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.

**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 bregm); 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**


**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);


**Agents:** Bevacizumab; RNA, small interfering (anti-HIF-1α/PEG); Immunotoxin, DTAT/DTATEGF; Endostatin; 17-ODYA; Miconazole;  
**Vehicle:** Not Stated;  
**Route:** CSF/CNS (intratumoral), IV;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** Not Stated;  
**ALZET Comments:** enzyme inhibitor (CYP epoxygenase); cancer (glioblastoma); This review describes methods (including convection-enhanced delivery devices, implantable polymer devices, nanocarriers, and cellular vehicles) to deliver antiangiogenic factors to intracranial tumors.

**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.”


**Agents:** Bevacizumab; Irinotecan  **Vehicle:** Not Stated;  **Route:** CSF/CNS (Intratumoral);  **Species:** Mice;  **Pump:** Not Stated;  **Duration:** Not Stated;

**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**


**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;


**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;


**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); Bleomycin aka BLM; dependence;


**Agents:** Bleomycin; Compound 3; Ibuprofen; Acetazolamide  **Vehicle:** PBS;  **Route:** SC;  **Species:** Mice;  **Pump:** 1007D;  **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;


**Agents:** Bleomycin  **Vehicle:** Saline;  **Route:** SC;  **Species:** Mice;  **Pump:** 1007D;  **Duration:** 7 days;

**ALZET Comments:** Dose (10 U/kg); animal info (10 weeks old, Male, CD1); Bleomycin aka BLM; dependence;


**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 mice Six-week-old); Therapeutic indication (lung fibrosis);
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); cardiovascular;  

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;  

Agents: Bleomycin hydrochloride Vehicle: Saline; Route: SC; Species: Mice; Pump: Not stated; 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. Kim1, James D. Beckett1*, Varun Nagpal1, Manuel A. Seman-Senderos1,2, Russell A. Gould1,3, Tyler J. Creamer4, Elena Gallo MacFarlane1,4, Yichun Chen1, Djahida Bedja5, Jonathan T. Butcher3, Wayne Mitzner6, Rosanne Rouf5, Shoji Hata7, Daniel S. Warren4, Harry C. Dietz1,8: Calpain 9 as a therapeutic target in TGFβ-induced mesenchymal transition and fibrosis. Science Translational Medicine 2019;  
Agents: Bleomycin; Angiotensin II Vehicle: Saline; Route: SC; Species: Mice; Pump: 1007D; 2004; Duration: 10 days;  
ALZET Comments: Dose (1.5 U/kg Bleomycin; 1.2 ug/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;  

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, C57BL6/J, 25-30g); immunology;  

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, C57BL6/female); dependence;  

Agents: Bleomycin Vehicle: Saline; Route: SC; Species: Mice; Pump: 2001; Duration: 7 days;  
ALZET Comments: Dose (100 mg/kg/day); Controls received mp w/ vehicle; animal info (C57BL/6); gene therapy;  

Carboplatin  
Agents: Carboplatin Vehicle: Not stated; Route: CSF/CNS (intracerebral); IV; Species: Rat; Pump: Not stated; Duration: 7 days;  
ALZET Comments: Dose (84 ug/g); animal info (Fischer rats); cancer (Glioma);
Agents: Carboplatin  Vehicle: Not Stated; Route: SC; Species: Rat; Pump: Not Stated; Duration: 1 week;
ALZET Comments: Dose (84 ug); cancer (Glioma);

Cisplatin
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
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
Agents: Bevacizumab; RNA, small interfering (anti-HIF-1α/PEG); Immunotoxin, DTAT/DTATEGF; Endostatin; 17-ODYA; Miconazole; Vehicle: Not Stated; Route: CSF/CNS (intratumoral), IV; Species: Mice; Pump: Not Stated; Duration: Not Stated;
ALZET Comments: enzyme inhibitor (CYP epoxygenase); cancer (glioblastoma); This review describes methods (including convection-enhanced delivery devices, implantable polymer devices, nanocarriers, and cellular vehicles) to deliver antiangiogenic factors to intracranial tumors.

Etoposide
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
Agents: 5-fluorouracil; Thiame-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);

**Agents:** fluorouracil, selumetinib  
**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 Rac1Δ/Δ+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)


**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;


**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);


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

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

**Methotexate**


**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;
**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;

**Topotecan**

**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);

**Agents:** Topotecan  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Mice (nude);  
**Pump:** 2001D;  
**Duration:** Not Stated;  
**ALZET Comments:** cancer;
Chemotherapeutic Agents Administered Using ALZET® Osmotic Pumps

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