References on the Administration of Antibiotics Using ALZET® Osmotic Pumps

1. Actinomycin D

ALZET Comments: Actinomycin D; Cycloheximide; Mitomycin C; Vinblastine; Ringer’s solution; CSF/CNS (sciatic nerve); Rat; 2001; 2002; 3, 4, 6 days; mp connected to silicone cuff; functionality of mp verified in vivo with dye; tissue perfusion.

2. Amikacin

ALZET Comments: Amikacin; SC; snake; 2002; 10 months; 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; Veterinary Application; temperature adjusted pumping rate for snake; Industry authored (American Association of Zoo Veterinarians); Interesting (Veterinary use presented for treating animal with antibiotics for extended duration; minimizing need for animal handling); Dose (26ug/kg/hr).

ALZET Comments: Amikacin; florfenicol; gonadotropin-releasing hormone; Snake; iguana; Animal info (E uttata corn snake, C scutulatus Mojave rattlesnake, green iguana); stress/adverse reaction: (see pg. 23).

ALZET Comments: Amikacin; gentamicin; SC; Pig (mini); Animal info (female, 3.5-4.5 mo old, 12-27 kg); 2ML sized pumps used; pump implanted in the back of the neck.

ALZET Comments: Amikacin; Ear; Antelope (bongo); 2ML4; 24 days; Functionality of mp verified by residual volume; animal info (10 years old, male, 326 kg); "An osmotic pump was beneficial for antibiotic delivery in case 2 and may be an effective therapy for low-grade infections or for continued therapy once a severe infection is under control." pg. 340.

ALZET Comments: Amikacin; Sub-masseteric tunnel; Pig; 2ML2; 14 days; Bone healing; x-ray image showing pump adjacent to mandible bone (p. 189); pump positioned near mandible bone to deliver antibiotics for infection control; tissue perfusion (sub-masseteric tunnel).

ALZET Comments: Amikacin; Saline, sterile; Intracoelomic; Snake (corn); 1002; Functionality of mp verified by plasma levels; comparison of IM injections vs. mp; half-life (p. 376) 44-45 hours; animal info (male, female, 115-328 grams); “…pumps delivered the drug at a predictable rate and were efficacious in achieving a constant plasma concentration of amikacin at the predicted level. Osmotic pumps may offer a safer alternative to periodic intramuscular injections for drug delivery in venomous or aggressive snakes.” (p. 373); temperatures between 27.2-27.7 C; surgical staples (wound clips) used.
ALZET Comments: Amikacin; gonadotropin-releasing hormone; Snake; iguana; 1002; Peptides; animal info (corn snake); review, see p. 211; ref #9; “Alzet osmotic pumps can deliver medications continuously without the need for periodic injections. They hold promise for future delivery options in reptiles.” (p. 211).

ALZET Comments: NT-3; Amikacin;; Perilymph, artificial;; Ear (cochlea);; Guinea pig;; 2ML2;; 15 days;; Antibiotic; Controls received mp w/ vehicle; tissue perfusion (scala tympani); Amikacin is an aminoglycoside antibiotic; Group 1 received amikacin, Group 2 received vehicle, Group 3 received amikacin and NT-3; All treatment groups received drug for 1 day, followed by 2 weeks perilymph;.

ALZET Comments: Amikacin; NT-3;; Perilymph, artificial;; Ear (cochlea);; Guinea pig;; 2ML2;; 2 weeks;; Antibiotic; controls received mp with vehicle; tissue perfusion (scala tympani); peptides; Lynch coil used, agents or vehicle given in different sequential combinations;.

ALZET Comments: Amikacin; Gentamicin; bone; rabbit; 2001; 2ML1; 6 days; Antibiotic; comparison of im injection vs. mp infusion; no stress p. 289 - no tissue reaction; antibiotic; tissue perfusion.

3. Bleomycin

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

ALZET Comments: Bleomycin; Saline; SC; Mice; 1007D; 7 days; Controls received mp w/ vehicle; dose-response pg 5); Pumps removed on day 10;  Dose (1, 10, 60, 110 u/kg);.

ALZET Comments: Bleomycin sulfate; SC; Mice; 1004; 56 days; Dose (2.8 mg/ml); animal info (12 week old C57/BL6 mice);.

ALZET Comments: Bleomycin; PBS; SC; Mice; 1007D; 7 days; animal info (6–8 week old male C57BL/6 mice); pulmonary fibrosis model wherein fibrosis was induced by osmotic pump-delivery of bleomycin; Dose (1.8 Unit/mouse);.

ALZET Comments: Bleomycin; Saline; SC; Mice; 10 days; Dose (100 mg/kg); Controls received mp w/ vehicle; animal info (Nine-week-old female WT mice weighing 19 to 21 g);.
ALZET Comments: Bleomycin; Saline; SC; Mice; 7 days; Controls received mp w/ vehicle; animal info (male, hPS-TG or C57Bl6, 18-22g, 8-12 weeks old); cardiovascular; Dose (100 mg/kg);

ALZET Comments: Bleomycin; SC; Mice; 1 week; animal info (C57Bl6, 6-10 weeks old); Dose (100 mg/kg);

ALZET Comments: Bleomycin sulfate; Saline; SC; Mice; 2001; 7 days; Controls received mp w/ vehicle; animal info (female, C57BL6J, 9 weeks old, 19-22g); cardiovascular;

ALZET Comments: Bleomycin; Saline; SC; Mice; 2004; 1 week; 2 weeks; 3 weeks; 4 weeks; Controls received mp w/ vehicle; animal info (C57BL6, 6-8 weeks old); no stress (see pg. 344); immunology;

ALZET Comments: Bleomycin; caveolin-1 scaffolding domain peptide; Saline; DMSO; water; SC; Mice; 1007D; 2002; 10 days; 12 days; Controls received mp w/ vehicle; animal info (male, CD1, 10 weeks old); 10% DMSO used; immunology; bleomycin had saline vehicle; CSD had DMSO and water vehicle; caveolin-1 scaffolding domain peptide aka CSD; bleomycin pumps removed after days 10-12 and replaced with CSD pumps;

ALZET Comments: Bleomycin; Saline; SC; Mice; 1007D; 10 days; Controls received mp w/ vehicle; animal info (male, CD1, 10 weeks old); comparison of injection vs mp; immunology; "the pump model provides additional major benefits compared with the direct model. Much less weight loss and mortality is observed in the pump model than in the direct model. Therefore, besides the fact that the pump model is more humane, it also benefits the researcher because it allows the number of surviving animals in treatment groups to be accurately predicted, thereby making analyses of biochemical and cell biological parameters at the end of an experiment more meaningful." pg L747; pumps removed after 10 days; human scleroderma interstitial lung disease model;

Q3961: R. Lee, et al. Caveolin-1 regulates chemokine receptor 5-mediated contribution of bone marrow-derived cells to dermal fibrosis. FRONTIERS IN PHARMACOLOGY 2014;5(U1-U14
ALZET Comments: Bleomycin; Saline; SC; Mice; 1007D; 10 days; Controls received mp w/ vehicle; animal info (male, CD1, 10 weeks old); comparison of injection vs mp; "Recently, we found that systemic bleomycin delivery using subcutaneously implanted osmotic minipumps can produce a very useful mouse model for SSC in which fibrosis is observed in the skin, lungs, and a variety of other internal organs" pg 2; "We recently compared two methods of delivering bleomycin [Direct Model (directly into the lungs) and Pump Model (systemic delivery using implanted osmotic minipumps)] and found that the lung disease induced in the Pump Model was distinct from the disease induced in the Direct Model and more similar to the lung disease observed in SSC patients" pg 4; pumps removed after 10 days;

ALZET Comments: Bleomycin; Saline; SC; Mice; 2001; 7 days; Controls received mp w/ vehicle; animal info (female, C57BL6, 9 weeks old); "Although intratracheal, intravenous, and subcutaneous injections are associated with disadvantages including variable distribution of lesions, high mortality,and a requirement for multiple procedures, the osmotic pump
method of BLM treatment reportedly avoids these difficulties" pg 11-12; Bleomycin infusion used to model pulmonary fibrosis.

ALZET Comments: Bleomycin; SC; Mice; 1004; 28 days; Controls received mp w/ PBS; animal info (BALB/c); good methods (picture of pump and pump implantation pg.71); no stress (see pg. 72); "The osmotic pump and infusion were well tolerated by the mice (Fig. 2). There were no obvious systemic differences in the bleomycin cohort compared with the control cohort. As the model did not involve a gross epidermal breach and the pump was positioned away from the insertion site (fig. 2), no macroscopic scarring was observed. The appearance of the murine skin was assessed for gross changes in appearance, but none was observed between the treatment groups." pg 72;.

ALZET Comments: Bleomycin; Saline; SC; Mice; 2001; Controls received mp w/ vehicle; animal info (female, C57BL6, 7 weeks old); cardiovascular; immunology; "colleagues performed intratracheal injection in rats, but we used systemic infusion with a minipump in mice, which induces more chronic and mild model of pulmonary fibrosis in mice" pg 799;.

ALZET Comments: Bleomycin sulfate; Sodium chloride; SC; Mice; 2001; 7 days; Animal info (C57BL/6, C3H/HeJ, 8 -10 wks old).

ALZET Comments: Bleomycin; Saline; Mice; 2001; 7 days; Controls received mp w/ vehicle; animal info (female, C57BL6, 8 weeks old); Pumps used to induce pulmony fibrosis.

ALZET Comments: Bleomycin; Immunoglobulin G; Saline; IP; Mice (transgenic); 2001; 7 days; Controls received mp w/ saline; animal info (8- to 10-wk-old, female, C57BL/6 mice, weighing 20–23 g); Therapeutic indication (Pulmonary fibrosis); Dose (60 mg/kg);.

4. Doxycycline

ALZET Comments: Doxycycline; PBS; CSF/CNS (right lateral ventricle); Mice (transgenic); 1007D; 7 days; 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);.

ALZET Comments: Telmisartan; PD123319; Doxycycline; aliskiren; Saline; water; SC; mice; 2004; 2, 6 weeks; 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
ALZET Comments: Doxycycline; Saline; CSF/CNS; Mice (transgenic); 1007D; 4 days; Controls received mp w/ vehicle; animal info (GFP/M2, 2-3 mo old).

ALZET Comments: Thyroxine, L-; doxycycline; SC; Rat; 1002; 14 days; Controls received mp w/ physiological serum; animal info (Wistar, male, 50-60 days old, 132 g).

ALZET Comments: Doxycycline; brain-derived neurotrophic factor; glial cell line-derived neurotrophic factor; Ear (scala tympani); Guinea pig; 2002; 27 days; 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.

ALZET Comments: Doxycycline; SC; Mice (SCID); 3 days; Controls received mp w/ saline; cancer (mammary carcinoma); animal info (SCID).

ALZET Comments: Doxycycline; PBS; SC; Mice; 2001; 7 days; Controls received mp w/ vehicle; cancer (prostate); animal info (C57BL/6J, 7-8 weeks old); paper states incorrect pump model.

ALZET Comments: Doxycycline hydrochloride; Saline; SC; IP; IA (aorta); Mice; 1002; 14 days; Controls received mp w/ vehicle; tissue perfusion (aorta); dose-response (table 1); comparison of oral vs. mp; half-life (p. 234), 26.5 hours; cardiovascular; animal info (C57BL/6J, male, 8-10 weeks old, 20-35 grams); catheter secured to a polyvinyl alcohol sponge positioned over the anterior surface of the aorta and secured to retroperitoneal tissues; (quote p. 233).

ALZET Comments: Doxycycline; SC; Rat; 2002; 7, 10, 14 days; Controls received no treatment; no stress (see pg. 217); enzyme inhibitor (collagenase); orthodontic appliance; agent also known as Doxylin; "The animals tolerated the appliance and the implanted mini-osmotic pump well. The incision wound from the implantation of the mini-osmotic pump was adequately healed by the day following surgery!" (p. 217).

5. Gentamicin

ALZET Comments: Amikacin; gentamicin; SC; Pig (mini); Animal info (female, 3.5-4.5 mo old, 12-27 kg); 2ML sized pumps used; pump implanted in the back of the neck.

ALZET®

Bibliography

ALZET Comments: Gentamicin; dexamethasone; melatonin; Ear (round window); Rat; 2001; 7 days; Controls received mp w/ saline; animal info (Wistar, male, 220-250 g); stability verified after 7 days (data not shown).

ALZET Comments: Gentamicin; SC; Rat (transgenic); 1007D; 5 days; Animal info (S3344ter-4, heterozygous, P15).

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

ALZET Comments: Gentamicin sulfate; SC; Guinea pig (pregnant); 2ML1; Functionality of mp verified by plasma levels taken; teratology; listeria; wound clips used.

ALZET Comments: Gentamicin; Saline; Ear (cochlea); Guinea pig; 2002; 14 days; 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).

ALZET Comments: Gentamicin; Hank's solution; Ear (semicircular canals); Chinchilla; 1007D; 7 days; Controls received mp w/ vehicle; Meniere's disease; microcatheter used; 27 gauge tubing used for cannulation; tissue perfusion (semicircular canals).

ALZET Comments: Gentamicin; PBS; Mice; 1-2 days;

ALZET Comments: Kanamycin; Gentamicin; Saline; SC; Rat; mice; 15 days; preliminary experiments on drug tolerance were carried out in mice using gentamicin; kanamycin infusion done in rats.

ALZET Comments: Gentamicin sulfate; Water, sterile; Ear; Chinchilla; 2001; 7 days; Dose-response (graph, table p. 1349); comparison of transtympanic injections vs. mp/; IntraEar catheter used; Meniere's Disease; Vertigo; tinnitus; tissue perfusion.

ALZET Comments: Gentamicin sulfate; PBS; SC; mice; 1007D; 4-6 days; controls received no gentamicin treatment; dose response (graph p. 1346); immunology.

6. Minocycline

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. Auton Neurosci 2019;217(49-57
ALZET Comments: Minocycline; CSF, artificial; CSF/CNS (left ventricle); Rat; 2004; Dose (5 ug/h); animal info (8 week old male Sprague-Dawley rats);

ALZET Comments: Minocycline, fluorocitrate; PBS, artificial cerebrospinal fluid; CSF/CNS (intrathecal); Rat; 2002; 6 days, 3 days; Dose (200 μg/day); Controls received mp w/ vehicle; animal info (adult male Sprague-Dawley rats);

ALZET Comments: Minocycline; inhibitor; CSF, artificial; CSF/CNS (cistern magna); Rat; 2001; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley, 250g); Dose (0.3 μL/hr);

ALZET Comments: Pentoxifylline; irbesartan; minocycline; angiotensin II; CSF, artificial; Na sodium bicarbonate; saline; CSF/CNS; Rat; 2004; 2002; 2001; 4 weeks; 2 weeks; 1 week; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley, 10-12 weeks old); cardiovascular; peptides; Dose (ICV - Pentoxifylline 10 ug/hr; irbesartan 125 ug/day; minocycline 5 ug/hr; SC AngII 120 ng/kg/min); brain coordinates;

ALZET Comments: Minocycline; Saline; CSF/CNS (intrathecal); Rat; 2002; 5 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 250g); behavioral testing (Randall-Selitto, Von Frey hairs); immunology;

ALZET Comments: Minocycline; aminoadipic acid, L-a-; Interleukin-1 receptor antagonist; DMSO; saline; CSF/CNS (occipital membrane, cistern); Rat; 2001; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, adult, 220-240g); 20% DMSO used; behavioral testing (air-puff pressure/behavioral response withdrawal, mechanical allodynia); L-a-aminoadipic acid aka LAA; LAA is an astrocytic specific inhibitor;

ALZET Comments: Minocycline HCl; Sodium fluorocitrate; PBS; CSF/CNS (intrathecal); Rat; 2004; 21 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 200-250g); behavioral testing (paw pressure test; von frey test; rota-rod test ); pumps primed overnight in 37°C PBS;

Q3772: M. Dworak, et al. Attenuation of microglial and neuronal activation in the brain by ICV minocycline following myocardial infarction. Autonomic Neuroscience-Basic & Clinical 2014;185(43-50
ALZET Comments: Minocycline; Saline; CSF/CNS; Rat; 12 weeks; Control animals received mp w/ saline; animal info (male, Sprague Dawley); pumps replaced every 4 weeks; 0.3 μl/h pump used; ischemia (cardiac); long-term study; cardiovascular;
ALZET Comments: Minocycline; PBS; CSF/CNS (intrathecal); Rat; 7 days; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, 250-300g); spinal cord injury; immunology; used PE-10 catheter. Pump sutured to paravertebral muscles.

8. Mitomycin

ALZET Comments: Mitomycin C; CSF/CNS (intrathecal); Rat; no duration posted; no comment posted.

ALZET Comments: Mitomycin C; Saline; IP; mice; no duration posted; cancer.

ALZET Comments: Mitomycin C; bladder; Rat; 2ML2; 2 weeks; 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.

ALZET Comments: Actinomycin D; Cycloheximide; Mitomycin C; Vinblastine; Ringer’s solution; CSF/CNS (sciatic nerve); Rat; 2001; 2002; 3, 4, 6 days; mp connected to silicone cuff; functionality of mp verified in vivo with dye; tissue perfusion.

ALZET Comments: Mitomycin; Water; bladder; Rat; 1 year and 3 weeks; pump replaced periodically; mp connected to bladder via catheter; tumors induced by infusion of water or agent; lesions reversible over time; long-term study; cancer; controls received surgery only; mps cultured upon removal; tissue perfusion.

ALZET Comments: Formalin, neutral buffered; Water; Cisplatin; Mitomycin C; Saline; Saline; bladder; Rat; 2002; 1, 2, and 3 weeks; cancer; comparison of agents carcinogenic effects; empty mp used in one exp.; mp connected to catheter in bladder; confusion over length of pumping time-states 18-22 days for 14 day pump; tissue perfusion.

8. Neomycin

ALZET Comments: Cisplatin; Sodium thiosulfate; Brain-derived neurotrophic factor; Fibroblast growth factor; D-JNKI-1; BN82270; Tretodotoxin; Perilymph, artificial; Dexamethasone; Methylprednisone; Caroverine; Methionine, D-; Thiourea; Liposome, cationic; Neomycin; SC; Ear (round window membrane); Ear (cochlea); Ear (scala tympani); Ear; Guinea pig; 3, 7, 14, 28 days; 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 tymphani, 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.
ALZET Comments: Trolox; neomycin; ascorbic acid; Perilymph, artificial; sodium bicarbonate; Ear (cochlea); Guinea pig; 2002; 26 days; 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).

ALZET Comments: Brain-derived neurotrophic factor; Ciliary neurotrophic factor; Neomycin;; Perilymph, artificial; Ear (scala tympani); Guinea pig; 2002; 26 days; 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.

ALZET Comments: Neomycin; Furosenide; PBS; ear (scala tympani); Guinea pig; 2004; 28 days; Tissue perfusion (round window); functionality of mp verified by residual volume; diagram of pump and electrode assembly (p. 94); catheter patency assessed by passing fluid through the line at the end of the experiment; Neomycin infused in pilot study; Kanamycin and furosenide were co-infused in a second study.

ALZET Comments: Neomycin; PBS; CSF/CNS (intratumoral); Rat; 2004; 26 days; Controls received mp w/ vehicle; tissue perfusion (tumor); cancer.

ALZET Comments: Neomycin; lipoic acid, alpha; Saline; Ear (round window); Guinea pig; 2ML4; 7 days; Controls received mp w/ vehicle; tissue perfusion (round window); no stress (see pg. 597); Neomycin antibiotic solution was 5%; micro polyurethane tubing used; the authors state that ALZET delivery system more closely approximates the clinical situation of repeated otic application, with minimal middle ear trauma.

ALZET Comments: Nerve growth factor; Neomycin; Saline; ear (cochlea); Guinea pig; 2 weeks; controls received mp w/vehicle; tissue perfusion (scala tympani); pulsed delivery; cannula/catheter filled with neomycin which was infused for the first 24 h; pump was filled with NGF; peptides.

ALZET Comments: Neomycin; Horseradish peroxidase; Saline; Ear (cochlea); Guinea pig; 2002; 2-14 days; Tissue perfusion (cochlea).

9. Penicillin

ALZET®
Bibliography

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

ALZET Comments: Interleukin-3, recomb. mouse; Penicillin; Streptomycin; Glycerol; PBS; IP; SC; mice; 2001; 2002; 7 days, 2 weeks; 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.

ALZET Comments: Clindamycin HCl; Penicillin G; Sodium hydroxide; Water; SC; mice; 72 hours; Pump model not stated; controls received mp w/water; dose-response; mp primed overnight in PBS; 2 doses of agent infused; agent infused separately; antibiotic.

ALZET Comments: Endotoxin, E. coli; Interleukin-3, recomb. mouse; Penicillin; Streptomyacin; Glycerol; PBS; IP; SC; mice; 3 and 7 days; infusion supplemented w/ip injections; interleukin activity in blood variable - aggregation in pump? (see p. 1004); mp infusion in normal and irradiated mice; half-life; peptides; antibiotic.

10. Rapamycin

ALZET Comments: Rapamycin, LY294002, Interleukin-1Receptor antagonist, SC144, etanercept,; CSF, artificial; CSF/CNS (midbrain periaqueductal gray); Rat; animal info (200-250 gr Wistar rats); rapamycin is an mTOR inhibitor; LY294002 is a PI3K inhibitor; IL-1Ra is an IL-1b receptor antagonist, SC144 is a gp130 antagonist, etanercept is a TNF-a receptor antagonist; 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).

ALZET Comments: Rapamycin; amyloid protein, beta (1-42); CSF, artificial; CSF/CNS; Rat; 1002; 14 days; animal info (male, Sprague Dawley, 3-4 months old, 300-350g); Multiple pumps per animal (2); neurodegenerative (Alzheimer’s); behavioral testing (Y-maze); immunology; Bilateral infusion; used jewelers’ screw and dental zinc cement; Dose (10 mg/kg amyloid beta, rapamycin 500 ug/2 weeks); Brain coordinates;.

ALZET Comments: Rapamycin; DMSO; PEG 400; CSF/CNS (third ventricle); Rat; 4 weeks; Controls received mp w/ vehicle; animal info (male, F344 Brown Norway, 23-25 months old); 10% DMSO and 90% PEG used; used PE-50 tubing; pumps initially filled with aCSF - after one week recovery, pumps replaced with rapamycin or vehicle pump; Dose (30 ug/day); Brain coordinates (1.1 mm posterior to Bregma and 1.6 mm ventral from the skull surface on the midline (medial s- sure), with the nose bar set at 4 mm below the ear bars (below zero)) pg 805;.

ALZET Comments: Rapamycin; DMSO; PEG 400; CSF/CNS; Rat; 28 days; Controls received mp w/ vehicle; animal info (male, F344 x Brown Norway, 24 months old); pumps replaced after 14 days; ALZET brain infusion kit used; 10% DMSO used; 90% PEG 400 used; post op. care (rats kept warm until recovered); used aCSF filled pump for 14 days, then replaced with
rapamycin or vehicle for 28 day infusion; obesity; Dose (30 ug/day); Brain coordinates (1.3 mm posterior to bregma, 1.9 mm lateral to the midsagittal suture and to a depth of 3.5mm);

ALZET Comments: FK506; Rapamycin; SC; Mice; 1004; 1 month; Dose (1 ug/g/day); animal info (3 week old mice); FK506 aka Tacrolimus;.

ALZET Comments: Rapamycin; CTOP; LY297002; DMSO; saline; CSF/CNS (intrathecal); Rat; 14 days; Controls received mp w/ saline; animal info (Wistar, 200-250g); 50% DMSO used; cancer (breast; bone); dose-response (pg 2015); behavioral testing (hindpaw withdrawal latency); Rapamycin is an mTOR antagonist; CTOP is an MOR antagonist; LY297002 an PI3K inhibitor;.

ALZET Comments: Rapamycin, marinobufagenin; SC; Rat; 2004; 4 weeks; animal info (Male Sprague-Dawley rats weighing 250–300 g); Multiple pumps per animal (2 minipumps were implanted for coadministration of rapamycin and MBG); Marinobufagenin is a cardiotonic steroid; Dose (MBG 10 ug/kg/day; rapamycin 0.2 mg/kg/d);.

ALZET Comments: Rapamycin; CSF/CNS; Mice; 1007D; 2 weeks; Animal info (GFAP -Tat tg, 7-8 months old); neurodegenerative (HIV-associated neurocognitive disorder); “Because Rapam poorly crosses into the CNS, it was infused intracerebrally into the lateral ventricle of 9-month-old mice at a concentration of 20 mg/kg.” pg 1923; Rapamycin is an autophagy activator;.

ALZET Comments: Rapamycin; Mice; 2 months; Control animals received mp w/ vehicle; animal info (C57BL/6, 12 wks old, male).

ALZET Comments: Rapamycin; PEG 400; DMSO; cremophor; CSF/CNS; Mice; 1004; Animal info (C57BL/6, 2, 12 mo old); ALZET brain infusion kit used; 10% DMSO used; 60% PEG 400 used; 30% cremophor used.

ALZET Comments: Rapamycin; epidermal growth factor; DMSO; CSF/CNS; Mice (pregnant); 1007D; 7 days; Control animals received mp w/ vehicle; animal info (C57BL/6, female, 2, 10, 18 mo old); ALZET brain infusion kit 3 used.

ALZET Comments: Bafilomycin, A1; rapamycin; CSF/CNS; Mice; 1007D; 2 weeks; Animal info (wt, alpha synuclein, 9 mo old); neurodegenerative (Parkinson’s disease).

Q5955: S. Haller. Marinobufagenin induced uremic cardiomyopathy : the role of passive immunization, rapamycin, and CD40 signaling in the generation of renal fibrosis. Theses and Dissertations 2012;331(ALZET Comments: Rapamycin; Marinobufagenin; SC; Rat; 2004; 4 weeks; animal info (Male Sprague Dawley rats weighing between 250-300 gms);
marinobufagenin is a cardiotonic steroid; Agents administered alone or in combination; Dose (rapamycin was administered at 0.2mg/kg/day and MBG at 10μg/kg/day);

11. Streptomycin

ALZET Comments: Y-27632; streptomycin; PBS, sterile; penicillin; CSF/CNS (intrathecal); Rat; 2002; 2 weeks; 2, 4 days; Controls received mp w/ vehicle; functionality of mp verified by ROCK inhibitory activity in CSF; dose-response (fig. 3); stability of Y27632 verified by ROCK inhibitory activity after 13 days in mp at 37 C; enzyme inhibitor (RHO Kinase); animal info (male, Sprague-Dawley); cervical 4/5 dorsal column transection; spinal cord injury.

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

ALZET Comments: Streptomycin; Saline; Ear (cochlea); Guinea pig; 2002; 24 hours; tissue perfusion (round window).

ALZET Comments: Interleukin-3, recomb. mouse; Penicillin; Streptomycin; Glycerol; PBS; IP; SC; mice; 2001; 2002; 7 days, 2 weeks; 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.

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

12. Tetracycline

ALZET Comments: Angiotensin II, Tetracycline-3, chemically modified; Saline; CSF, artificial; SC; CSF/CNS (left lateral ventricle); Rat; 2004; 4 weeks; 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;

ALZET Comments: Calcium hydroxide; Barium hydroxide; Tetracycline; Glycerol; bone (femur); Rat; 4 weeks; no stress (see pg. 274); tissue perfusion; good methods.
13. Tobramycin


**ALZET Comments**: Tobramycin; IP; Guinea pig; Rat; 2ML1; 7 days, 72 hours; 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.

14. Tunicamycin

**Q5674**: J. Y. Kim, *et al.* PDI regulates seizure activity via NMDA receptor redox in rats. Sci Rep 2017;7(42491

**ALZET Comments**: RNA, small interfering (PDI; DTNB); bactracin; Immunoglobulin, anti-PDI; tunicamycin ; CSF/CNS; Rat; 1007D; 7 days, 14 days; 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); Brain coordinates;

**Q3396**: V. Legry, *et al.* Endoplasmic reticulum stress does not contribute to steatohepatitis in obese and insulin-resistant high-fat-diet-fed foz/foz mice. Clinical Science 2014;127(507-518

**ALZET Comments**: Tunicamycin; DMSO; SC; Mice; 1004; 4 weeks; Control animsl received mp w/ vehicle; animal info (HFD-fed foz/foz).

**P4971**: G. Orsini, *et al.* Localized infusion of tunicamycin in rat hemimandibles: Alteration of the basal lamina associated with maturation stage ameloblasts. JOURNAL OF HISTOCHEMISTRY & CYTOCHEMISTRY 2001;49(165-176

**ALZET Comments**: Tunicamycin; Saline; bone (mandible); Rat; 2001; 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;


**ALZET Comments**: Tunicamycin; Cycloheximide; Desipramine; Fluoxetine; Mianserin; Trazodone; CSF/CNS; SC; Rat; 2001; 2ML1; 4-7 days; comparison of sc injections vs. mp; cyclo. and tunic. delivered icv for 5 days.