



## Recent References (2018-Present) on the Administration of Chemotherapeutic Agents Using ALZET® Osmotic Pumps

This is a truncated list. A list of all Chemotherapeutic Agents administered using ALZET Osmotic Pumps can be found [here](#).

### Angiostatin

**Q12658:** K. Shimizu, *et al.* Anti-angiogenic activity of a novel angiostatin-like plasminogen fragment produced by a bacterial metalloproteinase. *Heliyon* 2024;10(15):e35232

**Agents:** Angiostatin, BL- **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** CAnN.Cg-Foxn/CrCrJ nude; **Pump:** 1002; **Duration:** 70 days;

**ALZET Comments:** Dose (3 mg/kg/day); controls received mp w/ vehicle; animal info (female); pumps replaced every 2 weeks; peptides;

### Ara-C

**Q8905:** H. S. Nam, *et al.* Lrig1 expression prospectively identifies stem cells in the ventricular-subventricular zone that are neurogenic throughout adult life. *Neural Development* 2020;15(1):3

**Agents:** Ara-C **Vehicle:** CSF, artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** Not Stated; **Duration:** 6 days;

**ALZET Comments:** 2% Artificial CSF used; immunology;

**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 bregma); gene therapy;

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

**Agents:** Ara-C **Vehicle:** Serum, Physiological; **Route:** CSF/CNS (lateral ventricle); **Species:** Sheep; **Pump:** 2ML4; **Duration:** 4 weeks;

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

**Q7174:** M. Batailler, *et al.* Pineal-dependent increase of hypothalamic neurogenesis contributes to the timing of seasonal reproduction in sheep. *Sci Rep* 2018;8(1):6188

**Agents:** Ara-C **Vehicle:** Not Stated; **Route:** CSF/CNS (third ventricle); **Species:** Sheep; **Pump:** 2ML4; **Duration:** 4 Weeks;

**ALZET Comments:** Dose (500ug/day); animal info (Ewes, 58.8 ± 4.5 kg, 59.4 ± 4 kg); Ara-C aka cytosine-b-D-arabinofuranoside; Ara-C aka cytosine-b-D-arabinofuranoside;

### Bevacizumab

**Q11924:** M. Sun, *et al.* Treatment with the vascular endothelial growth factor-A antibody, bevacizumab, has sex-specific effects in a rat model of mild traumatic brain injury. *Journal of Cerebral Blood Flow & Metabolism* 2024;44(4):542-555

**Agents:** Bevacizumab **Vehicle:** CSF, artificial; BSA; **Route:** CSF/CNS (lateral ventricle); **Species:** Rats; **Strain:** Sprague-Dawley; **Pump:** 2002; **Duration:** 11 days;

**ALZET Comments:** Dose: (10 mg/kg) BSA (1 mg/mL) used; controls received mp w/ vehicle; animal info (10 weeks old male, female); post op. care (buprenorphine, 0.05 mg/kg); ALZET brain infusion kit 2 used; brain coordinates (bregma: posterior 0.2 mm, lateral 1.6 mm and at 4.5 mm depth from skull surface); dental cement used; behavioral testing (beam; water maze; open field test); neurodegenerative (traumatic brain injury);



**R0378:** B. Halle, *et al.* Convection-enhanced Drug Delivery for Glioblastoma: A Systematic Review Focused on Methodological Differences in the Use of the Convection-enhanced Delivery Method. *Asian-Australasian Journal of Animal Sciences* 2019;14(1):5-14

**Agents:** Etoposide, Bevacizumab, IMCA12, Interleukin-13-PE38, Tetrakis Chlorin **Vehicle:** Not Stated; **Route:** CSF/CNS (intratumoral); **Species:** Mice, Rat; **Pump:** 2001D, 1003D, 1007D, 1004, 2004; **Duration:** 24 hours, 3, 7, 21, 28 days; **ALZET Comments:** ALZET brain infusion kit 1,2, and 3 used; cancer (Glioblastoma);

**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 $\alpha$ /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.

**Q7219:** Y. X. Liu, *et al.* Delivery of bevacizumab by intracranial injection: assessment in glioma model. *Onco Targets Ther* 2018;11(2673-2683)

**Agents:** Bevacizumab **Vehicle:** PBS; **Route:** CSF/CNS (intratumoral); **Species:** Mice; **Pump:** Not Stated; **Duration:** 28 days; **ALZET Comments:** Dose (25 ug/ul); Controls received mp w/ vehicle; comparison of weekly IV injections vs intratumoral delivery via minipump; cancer (Glioma); "Localized BEV delivery by Alzet micro-osmotic pumps is more effective in reducing tumor size and tumor cell infiltration when compared with systemic administration."

**Q10099:** G. D. Arnone, *et al.* Localized targeted antiangiogenic drug delivery for glioblastoma. *Journal of Neuro-Oncology* 2018;137(2):223-231

**Agents:** Bevacizumab; Irinotecan; **Route:** CSF/CNS (Intratumoral); **Species:** Mice; **ALZET Comments:** Dose: Bevacizumab (10 mg/kg); dose-response (Studies have shown a dose dependent effect of bevacizumab on glioma cells such that low doses affect the vascularity of the tumor cells but higher doses may have additional specific antitumoral effects, independent of vascular regression.[48]); Controls received mp w/ vehicle; animal info (female rats); cancer: (Glioblastoma multiforme (GBM)); "Genetic therapy has also been considered among investigators as an approach for continuous local delivery of antiangiogenic inhibitors"

## Bleomycin

**Q12258:** H. Y. Ma, *et al.* Targeting CDK7/12/13 functional synergism reverses myofibroblast activation and ameliorates lung fibrosis. *iScience* 2025;28(7):112778

**Agents:** Bleomycin **Vehicle:** DMSO; Dextrose; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1007D; **Duration:** 7 days; **ALZET Comments:** Dose (10mg/kg); 10% DMSO in 5% dextrose solution used; controls received mp w/ saline; animal info (Adult male 12–16 weeks, isoflurane anesthesia); post op. care (Buprenorphine 0.05–0.1 mg/kg; Meloxicam 0.2mg/kg sc);

**Q12581:** J. C. Santos-Alvarez, *et al.* Allium sativum nanovesicles exhibit anti-inflammatory and antifibrotic activity in a bleomycin-induced lung fibrosis model. *Molecular Biology Reports* 2024;51(1):1166

**Agents:** Bleomycin **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** CD1; **Pump:** 1007D; **Duration:** 10 days; **ALZET Comments:** Dose (100 U/kg); animal info (Male CD1 8-10 weeks, 38-46 g);

**Q12140:** A. Grandi, *et al.* A mouse model of progressive lung fibrosis with cutaneous involvement induced by a combination of oropharyngeal and osmotic minipump bleomycin delivery. *American Journal of Physiology Lung Cellular and Molecular Physiology* 2024;326(6):L736-L753

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1007D; **Duration:** 7 days; **ALZET Comments:** Dose (80 mg/kg, 100 mg/kg; 150 mg/kg); dose-response; 0.9% NaCl used; controls received mp w/ vehicle; animal info (female; 8 weeks old; 20g, isoflurane anesthesia); post op. care (Betadine); good methods (p. L738);



**Q11923:** D. Y. Sun, *et al.* Pro-ferroptotic signaling promotes arterial aging via vascular smooth muscle cell senescence. *Nature Communications* 2024;15(1):1429

**Agents:** AngII; Bleomycin **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** WT; R26-GPX4; **Pump:** 1004; **Duration:** 2 w  
**ALZET Comments:** Dose (Ang II 400 ng/kg/min; Bleo 40 ng/kg/min); animal info (8 weeks old); blood pressure measured via tail cuff method; peptides; cardiovascular;

**Q11862:** S. Miura, *et al.* High S100A9 level predicts poor survival, and the S100A9 inhibitor paquinimod is a candidate for treating idiopathic pulmonary fibrosis. *BMJ Open Respiratory Research* 2024;11(1):

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 2001; **Duration:** 10 days;  
**ALZET Comments:** Dose (100 mg/kg); controls received mp w/ vehicle; animal info (male; 6-8 weeks old); peptides;

**Q11865:** A. Morozan, *et al.* Superiority of systemic bleomycin to intradermal HOCl for the study of interstitial lung disease. *Scientific Reports* 2023;13(1):20577

**Agents:** Bleomycin **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Strain:** C57Bl/6; **Pump:** 1007D; **Duration:** 10 days;  
**ALZET Comments:** Dose: (60 mg/kg); controls received mp w/ vehicle; animal info (ten-week-old); immunology;

**Q11710:** D. Wu, *et al.* Single-cell sequencing reveals the antifibrotic effects of YAP/TAZ in systemic sclerosis. *International Journal of Biochemistry & Cell Biology* 2022;149(106257

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 5 weeks;  
**ALZET Comments:** Dose: (0.3 mg/mL); Controls received mp w/ vehicle; animal info: male 3 months, 25-30 g; immunology;

**Q11684:** S. Tharavecharak, *et al.* Bleomycin-Induced Pulmonary Fibrosis in Transgenic Mice Carrying the Human MUC5B rs35705950 Variant. *Cells* 2024;13(18):

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; h-rs35705950-Tg; **Pump:** 2001; **Duration:** 7 d  
**ALZET Comments:** Dose (100 mg/kg); controls received mp w/ vehicle; animal info (male, female 20-22g, 8-9 weeks); "Lung fibrosis was induced in wild-type (WT/BLM) and human MUC5B rs 35705950 transgenic mice through continuous subcutaneous administration of bleomycin." pg. 7;

**Q11562:** T. Saito, *et al.* Adipose-derived stem/stromal cells with heparin-enhanced anti-inflammatory and antifibrotic effects mitigate induced pulmonary fibrosis in mice. *Biochemical and Biophysical Research Communications* 2022;629(135-141

**Agents:** Bleomycin **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 7 days;  
**ALZET Comments:** Dose: (3 mg/100 uL); animal info: female 8-week-old; "Continuous subcutaneous infusion of BLM using an osmotic minipump helped to form fibrotic lesions with collagen deposition mainly on the pleural side" pg. 138;

**Q11447:** E. Reyes-Jimenez, *et al.* Coadministration of 3'5-dimaleamylbenzoic acid and quercetin decrease pulmonary fibrosis in a systemic sclerosis model. *International Immunopharmacology* 2023;122(110664

**Agents:** Bleomycin; 3'5-dimaleamylbenzoic acid **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** CD1; **Pump:** 1007D;  
**Duration:** 10 days;  
**ALZET Comments:** Dose (100 U/kg); controls received mp w/ vehicle; animal info (male, 8-10 weeks); systemic sclerosis

**Q11444:** A. A. Ramirez-Hernandez, *et al.* Zingiber officinale-Derived Extracellular Vesicles Attenuate Bleomycin-Induced Pulmonary Fibrosis Trough Antioxidant, Anti-Inflammatory and Protease Activity in a Mouse Model. *Cells* 2023;12(14):

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** CD1; **Pump:** 1007D; **Duration:** 7 days;  
**ALZET Comments:** Dose (100 U/kg); controls received mp w/ vehicle; animal info (male, 8-10 weeks, 38-46 g); "This route of administration allows a constant and systemic deliery of the drug, and reproduces the distinctive marks of IPF compared to the classical methods " pg. 5; "Continuous administration of BLM via osmotic minipumps is the commonly used fibrosis model to reproduce hallmarks of interstitial lung disease, such as changes in lung architecture, fibroblast activation, differentiation to myofibroblasts, and collagen deposition." pg. 8



**Q11040:** R. Inoue, *et al.* Amelioration of Pulmonary Fibrosis by Matrix Metalloproteinase-2 Overexpression. International Journal of Molecular Sciences 2023;24(7):

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** hMMP-2 TG; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Dose (100 mg/kg); controls received mp w/ vehicle; animal info: female weighing 20~23 g, eight weeks; (Idiopathic pulmonary fibrosis)

**Q11040:** R. Inoue, *et al.* Amelioration of Pulmonary Fibrosis by Matrix Metalloproteinase-2 Overexpression. International Journal of Molecular Sciences 2023;24(7):

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** hMMP-2 TG; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Dose: 100 mg/kg; controls received mp w/ vehicle; animal info: mice weighing 20~23 g, eight weeks; (Idiopathic pulmonary fibrosis)

**Q10372:** C. N. D'Alessandro-Gabazza, *et al.* Inhibition of lung microbiota-derived proapoptotic peptides ameliorates acute exacerbation of pulmonary fibrosis. Nature Communications 2022;13(1):1558

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Controls received mp w/ vehicle; peptides; cardiovascular; Therapeutic indication (Lung injury);

**Q10307:** F. Ravanetti, *et al.* SSC-ILD mouse model induced by osmotic minipump delivered bleomycin: effect of Nintedanib. Scientific Reports 2021;11(1):18513

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;  
**ALZET Comments:** Dose: (60 u/kg); Controls received mp w/ vehicle; animal info: 7–8-week-old C57BL/6 female mice; Bleomycin aka (BLM); dependence;

**Q11163:** T. Kotani, *et al.* Human MIKO-1, a Hybrid Protein That Regulates Macrophage Function, Suppresses Lung Fibrosis in a Mouse Model of Bleomycin-Induced Interstitial Lung Disease. International Journal of Molecular Sciences 2022;23(17):

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not Stated; **Duration:** 7 days;  
**ALZET Comments:** Dose: 0.03 mg/ul; 0.9% NaCl vehicle used Controls received mp w/ vehicle; animal info: Female 13-week-old; immunology; Therapeutic indication (Interstitial lung disease);

**Q10060:** T. Saito, *et al.* Antifibrotic therapy by sustained release of low molecular weight heparin from poly(lactic-co-glycolic acid) microparticles on bleomycin-induced pulmonary fibrosis in mice. Scientific Reports 2020;10(1):19019

**Agents:** Bleomycin **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice; **Pump:** 2010; **Duration:** 7 days;  
**ALZET Comments:** Dose (5 mg); animal info (Female 13-14-week-old ICR mice); Bleomycin aka BLM; dependence;

**Q9811:** F. Ravanetti, *et al.* Modeling pulmonary fibrosis through bleomycin delivered by osmotic minipump: a new histomorphometric method of evaluation. American Journal of Physiology-Lung Cellular and Molecular Physiology 2020;318(2):L376-L385

**Agents:** Bleomycin **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;  
**ALZET Comments:** Dose (0.5 ul/hr); animal info (C57BL/6, 8 weeks old, Female); cardiovascular;

**Q8888:** L. Lucarini, *et al.* Effects of New NSAID-CAI Hybrid Compounds in Inflammation and Lung Fibrosis. Biomolecules 2020;10(9):

**Agents:** Bleomycin; Compound 3; Ibuprofen; Acetazolamide; **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Duration:** 21 days;  
**ALZET Comments:** Dose (1 mg/kg Compound 3; 0.5 mg/kg Ibuprofen; 0.5 mg/kg Acetazolamide); Controls received mp w/ vehicle; animal info (C57BL/6 WT mice, 2 months old, 25-30 g); Ibuprofen aka Ibu, Acetazolamide aka AAZ; cardiovascular;

**Q9042:** V. R. Vasquez-Garzon, *et al.* Liver damage in bleomycin-induced pulmonary fibrosis in mice. Naunyn-Schmiedeberg's Archives of Pharmacology 2019;392(12):1503-1513

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;  
**ALZET Comments:** Dose (10 U/kg); Controls received mp w/ vehicle; animal info (10 weeks old, Male, CD1); Bleomycin aka BLM; dependence;



**Q7495:** H. Urushiyama, *et al.* Naftopidil reduced the proliferation of lung fibroblasts and bleomycin-induced lung fibrosis in mice. *J Cell Mol Med* 2019;23(5):3563-3571

**Agents:** Bleomycin **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 14 days;  
**ALZET Comments:** Dose (50 µg/hour); animal info (Wild-type C57BL/6J 6 week old); Therapeutic indication (lung fibrosis);

**Q8739:** J. K. Park, *et al.* Bleomycin induces drug efflux in lungs: A pitfall for pharmacological studies of pulmonary fibrosis. *American Journal of Respiratory Cell and Molecular Biology* 2019;

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;  
**ALZET Comments:** Dose (100 U/kg); Controls received mp w/ vehicle; animal info (Male, 13 or 24 weeks old, 25-28 g);

**Q8276:** G. M. Marchetti, *et al.* Targeted drug delivery via caveolae-associated protein PV1 improves lung fibrosis. *Commun Biol* 2019;2(92)

**Agents:** Bleomycin **Vehicle:** Not stated; **Route:** SC; **Species:** Mice; **Pump:** Not stated; **Duration:** 28 days;  
**ALZET Comments:** Dose (100 mg/kg); animal info (C57BL/6); dependence;

**Q7620:** N. Kokuho, *et al.* Analyses of alveolar epithelial injury via lipid-related stress in mammalian target of rapamycin inhibitor-induced lung disease. *Lab Invest* 2019;99(6):853-865

**Agents:** Bleomycin hydrochloride **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 14 days;  
**ALZET Comments:** Dose (100 mg/kg); Controls received i.p. injection w/ DMSO; animal info (7 weeks, female, C57BL/6); comparison of i.p. temsirolimus injection vs mp; BLM causes marked inflammation and epithelial injury in the lung; immunology; BLM dissolved in saline for pump (injury group) although controls used i.p. injected DMSO;

**Q8573:** David H. Kim<sup>1</sup>, James D. Beckett<sup>1\*</sup>, Varun Nagpal<sup>1</sup>, Manuel A. Seman-Senderos<sup>1,2</sup>, Russell A. Gould<sup>1,3</sup>, Tyler J. Creamer<sup>4</sup>, Elena Gallo MacFarlane<sup>1,4</sup>, Yichun Chen<sup>1</sup>, Djahida Bedja<sup>5</sup>, Jonathan T. Butcher<sup>3</sup>, Wayne Mitzner<sup>6</sup>, Rosanne Rouf<sup>5</sup>, Shoji Hata<sup>7</sup>, Daniel S. Warren<sup>4</sup>, Harry C. Dietz<sup>1,8†</sup>. Calpain 9 as a therapeutic target in TGF- $\beta$ -induced mesenchymal transition and fibrosis. *Science Translational Medicine* 2019;

**Agents:** Bleomycin; Angiotensin II **Vehicle:** Saline; **Route:** Not stated; **Species:** Mice; **Pump:** 1007D; 2004;  
**Duration:** 10 days; 28 days;  
**ALZET Comments:** Dose (1.5 U/kg Bleomycin; 1.2 µg/kg/min Angiotensin II); Controls received mp w/ vehicle; animal info (Wild-type mice, 6 weeks old); Blood pressure measured via tail cuff method; Angiotensin II aka Ang II; cardiovascular;

**Q7769:** F. Kurosaki, *et al.* AAV6-Mediated IL-10 Expression in the Lung Ameliorates Bleomycin-Induced Pulmonary Fibrosis in Mice. *Human Gene Therapy* 2018;29(11):1242-1251

**Agents:** bleomycin **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Dose (1 µL/h of 125 mg/kg bleomycin); Controls received no vector and mp w/ vehicle; animal info (10-12 weeks, male, C57BL/6J, 25-30g); immunology;

**Q8048:** M. Kishi, *et al.* Blockade of platelet-derived growth factor receptor-beta, not receptor-alpha ameliorates bleomycin-induced pulmonary fibrosis in mice. *PLoS One* 2018;13(12):e0209786

**Agents:** Bleomycin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Dose (140 mg/kg); Controls received mp w/ vehicle; animal info (5 week old, C57BL/6, female);

### Carboplatin

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

**Q9068:** M. Shi, *et al.* Convection-Enhanced Delivery in Malignant Gliomas: A Review of Toxicity and Efficacy. *Journal of Oncology* 2019;2019(9342796)

**Agents:** Carboplatin **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 1 week;  
**ALZET Comments:** Dose (84 µg); cancer (Glioma);



### Cetuximab

**Q11603:** L. Tian, *et al.* Specific targeting of glioblastoma with an oncolytic virus expressing a cetuximab-CCL5 fusion protein via innate and adaptive immunity. *Nature Cancer* 2022;3(11):1318-1335

**Agents:** CCL5, cetuximab antibody; CCL5, mouse protein **Vehicle:** Saline; **Route:** CSF/CNS (tumor); **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1003D; **Duration:** 3,5,7 days;

**ALZET Comments:** Dose (24 nmol/3days); Controls received mp w/ vehicle; animal info: 6–8-week-old female and male; CCL5/C-C motif ligand 5 is chemokine that promotes chemotaxis of immune cells; ALZET brain infusion kit 3 used; Brain coordinates (2 mm lateral and 1 mm anterior to bregma at a depth of 3 mm); cancer; immunology;

### Cisplatin

**Q7638:** J. Enriquez Perez, *et al.* The effect of locally delivered cisplatin is dependent on an intact immune function in an experimental glioma model. *Sci Rep* 2019;9(1):5632

**Agents:** Cisplatin **Vehicle:** Saline; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 1003D; **Duration:** 3 days;

**ALZET Comments:** Dose (1080, 120, or 12 ug/kg/day); 0.9% Saline used; animal info (C57BL/6, NSG, 8-10 weeks old, 18-21 weeks old); ALZET brain infusion kit 3 used; cyanoacrylate adhesive; cancer (Glioma);

### Doxorubicin

**Q10918:** R. Ge, *et al.* A Novel Tumor-Promoting Role for Nuclear Factor IX in Glioblastoma Is Mediated through Transcriptional Activation of GINS1. *Molecular Cancer Research* 2023;21(3):189-198

**Agents:** Doxorubicin **Vehicle:** Not Stated; **Route:** CSF/CNS (intratumoral); **Species:** Mice; **Pump:** 1003D; **Duration:** Not Stated;

**ALZET Comments:** animal info (Male; Mice; BALB/cJ genetic background); enzyme inhibitor (Topo isomerase 2); cyanoacrylate adhesive; cancer (Glioblastoma); Therapeutic indication (Glioblastoma);

**Q10614:** F. Mota, *et al.* A Reactivity-Based (18)F-Labeled Probe for PET Imaging of Oxidative Stress in Chemotherapy-Induced Cardiotoxicity. *Molecular Pharmaceutics* 2022;19(1):18-25

**Agents:** Doxorubicin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days;

**ALZET Comments:** Dose (30 mg/kg); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (Male; Wistar; Weighed 280-300 g); enzyme inhibitor (Doxorubicin); cardiovascular (cardiotoxicity)

**Q10539:** M. A. Harris, *et al.* ssDNA Nanotubes For Selective Targeting Of Glioblastoma And Delivery Of Doxorubicin For Enhanced Survival. *Science Advances* 2021;7(49):

**Agents:** Doxorubicin **Vehicle:** PBS; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;

**ALZET Comments:** Dose: (70 uM or 0.2 mg/kg) Controls received mp w/ vehicle; animal info: Eight-week-old mice; ALZET BIK 3 used; Brain coordinates (right hemisphere from bregma: anterior, 1.0 mm; and lateral, 1.5 mm); cancer (Glioblastoma);

**Q10421:** A. Casazza, *et al.* PhAc-ALGP-Dox, a Novel Anticancer Prodrug with Targeted Activation and Improved Therapeutic Index. *Molecular Cancer Therapeutics* 2022;21(4):568-581

**Agents:** Doxorubicin; PhAc-ALGP-Dox **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

**ALZET Comments:** Dose (58 mg/kg; 1026 mg/kg/wk); animal info (Female; 6-8 weeks old); doxorubicin and PhAc-ALGP-Dox are chemotherapeutics; cancer (General);

**Q7146:** X. Jing, *et al.* MicroRNA-29b Regulates the Mitochondria-Dependent Apoptotic Pathway by Targeting Bax in Doxorubicin Cardiotoxicity. *Cellular Physiology and Biochemistry* 2018;48(2):692-704

**Agents:** Doxorubicin **Vehicle:** Saline; **Route:** SC; **Species:** Rats; **Pump:** 2002; **Duration:** 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; Dose (30 mg/kg body weight); animal info (Male Wistar rats);



### Endostatin

**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 $\alpha$ /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.

### Etoposide

**R0378:** B. Halle, *et al.* Convection-enhanced Drug Delivery for Glioblastoma: A Systematic Review Focused on Methodological Differences in the Use of the Convection-enhanced Delivery Method. *Asian-Australasian Journal of Animal Sciences* 2019;14(1):5-14

**Agents:** Etoposide, Bevacizumab, IMCA12, Interleukin-13-PE38, Tetrakis Chlorin **Vehicle:** Not Stated; **Route:** CSF/CNS (intratumoral); **Species:** Mice, Rat; **Pump:** 2001D, 1003D, 1007D, 1004, 2004; **Duration:** 24 hours, 3, 7, 21, 28 days; **ALZET Comments:** ALZET brain infusion kit 1,2, and 3 used; cancer (Glioblastoma);

### Fluorouracil

**Q11453:** N. Salerno, *et al.* A Mouse Model of Dilated Cardiomyopathy Produced by Isoproterenol Acute Exposure Followed by 5-Fluorouracil Administration. *Journal of Cardiovascular Development and Disease* 2023;10(6):

**Agents:** Isoproterenol; 5-Fluorouracil **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2004; **Duration:** 25 days; 28 days;

**ALZET Comments:** Dose ISO (200 mg/Kg); 5-FU(15 mg/Kg/day); NaCl 0.9%; controls received mp w/ vehicle; animal info (12/14-week-old male); cardiovascular (cardiomyopathy); "5-FU is administered through osmotic pumps to have a systemic constant release of low doses of the drug that can target only highly proliferative cells." pg. 15;

**Q10285:** N. Very, *et al.* Thymidylate synthase O-GlcNAcylation: a molecular mechanism of 5-FU sensitization in colorectal cancer. *Oncogene* 2022;41(5):745-756

**Agents:** 5-fluorouracil; Thiamet-G **Vehicle:** NaCl; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 13 days;

**ALZET Comments:** Dose (12.5 mg/kg/day); (90 mg/kg/ day); 0.9% sodium chloride used; animal info (C57BL/6J; 8 week male mice); cancer (colorectal);

**Q7630:** H. Y. Jang, *et al.* Schedule-dependent synergistic effects of 5-fluorouracil and selumetinib in KRAS or BRAF mutant colon cancer models. *Biochemical Pharmacology* 2019;160(110-120)

**Agents:** fluorouracil, 5- **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

**ALZET Comments:** Dose (10, 30 mg/kg/day); Controls received mp w/ vehicle; animal info (5.5 weeks, male, athymic, Balb-c/nu); cancer (colorectal); "An equivalent dose of 5-FU (JW Pharmaceutical, Seoul, Korea) was continuously delivered by osmotic pumps (Durect, Cupertino, CA, USA) over 7 days, to minimize possible side effects of severe weight loss by repeated bolus injections of 5-FU [26]." pg.112; Therapeutic indication (improved effectiveness of capecitabine (5-FU precursor) monotherapy due to synergistic effect with MEK inhibitor);

### Imatinib

**Q10274:** S. Hegde, *et al.* Inhibition of the RacGEF VAV3 by the small molecule IODVA1 impedes RAC signaling and overcomes resistance to tyrosine kinase inhibition in acute lymphoblastic leukemia. *Leukemia* 2022;36(3):637-647

**Agents:** IODVA1; Imatinib **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 28 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (Vav3-deficient mice and Rac1 $\Delta/\Delta$ +Rac2-deficient mice; C57Bl/10 (females, 8–16 weeks old) and NSG (NOD/SCID/IL2RG $^{-/-}$  males and females, 8–14 weeks old); IODVA1 aka 2-guanidinobenzimidazole derivative with anti-tumorigenic properties; cancer (leukemia)



**Q12001:** A. Ibrayeva, *et al.* Early stem cell aging in the mature brain. *Cell Stem Cell* 2021;28(5):955-966 e7

**Agents:** Imatinib **Vehicle:** DMSO; **Route:** CSF/CNS (hippocampal fimbria); **Species:** Mice; **Strain:** C57/BL6; **Pump:** 1007D; **Duration:** 6 days;

**ALZET Comments:** Dose: (1 mM); 10% DMSO used; controls received mp w/ vehicle; animal info (10-months-old, isoflurane anesthesia); ALZET brain infusion kit 3 used; brain coordinates (bregma: - 0.8 mm posterior, - 0.75 mm medial-lateral, and 2.5 mm ventra); aging;

**Q10054:** L. Pandolfi, *et al.* Loading Imatinib inside targeted nanoparticles to prevent Bronchiolitis Obliterans Syndrome. *Scientific Reports* 2020;10(1):20726

**Agents:** Imatinib **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2004; **Duration:** 28 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (Pathogen-free, male C57BL/6 and Balb/c mice, 20-24 g); Imatinib aka GNP-HClm; toxicology;

**Q6168:** R. C. Nayak, *et al.* The signaling axis atypical protein kinase C lambda/iota-Satb2 mediates leukemic transformation of B-cell progenitors. *Nat Commun* 2019;10(1):1-16

**Agents:** Ro-31-8220; imatinib **Vehicle:** PBS; **Route:** SC; **Species:** Mice (transgenic); **Pump:** 2002; **Duration:** 14 days;

**ALZET Comments:** Dose (Ro-31-8220 (1 mM); imatinib (0.5 mM)); Controls received mp w/ vehicle; animal info (6-12 week old transgenic mice); enzyme inhibitor (Protein Kinase C);

**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 pump, but recommends using it in future studies of these agents in mice or guinea pigs;

### Methotrexate

**Q11793:** S. Liu. Scaffolded Chondrogenic Spheroid-Engrafted Model. *Rheumatoid Arthritis Methods and Protocols* 2024;

**Agents:** Methotrexate **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** NOD/SCID; **Pump:** Not Stated; **Duration:** 28 d

**ALZET Comments:** Dose (0, 5, 10 mg/kg/d); dose-response; xenograft arthritis model;

**Q8881:** S. Liu, *et al.* Assessment and Comparison of the Efficacy of Methotrexate, Prednisolone, Adalimumab, and Tocilizumab on Multipotency of Mesenchymal Stem Cells. *Frontiers in Pharmacology* 2020;11(1004

**Agents:** Methotrexate; Prednisolone; Adalimumab; Tocilizumab **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 4 weeks;

**ALZET Comments:** Dose (0.25 or 0.5 mg/kg methotrexate; 0.1 or 0.2 mg/kg prednisolone; 0.75 or 1.5 mg/kg adalimumab; 4 or 8 mg/kg tocilizumab); Controls received mp w/ vehicle; animal info (male mice, 6-10 weeks old); dependence;

### Paclitaxel

**Q11740:** Y. Hu, *et al.* Analysis of the contributing role of drug transport across biological barriers in the development and treatment of chemotherapy-induced peripheral neuropathy. *Fluids and Barriers of the CNS* 2024;21(1):13

**Agents:** Paclitaxel; Vincristine **Vehicle:** Not Stated; **Route:** SC; **Species:** Rats; **Strain:** Sprague-Dawley; Wistar-Han; **Pump:** Not Stated; **Duration:** 10 days;

**ALZET Comments:** animal info (male; 240-340 g); functionality of mp verified by plasma concentrations;



### TIMP

**Q10831:** L. Xu, *et al.* Fibroblasts Repair Blood-Brain Barrier Damage and Hemorrhagic Brain Injury Via TIMP2. *Cell Reports* 2022;41(8):111709

**Agents:** Diphtheria toxin; TIMP2 **Vehicle:** Saline, sterile; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1002; **Duration:** 5 days; 4 days;

**ALZET Comments:** Dose: 1500ng DT; Controls received mp w/ vehicle; animal info (FKO mice); post op. care (Treated with carprofen (5mg/kg of body weight subcutaneously); Diphtheria toxin aka (DT);ALZET brain infusion kit used; Brain coordinates (0.2mm posterior to bregma, 2.4mm lateral from the midline, and 3.7mm in depth);

### Topotecan

**Q11410:** T. Mitra Ghosh, *et al.* Metronomic Administration of Topotecan Alone and in Combination with Docetaxel Inhibits Epithelial-mesenchymal Transition in Aggressive Variant Prostate Cancers. *Cancer Research Communications* 2023;3(7):1286-1311

**Agents:** Topotecan **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Nude; **Pump:** Not Stated; **Duration:** 21 days; **ALZET Comments:** Dose (2.45 mg/kg/day); animal info (male); comparison of low dose-therapy (METRO-TOPO, CONV-TOPO IV) vs mp; enzyme inhibitor (Topoisomerase 1); cancer (Prostate); tumor xenografts

**Q6792:** G. M. Shackleford, *et al.* Continuous and bolus intraventricular topotecan prolong survival in a mouse model of leptomeningeal medulloblastoma. *PLoS One* 2019;14(1):e0206394

**Agents:** Topotecan **Vehicle:** Saline; **Route:** CSF/CNS (ventricle); **Species:** Mice; **Pump:** 2004; **Duration:** 28 days; **ALZET Comments:** Dose (5.28 µg/day); Controls received mp w/ vehicle; animal info (J:NU mice (homozygous for the Foxn1nu mutation); comparison of bolus dosing vs mp; cancer (Leptomeningeal medulloblastoma);

**Q6341:** G. Pascual-Pasto, *et al.* Increased delivery of chemotherapy to the vitreous by inhibition of the blood-retinal barrier. *J Control Release* 2017;264(34-44)

**Agents:** Topotecan **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice (nude); **Pump:** 2001D; **Duration:** Not Stated; **ALZET Comments:** cancer;

### Vincristine

**Q11740:** Y. Hu, *et al.* Analysis of the contributing role of drug transport across biological barriers in the development and treatment of chemotherapy-induced peripheral neuropathy. *Fluids and Barriers of the CNS* 2024;21(1):13

**Agents:** Paclitaxel; Vincristine **Vehicle:** Not Stated; **Route:** SC; **Species:** Rats; **Strain:** Sprague-Dawley; Wistar-Han; **Pump:** Not Stated; **Duration:** 10 days;

**ALZET Comments:** animal info (male; 240-340 g); functionality of mp verified by plasma concentrations;



**Chemotherapeutic Agents Administered Using ALZET® Osmotic Pumps**

To request a list of references for an agent, please click the agent below.

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<a href="#"><u>Ara-C</u></a>	<a href="#"><u>Doxorubicin</u></a>	<a href="#"><u>Paclitaxel</u></a>
<a href="#"><u>Azacytidine</u></a>	<a href="#"><u>Erlotinib</u></a>	<a href="#"><u>Pemetrexed</u></a>
<a href="#"><u>Bevacizumab</u></a>	<a href="#"><u>Endostatin</u></a>	<a href="#"><u>Ruxolitinib</u></a>
<a href="#"><u>Bleomycin</u></a>	<a href="#"><u>Etoposide</u></a>	<a href="#"><u>Sorafenib</u></a>
<a href="#"><u>Carboplatin</u></a>	<a href="#"><u>Fluorouracil</u></a>	<a href="#"><u>Sunitinib</u></a>
<a href="#"><u>CDDP</u></a>	<a href="#"><u>Gefitinib</u></a>	<a href="#"><u>TIMP</u></a>
<a href="#"><u>Cediranib</u></a>	<a href="#"><u>Imatinib</u></a>	<a href="#"><u>Topotecan</u></a>
<a href="#"><u>Cetuximab</u></a>	<a href="#"><u>Marimastat</u></a>	<a href="#"><u>Vinblastine</u></a>
<a href="#"><u>Cisplatin</u></a>	<a href="#"><u>Metacept 1</u></a>	<a href="#"><u>Vincristine</u></a>