular sigma peptide (ISP), TAT- conjugated peptides **Vehicle:** Saline; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 2001D, 1003D, 2001, 2002, 2004; **Duration:** 1, 3, 5, 7, or 14 days;
**ALZET Comments:** Dose (10 ug/day); Controls received mp w/ vehicle; animal info (Sprague-Dawley, adult, female, 250 g); animal info (Sprague-Dawley, adult, female, 250 g); spinal cord injury;

**Q9467:** Methods for Assessing Serpins as Neuroprotective Therapeutics. Methods in Molecular Biology 2018;
**Agents:** Dexamethasone **Vehicle:** Saline; **Route:** CSF/CNS (Intrathecal); **Species:** Rat; **Pump:** 2ML4, 2ML2, 2ML1; **Duration:** 2 weeks;
**ALZET Comments:** Dose (2.5-10 mL/h); animal info (Long Evans, Male, 16 week old rat, 370-420 g); spinal cord injury;

**Q10078:** A. Alizadeh*, et al.* Neuregulin-1 elicits a regulatory immune response following traumatic spinal cord injury. Journal of Neuroinflammation 2018;15(1):53
**Agents:** Neregulin-1 **Vehicle:** Bovine serum albumin, BSA in saline; **Route:** SC; **Species:** Rat; **Pump:** 1003D; 2001; 2002; 2006; **Duration:** 3 days; 7 days; 14 days; 42 days;
**ALZET Comments:** Dose (2ug/day); 0.1% bovine serum albumin, BSA, in 0.9% saline used; 2 sets of controls. 1 uninjured no pumps, 2 SCI injury received mp w/ vehicle; animal info (female, 8-10weeks, 250g Sprague-Dawley); post op. care (buprenorphine 0.05mg/kg; meloxicam 2mg/kg, 3 additional doses buprenorphine every 8h); Neuregulin-1 aka Nrg-1 aka rhNrg-1β1; delayed delivery (30min after SCI); spinal cord injury; immunology; We provide the first evidence of a significant regulatory role for Nrg-1 in neuroinflammation after SCI. Establishes the promise of systemic Nrg-1 treatment as a candidate immunotherapy for traumatic SCI and other CNS neuroinflammatory conditions.; Therapeutic indication (neuroinflammatory conditions);

**Q7097:** A. Alastrue-Agudo*, et al.* FM19G11 and Ependymal Progenitor/Stem Cell Combinatory Treatment Enhances Neuronal Preservation and Oligodendrogenesis after Severe Spinal Cord Injury. Int J Mol Sci 2018;19(1):
**Agents:** FM19G11 **Vehicle:** DMSO; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1007D; **Duration:** 3 days;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (2-month-old Sprague Dawley rats weighing ~200 g); FM19G11 is an inhibitor of Hypoxia inducible factor-alpha protein expression; spinal cord injury;