References on the Administration of Antibiotics Using ALZET® Osmotic Pumps

Actinomycin D

Q7407: J. Apulei, et al. Non-cell autonomous Otx2 homeoprotein regulates visual cortex plasticity through Gadd45b. Cerebral Cortex 2018;

**Agents:** cycloheximide; actinomycin D  
**Vehicle:** Saline;  
**Route:** CSF/CNS (visual cortex);  
**Species:** Mice;  
**Pump:** 1003D;  
**Duration:** 3 days;

**ALZET Comments:** Dose: cycloheximide (0.1 μg/μl); actinomycin D (0.2 μg/μl); Controls received mp w/ vehicle; animal info (CS7Bl/6N and Otx2+/GFP knock-in mice); Brain coordinates (lambda: x = 1.7 mm, y = 0 mm, z = 0.5 mm);


**Agents:** Actinomycin D; Cycloheximide; Mitomycin C; Vinblastine  
**Vehicle:** Ringer’s solution;  
**Route:** CSF/CNS (sciatic nerve);  
**Species:** Rat;  
**Pump:** 2001; 2002;  
**Duration:** 3, 4, 6 days;

**ALZET Comments:** mp connected to silicone cuff; functionality of mp verified in vivo with dye; tissue perfusion

Amikacin (2014-Present)


**Agents:** Florfenicol; voriconazole; fentanyl; amikacin  
**Route:** SC; in vitro;  
**Species:** Rat; Snake (corn, rattle); Iguana; Cat; Hamster; Gelada; Pudu; Wallaby; Monkey; Quail; Hen;

**ALZET Comments:** “animal info (Eastern massasauga rattlesnakes (Sistrurus catenatus); timber rattlesnake (Crotalus horridus); pudu (Pudu puda); wallaby (Macrops rufogriseus); iguanas (Iguana iguana); Mojave rattlesnakes (Crotalus scutulatus); corn snakes (Elaphe guttata guttata); Japanese quails (Coturnix coturnix japonica); hens (Gallus domesticus); ”

Finally, the use of intracoelomic osmotic pumps was reported in iguanas (Iguana iguana) in a study of reproductive behavior.26 No complication due to the pump placement was reported in that study.” pg. 508; Advantages: Can be extracted in case of drug overdose or toxicity. Is not altered by its biological environment. Release the drug at a constant rate. Low cost, Commercially available, Release rate and operation time can be chosen; Drawbacks: Necessitate 2 light surgical procedures under anesthesia to be implanted and explanted, Can sometimes migrate in unwanted location (especially if implanted accidently in air sacs during intracoelomic implantation) "


**Agents:** Amikacin  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Snake;  
**Pump:** 2002;  
**Duration:** 10 months;

**ALZET Comments:** animal info (adult female Taylor’s cantil, 6 yr old); good methods; spinal cord injury; long-term study; “This study demonstrates that the infection can be suppressed and the animal’s life extended by long-term continuous infusion of amikacin and that such treatment did not result in renal compromise in this individual.” pg 694; temperature adjusted pumping rate for snake; Industry authored (American Association of Zoo Veterinarians); Interesting (Veterinary use presented for treating animal w/ antibiotics for extended duration; minimizing need for animal handling); Dose (26ug/kg/hr);


**Agents:** Amikacin; Florfenicol; Gonadotropin-releasing hormone  
**Species:** Snake; Iguana;

**ALZET Comments:** Animal info (E uttara corn snake, C scutulatus Mojave rattlesnake, green iguana); stress/adverse reaction:
Bleomycin (2019-Present)

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: 1007D; 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); cardiovascular;

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;

Agents: Bleomycin Vehicle: Saline; Route: SC; Species: Mice; Pump: 1007D; Duration: 7 days;
ALZET Comments: Dose (10 U/kg); animal info (Male, 13 or 24 weeks old, 25-28 g); Therapeutic indication (lung fibrosis);

Agents: Bleomycin Vehicle: Not Stated; Route: SC; Species: Mice; Pump: Not Stated; Duration: 14 days;
ALZET Comments: Dose (50 mg/kg/hour); animal info (Wild-type C57BL/6J mice 6 wk);

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);

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

Agents: Bleomycin hydrochloride Vehicle: Saline; Route: SC; Species: Mice; Pump: 1007D; 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;
**Clindamycin**


**Agents**: Acyclovir; cimetidine; clindamycin; metformin; terbutaline; verapamil; **Route**: IP; **Species**: Mice; **Pump**: 1003D; **Duration**: 72 hours;

**ALZET Comments**: Animal info (female, lactating, Bcrp KO or WT FVB); functionality of mp verified by plasma and milk concentrations; no stress "All mice survived the surgical procedure and appeared to be lactating normally, and all pups thrived throughout the course of the experiment.” (see pg. 3343);


**Agents**: acetaminophen, cephalothin sodium salt, clindamycin hydrochloride, disopyramide phosphate salt, labetalol hydrochloride, nitrofurantoin + -propranolol hydrochloride, terbutaline hemisulfate salt, verapamil hydrochloride, Acyclovir, alprazolam, atenolol, anhydrous caffeine, cefotaxime sodium salt, cepaprin sodium salt, diltiazem hydrochloride, metronidazole, nitrazepam, prednisolone, 6-propyl-2-thiouracil, trazodone hydrochloride, chloramphenicol, cimetidine, theophylline, fluconazole, metoprolol, mirtazapine, praziquantel, quetiapine fumarate, triprolidine hydrochloride, metformin, moclobemide. **Vehicle**: DMSO; water; **Route**: IP; **Species**: mice; **Pump**: 1003D; **Duration**: Not Stated;

**ALZET Comments**: animal info: lactating mice, postnatal age of 14 days; functionality of mp verified by measurement of drug concentration in milk and plasma; mp were used to infuse study lactational drug transfer.


**Agents**: Clindamycin HCl; Penicillin G **Vehicle**: Sodium hydroxide; Water; **Route**: SC; **Species**: mice; **Duration**: 72 hours;

**ALZET Comments**: Pump model not stated; controls received mp w/water; dose-response; mp primed overnight in PSB; 2 doses of agent infused; agent infused separately; antibiotic


**Agents**: Clindamycin; Methylprednisolone; Gentamicin; Naloxone **Vehicle**: Saline; **Route**: SC; **Species**: Rat; **Pump**: 2001; **Duration**: 7 days;

**ALZET Comments**: controls received mp w/saline; multiple pumps per animal (3); comparison of bolus injections vs. mp infusion; antibiotic

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**Doxycycline (2008-Present)**

**Q6660**: J. H. Seo, *et al.* In Situ Pluripotency Factor Expression Promotes Functional Recovery From Cerebral Ischemia. Mol Ther 2016;24(9):1538-49

**Agents**: Doxycycline **Vehicle**: PBS; **Route**: CSF/CNS (right lateral ventricle); **Species**: Mice (transgenic); **Pump**: 1007D; **Duration**: 7 days;

**ALZET Comments**: Dose ((12 ng/day or 1,200 ng/day); Controls received mp w/ vehicle; animal info (transgenic mice expressing Pou5f1 (Oct4), Sox2, Myc, and Klf4); Doxycycline aka DOX; ALZET brain infusion kit 3 used; Brain coordinates ((AP +0.3 mm from Bregma; ML −0.7 mm from Bregma; DV −2.0 mm from Dura); ischemia (cerebral); Therapeutic indication (Cerebral ischemia);

**Q4941**: P. Rai, *et al.* Renin angiotensin system modulates mTOR pathway through AT2R in HIVAN. Experimental and Molecular Pathology 2014;96(3):431-7

**Agents**: Telmisartan; PD123319; Doxycycline; aliskiren **Vehicle**: Saline; water; **Route**: SC; **Species**: mice; **Pump**: 2004; **Duration**: 2, 6 weeks;

**ALZET Comments**: Controls received mp w/ vehicle; animal info : Tg26 mice; FVBN mice, Tg26 mice; Vpr transgenic mice (4 week old); immunology; Dose: Telmisartan (AT1R blocker, 300 μg/day), PD123319 (AT2R blocker, 3 μg/day); Doxycycline + aliskiren (50 mg/kg)
Q1540: L. Clarke, et al. The Adult Mouse Dentate Gyrus Contains Populations of Committed Progenitor Cells that are Distinct from Subependymal Zone Neural Stem Cells. Stem Cells 2011;29(9):1448-1458
Agents: Doxycycline Vehicle: Saline; Route: CSF/CNS; Species: Mice (transgenic); Pump: 1007D; Duration: 4 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (GFP/M2, 2-3 mo old)

Agents: Thyroxine, L-; doxycycline Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 1002; Duration: 14 days;
ALZET Comments: Controls received no treatment to contralateral ear; pumps replaced; peptides; tissue perfusion (scala tympani); animal info (Wistar, male, 50-60 days old, 132 g);

Agents: Doxycycline; Brain-derived neurotrophic factor; Glial cell line-derived neurotrophic factor Vehicle: Not Stated; Route: Ear (scala tympani); Species: Guinea pig; Pump: 2002; Duration: 27 days;
ALZET Comments: Controls received no treatment to contralateral ear; pumps replaced; peptides; tissue perfusion (scala tympani); animal info (NIH strain, 275-315 g., deafened); cannula and catheter contained doxycycline, mp contained BDNF/GDNF (delayed delivery) to follow, thus providing 2 days Dox, 25 days BDNF/GDNF

Gentamicin (2004-Present)
Agents: Amikacin; gentamicin Vehicle: Not Stated; Route: SC; Species: Pig (mini); Pump: Not Stated; Duration: Not Stated;
ALZET Comments: Animal info (female, 3.5-4.5 mo old, 12-27 kg); 2ML sized pumps used; pump implanted in back of the neck

Agents: Gentamicin; dexamethasone; melatonin Route: Ear (round window); Species: Rat; Pump: 2001; Duration: 7 days;
ALZET Comments: Controls received mp w/ saline; animal info (Wistar, male, 220-250 g); stability verified after 7 days

Agents: Gentamicin Vehicle: Not Stated; Route: SC; Species: Rat (transgenic); Pump: 1007D; Duration: 5 days;
ALZET Comments: Animal info (SS34 tetra-4, heterozygous, P15)

Agents: Gentamicin Route: Ear (round window); Species: Chinchilla; Pump: 2002; Duration: 1, 3, 6, 14 days; 4, 8 hours;
ALZET Comments: Comparison of transtympanic injections vs. mp; tissue perfusion (round window); animal info (male, female, chinchilla langier)

Agents: Gentamicin sulfate Vehicle: Not Stated; Route: SC; Species: Guinea pig (pregnant); Pump: 2ML1;
ALZET Comments: Functionality of mp verified by plasma levels taken; teratology; listeria; wound clips used

Agents: Gentamicin Vehicle: Saline; Route: Ear (cochlea); Species: Guinea pig; Pump: 2002; Duration: 14 days;
ALZET Comments: Controls received mp w/ vehicle; pumps replaced at day 7; pump contained saline only for the first seven days; PE-10 used; tissue perfusion (cochlea)
**Agents:** Gentamicin  
**Vehicle:** Hank's soln;  
**Route:** Ear (semicirc canals);  
**Species:** Chinchilla;  
**Pump:** 1007D;  
**Duration:** 7 days;  
**ALZET Comments:** Controls received mp w/ vehicle; Meniere's disease; microcatheter used; 27 gauge tubing used for cannulation; tissue perfusion (semicircular canals)

**Metronidazole**
**Agents:** acetaminophen, cephalothin sodium salt, disopyramide phosphate salt, labetalol hydrochloride, nitrofurantoin + -propranolol hydrochloride, terbutaline hemisulfate salt, verapamil hydrochloride, Acyclovir, alprazolam, atenolol, anhydrous caffeine, cefotaxime sodium salt, cepapirin sodium salt, diltiazem hydrochloride, metronidazole, nitrazepam, prednisolone, 6-propyl-2-thiouracil, trazadone hydrochloride, chloramphenicol, cimetidine, theophylline, fluconazole, metformin, moclobemide.  
**Vehicle:** DMSO; water;  
**Route:** IP;  
**Species:** mice;  
**Pump:** 1003D;  
**Duration:** Not Stated;  
**ALZET Comments:** animal info: lactating mice, postnatal age of 14 days; functionality of mp verified by measurement of drug concentration in milk and plasma; mp were used to infuse study lactational drug transfer

**Minocycline (2018-Present)**
**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: (1μl/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

**Agents:** Dextrose; Fluorocitrate; Minocycline; SB203580; PD98059  
**Vehicle:** DMSO;  
**Route:** CSF/CNS (intracerebral); IV;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 7 days;  
**ALZET Comments:** 1% DMSO used; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley rats, weight, 200–250 g); behavioral testing (Von Frey filament test, Plantar test); functionality of mp verified by residual volume; SB203580 aka p38 MAPK inhibitor, PD98059 aka extracellular signal-regulated kinase inhibitor; Brain coordinates (0.8 mm posterior and 1.3 mm lateral to the bregma, and 4.0 mm ventral to the skull surface); dependence;

**Agents:** Minocycline  
**Vehicle:** CSF, Artificial;  
**Route:** CSF/CNS (intracerebral); IV;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 15 days;  
**ALZET Comments:** Dose (172 ng/mL); animal info (Male Sprague–Dawley rats, seven-week-old, 170–190 g); Minocycline aka MC; ALZET brain infusion kit 2 used; Brain coordinates (0.8 mm caudal to the bregma; 1.5 mm lateral to the midline; 4 mm below the surface of the skull); dependence;
Q6949: T. Zera, et al. Microglia and brain angiotensin type 1 receptors are involved in desensitising baroreflex by intracerebroventricular hypertonic saline in male Sprague-Dawley rats. Autonomic Neuroscience: Basic and Clinical 2019;217(49-57

**Agents:** Minocycline, Losartan

**Vehicle:** Saline, iso-osmotic, Saline, hyperosmotic

**Route:** CSF/CNS (lateral ventricle)

**Species:** Rat

**Pump:** 2ML2

**Duration:** 2 weeks

**ALZET Comments:** Dose (Minocycline-5 μg/h; Losartan -12.5 μg/h); 0.9% isosmotic saline with minocycline, 5% Hyperosmotic saline with Losartan used; animal info (Normotensive adult male Sprague-Dawley rats); enzyme inhibitor (microglia); ALZET brain infusion kit 2 used; Brain coordinates (1.2mm posterior to bregma, −1.8mm laterolateral from sagittal suture, diameter 0.5 mm) bilateral cannula used; cyanoacrylate adhesive; cardiovascular;


**Agents:** M=Minocycline

**Vehicle:** Cerebrospinal fluid, artificial

**Route:** SC

**Species:** Rat

**Pump:** 2002

**Duration:** Not Stated

**ALZET Comments:** Dose (2 ug/day); Controls received mp w/ vehicle; animal info (Male, Sprague Dawley, 300-470 g); bilateral cannula used; dependence;


**Agents:** Minocycline

**Vehicle:** CSF, artificial

**Route:** CSF/CNS (left ventricle)

**Species:** Rat

**Pump:** 2004

**Duration:** Not Stated

**ALZET Comments:** Dose (5 ug/h); animal info (8 week old male Sprague-Dawley rats);


**Agents:** Minocycline

**Vehicle:** Not stated

**Route:** SC

**Species:** Rat

**Pump:** Not stated

**Duration:** 7 days

**ALZET Comments:** Dose (200 ug/day); animal info (24 weeks old, SD, Female); enzyme inhibitor (Microglia inhibitor);

Mitomycin (1988-Present)


**Agents:** Mitomycin C

**Vehicle:** Not Stated

**Route:** CSF/CNS (intrathecal)

**Species:** Rat

**Pump:** Not Stated

**ALZET Comments:** no comment posted


**Agents:** Mitomycin C

**Vehicle:** Saline

**Route:** IP

**Species:** mice

**Pump:** Not Stated

**Duration:** no duration posted

**ALZET Comments:** cancer


**Agents:** Mitomycin C

**Vehicle:** Not Stated

**Route:** bladder

**Species:** Rat

**Pump:** 2ML2

**Duration:** 2 weeks

**ALZET Comments:** mp connected to catheter; dose-response (graph, text); comparison of twice weekly injections vs. mp infusion; functionality of mp verified by urine levels; cancer/immunology; tissue perfusion


**Agents:** Actinomycin D; Cycloheximide; Mitomycin C; Vinblastine

**Vehicle:** Ringer’s solution

**Route:** CSF/CNS (sciatic nerve)

**Species:** Rat

**Pump:** 2001; 2002

**Duration:** 3, 4, 6 days

**ALZET Comments:** mp connected to silicone cuff; functionality of mp verified in vivo with dye; tissue perfusion
Neomycin (2002-Present)


**Agents:** Cisplatin; Sodium thiosulfate; Brain-derived neurotrophic factor; Fibroblast growth factor; D-JNKI-1; BN82270; Tetrodotoxin; Perilymph, artificial; Dexamethasone; Methylprednisolone; Caroverine; Methionine, D-; Thiourea; Liposome, cationic; Neomycin  
**Route:** SC; Ear (round window membrane); Ear (cochlea); Ear (scala tympani); Ear  
**Species:** Guinea pig  
**Duration:** 3, 7, 14, 28 days;  
**ALZET Comments:** Gene therapy; peptides; no stress; enzyme inhibitor (peroxidase); stress/adverse reaction (see pg 1593) "Ref #161 found local trauma and inflammatory responses"; tissue perfusion (scala tympani, cochlea, round window membrane); comparison of middle ear injections vs. mp; Review, see pgs. 1587 - 1589, 1591, 1593 - 1595, refs #49, 50, 60, 63, 72, 75, 102, 104,180, 181, 194-201


**Agents:** Trolox; Neomycin; Ascorbic acid  
**Vehicle:** Perilymph, artificial; Sodium bicarbonate  
**Route:** Ear (cochlea);  
**Species:** Guinea pig  
**Pump:** 2002;  
**Duration:** 26 days;  
**ALZET Comments:** Controls received mp w/ vehicle; pumps replaced after 14 days; post op. care (doxycycline); animal info (male, pigmented, 250-400g., neomycin deafening); cannula primed with 10% neomycin solution followed by a small air bubble spacer to allow neomycin infusion for first 2 days; trolox, a vitamin F analogue, and ascorbic acid delivered together in 1 mp; tissue perfusion (cochlea)


**Agents:** Brain-derived neurotrophic factor; Ciliary neurotrophic factor; Neomycin;  
**Vehicle:** Perilymph, artificial;  
**Route:** Ear (scala tympani);  
**Species:** Guinea pig  
**Pump:** 2002;  
**Duration:** 26 days;  
**ALZET Comments:** Controls received mp w/ vehicle; tissue perfusion (cochlea, scala tympani); pumps replaced at day 15; peptides; catheter filled with perilymph and 10% neomycin; pump filled with vehicle or neurotrophic factor solution; 48-hr infusion of neomycin to cause deafness followed by 12 or 26 day infusion of neurotrophic factor pump reservoir

Penicillin


**Agents:** Antibody, anti-nerve growth factor, neutralizing mouse; serum; immunoglobulin-G; penicillin; streptomycin  
**Vehicle:** PBS;  
**Route:** CSF/CNS (cortex);  
**Species:** Rat  
**Pump:** 2001;  
**Duration:** 1 week;  
**ALZET Comments:** Controls received mp w/ vehicle


**Agents:** Interleukin-3, recomb. mouse; Penicillin; Streptomycin  
**Vehicle:** Glycerol; PBS;  
**Route:** IP; SC;  
**Species:** Mice  
**Pump:** 2001; 2002;  
**Duration:** 7 days, 2 weeks;  
**ALZET Comments:** Controls received mp w/vehicle; 2002 mp infused IL-3 ip for 2 weeks, additional mps implanted sc; peptides; antibiotics; IL-3 infused simultaneously with penicillin and streptomycin


**Agents:** Clindamycin HCI; Penicillin G  
**Vehicle:** Sodium hydroxide; Water;  
**Route:** SC;  
**Species:** Mice  
**Duration:** 72 hours;  
**ALZET Comments:** Pump model not stated; controls received mp w/water; dose-response; mp primed overnight in PSB; 2 doses of agent infused; agent infused separately; antibiotic

**Agents:** Endotoxin, E. coli; Interleukin-3, recomb. mouse; Penicillin; Streptomycin  
**Vehicle:** Glycerol; PBS;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 3, 7 days;  
**ALZET Comments:** Infusion supplemented w/ip injections; interleukin activity in blood varible - aggregation in pump? (see p. 1004); mp infusion in normal and irradiated mice; half-life; peptides; antibiotic

**Rapamycin (2016-Present)**

**Q9566:** H. Xu, et al. Limited efficacy of rapamycin monotherapy in vascularized composite allotransplantation. Transplant Immunology 2020;61(101308)

**Agents:** Rapamycin; Tacrolimus  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 28 days;  
**ALZET Comments:** Dose (0.5-2 mg/kg/day Rapamycin; 2 mg/kg/day Tacrolimus); animal info (Inbred male mice);


**Agents:** Rapamycin; Tacrolimus  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** Not Stated;  
**ALZET Comments:** Dose: (1 μg/g/day) Rapamycin; Tacrolimus; Controls received mp w/ vehicle; animal info :Male Six-week-old C57BL/6J; Tacrolimus aka (FK506); diabetes;  

**Q9537:** L. Wang, et al. Donor bone-marrow CXCR4+ Foxp3+ T-regulatory cells are essential for costimulation blockade-induced long-term survival of murine limb transplants. Scientific Reports 2020;10(1):9292

**Agents:** Rapamycin; Tacrolimus  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** Not Stated;  
**ALZET Comments:** Dose (2 mg/kg/d); animal info (WT BALB/c and WT C57BL/6 mice, 8-12 weeks old); dependence;


**Agents:** αKlotho protein, recombinant; rapamycin; chloroquine  
**Vehicle:** Saline;  
**Route:** IP;  
**Species:** Mice;  
**Pump:** 1004;  
**Duration:** 4 weeks;  
**ALZET Comments:** Dose (0.3 mg/kg body weight aKlotho protein; 28 mg/Kg rapamycin; 50 mg/Kg chloroquine); Controls received mp w/ vehicle; animal info (Wild type mice, 10-12 weeks old); dependence;

**Q8533:** M. Hayashi-Hori, et al. Therapeutic Effect of Rapamycin on Aortic Dissection in Mice. Int J Mol Sci 2020;21(9):  

**Agents:** Angiotensin II; Aminopropionitrile, B-; Gefitinib; Rapamycin  
**Vehicle:** DMSO;  
**Route:** IP;  
**Species:** Mice;  
**Pump:** 1002;  
**Duration:** 14 days;  
**ALZET Comments:** Dose (1000 ng/kg/min Angiotensin II; 150 mg/kg/day B-aminopropionitrile; 1000 mg/kg/day Gefitinib; 2 mg/kg/day Rapamycin); Controls received mp w/ vehicle; animal info (male mice aged 11–14 weeks);

**Q7037:** J. Zhang, et al. Neuroinflammation and central PI3K/Akt/mTOR signal pathway contribute to bone cancer pain. Mol Pain 2019;15(1744806919830240)

**Agents:** Rapamycin, LY294002, Interleukin-1Receptor antagonist, SC144, etanercept,  
**Vehicle:** CSF, artificial;  
**Route:** CSF/CNS (midbrain periaqueductal gray);  
**Species:** Rat;  
**Pump:** 1001D;  
**Duration:** Not Stated;  
**ALZET Comments:** animal info (200–250 gr Wistar rats); ALZET brain infusion kit used; Brain coordinates (7.6 mm posterior to the bregma, 0.65mm lateral to the midline, and 4.2 mm ventral to the brain surface); Therapeutic indication (bone cancer pain);

**Q8554:** Z. Jiang, et al. Involvement of pro-inflammatory cytokines in diabetic neuropathic pain via central PI3K/Akt/mTOR signal pathway. Archives of Physiology and Biochemistry 2019;1-9

**Agents:** Rapamycin; LY294002; Interleukin-1 beta receptor antagonist; SC144; etanercept  
**Vehicle:** CSF, Artificial;  
**Route:** CSF/CNS (dorsolateral striatum);  
**Species:** Rat;  
**Pump:** 1003D;  
**Duration:** Not stated;  
**ALZET Comments:** “Controls received mp w/ vehicle; animal info (Adult male Sprague-Dawley rats, 200-250 g); behavioral testing (Mechanical paw withdrawal threshold; Thermal Place Preference System); ALZET brain infusion kit used; Brain coordinates (7.6 mm posterior to the bregma, 0.65 mm lateral to the midline, and 4.2 mm ventral to the brain surface);”

**Agents:** Rapamycin  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Mice  
**Pump:** Not Stated  
**Duration:** 28 days  
**ALZET Comments:** Dose (2 mg/kg/day); Controls did not receive mp; animal info (male, C57BL/6 and BALB/c); comparison of IP injection of FK506 vs mp; immunology; RPM monotherapy was about as effective as post-Tx IL-2C in prolonging survival. Co-administration of IL-2C and post-Tx RPM had additional benefits, with pre-Tx IL-C plus RPM causing a fivefold increase in survival, and post-Tx IL-2C plus RPM causing a threefold increase in survival.


**Agents:** Rapamycin  
**Vehicle:** Not Stated  
**Route:** Not Stated  
**Species:** Mice  
**Pump:** Not Stated  
**Duration:** 14 days  
**ALZET Comments:** Dose (0.5 mg/kg/d); animal info (C57BL/6 with BALB/c cardiac allografts).


**Agents:** Rapamycin  
**Vehicle:** DMSO  
**Route:** SC  
**Species:** Mice  
**Pump:** Not Stated  
**Duration:** 3 weeks  
**ALZET Comments:** Dose (0.5 mg/kg); 20% DMSO used; Controls received mp w/ vehicle; animal info (2 month old); Rapamycin aka RAPA; enzyme inhibitor (mTOR signaling); "Our findings not only disclose novel insights into the mechanisms underlying FLX action, but could also be exploited towards an increased awareness for the use of this drug in the clinical setting, especially in the context of obesity treatment;”


**Agents:** Rapamycin  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Mice  
**Pump:** Not Stated  
**Duration:** 14 days  
**ALZET Comments:** Dose (0.5 mg/kg/d); animal info (C57BL/6); immunology; mp model not stated but listed as a 28d pump; Therapeutic indication (combined TGFb/RPM led to a doubling of Foxp3+ Tregs when assessed at day 14 post-Tx, suppressed T cell activation, and resulted in permanent cardiac allograft survival;

**Streptomyacin**


**Agents:** Y-27632; Streptomycin  
**Vehicle:** PBS; penicillin;  
**Route:** CSF/CNS;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 1 week;  
**ALZET Comments:** Controls received mp w/ vehicle  
**Streptomyacin**


**Agents:** Antibody, anti-nerve growth factor, neutralizing mouse; serum; immunoglobulin-G; penicillin; streptomycin  
**Vehicle:** PBS;  
**Route:** CSF/CNS (cortex);  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 1 week;  
**ALZET Comments:** Controls received mp w/ vehicle  


**Agents:** Streptomycin  
**Vehicle:** Saline;  
**Route:** Ear (cochlea);  
**Species:** Guinea pig;  
**Pump:** 2002;  
**Duration:** 24 hours;  
**ALZET Comments:** tissue perfusion (round window)

Agents: Interleukin-3, recomb. mouse; Penicillin; Streptomycin Vehicle: Glycerol; PBS; Route: IP; SC; Species: Mice; Pump: 2001; 2002; Duration: 7 days, 2 weeks;
ALZET Comments: Controls received mp w/vehicle; 2002 mp infused IL-3 ip for 2 weeks, additional mps implanted sc; peptides; antibiotics; IL-3 infused simultaneously with penicillin and streptomycin.


Agents: Endotoxin, E. coli; Interleukin-3, recomb.; Penicillin; Streptomycin Vehicle: Glycerol; PBS; Route: SC; Species: Mice; Duration: 3, 7 days;
ALZET Comments: Infusion supplemented w/ip injections; interleukin activity in blood varible - aggregation in pump? (see p. 1004); mp infusion in normal and irradiated mice; half-life; peptides; antibiotic

Tetracycline

Agents: Angiotensin II, Tetracycline-3, chemically modified Vehicle: Saline; CSF, artificial; Route: SC; CSF/CNS (left lateral ventricle); Species: Rat; Pump: 2004; Duration: 4 weeks;
ALZET Comments: Dose: Ang II (200 ng/kg/min), CMT-3 (3.5μg/h); Controls received mp w/ vehicle; animal info (Sprague-Dawley rats (250-280g) and six-week old male SHR and their normotensive controls); Brain coordinates (1.0mm caudal to bregma,1.8mm lateral to midline and 4.4mm ventral to the skull surface); cardiovascular;


Agents: Calcium hydroxide; Barium hydroxide; Tetracycline Vehicle: Glycerol; Route: bone (femur); Species: Rat; Pump: Not Stated; Duration: 4 weeks;
ALZET Comments: no stress (see pg. 274); tissue perfusion; good methods

Tobramycin

Agents: Tobramycin Vehicle: Not Stated; Route: IP; Species: Guinea pig; Rat; Pump: 2ML1; Duration: 7 days, 72 hours;
ALZET Comments: comparison of single injection vs. mp infusion; mps primed in saline for 4 hours; studies also used dogs and humans; one study used rabbits w/ infusaid pumps; antibiotics

Tunicamycin
Q9337: D. S. Lee, et al. Regional specific activations of ERK1/2 and CDK5 differently regulate astroglial responses to ER stress in the rat hippocampus following status epilepticus. Brain Research 2021;1753(147262

Agents: Tunicamycin; U0126; Roscovitine Vehicle: Saline; Route: CSF/CNS (right lateral ventricle); Species: Rat; Pump: 1007D; Duration: 7 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (Adult male Sprague-Dawley rats, weight 250–280 g); ALZET brain infusion kit 1 used; Brain coordinates (1 mm posterior; 1.5 mm lateral; – 3.5 mm depth; flat skull position with bregma as reference); neurodegenerative (status epilepticus);

**Agents:** RNA, small interfering (PDI; DTNB); bactracin; Immunoglobulin, anti-PDI; tunicamycin; **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 1007D; **Duration:** 7 days, 14 days;

**ALZET Comments:** Controls received mp w/ vehicle or control siRNA or control IgG; animal info (male, Sprague Dawley, 7 weeks old); pumps replaced every week; ALZET brain infusion kit 1 used; behavioral testing (behavioral seizure severity);


**Agents:** Tunicamycin **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 4 weeks;

**ALZET Comments:** Control animals received mp w/ vehicle; animal info (HFD-fed foz/foz)


**Agents:** Tunicamycin **Vehicle:** Saline; **Route:** bone (mandible); **Species:** Rat; **Pump:** 2001; **Duration:** Not Stated;

**ALZET Comments:** Controls received mp w/ vehicle; tissue perfusion (bony elevation over incisor); article incorrectly states use of 2001D pump, but states 7 day delivery period and pump; Tunicamycin is an antibiotic that interferes with N-glycosylation;


**Agents:** Tunicamycin; Cycloheximide; Desipramine; Fluoxetine; Mianserin; Trazodone **Route:** CSF/CNS; SC; **Species:** Rat; **Pump:** 2001; 2ML1; **Duration:** 4-7 days;

**ALZET Comments:** comparison of sc injections vs. mp; cyclo. and tunica. delivered icv for 5 days