Recent References on the Administration of Antihypertensive Agents Using ALZET® Osmotic Pumps

Atenolol (2015-Present)


**Agents:** Isoproterenol, Atenolol, ICI-118551  
**Vehicle:** Saline, ascorbic acid;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 48 Hours;  
**ALZET Comments:** Dose: ISO (2, 6 or 30 mg/kg/day; atenolol (2 mg/kg/day), ICI-118551 (1 mg/kg/day); 0.4 mM ascorbic used; animal info (12~14 week-old C57Bl/6 mice); cardiovascular;


**Agents:** Atenolol  
**Vehicle:** PEG 200; DMSO;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001D;  
**Duration:** 4 hours;  
**ALZET Comments:** Dose (0.25 mg/kg/h); 50% PEG 200 used, 50% DMSO used; animal info (19 month old Fischer rats); Resultant plasma level (p.10);


**Agents:** Atenolol  
**Vehicle:** DMSO, PEG 300;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 2 weeks;  
**ALZET Comments:** Dose (10 mg/kg/d); 50% PEG 300/50% DMSO used; animal info (8 to 10-week-old male Wistar-Kyoto rats); Atenolol is a selective beta1-blocker;

Q4508: C. Disdier, et al. Tissue biodistribution of intravenously administrated titanium dioxide nanoparticles revealed blood-brain barrier clearance and brain inflammation in rat. Particle and Fibre Toxicology 2015;12(U1-U20

**Agents:** Atenolol; digoxin; prazosin  
**Vehicle:** PEG 200; DMSO;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2004;  
**Duration:** Not Stated;  
**ALZET Comments:** Animal info (male, Fisher F344, 8 weeks old, 180-250g); 50% PEG 200 used; 50% DMSO used;

Benazepril

P9490: M. Abu-Taha, et al. Menopause and Ovariectomy Cause a Low Grade of Systemic Inflammation that May Be Prevented by Chronic Treatment with Low Doses of Estrogen or Losartan. Journal of Immunology 2009;183(2):1393-1402

**Agents:** Estradiol, 17b-; benazepril  
**Vehicle:** DMSO;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2004;  
**Duration:** Not Stated;  
**ALZET Comments:** Controls received mp w/ vehicle or sham operation; animal info (male, female, Sprague Dawley, OVX); 50% DMSO used; dose (5 ug/kg/d)

P6345: S. Yagi, et al. Combined treatment with an AT1 receptor blocker and angiotensin converting enzyme inhibitor has an additive effect on inhibiting neointima formation via improvement of nitric oxide production and suppression of oxidative stress. HYPERTENSION RESEARCH 2004;27(2):129-135

**Agents:** Valsartan; benazepril  
**Vehicle:** Potassium hydroxide; HCL;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** Not Stated;  
**ALZET Comments:** Controls received mp w/ vehicle or sham operation; animal info (male, female, Sprague Dawley, OVX); 50% DMSO used; dose (5 ug/kg/d)


**Agents:** Benazepril; candesartan  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2ML4;  
**Duration:** Not Stated;  
**ALZET Comments:** Blood pressure taken


**Agents:** Benazepril; Valsartan  
**Vehicle:** Water, distilled; NaOH; HCl;  
**Route:** IP;  
**Species:** Rat;  
**Pump:** 2ML4;  
**Duration:** 12 weeks;  
**ALZET Comments:** controls received mp with saline; long-term study, pumps replaced every 28 days; valsartan is an angiotensin AT1 receptor antagonist; antihypertensive
Benazeprilat (2013-Present)


**Agents:** Aliskiren; benazeprilat; valsartan; PD123319 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 10 weeks;

**ALZET Comments:** Cardiovascular; peptides; animal info (12 wks old, male, AT-KO); functionality of mp verified by echocardiography; pumps replaced every 4 weeks; enzyme inhibitor (renin);


**Agents:** Insulin (Humulin N); aliskiren (renin inhibitor); benazeprilat (ACEi); valsartan (ARB); streptozotocin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 10 weeks;

**ALZET Comments:** Controls received mp w/vehicle, or (0.1M sodium citrate buffer (pH 4.5)); cardiovascular; animal info (male, C57b16/J, 12 weeks, blood glucose > 250 mg/dl); pumps replaced every 4 weeks; enzyme inhibitor (renin); diabetes;

Bendroflumethiazide


**Agents:** Bendroflumethiazide; Furosemide **Vehicle:** Lithium citrate; Ethanolamine; **Route:** IP; **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

**ALZET Comments:** antihypertensive

Bisoprolol


**Agents:** Isoproterenol HCL; Bisoprolol; Nebivolol; Metoprolol, CGP2712A **Vehicle:** Saline; DMSO; Ascorbic acid; **Route:** SC; **Species:** Mice; **Pump:** 1007D; 2001; **Duration:** 7 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (FVB); 40% DMSO used for CGP20712A & nebivolol vehicle; post op. care (Carpofen 5 mg/kg); cardiovascular; antihypertensive;


**Agents:** Norepinephrine HCl; Norepinephrine bitartrate; Bunazosin; Bisoprolol **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 7, 14 days;

**ALZET Comments:** controls received mp w/saline or norepinephrine; dose-response; antihypertensive; cardiovascular; 2 pumps implanted in each animal

Bunazosin


**Agents:** Norepinephrine HCl; Norepinephrine bitartrate; Bunazosin; Bisoprolol **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 7, 14 days;

**ALZET Comments:** controls received mp w/saline or norepinephrine; dose-response; antihypertensive; cardiovascular; 2 pumps implanted in each animal
Candesartan (2018-Present)


**Agents:** Candesartan  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** 2001D  
**Duration:** 24 hours;

**ALZET Comments:** Dose (0.01 mg/kg/min); 5% dextrose in water used; animal info (4/10-week old female Wistar-Kyoto rats); Blood pressure measured via direct intracarotid method with use of digital BP analyzer; enzyme inhibitor; gene therapy; Therapeutic indication (treating renal Na+ retention and hypertension);


**Agents:** Ciclosporine A; Candesartan; Celecoxib  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** 2ML4  
**Duration:** 3 weeks;

**ALZET Comments:** Dose: Cyclosporine (25 mg/kg); Candersatan (5 mg/kg); Celecoxib ((50mg/kg)Controls received mp w/ vehicle; animal info: Adult (10 to12 weeks) male Wistar rats; Cyclosporine A aka (CsA); Candesartan aka (RAS); Celecoxib aka (COX-2)


**Agents:** VIPER or Candesartan  
**Vehicle:** CSF, artificial  
**Route:** CNS/CSF  
**Species:** Rat  
**Pump:** 2002  
**Duration:** 14 days;

**ALZET Comments:** Dose (VIPER-40 ug/kg/day or Candesartan-4 ug/day); Controls received mp w/ vehicle; animal info (7 weeks old, Male, Sprague Dawley); Brain coordinates (0.5 mm caudal to bregma, 1.5 mm lateral to the midline, and 2.7 mm below the skull surface); bilateral cannula used; cardiovascular;


**Agents:** Candesartan  
**Vehicle:** Dextrose  
**Route:** SC  
**Species:** Rat  
**Pump:** 2001D  
**Duration:** 24 hours;

**ALZET Comments:** Dose (0.01 mg/kg/min); 5% dextrose used; animal info (12-week-old female Sprague-Dawley rats ); Candesartan aka CAND; dependence;


**Agents:** Candesartan  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** 2001D  
**Duration:** 1 day;

**ALZET Comments:** Dose (0.01 mg/kg/min); animal info (4 weeks old); Blood pressure measured via Direct Intracarotid Method


**Agents:** Relaxin-2; candesartan cilexetil  
**Vehicle:** Saline  
**Route:** SC  
**Species:** Mice  
**Pump:** 1007D; 2002  
**Duration:** 7 days;

**ALZET Comments:** Dose (0.5 mg/kg/day); Controls received mp w/ vehicle; animal info (eight week old male C57BL/6 mice); Blood pressure measured via tail cuff plethysmography;Relaxin-2 aka RLX; cardiovascular;


**Agents:** Relaxin-2; Candesartan cilexetil  
**Vehicle:** Saline  
**Route:** SC  
**Species:** Mice  
**Pump:** 1007D; 2002  
**Duration:** 7 days;

**ALZET Comments:** Dose (0.5 mg/kg/day); Controls received mp w/ vehicle; animal info (eight week old male C57BL/6 mice); Blood pressure measured via tail cuff plethysmography;Relaxin-2 aka RLX; cardiovascular;


**Agents:** candesartan  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** 2001D  
**Duration:** 24 hours;

**ALZET Comments:** Dose (0.01 mg/kg/min); Controls received mp w/ agent; animal info (4 weeks, male and female, Wistar-Kyoto (WKY) and spontaneously hypertensive (SHR)); enzyme inhibitor (Ang type-1 receptor); all animals received pump with candesartan 24h prior to experiments to block systemic AT1Rs;

**Agents:** Candesartan  
**Vehicle:** DMSO  
**Route:** SC  
**Species:** Mice  
**Pump:** 1004  
**Duration:** 2 months  

**ALZET Comments:** Dose (1 mg/kg per day); 25% DMSO used; animal info (male and female, C57BL6 mice with APP mutations, 3-4 months old); behavioral testing (Morris water maze); pumps replaced at 34 days; comparison of oral delivery via drinking water vs mp; neurodegenerative (Alzheimer disease); “It is thus possible that delivery of candesartan through osmotic minipumps (cohort 1) compared with drinking water (cohort 2) allowed for better control of drug concentration and steady-state levels that conferred a better drug efficacy despite a shorter treatment.

Q7242: Y. Takeda, et al. Epigenetic Regulation of Aldosterone Synthase Gene by Sodium and Angiotensin II. J Am Heart Assoc 2018;7(10)

**Agents:** Angiotensin II, Candesartan  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** Not Stated  
**Duration:** 4 weeks  

**ALZET Comments:** Dose (Ang II 200 ng/kg/min, Candesartan 1mg/kg/day); animal info (Male, Wistar, 6 weeks old); Candesartan aka Ang II type 1 receptor antagonist; gene therapy; Captopril (2012-Present)


**Agents:** ICI-118,551 hydrochloride; Toxin, Diptheria; reserpine; captopril; norepinephrine  
**Vehicle:** PBS  
**Route:** Intrasplenic  
**Species:** Mice  
**Pump:** 1002  
**Duration:** 1, 2, 3 weeks  

**ALZET Comments:** Dose ((ICI-118,551 12 mg/kg/hr), (Diptheria Toxin 5 mg/kg/day), (reserpine 5mg/kg/day), (captopril 6mg/kg/day), (norepinephrine 5mg/kg/day)); Controls received mp w/ vehicle; animal info (10-12 weeks, Apoe(-/-)); comparison of intrasplenic injection vs mp; ICI-118,551 hydrochloride is a selective antagonist of the beta2 adrenergic receptor. angiotensin converting enzyme (ACE) inhibitor. Reserpine blocks the uptake of catecholamines into synaptic vesicles; Reserpine is an enzyme inhibitor (vesicular monoamine transporter 2); immunology; Diptheria toxin used to deplete TH+ leukocytes. Splenic nerves were depleted by intrasplenic DT using mp for 7 days; Therapeutic indication (ICI-118,551 reduced splenic GMP proliferation and inflammatory myeloid cell generation); ”


**Agents:** Captopril  
**Vehicle:** PEG 300; DMSO  
**Route:** SC  
**Species:** Rat  
**Pump:** 2002  
**Duration:** 2 weeks  

**ALZET Comments:** Dose (30 mg/kg/d); Controls received mp w/ vehicle; enzyme inhibitor (ACE);  


**Agents:** Losartan; captopril; CAS92-78-4  
**Vehicle:** CSF, artificial  
**Route:** CSF/CNS  
**Species:** Mice  
**Pump:** 1004  
**Duration:** 3 weeks  

**ALZET Comments:** Controls received mp w/ vehicle; animal info (C57BL6J); cardiovascular; CAS92-78-4 is a CREB-CBP interaction inhibitor;  


**Agents:** Captopril; losartan; CGP42112A  
**Route:** SC  
**Species:** Guinea pig  
**Pump:** 2ML4  
**Duration:** 4 weeks; 6 weeks  

**ALZET Comments:** Animal info (male, Hartley, 9 weeks old, 500-650g); pumps replaced every 3 weeks; cardiovascular; long-term study;  

Q3953: S. Lankhorst, et al. Treatment of Hypertension and Renal Injury Induced by the Angiogenesis Inhibitor Sunitinib Preclinical Study. Hypertension 2014;64(1282-U260

**Agents:** Captopril  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** 2ML2  
**Duration:** 8 days  

**ALZET Comments:** Animal info (male, Wistar Kyoto, 280-300g); cardiovascular; antihypertensive; bp measured using radiotelemetry (DSI);
Agents: Fenofibrate nanosuspension; captopril; methylene blue Vehicle: Hydroxypropylmethylcellulose; dioctyl sulfoisuccinate sodium salt; hydroxyethylcellulose; Route: In vitro; Species: Not Stated; Pump: 1007D; Duration: 7 days;
ALZET Comments: Functionality of mp verified; effect of different osmolalities, viscosities, particle size, and pump orientation on release rate kinetics

Agents: Captopril Vehicle: Not Stated; Route: IP; Species: Rat; Pump: Not Stated; Duration: 24, 48, 168 hours;
ALZET Comments: Controls received mp w/ saline; animal info (Sprague Dawley, male, 2 mo old, 25-300 g, nephrectomized); enzyme inhibitor (ACE)

Clonidine (2015-Present)

Agents: Naltrexone; Clonidine Vehicle: Saline; Route: SC; Species: Rat; Pump: 2001; Duration: 1 week;
ALZET Comments: Dose (Naltrexone- 0.01, 0.032, or 0.1 mg/kg/hr or 3.2, 10 ug/kg/hr); Controls received mp w/ vehicle; animal info (19 Sprague Dawley, 10 weeks old); behavioral testing (Tail Withdrawal Test); dependence;

Agents: Losartan; Tempol; Clonidine Vehicle: CSF, artificial; Route: CSF/CNS (lateral ventricle); Species: Rat; Pump: Not Stated; Duration: Not Stated;
ALZET Comments: Dose (1 mg/kg/day losartan; 4.5 ug/kg/day tempol; 5.76 ug/kg/day clonidine); Controls received mp w/ vehicle; animal info (Five-week-old male Sprague-Dawley rats); Therapeutic indication (5/6 nephrectomy);

Q6376: G. D. Fink, et al. Can we predict the blood pressure response to renal denervation? Autonomic Neuroscience: Basic and Clinical 2017;204(112-118
Agents: Clonidine Vehicle: Not Stated; Route: Not Stated; Species: Rat; Pump: 2006; Duration: Not Stated;
ALZET Comments: Dose (125 μg/kg/day); animal info (Male SHR); antihypertensive;

Agents: Bupivacaine; clonidine; dexamethasone Vehicle: Saline; Route: CSF/CNS (sciatic nerve); Species: Rat; Pump: 2ML1; Duration: 7 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, albino, CD[SD]); no stress (see pg. 192); post op. care (IM butorphanol tartrate 0.05 mg/kg, ceftiofur sodium 5 mg/kg); stability verified by (pg. 195); used polyurethane catheter 0.5mm ID 0.9 mmOD; pumps removed after 1 week; dose (66.6 ug/mL)

Agents: Losartan; tempol; hydralazine Vehicle: PBS; CSF, artificial; Route: CSF/CNS; intragastric; Species: Rat; Pump: Not Stated; Duration: 2 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 5 weeks old, 5/6x nephrectomy); dose-response (pg 1627); cardiovascular; bp measured using catheter;
Digotoxin and Digoxin


**Agents:** Digoxin  
**Vehicle:** DMSO; saline  
**Route:** SC  
**Species:** Mice  
**Pump:** 2002  
**Duration:** 3 days; 7 days; 10 days  

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, C57BL6J or RGS2 -/-, 8-18 weeks old); 0.04% DMSO used; dependence; pumps primed overnight in 37C saline; Dose (2 ug/kg/day);


**Agents:** Digoxin  
**Vehicle:** Promethylcellulose, Tween80, DMSO  
**Route:** SC  
**Species:** Mice  
**Pump:** Not Stated  

**ALZET Comments:** Controls received mp w/ vehicle; animal info (NSG mice); 0.5% used Promethylcellulose, 0.2% Tween80 used, 5% DMSO; cancer (xenograft models); dose-response (pg. 14); Dose (10 mg/kg/day);

Q4508: C. Disdier, et al. Tissue biodistribution of intravenously administrated titanium dioxide nanoparticles revealed blood-brain barrier clearance and brain inflammation in rat. Particle and Fibre Toxicology 2015;12(U1-U20

**Agents:** Atenolol; digoxin; prazosin  
**Vehicle:** PEG 200; DMSO  
**Route:** SC  
**Species:** Rat  
**Pump:** 2001D  
**Duration:** Not Stated  

**ALZET Comments:** Animal info (male, Fisher F344, 8 weeks old, 180-250g); 50% PEG 200 used; 50% DMSO used;


**Agents:** Digoxin  
**Vehicle:** DMSO; saline  
**Route:** SC  
**Species:** Mice  
**Pump:** 2002  
**Duration:** 7 days  

**ALZET Comments:** Control animals received mp w/ vehicle; animal info (C57BL/6, male, 8-13 wks old); 0.4% DMSO used;


**Agents:** Digoxin; ouabain  
**Vehicle:** PBS; sterile  
**Route:** SC  
**Species:** Rat  
**Pump:** Not Stated  
**Duration:** 42 days  

**ALZET Comments:** Controls received mp w/ vehicle; functionality of mp verified by plasma levels of ouabain and digoxin; antihypertensive; ouabain and digoxin are sodium pump inhibitors;


**Agents:** Ouabain; Ouabagenin; Digoxin; Digotoxin  
**Vehicle:** PBS  
**Route:** SC; CSF/CNS  
**Species:** Rat  
**Pump:** 2002; 2ML2  
**Duration:** 12,14 days  

**ALZET Comments:** Controls received mp w/ vehicle; functionality of mp verified by plasma levels of ouabain and digoxin; antihypertensive; ouabain and digoxin are sodium pump inhibitors;


**Agents:** Ouabain; Digoxin  
**Vehicle:** PBS, sterile  
**Route:** SC  
**Species:** Rat  
**Pump:** Not Stated  
**Duration:** 5 weeks  

**ALZET Comments:** Controls received mp w/ vehicle; functionality of mp verified by plasma levels of ouabain and digoxin; antihypertensive; ouabain and digoxin are sodium pump inhibitors;


**Agents:** Digoxin; Antibody, Fab fragments; Gamma globulin  
**Vehicle:** Not Stated  
**Route:** SC; CSF/CNS  
**Species:** Rat  
**Pump:** 2002; 2ML2  
**Duration:** 12,14 days  

**ALZET Comments:** Controls received mp w/ gamma globulin solution; peptides; antihypertensive; digoxin infused SC via 2ML2 pumps; some animals received ICV Fab fragments concomitantly via 2002 pumps
Doxazosin


**Agents:** Doxazosin; Atipamezole; Metoprolol; ICI118551; L748337; Imiloxan; Spiroxatrine **Vehicle:** PBS; DMSO; **Route:** IP; **Species:** Mice; **Pump:** Not Stated; **Duration:** 10 days;

**ALZET Comments:** Dose (doxazosin (α1-AR antagonist, 12 mg/kg/d), atipamezole (α2-AR antagonist, 2.4mg/kg/d), metoprolol (β1-AR antagonist, 12 mg/kg/d), ICI118551 (β2-AR antagonist, 2.4 mg/kg/d), L748337 (β3-AR antagonist, 2.4 mg/kg/d), BRL44408 (α2A-AR antagonist, 12mg/kg/d), imiloxan (α2B-AR antagonist, 12 mg/kg/d), spiroxatrine (α2C-AR antagonist, 12mg/kg/d)); 10% DMSO used; animal info (8-10 week old male 129S1/SvImJ mice);


**Agents:** Doxazosin **Vehicle:** DMSO; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 12 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; functionality of mp verified by plasma doxazosin levels; long-term study; antihypertensive; 50% DMSO; doxazosin supplemented orally in drinking water


**Agents:** Doxazosin **Vehicle:** DMSO; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 8,12 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; dose-response (table 2); long-term study; cancer (prostatic hyperplasia); 50% DMSO; due to limitations in solubility mp was combined with oral dosing to deliver higher doses

**P3785:** E. M. van Kleef, et al. Doxazosin blocks the angiotensin II-induced smooth muscle cell DNA synthesis in the media, but not in the neointima of the rat carotid artery after balloon injury. Cardiovascular Research 1996;31(3):324-330

**Agents:** Angiotensin II, [val 5]; Doxazosin; Uridine, bromodeoxy- **Vehicle:** Saline; DMSO; **Route:** SC; **Species:** Rat; **Pump:** 2002; 2ML1; **Duration:** 2 weeks;

**ALZET Comments:** Controls received mp w/vehicle; 2ML1 pumps replaced after 1 week; antihypertensive; cardiovascular; multiple pumps per animal (2) - 1 w/drug, 1 w/BrdU

**Enalapril (2013-Present)**

**Q10238:** L. Lin, et al. Oxidized LDL but not angiotensin II induces cardiomyocyte hypertrophic responses through the interaction between LOX-1 and AT1 receptors. Journal of Molecular and Cellular Cardiology 2022;162(1):110-118

**Agents:** Lipoprotein, oxidize low density; Angiotensin II; Losartan; LOX-1 neutralizing antibody; Enalapril **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;

**ALZET Comments:** Dose: Lipoprotein (250 ng/kg/min); Ang II (200 ng/kg/min); Losartan (3 mg/kg/day); LOX-1 neutralizing antibody (0.6 mg/kg/day); Enalapril (10 mg/kg/day); animal info: C57BL/6 mice; Lipoprotein, oxaldehyd low density aka (ox-LDL); Angiotensin II aka (Ang II)cardiovascular;


**Agents:** Enalapril **Vehicle:** DMSO; Saline; **Route:** SC; **Species:** Mice; **Pump:** 2006; **Duration:** 6 weeks;

**ALZET Comments:** Dose: Lipoprotein (20 mg/kg/day); 50% DMSO, 50% Saline used; Controls received mp w/ vehicle; animal info (C57BL/6J and BALB/c male mice, 10-11 weeks old); 78 mmHg - 103 mmHg;cardiovascular;


**Agents:** Enalapril maleate **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 30 days;

**ALZET Comments:** Dose: (2.85 mg/kg/day); Controls received mp w/ vehicle; animal info (Pregnant Wistar rats (230-250g));
Agents: Enalapril Vehicle: DMSO, Saline; Route: SC; Species: Mice; Pump: 2006; Duration: 6 weeks; ALZET Comments: Dose (20 mg/kg/day); 50% DMSO used; Controls received sham mp implantation;

Agents: Enalapril maleate, Losartan, Tempol Vehicle: CSF, artificial; Route: CSF/CNS (ventricle); Species: Rat; Pump: 1003D; Duration: 14 days; ALZET Comments: Controls received mp w/ aCSF; ALZET brain infusion kit 2 used; Enalapril is an ACE inhibitor; Losartan is an ANG II AT1 receptor antagonist; tempol is a SOD mimetic; Therapeutic indication (erectile dysfunction); Dose: Enalapril (0.5 mg/m), losartan (2 mg/mL), tempol (50 mg/mL);

Enalapril (2012-Present)
Q3528: Y. M. Kang, et al. Chronic infusion of enalapril into hypothalamic paraventricular nucleus attenuates angiotensin II-induced hypertension and cardiac hypertrophy by restoring neurotransmitters and cytokines. TOXICOLOGY AND APPLIED PHARMACOLOGY 2014;274(3):436-444
Agents: Angiotensin II; enalapril Vehicle: Saline; CSF, artificial; Route: SC; CSF/CNS (paraventricular nucleus); Species: Rat; Pump: 2004; Duration: 4 weeks; ALZET Comments: Controls received mp w/ vehicle; animal info (male, Sprague Dawley, adult, 275-300g); functionality of mp verified by increased bp; post op. care (buprenorphine); tissue perfusion (bilateral paraventricular nucleus); cardiovascular; peptides; antihypertensive; bp measured using tail-cuff; pumps primed in 37C saline; used wound clips; enalaprilat is an ACE inhibitor; Plastics One bilateral PVN cannulae; bilateral infusion

Eprosartan (2005-Present)
Agents: Moxonidine; eprosartan Vehicle: Saline; NaOH; HCl; Route: SC; Species: Rat; Pump: 2004; 2ML4; Duration: 8 weeks; ALZET Comments: Controls received mp w/ vehicle; animal info (SP-SHR, 14 wks old, 250-275 g); antihypertensive; pumps replaced after 4 weeks; long-term study; multiple pumps per animal (2); moxonidine or eprosartan were infused separately or in combination

Agents: Spironolactone; Eprosartan Vehicle: PEG 400; Sodium bicarbonate; Route: IP; Species: Rat; Pump: 2ML2; 2ML4; Duration: 14, 28 days; ALZET Comments: Controls received mp w/ vehicle; functionality of mp verified by plasma levels (H1353); cardiovascular; animal info (male, Wistar 300 g); aldosterone antagonist; ANG II receptor antagonist

Agents: Candesartan; Losartan; Eprosartan; Irbesartan Vehicle: NaOH; Route: IP; Species: Rat; Pump: 2ML4; Duration: 4 weeks; ALZET Comments: Controls received mp w/ vehicle; functionality of mp verified by blood pressure taken; dose-response (fig. 1); cardiovascular; antihypertensive; animal info (male, SHR, 10 wk old, 250-280 g)

**Agents**: Angiotensin II; Eprosartan; Norepinephrine **Vehicle**: Saline; **Route**: SC; IP; IV (jugular); **Species**: Rat; **Pump**: 2001; 2ML2; **Duration**: 3, 7 days;

**ALZET Comments**: Controls received mp w/ vehicle or sham HS surgery; animal info (male, Sprague-Dawley 280-310 g)

**Felodipin**


**Agents**: Felodipine **Vehicle**: Not Stated; **Route**: CSF/CNS; **Species**: Mice; **Pump**: 2002; 2004; **Duration**: 14 days; 28 days;

**ALZET Comments**: Dose (42 ng/g); animal info (C57BL/6); Felodipine aka L-type calcium channel blocker; neurodegenerative

**P5185**: X. J. Zhou, et al. Defective calcium signalling in uraemic platelets and its amelioration with long-term erythropoietin therapy. NEPHROLOGY DIALYSIS TRANSPLANTATION 2002;17(992-997

**ALZET Comments**: Felodipine; Rat; 6 weeks; Cardiovascular; antihypertensive; calcium channel blocker.


**ALZET Comments**: Felodipine; Water, distilled; SC; Rat; 2ML4; 4 weeks; controls received mp w/ NaCl; antihypertensive;


**ALZET Comments**: Felodipine; SC; Rat; 2ML4; 4 weeks; controls received mp w/ saline; antihypertensive; cardiovascular.

**Furosemide (2010-Present)**

**Q6899**: N. Tokonami, et al. Uromodulin is expressed in the distal convoluted tubule, where it is critical for regulation of the sodium chloride cotransporter NCC. Kidney Int 2018;94(4):701-715

**Agents**: Furosemide **Vehicle**: DMSO; Saline; **Route**: SC; **Species**: Mice; **Pump**: 2001; **Duration**: Not Stated;

**ALZET Comments**: 50% DMSO used; animal info (8–12-week-old C57BL6J male mice);


**Agents**: Uridine, bromodeoxy-; furosemide **Vehicle**: DMSO; **Route**: SC; **Species**: Mice; **Pump**: 1007D; 2001; **Duration**: 7 days;

**ALZET Comments**: Animal info (WT or Hsd1 1b2 -/-); 50% DMSO used; pumps primed overnight in 37C saline;


**Agents**: Furosemide; Angiotensin II **Vehicle**: NaCl; Acetic Acid; **Route**: SC; **Species**: Mice; **Pump**: 1002; 2001; **Duration**: 7 days;

**ALZET Comments**: Controls received mp w/ vehicle; animal info (male, C57BL6, 8–10 weeks); functionality of mp verified by increased arterial BP; cardiovascular; bp measured using tail-cuff;


**Agents**: Furosemide **Vehicle**: Not Stated; **Route**: Ear (round window niche); **Species**: Gerbil; **Pump**: 2004; **Duration**: 4 weeks;

**ALZET Comments**: Control animals received mp w/ vehicle; animal info (Sprague Dawley, male)


**Agents**: Furosemide **Vehicle**: Not Stated; **Route**: Ear (round window niche); **Species**: Gerbil; **Pump**: 2004; **Duration**: 4 weeks;

**ALZET Comments**: Controls were untreated; animal info (3-6 mo old, young adult); good methods, pg 421; tissue perfusion...
Guanabenz


**Agents:** Guanabenz acetate  
**Vehicle:** Ethanol; water; propylene glycol  
**Route:** SC  
**Species:** Mice  
**Pump:** 2004  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (SOD1-G93A); pumps replaced every 28 days; dose-response (pg 4); neurodegenerative (amyotrophic lateral sclerosis); post op. care (antibiotic ointment; buprenorphine 0.1 mg/kg); used lot#10284-12; Dose (0.45, 1.5, or 4.5 mg/kg/day);  


**Agents:** Guanabenz; Clonidine; Rilmenidine  
**Vehicle:** Water, sterile; Ethanol  
**Route:** IV (femoral)  
**Species:** Rabbit  
**Duration:** 6 days  
**ALZET Comments:** Controls received mp w/ vehicles; mp and catheter embedded in thigh muscle; antihypertensive

Hydralazine (2010-Present)


**Agents:** Olmesartan, Hydralazine Hydrochloride  
**Vehicle:** Saline  
**Route:** SC  
**Species:** Rat  
**Pump:** 2ML2  
**Duration:** 26 weeks  
**ALZET Comments:** Dose (Olmesartan- 3 mg/kg/day or Hydralazine Hydrochloride- 10 mg/kg/day); Controls received mp w/ vehicle; animal info (); pumps replaced every 2 weeks; long-term study; Blood pressure measured via Tail Cuff Method


**Agents:** SOL1, Losartan, Hydralazine  
**Vehicle:** Saline  
**Route:** SC  
**Species:** Rat  
**Pump:** 2ML4  
**Duration:** 4 weeks  
**ALZET Comments:** Dose: SOL1 (50 mg/kg/d), Losartan (20 mg/kg/d), Hydralazine (9 mg/kg/d); Controls received a dummy device (polyethylene tube of the same size as the 2ML4 pumps); animal info (28 week old SHR); enzyme inhibitor (endothelin-converting enzyme; neutral endopeptidase); cardiovascular


**Agents:** Angiotensin II; olmesartan; hydralazine  
**Vehicle:** Saline; sodium bicarbonate  
**Route:** SC  
**Species:** Mice  
**Pump:** 2004  
**Duration:** 2 weeks; 4 weeks  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (female, C57BL/6NJ, 20-22g); dose-response (p. 385); cardiovascular; antihypertensive; peptides; bp measured using tail cuff;


**Agents:** Losartan; clonidine; tempol; hydralazine  
**Vehicle:** PBS; CSF, artificial  
**Route:** SC/FNS; intragastric  
**Species:** Rat  
**Pump:** Not Stated  
**Duration:** 2 weeks  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 5 weeks old, 5/6x nephrectomy); dose-response (pg 1627); cardiovascular; bp measured using catheter;


**Agents:** Hydralazine; Lisinopril; Valsartan  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** Not Stated  
**Duration:** 1 week; 14 days  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (SHRHP, 16 wks old)

Q1140: M. Iwamoto, *et al.* Connective tissue growth factor induction in a pressure-overloaded heart ameliorated by the angiotensin II type 1 receptor blocker olmesartan. Hypertension Research 2010;33(12):1305-1311

**Agents:** Olmesartan; Hydralazine  
**Vehicle:** Not Stated  
**Route:** SC  
**Species:** Rat  
**Pump:** 2ML2  
**Duration:** 14 days  
**ALZET Comments:** Controls received mp w/ saline; animal info (male, Sprague-Dawley, 250-300 g); antihypertensive
Hydrochlorothiazide (2010-Present)

Agents: Norepinephrine; hydrochlorothiazide; losartan Vehicle: Saline; DMSO; Route: SC; Species: Rat; Pump: 2ML2; Duration: 14 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, Sprague Dalwey, 275-299g); post op. care (penicillin 0.3 ml IM 300,000 units/ml); cardiovascular; Dose (losartan 3 mg/kg/day, NE 600 ng/min; HCTZ 4 mg/kg/day);

Agents: Hydrochlorothiazide; spironolactone; losartan Vehicle: Saline; DMSO; Route: Not Stated; Species: Rat; Pump: 2ML1; Duration: 7 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, cyp1a1-Ren2 TGR, Fischer 344, 12-14 wks old);

Imidapril

Agents: Imidapril hydrochloride Vehicle: DMSO; Route: IP; Species: Rat; Pump: 2ML4; Duration: 1 month;
ALZET Comments: Controls received mp w/ vehicle; animal info (Sprague Dawley, male, 7 wks old);

Agents: Enalaprilat; Lisinopril; Imidapril Vehicle: Saline; Route: IP; Species: Guinea pig; Pump: 2ML1; Duration: Not Stated;
ALZET Comments: Dose (enalaprilat (0.1, 0.5, 1, 5, 10, 20 mg/ml), lisinopril (0.1, 0.5, 1, 5, 10, 20 mg/ml), imidapril (1, 5, 10, 20, 30 mg/ml)); Controls received mp w/ vehicle; enzyme inhibitor (angiotensin-converting-enzyme); cardiovascular;

Agents: Imidapril Vehicle: Saline; Route: SC; Species: Rat; Pump: 2ML4; Duration: 4 weeks;
ALZET Comments: Controls received mp w/ vehicle; cardiovascular; enzyme inhibitor;

Agents: Imidapril Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2ML4; Duration: 4 weeks;
ALZET Comments: Cardiovascular; enzyme inhibitor (ACE inhibitor)

Agents: Imidapril Vehicle: Saline, sterile; Route: SC; Species: Rat; Pump: 2ML4; Duration: 4 weeks;
ALZET Comments: controls received mp w/vehicle; cardiovascular; enzyme inhibitor;

Isoproterenol (2020-Present)

Q9522: E. Walsh-Wilkinson, et al. Segmental analysis by speckle-tracking echocardiography of the left ventricle response to isoproterenol in male and female mice. PeerJ 2021;9(e11085
Agents: Isoproterenol Vehicle: Saline; Route: SC; Species: Mice; Pump: 1004; Duration: 21 days;
ALZET Comments: Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (C57Bl6/J mice, 8 weeks old); Isoproterenol aka Iso; dependence;

**Agents:** Isoproterenol  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 1004;  
**Duration:** 28 days;  

**ALZET Comments:** Dose: (30 mg/kg/day); Controls received mp w/ vehicle; animal info: Sixteen 10-week-old male C57BL/6 mice; post op. care: Buprenorphine (0.3 mg/kg, i.p.); Isoproterenol aka (ISO); cardiovascular;


**Agents:** Isoproterenol  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 2 weeks;  

**ALZET Comments:** Dose: Isoproterenol (5 mg/kg per day); Controls received mp w/ vehicle; animal info: Spontaneously hypertensive rats (SHRs) 6 weeks of age, Blood pressure measured via: Tail cuff; 18.88 mmHg - 74.06 mmHg; cardiovascular; Hypertension


**Agents:** Isoproterenol  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** 14 days;  

**ALZET Comments:** Dose (5 mg/kg/day); 0.9% Saline used; Controls received mp w/ vehicle; animal info (24-week-old male Sprague-Dawley rats); Isoproterenol aka ISO; cardiovascular;


**Agents:** Isoproterenol; Phenylephrine  
**Vehicle:** Ascorbic acid; PBS;  
**Species:** Mice;  
**Pump:** 1007D;  
**Duration:** 1 week;  

**ALZET Comments:** Dose: Isoproterenol (10 mg/kg/day); Phenylephrine (30 mg/kg/day); 0.002% Ascorbic acid vehicle used; Controls received mp w/ vehicle; animal info: 9 weeks-old male C57/BL6 mice; cardiovascular;


**Agents:** Isoproterenol  
**Vehicle:** Not Stated;  
**Route:** Not Stated;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 14; 28 days;  

**ALZET Comments:** Dose: (30 mg/kg/day); animal info: adult male mice (9–20 week-old) C57BL/6J mice; 11–13 week-old male C57BL/6J mice; Isoproterenol aka (ISO); cardiovascular;


**Agents:** Apelin-13; Isoproterenol  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001D; 2001;  
**Duration:** 7 days;  

**ALZET Comments:** Dose (10 nmol/kg/h Apelin-13; 5 mg/kg/day Isoproterenol); Controls received mp w/ vehicle; animal info (male Sprague Dawley rats, 3 months old, 400 g); 96.8 mmHg - 105.1 mmHg; Apelin-13 aka APLN-13, Isoproterenol aka ISO;

Q9171: J. E. Camacho Londono, et al. Transcriptional signatures regulated by TRPC1/C4-mediated Background Ca(2+) entry after pressure-overload induced cardiac remodelling. Progress in Biophysics and Molecular Biology 2021;159(86-104

**Agents:** Isoproterenol; Angiotensin II  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 1007D; 1002;  
**Duration:** 7 days;  

**ALZET Comments:** Dose (30 mg/kg/day Isoproterenol; 3 mg/kg/day Angiotensin II); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (male mice, 2.5 to 4 months old); Blood pressure measured via 1.4F Mikro-Tip Catheter pressure transducer; Isoproterenol aka Iso, Angiotensin II aka AngII; cardiovascular;


**Agents:** Isoproterenol  
**Vehicle:** Ascorbic acid; Saline;  
**Route:** Not Stated;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 5 days;  

**ALZET Comments:** Dose: (25 mg/kg/day Protocatechuic acid); 0.1% ascorbic acid; 0.9% Saline; Controls received mp w/ vehicle; Mice were randomly divided into three following groups (n = 8/group); vehicle-treated sham group, isoproterenol-infused group, and isoproterenol-infused group with protocatechuic acid (100 mg/kg/day). * animal info Male CD-1 (age, 7 weeks; average weight 33 g); cardiovascular; (Cardiac Hypertropy)
Agents: Isoproterenol Vehicle: Saline; Route: SC; Species: Mice; Pump: Not stated; Duration: 14 days;
ALZET Comments: Dose (60 mg/kg/day); Controls received mp w/ vehicle; animal info (8 weeks old); cardiovascular;

Agents: Isoproterenol Vehicle: PBS; Route: SC; Species: Mice; Pump: Not Stated; Duration: 2 weeks;
ALZET Comments: Dose (60 mg/kg per day); Controls received mp w/ vehicle; animal info (TRIC-A −/− mice);

Q9820: Q. Zhou, et al. The anti-microbial peptide LL-37/CRAMP levels are associated with acute heart failure and can attenuate cardiac dysfunction in multiple preclinical models of heart failure. Theranostics 2020;10(14):6167-6181
Agents: Angiotensin II; Isoproterenol Vehicle: Saline; Acetic Acid; Ascorbic Acid; Route: Not Stated; Species: Mice; Pump: 2004; 2002; Duration: 4 weeks; 2 weeks;
ALZET Comments: Dose (1.3 mg/kg/day Angiotensin II; 30 mg/kg/day Isoproterenol); 0.006% Acetic Acid, 0.002% Ascorbic Acid used; Controls received mp w/ vehicle; animal info (Male C57BL/6 mice at 10-12 weeks old); Angiotensin II aka Ang II, isoproterenol aka ISO; cardiovascular;

Agents: Isoproterenol Vehicle: Saline; Route: SC; Species: Mice; Pump: 2001; Duration: 7 days;
ALZET Comments: Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (Wild-type male mice, 12 weeks old);

Agents: Isoproterenol Vehicle: Not Stated; Route: Abdomen; Species: Mice; Pump: 2004; Duration: 14 days;
ALZET Comments: Dose (60 mg/kg/day); animal info (12 weeks old C57BL/6 mice);

Agents: Isoproterenol Vehicle: Saline; Acetic Acid; Route: Abdomen; Species: Mice; Pump: 2004; Duration: 28 days;
ALZET Comments: Dose (8.7 mg/kg/d); Controls received mp w/ vehicle; animal info (12 weeks old C57BL/6 mice);

Agents: Isoproterenol Vehicle: Not Stated; Route: Not Stated; Species: Mice; Pump: Not Stated; Duration: 14 days;
ALZET Comments: Dose (30 mg/kg/d); Controls received mp w/ vehicle; animal info (Male C57BL/6 mice, aged 8-10 weeks and weighing 25.2 ± 2 g); Isoproterenol aka ISO; cardiovascular;

Agents: Isoproterenol Vehicle: Saline; Route: Not Stated; Species: Mice; Pump: 1002; Duration: 14 days;
ALZET Comments: Dose (40 mg/kg/day); Controls received mp w/ vehicle; animal info (Adult male C57BL/6 mice, 10-wk-old); Isoproterenol aka ISO; cardiovascular;

Q10343: N. Stafford, et al. Signaling via the Interleukin-10 Receptor Attenuates Cardiac Hypertrophy in Mice During Pressure Overload, but not Isoproterenol Infusion. Frontiers in Pharmacology 2020;11(559220
Agents: Isoproterenol Vehicle: Saline; Route: SC; Species: Mice; Pump: Not Stated; Duration: 10 days;
ALZET Comments: Dose: (10 mg/kg BW per day); Controls received mp w/ vehicle; animal info: mice with ubiquitous ablation of the IL-10R1 gene 8–12 weeks old mice; post op. care: The chest was sutured shut and mice administered with 0.1 mg/kg BW buprenorphine; cardiovascular;
Ketanserin

Agents: Ketanserin tartrate or MSX-3 hydrate Vehicle: Saline; Route: SC; Species: Rat; Pump: 2002; Duration: 2 weeks;
ALZET Comments: Dose (1 mg/kg/day); Controls received mp w/ vehicle; animal info (Sprague-Dawley, 250-300 g); post op. care (Bupenorphine, Enrofloxacin); Ketanserin tartrate aka antagonist of sertonin 5HT2 receptors, MSX-3 aka antagonist adenosine A2A receptors ; dependence;

Agents: Ketanserin; M100907 Vehicle: DMSO; saline; hydrochloric acid; Route: IP; Species: Mice (transgenic); Pump: Not Stated; Duration: 4 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, Tg8 MAO-A KO, wt, 10 wks old); 10% DMSO used; 5-HT2A receptor antagonists

Agents: Ketanserin; Ly-53857; ICS-205930 Vehicle: Saline; Route: CSF/CNS; Species: Rat; Pump: 2ML4; Duration: 24 hours;
ALZET Comments: Stylet used; pump implanted IP; drugs were 5-ht antagonists

Agents: Dihydroxytryptamine, 5,7-; Methysergide; Ketanserin Vehicle: Saline; Ascorbic acid; Route: CSF/CNS (visual cortex); Species: Cat (kitten); Pump: 2001; Duration: 3.7 days;
ALZET Comments: Controls received mp w/saline; 5,7-dihydroxytryptamine is a neurotoxin; serotonin receptor blockers; antihypertensive

Agents: Ketanserin Vehicle: Dextrose; Route: IV (femoral); Species: Rat; Pump: 2ML1; Duration: 7 days;
ALZET Comments: controls received mp w/ vehicle; antihypertensive

Agents: Ketanserin Vehicle: Dextrose, isotonic; Route: IV (femoral); Species: Rat; Pump: 2ML1; Duration: 7 days;
ALZET Comments: antihypertensive

Losartan (2020-Present)

Q10238: L. Lin, et al. Oxidized LDL but not angiotensin II induces cardiomyocyte hypertrophic responses through the interaction between LOX-1 and AT1 receptors. Journal of Molecular and Cellular Cardiology 2022;162(110-118
Agents: Lipoprotein, oxydize low density; Angiotensin II; Losartan; LOX-1 neutralizing antibody; Enalapril Vehicle: Not Stated; Route: SC; Species: Mice; Pump: Not Stated; Duration: Not Stated;
ALZET Comments: Dose: Lipoprotein (250 ng/kg/min); Ang II (200 ng/kg/min); Losartan (3 mg/kg/day); LOX-1 neutralizing antibody (0.6 mg/kg/day); Enalapril (10 mg/kg/day); animal info: C57BL/6 mice; Lipoprotein, oxydize low density aka (ox-LDL); Angiotensin II aka (Ang II) cardiovascular;

Q8639: J. Li, et al. Silencing of Central (Pro)renin Receptor Ameliorates Salt-Induced Renal Injury in Chronic Kidney Disease. Antioxidants and Redox Signaling 2021;
Agents: U0126; Wortmannin; Losartan Vehicle: CSF, artificial; Route: CSF/CNS (intracerebral); IV; Species: Rat; Pump: Not stated; Duration: 4 weeks;
ALZET Comments: Dose (2.5 ug/day U0126; 2.5 ug/day Wortmannin; 1 mg/kg/day Losartan); Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats, 5 weeks old, 150-180 g); Blood pressure measured via tail cuff method; cardiovascular;
Q10179: S. Hall, et al. Mechanical activation of the angiotensin II type 1 receptor contributes to abdominal aortic aneurysm formation. JVS Vascular Science 2021;2(194-206)
**Agents:** Losartan **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 21 days;
**ALZET Comments:** Dose: (30 mg/kg/d) Controls received mp w/ vehicle; animal info: BPN/3 mice aged 16 to 20 weeks; Blood pressure measured via tail cuff/cardiovascular; (Aortic aneurysm; hypertension)

**Agents:** Losartan **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 8 weeks;
**ALZET Comments:** Dose (6.5, 5.0 mg/kg/day); Controls received mp w/ vehicle; animal info (Adult, male C57BL6/J mice, 8 to 12 weeks old, 23 to 30 g); post op. care (buprenorphine); pumps replaced every 4 weeks; cardiovascular;

**Agents:** Dexamethasone; Losartan **Vehicle:** Ethanol; DMSO; PEG; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 weeks;
**ALZET Comments:** Dose (12 ug/kg/day Dexamethasone; 30 mg/kg/day Losartan); 10% Ethanol, 15% DMSO, 75% PEG used; Controls received mp w/ vehicle; animal info (Male Sprague-Dawley rats, 6 weeks old, 200 g); Blood pressure measured via radiotelemetry transmitters; dependence;

**Agents:** Angiotensin II; Losartan **Vehicle:** Not Stated; **Route:** SC/CNS (cistern magna); **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 days;
**ALZET Comments:** Dose (200 ng/min per kg BW; 4 ug/min per kg BW); Controls received mp w/ vehicle; animal info (8-week-old male and/ or female mice); Angiotensin II aka AngII; dependence;

**Agents:** Losartan **Vehicle:** CSF, Artificial; **Route:** CSF/CNS (cistern magna); **Species:** Rat; **Pump:** 1007D; **Duration:** 4 weeks;
**ALZET Comments:** Dose (3 μg·μL−1·h−1); Controls received mp w/ vehicle; animal info (Sprague-Dawley rats at age of 10 weeks); functionality of mp verified by drainage of cerebrospinal fluid; Blood pressure measured via tail-cuff method; 130 mmHg - 160 mmHg; cardiovascular;

**Metoprolol (2017-Present)**

**Agents:** Metoprolol **Vehicle:** Not stated; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 3 months; 2 months;
**ALZET Comments:** Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (male mice, 3.5 months old; female mice, 6 months old); behavioral testing (Morris Water Maze; Fear Conditioning); pumps replaced every 4 weeks; long-term study;

**Agents:** β2-AR–selective antagonist, nonselective adrenergic receptor antagonist, β1-AR–selective antagonist metoprolol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** Not stated; **Duration:** 2 weeks;
**ALZET Comments:** Dose (β2-AR–selective antagonist- 50 mg/kg/day, nonselective adrenergic receptor antagonist 10 mg/kg/day, β1-AR–selective antagonist metoprolol- 1 mg/kg/day); Controls received mp w/ vehicle; animal info (C57BL/6J, Male, 10-12 weeks old); β2-AR–selective antagonist aka ICI-118,551 , nonselective adrenergic receptor antagonist aka carvedilol, β1-AR–selective antagonist metoprolol aka Met Low; cardiovascular;
**Agents:** Losartan; Metoprolol; Indapamide **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML2; 2ML4; **Duration:** 14,28 days;
**ALZET Comments:** Dose (Losartan: 10 mg/kg/day; Metoprolol: 10 mg/kg/day; Indapamide: 1 mg/kg/day); Controls received mp w/ vehicle;

**Agents:** Isoproterenol; Metoprolol **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 3 days;
**ALZET Comments:** Dose (Isoproterenol: 0.025 g/ml; Metoprolol: 0.0684 g/ml); animal info (CD1 and C57BL/6 (BL6) mice);

Minoxidil
**Agents:** Minoxidil HCl; Captopril; Enalaprilat **Vehicle:** Acetic acid; Ethanol; Propylene glycol; Saline; Water; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 5 days;
**ALZET Comments:** no comment posted; antihypertensive

Moxonidine (2011-Present)
**Agents:** Moxonidine **Vehicle:** CSF, artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** 2006; **Duration:** 42 days;
**ALZET Comments:** Controls received mp w/ vehicle; ALZET brain infusion kit 2 used; Therapeutic indication (Heart failure); Dose (4 mmol/L);

**Agents:** Moxonidine **Vehicle:** Saline, normal; **Route:** SC; **Species:** Hamster; **Pump:** 2ML4; **Duration:** 4 weeks;
**ALZET Comments:** Controls received mp w/ vehicle; animal info (BIO 14.6, male, 6, 10 m old)

Nicardipine
**Agents:** Nicardipine **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML2; **Duration:** Not Stated;
**ALZET Comments:** Dose (1 mg/kg); animal info (12 weeks old, Male); post op. care (Buprenorphine); behavioral testing (Barnes Maze Test); cardiovascular;

**Agents:** Nicardipine **Vehicle:** Not Stated; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** 1007D; **Duration:** 5 days;
**ALZET Comments:** Animal info (adult, Wistar, 250-300 g.); PE-10 catheter used

**Agents:** Nicardipine; FK506; cyclosporin A **Vehicle:** DMSO; ethanol; fluorescein; **Route:** CSF/CNS (dorsal left dentate gyrus); **Species:** Rat; **Pump:** 2004; **Duration:** 28 days;
**ALZET Comments:** Controls were treated identically without status epilepticus; animal info (34-52 day old, male, Sprague-Dawley, status epilepticus); functionality of mp verified by fluorescein labeling; ALZET brain infusion kit 2 used; 50% DMSO used; 15% ethanol used
Agents: Hydralazine; Nicardipine Vehicle: Not Stated; Route: CSF/CNS; Species: Mice; Pump: 1002; Duration: 14 days;
ALZET Comments: Controls received mp w/ saline; animal info (adult, male, ALK1 +/-); fig. 1 illustrates cannula placement; cannula placement verified by CBF measurements

Agents: Nicardipine HCl Vehicle: Not Stated; Route: SC; Species: Mice; Pump: 2002; Duration: Not Stated;
ALZET Comments: Calcium-channel blocker; cancer; antihypertensive

Agents: Nicardipine Vehicle: Not Stated; Route: SC; Species: Gerbil; Pump: 1003D; Duration: 3 days;
ALZET Comments: No comment posted; antihypertensive; ischemia (cerebral)

Nifedipine (2020-Present)
Q8333: M. Stanley M Chen Cardenas, Larissa A Shimoda, PhD, Naresh M Punjabi, MD. SUN-LB121 Nifedipine Worsens Glucose Tolerance in C57BL/6J Mice Exposed to Intermittent Hypoxia. Journal of the Endocrine Society 2020;
Agents: Nifedipine Vehicle: PEG 400; Route: SC; Species: Mice; Pump: 2001; Duration: 5 days;
ALZET Comments: Dose (20 mg/kg/day); animal info (Adult male C57BL6/J mice (age 19-week-old));

Agents: Nifedipine Vehicle: PEG 400; Route: SC; Species: Mice; Pump: 2001; Duration: 5 days;
ALZET Comments: Dose (20 mg/kg/day); Controls received mp w/ vehicle; animal info (Adult male C57BL6/J mice (age 19-week-old)); Nifedipine aka L-type calcium channel blockers (CCB); dependence;

Agents: Nifedipine Vehicle: PEG 400; Route: SC; Species: Mice; Pump: 2001; Duration: 5 days;
ALZET Comments: Dose (20 mg/kg/day); animal info (Adult male C57BL6/J mice (age 19-week-old));

Q9190: Nifedipine Worsens Glucose Tolerance in C57BL/6J Mice Exposed to Intermittent Hypoxia. Metabolic Interactions in Diabetes 2020;
Agents: Nifedipine Vehicle: PEG 400; Route: SC; Species: Mice; Pump: 2001; Duration: 5 days;
ALZET Comments: Dose (20 mg/kg/day); Controls received mp w/ vehicle; animal info: Adult male C57BL6/J (19 weeks of age)

Nilvadipine
Agents: Nilvadipine Vehicle: PEG, Route: SC; Species: Rat; Pump: 2ML1; Duration: 7 days;
ALZET Comments: controls received vehicle infusion; antihypertensive; ischemia (cerebral)

pd123319 (2016-Present)
Agents: TY-51469, H4R antagonist, MK-571, PD123319 Vehicle: Not Stated; Route: SC; Species: Mice;
ALZET Comments: Dose: TY-51469 (0.1 or 1.0 mg/kg/day), H4R antagonist (40 mg/kg); PD123319 (0.5 or 5 mg/kg/d); animal info (ICR, C57BL/6 mice); TY-51469 is a Chymase inhibitor; enzyme inhibitor (Chymase); cardiovascular;
**Agents:** Angiotensin II, AT2 antagonist PD123319 **Vehicle:** Saline; **Route:** Saline; **Species:** Rat; **Pump:** 2001; **Duration:** 1 week;  
**ALZET Comments:** Dose (1.0 mg/kg/day); Controls received mp w/ vehicle; animal info (Pregnant Wistar, 230-250 g); PD123319 aka AT2 antagonist; enzyme inhibitor (PD123319); neurodegenerative (Brain development);

Q8833: P. Wu, et al. AT2R (Angiotensin II Type 2 Receptor)-Mediated Regulation of NCC (Na-Cl Cotransporter) and Renal K Excretion Depends on the K Channel, Kir4.1. Hypertension 2018;71(4):622-630  
**Agents:** PD 123319 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 1, 4, 7 days;  
**ALZET Comments:** Dose (4 μg/kg/min); Controls received mp w/ vehicle; animal info (Kcnj10(flox/flox) and KSR-Kir4.1 KO); cardiovascular; vehicle used but identity was not stated.;

**Agents:** PD123319 difluoroacetate **Vehicle:** Water, distilled; **Route:** IP; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;  
**ALZET Comments:** Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (Sprague Dawley rats, ~60 days, 190-200 g); behavioral testing (perivaginal mechanical sensitivity via Semmes-Weinstein monofilaments);

**Agents:** Dextrose, C21, PD-123319, Ang II **Vehicle:** Water; **Route:** SC; **Species:** Rat; **Pump:** 1007D, 2001; **Duration:** 1 week;  
**ALZET Comments:** Dose (C21: 60ng/kg/min, PD-123319: 10 ng/kg/min, Dextrose/AngII: 200 ng/kg/min); good methods (p. 546); Multiple pumps per animal (2); Intrarenal infusion; Therapeutic indication (Hypertension);

Q6605: Angiotensin type II receptor protects cardiovascular functions at the onset of atherosclerosis in young apolipoprotein E-deficient mouse. Journal of the American College of Cardiology 2016;68(16):C175  
**Agents:** Angiotensin II, PD123319 **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice; **Pump:** 2002; **Duration:** 7 days;  
**ALZET Comments:** Dose (12 μg/kg/hr Ang II, 10mg/kg/day PD123319); Controls received mp w/ vehicle; animal info (9-week-old male C57BL/6 and apoE(-/-)); PD123319 is a AT2R antagonist; cardiovascular;

Perindopril  
**Agents:** Perindopril; bradykinin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 7 days;  
**ALZET Comments:** Dose (12 μg/kg/hr Ang II, 10mg/kg/day PD123319); Controls received mp w/ vehicle; animal info (9-week-old male C57BL/6 and apoE(-/-)); PD123319 is a AT2R antagonist; cardiovascular;

**Agents:** Perindopril **Vehicle:** Saline; PEG 400; **Route:** IP; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 days;  
**ALZET Comments:** Controls received mp w/vehicle; cardiovascular

**Agents:** Captopril; Perindopril **Vehicle:** Saline; **Route:** IP; **Species:** Rat; **Pump:** Not Stated; **Duration:** 6 days;  
**ALZET Comments:** controls received mp with saline; antihypertensive

**Agents:** Perindopril **Vehicle:** Water; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;  
**ALZET Comments:** antihypertensive
Pindolol


**Agents:** Pindolol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 2 weeks;

**ALZET Comments:** controls received mp w/ vehicle; comparison of ip injections vs. mp;


**Agents:** Befloxatone; Pindolol **Vehicle:** Water; Ethanol; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 2, 21 days;

**ALZET Comments:** controls received mp w/ vehicle; befloxatone is an antidepressant; agents infused separately or concomitantly; antihypertensive


**Agents:** Mirtazapine; Pindolol **Vehicle:** NaCl; Ascorbic acid; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 2, 21 days;

**ALZET Comments:** Controls received mp w/ vehicle; comparison of IV injections vs mp; antidepressant; pindolol infused for 2 days; mirtazapine administered for 21 days.


**Agents:** Celiprolol; Pindolol; Isoproterenol; Propranolol **Vehicle:** HCI; Saline; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** antihypertensive

Prazosin (2014-Present)


**Agents:** Prazosin; Propranolol **Vehicle:** CSF, artificial; **Route:** CSF/CNS (intracerebral); IV; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

**ALZET Comments:** 0.5% ACSF used; Controls received mp w/ vehicle; animal info (C57BL/6N male mice, 8 to 12 weeks old); Prazosin aka β-AR antagonist, Propranolol aka β-AR antagonist; dependence;


**Agents:** Losartan, Prazosin, or Atipamezole **Vehicle:** CSF, artificial; **Route:** SC; **Species:** Rat;

**ALZET Comments:** Dose (Losartan- 1 mg/kg/day, Prazosin- 40 mg/kg/day, or Atipamezole- 2 mg/kg/day); animal info (4 weeks old, Male, Sprague Dawley); dependence;

Q4508: C. Didier, et al. Tissue biodistribution of intravenously administrated titanium dioxide nanoparticles revealed blood-brain barrier clearance and brain inflammation in rat. Particle and Fibre Toxicology 2015;12(U1-U20

**Agents:** Atenolol; digoxin; prazosin **Vehicle:** PEG 200; DMSO; **Route:** SC; **Species:** Rat; **Pump:** 2001D; **Duration:** Not Stated;

**ALZET Comments:** Animal info (male, Fisher F344, 8 weeks old, 180-250g); 50% PEG 200 used; 50% DMSO used;


**Agents:** Prazosin; propranolol; duloxetine **Vehicle:** DMSO; saline, sterile; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Long Evans, adult, 300g); functionality of mp verified by residual volume; 10% DMSO used; stress/adverse reaction: (see pg. 472); post op. care (ketoprofen 3 mg/kg SC); behavioral testing (ethanol intake, open field test, locomotor activity, elevated plus maze); dependence; “Drug doses were calculated based on the estimated mean weight of animals in each group halfway through the drug delivery period (taking the mean weight at baseline and adding projected weight gain across 2 weeks)” pg 470; pumps removed after 4 weeks;
Propranolol (2016-Present)


**Agents:** Prazosin; Propranolol  
**Vehicle:** CSF, artificial; **Route:** CSF/CNS (intracerebral); IV;  
**Species:** Mice; **Duration:** 7 days;  
**ALZET Comments:** 0.5% ACSF used; Controls received mp w/ vehicle; animal info (C57BL/6N male mice, 8 to 12 weeks old); Prazosin aka β-AR antagonist, Propranolol aka β-AR antagonist; dependence;


**Agents:** Propranolol Hydrochloride  
**Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** Not stated; **Duration:** 21 days;  
**ALZET Comments:** Dose (2 mg/kg/day); Controls received mp w/ vehicle; animal info (Male BALB/c nude mice (5 weeks old, weighing ~20 g)); cancer (gastric cancer);


**Agents:** Propranolol Hydrochloride or Terazosin Hydrochloride  
**Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 21,42 days;  
**ALZET Comments:** Dose (10 mg/kg/day); Controls received mp w/ vehicle; animal info (Male, Sprague Dawley, 9-12 weeks old); cardiovascular;


**Agents:** Propranolol hydrochloride  
**Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;  
**ALZET Comments:** Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (female Balb/C mice); enzyme inhibitor (ADRB antagonist); Therapeutic indication (endometriosis);

Ramiprilat


**Agents:** Ramiprilat; HR 720  
**Vehicle:** DMSO; Water; **Route:** SC; **Species:** Rat; **Pump:** 2ML2; 2ML4; **Duration:** 21 days;  
**ALZET Comments:** 2ML2 pumps replaced after 14 days; antihypertensive; cardiovascular; some animals received multiple pumps per animal (2); ramiprilat is the active metabolite of ramipril; HR 720 is an angiotensin II receptor antagonist

Reserpine


**Agents:** ICI-118,551 hydrochloride; Toxin, Diptheria; reserpine; captopril; norepinephrine  
**Vehicle:** PBS; **Route:** Intrasplenic; **Species:** Mice; **Pump:** 1002; **Duration:** 1, 2, 3 weeks;  
**ALZET Comments:** Dose ((ICI-118,551 12 mg/kg/hr), (Diptheria Toxin 5 mg/kg/day), (reserpine 5mg/kg/day), (captopril 6mg/kg/day), (norepinephrine 5mg/kg/day)); Controls received mp w/ vehicle; animal info (10-12 weeks, APOE(-/-)); comparison of intrasplenic injection vs mp; Diptheria toxin used to deplete TH+ leukocytes. Splenic nerves were depleted by intrasplenic DT using mp for 7 days; Therapeutic indication (ICI-118,551 reduced splenic GMP proliferation and inflammatory myeloid cell generation); ”

Q0550: J. E. Ghia, et al. Reactivation of Inflammatory Bowel Disease in a Mouse Model of Depression. Gastroenterology 2009;136(7):2280-2288

**Agents:** Reserpine; Choline chloride; Methylylcaconitine  
**Vehicle:** Water; Acetic acid; **Route:** CSF/CNS; IP; **Species:** Mice; **Duration:** 5, 10, 14 days;  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, C57BL/6, 7-9 wks old, alpha 7nAchR -/-); post op. care (buprenorphine); Plastics One cannula used with PE60 tubing
ALZET®
Bibliography

Agents: Reserpine Vehicle: Acetic acid; Route: CSF/CNS; Species: Mice; Pump: Not Stated; Duration: 14 days;
ALZET Comments: Controls received mp w/ vehicle; dose-response (Fig. 1); antihypertensive; animal info (male, female, C57BL/6, op/op, wt, 7-9 wks old, colitis, vagotomy); animal model of depression;

Agents: Reserpine Vehicle: Citric acid; Route: SC; Species: Rabbit; Pump: 2ML4; Duration: 6 weeks;
ALZET Comments: controls received mp w/ vehicle; pumps replaced after 3 wks; cardiovascular; antihypertensive; vehicle included 4% citric acid

Rilmenidine

Agents: rilmenidine Vehicle: Ringer’s solution; Route: CSF/CNS (ventricles); Species: mice; Pump: 1002; Duration: 1 week;
ALZET Comments: Controls received mp w/ ringer’s solution vehicle; animal info (BPH/2J and BPN/3J mice); functionality of mp verified by behavioral tests; dose-response; behavioral testing (pg 577; mice were exposed to aversive behavioral stimuli; restraint stress and dirty cage-switch tests conducted); tissue perfusion (brain tissue); antihypertensive; anti-hypertensive; Dose: 15ug/hr of rilmenidine

Agents: Rilmenidine Vehicle: Saline; Route: SC; Species: Rabbit; Pump: 2ML4; Duration: 3 weeks;
ALZET Comments: Controls received mp w/ vehicle; comparison of IV injections vs. SC mp; antihypertensive; animal info (mixed breed, male, female, 2.4-3.2 kg.)

Agents: Rilmenidine; Metoprolol Vehicle: Not Stated; Route: SC; Species: Rabbit; Pump: 2ML2; Duration: 6 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (New Zealand, White, 4-6 wks old, male, 0.7-0.9 kg., nephrectomized); long-term study

Agents: Rilmenidine Vehicle: Saline; Route: IP; Species: Rat; Pump: 2002; Duration: 1 month;
ALZET Comments: Comparison of IP injections vs. IP mp; pumps replaced at 15 days; stability verified (30 days at 37C);

Agents: Moxonidine; clonidine; rilmenidine Vehicle: Saline; HCl; Sodium hydroxide; Route: SC; Species: Rabbit; Pump: 2ML2; Duration: 4 weeks;
ALZET Comments: Controls received mp w/ vehicle; functionality of mp verified by residual volume; pumps replaced after 2 weeks; antihypertensive; moxonidine dissolved in saline/HCl/NaOH; other agents dissolved in saline; moxonidine & rilmenidine are imidazoline receptor agonists

**Agents:** Rilmenidine; SK&F-86466  
**Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks;  
**ALZET Comments:** controls received mp w/ vehicle; cardiovascular; rilmenidine is a central I1 imidazoline receptor agonist, SF&F-86466 is a specific a-2 receptor blocker; cold-induced hypertension; pump implanted IP and connected to brain cannula;


**Agents:** Guanabenz; Clonidine; Rilmenidine  
**Vehicle:** Water, sterile; Ethanol;  
**Route:** IV (femoral);  
**Species:** Rabbit;  
**Duration:** 6 days;  
**ALZET Comments:** Controls received mp w/ vehicles; agents are antihypertensives; mp and catheter embedded in thigh muscle; antihypertensive

**Tertaolol**


**Agents:** Tertatolol; Propranolol  
**Vehicle:** HCl; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 14 days;  
**ALZET Comments:** controls received mp w/ vehicle; antihypertensive; cardiovascular; beta-adrenoceptor antagonists; examined heart rate and systolic blood pressure

**Valsartan (2013-Present)**


**Agents:** Sacubitril; Valsartan  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2ML4; **Duration:** 3 days;  
**ALZET Comments:** Dose (75 u?g/day); Controls received mp w/ vehicle; animal info (Male Dahl SS rats, 7 wk of age); Blood pressure measured via tail-cuff plethysmography;155.8 mmHg - 176.0 mmHg;diabetes;

Q3611: T. A. Ramirez, *et al.* Aliskiren and valsartan mediate left ventricular remodeling post-myocardial infarction in mice through MMP-9 effects. Journal of Molecular and Cellular Cardiology 2014;72(326-335

**Agents:** Aliskiren; valsartan  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 2004; **Duration:** 28 days;  
**ALZET Comments:** Controls received mp w/ vehicle; animal info (MMP-9 null or WT); cardiovascular; bp measured using MC4000 bp analysis system;


**Agents:** Valsartan; angiotensin II; aldosterone  
**Vehicle:** Not Stated;  
**Route:** IP;  
**Species:** Mice;  
**Pump:** Not Stated; **Duration:** Not Stated;  
**ALZET Comments:** Animal info (C57BL/6J. male); peptides

Q2883: Q. C. Yong, *et al.* Angiotensin type 1a receptor-deficient mice develop diabetes-induced cardiac dysfunction, which is prevented by renin-angiotensin system inhibitors. Cardiovascular Diabetology 2013;12(;):U1-U13

**Agents:** Aliskiren; benazeprilat; valsartan; PD123319  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 1004; **Duration:** 10 weeks;  
**ALZET Comments:** Cardiovascular; petides; animal info (12 wks old, male, AT-KO); functionality of mp verified by echocardiography; pumps replaced every 4 weeks; enzyme inhibitor (renin);