



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

**Atenolol (2015-Present)**

**Q7241:** M. N. Nguyen, *et al.* Mechanisms responsible for increased circulating levels of galectin-3 in cardiomyopathy and heart failure. *Sci Rep* 2018;8(1):8213

**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;

**Q6161:** C. Disdier, *et al.* Brain Inflammation, Blood Brain Barrier dysfunction and Neuronal Synaptophysin Decrease after Inhalation Exposure to Titanium Dioxide Nano-aerosol in Aging Rats. *Sci Rep* 2017;7(1):12196

**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);

**Q6167:** W. L. Lin, *et al.* Sleep-related changes in cardiovascular autonomic regulation in left coronary artery ligation rats: Neural mechanism facilitating arrhythmia after myocardial infarction. *Int J Cardiol* 2016;225(65-72

**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:** 2001D; **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 AT<sub>1</sub> 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; dose-response (p131); pump model not stated

**P6612:** M. Mizukami, *et al.* Gene expression profile revealed different effects of angiotensin II receptor blockade and angiotensin-converting enzyme inhibitor on heart failure. *Journal of Cardiovascular Pharmacology* 2003;42(S1-S6

**Agents:** Benazepril; candesartan **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** Not Stated;

**ALZET Comments:** Blood pressure taken

**P3188:** L. Chow, *et al.* Improved glucose metabolism following blockade of angiotensin converting enzyme but not angiotensin AT receptors. *European Journal of Pharmacology* 1995;282(77-86

**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)

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

**Q2934:** C. M. Thomas, *et al.* Direct renin inhibition prevents cardiac dysfunction in a diabetic mouse model: comparison with an angiotensin receptor antagonist and angiotensin-converting enzyme inhibitor. *Clinical Science* 2013;124(7-8):529-541

**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

**P2385:** H. E. Lunau, *et al.* Renal adaptations to continuous administration of furosemide and bendroflumethiazide in rats. *Pharmacol. Toxicol* 1994;74(216-222

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

**ALZET Comments:** antihypertensive

### Bisoprolol

**Q3145:** C. C. Sucharov, *et al.* beta-Adrenergic receptor antagonism in mice: a model for pediatric heart disease. *Journal of Applied Physiology* 2013;115(7):979-987

**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;

**P3796:** H. Hamada, *et al.* Age-related effects of norepinephrine on rat ventricular hypertrophy. *Jpn. Heart J* 1997;38(3):433-443

**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

**P3796:** H. Hamada, *et al.* Age-related effects of norepinephrine on rat ventricular hypertrophy. *Jpn. Heart J* 1997;38(3):433-443

**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)

**Q10277:** B. A. Kemp, *et al.* Renal AT2 Receptors Mediate Natriuresis via Protein Phosphatase PP2A. *Circulation research* 2022;130(1):96-111

**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<sup>+</sup> retention and hypertension);

**Q10191:** J. Hu, *et al.* Angiotensin II receptor blockade alleviates calcineurin inhibitor nephrotoxicity by restoring cyclooxygenase 2 expression in kidney cortex. *Acta Physiologica* 2021;232(1):e13612

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

**ALZET Comments:** Dose: Cyclosporine (25 mg/kg); Candesartan (5 mg/kg); Celecoxib ((50mg/kg) Controls received mp w/ vehicle; animal info: Adult (10 to 12 weeks) male Wistar rats; Cyclosporine A aka (CsA); Candesartan aka (RAS); Celecoxib aka (COX-2)

**Q9907:** H. Yang, *et al.* TLR4/MyD88/NF-kappaB Signaling in the Rostral Ventrolateral Medulla Is Involved in the Depressor Effect of Candesartan in Stress-Induced Hypertensive Rats. *ACS Chemical Neuroscience* 2020;11(19):2978-2988

**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;

**Q8609:** L. M. H. Krause, *et al.* Renal functional effects of the highly selective AT2R agonist, beta-Pro7 Ang III, in normotensive rats. *Clinical Science (Lond)* 2020;134(7):871-884

**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;

**Q9792:** B. A. Kemp, *et al.* Identification of a Primary Renal AT2 Receptor Defect in Spontaneously Hypertensive Rats. *Circulation Research* 2020;126(5):644-659

**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

**Q9189:** B. S. Man Chow, *et al.* Evidence of AT1R-AT2R-RXFP1 Functional Crosstalk in Myofibroblasts and its Impact on the Therapeutic Targeting of Renal and Cardiac Fibrosis. 2019;

**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;

**Q8425:** B. S. Man Chow, *et al.* AT1R-AT2R-RXFP1 functional crosstalk. *Journal of the American Society of Nephrology* 2019;

**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;

**Q7624:** B. A. Kemp, *et al.* Defective Renal Angiotensin III and AT2 Receptor Signaling in Prehypertensive Spontaneously Hypertensive Rats. *J Am Heart Assoc* 2019;8(9):e012016

**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;



**Q7311:** L. J. Trigiani, *et al.* Pleiotropic Benefits of the Angiotensin Receptor Blocker Candesartan in a Mouse Model of Alzheimer Disease. *Hypertension* 2018;72(5):1217-1226

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

**ALZET Comments:** Dose (1 mg/kg per day); 25% DMSO used; 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 (2014-Present)

**Q10459:** E. O. Cruz-Lopez, *et al.* Blood pressure-independent renoprotective effects of small interference RNA targeting liver angiotensinogen in experimental diabetes. *British Pharmacological Society* 2023;180(1):80-93

**Agents:** Valsartan; Captopril **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 3 weeks;

**ALZET Comments:** "Dose: Valsartan (4 mg/kg/day); Captopril (6 mg/kg/day); animal info: Male, heterozygous Ren2 rats (10-week-old; weight 300–500 g); Blood pressure measured via: radiotelemetry transmitters; Blood pressure results see (pg.5) antihypertensive; antisense (Oligonucleotides); dependence; "

**Q10471:** D. C. Ensminger, *et al.* Contrasting effects of sleep fragmentation and angiotensin-II treatment upon pro-inflammatory responses of mice. *Scientific Reports* 2022;12(1):14763

**Agents:** Angiotensin II; Captopril **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Pump:** 1002; **Duration:** 8 days;

**ALZET Comments:** Dose: (Angiotensin II 800 ng/mg/day, Captopril: 3 mg/kg/day) 0.9% NaCl vehicle used Controls received mp w/ vehicle; animal info: Male mice (8–9 weeks of age) 20–25 g; Angiotensin II aka (Ang II)

**Q7929:** S. B. Vasamsetti, *et al.* Sympathetic Neuronal Activation Triggers Myeloid Progenitor Proliferation and Differentiation. *Immunity* 2018;49(1):93-106 e7

**Agents:** ICI-118,551 hydrochloride; Toxin, Diphtheria; 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), (Diphtheria 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; Diphtheria 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); "

**Q7067:** W. L. Lin, *et al.* Neural mechanism of angiotensin-converting enzyme inhibitors in improving heart rate variability and sleep disturbance after myocardial infarction. *Sleep Med* 2018;48(61-69)

**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);

**Q4442:** J. C. Hardwick, *et al.* Angiotensin receptors alter myocardial infarction-induced remodeling of the guinea pig cardiac plexus. *American Journal of Physiology Regulatory, Integrative, and Comparable Physiology* 2015;309(R179-R188)

**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;



**Q4497:** W. C. Li, *et al.* Angiotensin II regulates brain (pro)renin receptor expression through activation of cAMP response element-binding protein. *American Journal of Physiology Regulatory, Integrative, and Comparable Physiology* 2015;309(R138-R147

**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;

**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);

### Clonidine (2015-Present)

**Q9088:** E. A. Townsend, *et al.* Conjugate vaccine produces long-lasting attenuation of fentanyl vs. food choice and blocks expression of opioid withdrawal-induced increases in fentanyl choice in rats. *Neuropsychopharmacology* 2019;44(10):1681-1689

**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;

**Q6941:** W. Cao, *et al.* A renal-cerebral-peripheral sympathetic reflex mediates insulin resistance in chronic kidney disease. *EBioMedicine* 2018;37(281-293

**Agents:** Losartan; Tempol; Clonidine **Vehicle:** CSF, artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** 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;

**Q4646:** B. A. Williams, *et al.* Multimodal Perineural Analgesia with Combined Bupivacaine-Clonidine-Buprenorphine-Dexamethasone: Safe In Vivo and Chemically Compatible in Solution. *PAIN MEDICINE* 2015;16(186-198

**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)

**Q4343:** W. Cao, *et al.* A Salt-Induced Reno-Cerebral Reflex Activates Renin-Angiotensin Systems and Promotes CKD Progression. *JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY* 2015;26(1619-1633

**Agents:** Losartan; clonidine; 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

**Q5206:** B. Sjogren, *et al.* Digoxin-Mediated Upregulation of RGS2 Protein Protects against Cardiac Injury. *J Pharmacol Exp Ther* 2016;357(2):311-9

**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);

**Q5344:** U. Eskiciok, *et al.* Synergistic effects of ion transporter and MAP kinase pathway inhibitors in melanoma. *Nat Commun* 2016;7(12336

**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;

**Q2688:** B. Sjoegren, *et al.* Cardiotonic Steroids Stabilize Regulator of G Protein Signaling 2 Protein Levels. *MOLECULAR PHARMACOLOGY* 2012;82(3):500-509

**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

**R0295:** M. P. Blaustein, *et al.* How NaCl raises blood pressure: a new paradigm for the pathogenesis of salt-dependent hypertension. *American Journal of Physiology Heart and Circulatory Physiology* 2012;302(5):H1031-H1049

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

**ALZET Comments:** Controls received mp w/ vehicle; animal info (normal); blood pressure measured via tail cuff

**P5253:** P. Manunta, *et al.* Chronic hypertension induced by ouabain but not digoxin in the rat: antihypertensive effect of digoxin and digitoxin. *Hypertens Res* 2000;23 Suppl(S77-S85

**Agents:** Ouabain; Ouabagenin; Digoxin; Digotoxin **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 5 weeks;

**ALZET Comments:** Controls received mp/ vehicle; functionality of mp verified by residual volume; dose-response (p.581); pumps replaced every 14 days; antihypertensive; plasma levels of all agents verified by immunoassay; multiple pumps per animal (2) used simultaneously in one experiment

**P4750:** K. Kimura, *et al.* Different effects of *in vivo* ouabain and digoxin on renal artery function and blood pressure in the rat. *Hypertens Res* 2000;23(Suppl):S67-S76

**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

**P5308:** B. S. Huang, *et al.* Digoxin prevents ouabain and high salt intake-induced hypertension in rats with sinoaortic denervation. *Hypertension* 1999;34(4 Pt 2):733-738

**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

**Q6678:** J. Kim, *et al.* Renal nerves drive interstitial fibrogenesis in obstructive nephropathy. *J Am Soc Nephrol* 2013;24(2):229-42

**Agents:** Doxazosin; Atipamezole; Metoprolol; ICI118551; L748337; BRL44408; Imiloxan; Spiroxastrine **Vehicle:** PBS; DMSO;

**Route:** IP; **Species:** Mice; **Pump:** Not Stated; **Duration:** 10 days;

**ALZET Comments:** Dose (doxazosin ( $\alpha$ 1-AR antagonist, 12 mg/kg/d), atipamezole ( $\alpha$ 2-AR antagonist, 2.4mg/kg/d), metoprolol ( $\beta$ 1-AR antagonist, 12 mg/kg/d), ICI118551 ( $\beta$ 2-AR antagonist, 2.4 mg/kg/d), L748337 ( $\beta$ 3-AR antagonist, 2.4 mg/kg/d), BRL44408 ( $\alpha$ 2A-AR antagonist, 12mg/kg/d), imiloxan ( $\alpha$ 2B-AR antagonist, 12 mg/kg/d), spiroxastrine ( $\alpha$ 2C-AR antagonist, 12mg/kg/d)); 10% DMSO used; animal info (8-10 week old male 129S1/SvImJ mice);

**P6787:** M. Yono, *et al.* Doxazosin treatment causes differential alterations of  $\alpha$ 1-adrenoceptor subtypes in the rat kidney, heart and aorta. *Life Sciences* 2004;75(21):2605-2614

**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

**P7070:** H. J. Foster, *et al.* Effects of chronic administration of doxazosin on  $\alpha$ 1-adrenoceptors in the rat prostate. *Journal of Urology* 2004;172(6):2465-2470

**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(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;

**Q10065:** S. Tannu, *et al.* Experimental model of congestive heart failure induced by transverse aortic constriction in BALB/c mice. *Journal of Pharmacological and Toxicological Methods* 2020;106(106935

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

**ALZET Comments:** Dose (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;

**Q8176:** D. N. Capelari, *et al.* Maternal Exposure to Enalapril Impairs Alveolarization in Neonatal Developing Rat Lung. *International Journal of Sciences* 2019;8(02):1-12

**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));



**Q7374:** X. Ma, *et al.* A mouse model of heart failure exhibiting pulmonary edema and pleural effusion: Useful for testing new drugs. *J Pharmacol Toxicol Methods* 2019;96(78-86)

**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;

**Q5520:** H. Zheng, *et al.* Centrally mediated erectile dysfunction in rats with type 1 diabetes: role of angiotensin II and superoxide. *J Sex Med* 2013;10(9):2165-76

**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);

### Enalaprilat (2012-Present)

**Q3528:** Y. M. Kang, *et al.* Chronic infusion of enalaprilat 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; enalaprilat **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

**R0364:** R. Gatti, *et al.* Enhanced Cough, *Animal Models. Methods in Pharmacology and Toxicology* 2012;1(17):343-360

**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;

### Eprosartan (2005-Present)

**Q0529:** S. Mukaddam-Daher, *et al.* Hemodynamic and Cardiac Effects of Chronic Eprosartan and Moxonidine Therapy in Stroke-Prone Spontaneously Hypertensive Rats. *Hypertension* 2009;53(5):775-U58

**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

**P7557:** T. Karram, *et al.* Effects of spironolactone and eprosartan on cardiac remodeling and angiotensin-converting enzyme isoforms in rats with experimental heart failure. *American Journal of Physiology Heart and Circulatory Physiology* 2005;289(4):H1351-H1358

**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

**P7356:** A. Dendorfer, *et al.* Peripheral sympatholytic actions of four AT<sub>1</sub> antagonists: are they relevant for long-term antihypertensive efficacy? *Journal of Hypertension* 2005;23(10):1861-1867

**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)





**P7583:** Y. Chen, *et al.* Heat shock treatment suppresses angiotensin II-induced SP-1 and AP-1 and stimulates Oct-1 DNA-binding activity in heart. *Inflammation Research* 2005;54(8):338-343

**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

**Q9071:** F. H. Siddiqi, *et al.* Felodipine induces autophagy in mouse brains with pharmacokinetics amenable to repurposing. *Nature Communications* 2019;10(1):1817

**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.

**P3960:** E. M. A. Mervaala, *et al.* Influence of dietary salts on the cardiovascular effects of low-dose combination of ramipril and felodipine in spontaneously hypertensive rats. *British J. Pharmacol* 1998;123(195-204)

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

**P3540:** E. M. A. Mervaala, *et al.* Cardiovascular effects of a low-dose combination of ramipril and felodipine in spontaneously hypertensive rats. *Br. J. Pharmacol* 1997;121(503-510)

**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 C57BL/6J male mice);

**Q4455:** R. W. Hunter, *et al.* Hypertrophy in the Distal Convoluted Tubule of an 11-Hydroxysteroid Dehydrogenase Type 2 Knockout Model. *JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY* 2015;26(1537-1548)

**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;

**Q3156:** I. M. Schiessl, *et al.* Dietary salt intake modulates differential splicing of the Na-K-2Cl cotransporter NKCC2. *American Journal of Physiology Renal Physiology* 2013;305(8):F1139-F1148

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

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, C57BL/6, 8-10 weeks); functionality of mp verified by increased arterial BP; cardiovascular; bp measured using tail-cuff;

**Q2841:** S. Seidel, *et al.* Annexin A1 modulates macula densa function by inhibiting cyclooxygenase 2. *American Journal of Physiology Renal Physiology* 2012;303(6):F845-F854

**Agents:** Furosemide **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Pump:** 2ML1; **Duration:** Not Stated;

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

**Q1616:** H. N. Lang, *et al.* Chronic Reduction of Endocochlear Potential Reduces Auditory Nerve Activity: Further Confirmation of an Animal Model of Metabolic Presbycusis. *JARO-JOURNAL OF THE ASSOCIATION FOR RESEARCH IN OTOLARYNGOLOGY* 2010;11(3):419-434

**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

**Q4951:** F. G. Vieira, *et al.* Guanabenz Treatment Accelerates Disease in a Mutant SOD1 Mouse Model of ALS. *PLoS One* 2015;10(8):e0135570

**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);

**P2311:** C. A. Hamilton, *et al.* Do centrally-acting antihypertensive drugs act at non-adrenergic as well as alpha-2 adrenoceptor sites? *Clinical and Experimental Hypertension* 1992;A14(5):815-835

**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)

**Q9957:** T. Wakamatsu, *et al.* Type I Angiotensin II Receptor Blockade Reduces Uremia-Induced Deterioration of Bone Material Properties. *Journal of Bone & Mineral Research* 2021;36(1):67-79

**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

**Q6070:** P. Lemkens, *et al.* Dual NEP/ECE inhibition improves endothelial function in mesenteric resistance arteries of 32-week-old SHR. *Hypertens Res* 2017;40(8):738-745

**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;

**Q4476:** H. Kawahata, *et al.* Continuous infusion of angiotensin II modulates hypertrophic differentiation and apoptosis of chondrocytes in cartilage formation in a fracture model mouse. *HYPERTENSION RESEARCH* 2015;38(382-393)

**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;

**Q4343:** W. Cao, *et al.* A Salt-Induced Reno-Cerebral Reflex Activates Renin-Angiotensin Systems and Promotes CKD Progression. *JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY* 2015;26(1619-1633)

**Agents:** Losartan; clonidine; 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;

**Q1307:** Y. Sakurai-Yamashita, *et al.* Lercanidipine Rescues Hippocampus Pyramidal Neurons from Mild Ischemia-Induced Delayed Neuronal Death in SHRSP. *Cellular and Molecular Neurobiology* 2011;31(4):561-567

**Agents:** Hydralazine; Lisinopril; Valsartan **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **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)

**Q4898:** J. T. K. Kathryn R. Walsh, Joon W. Shim, and Richard D. Wainford. Norepinephrine-evoked salt-sensitive hypertension requires impaired renal sodium chloride cotransporter activity in Sprague-Dawley rats. *American Journal of Physiology Regulatory, Integrative, and Comparable Physiology* 2016;310(R115-R124)

**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);

**Q2139:** A. Ashek, *et al.* Activation of Thiazide-Sensitive Co-Transport by Angiotensin II in the cyp1a1-Ren2 Hypertensive Rat. *PLoS One* 2012;7(4):U1890-U1899

**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

**Q1882:** R. Ishibashi, *et al.* Imidapril Inhibits Cerebral Aneurysm Formation in an Angiotensin-Converting Enzyme-Independent and Matrix Metalloproteinase-9-Dependent Manner. *Neurosurgery* 2012;70(3):722-730

**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);

**R0364:** R. Gatti, *et al.* Enhanced Cough, Animal Models. *Methods in Pharmacology and Toxicology* 2012;1(17):343-360

**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;

**P5298:** Y. Kurosawa, *et al.* Tissue Angiotensin-converting enzyme activity plays an important role in pressure overload-induced cardiac fibrosis in rats. *J Cardiovasc. Pharmacol* 2002;39(4):600-609

**Agents:** Imidapril **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; cardiovascular; enzyme inhibitor;

**P5293:** M. Kakoki, *et al.* Effects of hypertension, diabetes mellitus, and hypercholesterolemia on endothelin type B receptor-mediated nitric oxide release from rat kidney. *Circulation* 1999;99(9):1242-1248

**Agents:** Imidapril **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks;

**ALZET Comments:** Cardiovascular; enzyme inhibitor (ACE inhibitor)

**P4062:** Y. Hirata, *et al.* Nitric oxide release from kidneys of hypertensive rats treated with imidapril. *Hypertension* 1996;27(pt 2):672-678

**Agents:** Imidapril **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 4 weeks;

**ALZET Comments:** controls received mp w/vehicle; dose-response (1 or 10 mg/kg); antihypertensive; cardiovascular

### Isoproterenol (2021-Present)

**Q11027:** W. Wu, *et al.* Mitochondrial damage in a Takotsubo syndrome-like mouse model mediated by activation of beta-adrenoceptor-Hippo signaling pathway. *American Journal of Physiology Heart and Circulatory Physiology* 2023;324(4):H528-H541

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** 2001; **Duration:** 23 hours;

**ALZET Comments:** Dose (1.25 mg/kg/h); Controls received mp w/ vehicle; animal info: 9 mo. old menopausal; post op. care (antibiotic ointment); cardiovascular; Takotsubo syndrome (cardiomyopathy)



- Q11016:** P. Verdino, *et al.* Development of a long-acting relaxin analogue, LY3540378, for treatment of chronic heart failure. *British Pharmacological Society* 2023;180(15):1965-1980  
**Agents:** Isoproterenol hydrochloride **Vehicle:** PBS; sodium ascorbate; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1002; **Duration:** 14 days;  
**ALZET Comments:** Dose Isoproterenol (15 mg/kg/day); Controls received mp w/ vehicle; animal info: Male, 11-week-old; post op. care: Postoperative analgesia was achieved with a single dose of meloxicam 4 mg/kg; ; half-life (p.13); cardiovascular (chronic heart failure)
- Q11007:** G. Subramaniam, *et al.* Integrated Proteomics Unveils Nuclear PDE3A2 as a Regulator of Cardiac Myocyte Hypertrophy. *Circulation Research* 2023;132(7):828-848  
**Agents:** Isoproterenol **Vehicle:** Saline; ascorbic acid; **Route:** Not Stated; **Species:** Rat; **Pump:** 2ML2; **Duration:** 14 days;  
**ALZET Comments:** Dose: (0.13 mg/kg per hour) (0.9% NaCl+0.02% ascorbic acid) used; Controls received mp w/ vehicle; animal info: Male rats (circa 6–8 months)cardiovascular (cardiac myocyte hypertrophy)
- Q10998:** W. Simonides, *et al.* Divergent Thyroid Hormone Levels in Plasma and Left Ventricle of the Heart in Compensated and Decompensated Cardiac Hypertrophy Induced by Chronic Adrenergic Stimulation in Mice. *Metabolites* 2023;13(308):  
**Agents:** Isoproterenol; phenylephrine **Vehicle:** Water, sterile, distilled; ascorbic acid; **Route:** SC; **Species:** Mice; **Strain:** C57BL6/J-Dio3fl/flMerCreMer+/- (cD3KO-CS); **Pump:** 1007D; 1002; **Duration:** 7 days; 14 days;  
**ALZET Comments:** Dose: 30 mg/kg/d; 0.1% ascorbic acid used; Controls received mp w/ vehicle; animal info: 12 weeks; cardiovascular; (ventricular hypertrophy, heart failure)
- Q11183:** J. Qian, *et al.* Toll-like receptor-2 in cardiomyocytes and macrophages mediates isoproterenol-induced cardiac inflammation and remodeling. *FASEB Journal* 2023;37(2):e22740  
**Agents:** Isoproterenol **Vehicle:** Ascorbic acid; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; TLR2KO; **Pump:** 1002; **Duration:** 2 weeks;  
**ALZET Comments:**
- Q10737:** R. Zhai, *et al.* Myocardial GRK2 Reduces Fatty Acid Metabolism and beta-Adrenergic Receptor-Mediated Mitochondrial Responses. *International Journal of Molecular Sciences* 2022;23(5):  
**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Wild-type C57BL/6; **Pump:** Not Stated; **Duration:** 6, 7 days;  
**ALZET Comments:** Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (Male; 10-13 weeks old; ; Crossed with transgenic GRK2-overexpressing mice); cardiovascular; Therapeutic indication (Heart failure);
- Q10849:** Y. Yoshida, *et al.* Brown Adipose Tissue Dysfunction Promotes Heart Failure Via a Trimethylamine N-Oxide-Dependent Mechanism. *Scientific Reports* 2022;12(1):14883  
**Agents:** Isoproterenol; Trimethylamine N-oxide **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/9; **Pump:** Not Stated; **Duration:** Not Stated;  
**ALZET Comments:** Dose: (ISO 30 mg/kg/day; TMAO 25 mg/kg/day); animal info ( Male; 11 weeks old); cardiovascular; Therapeutic indication (Heart failure);
- Q11215:** E. L. Robinson, *et al.* MSK-Mediated Phosphorylation of Histone H3 Ser28 Couples MAPK Signalling with Early Gene Induction and Cardiac Hypertrophy. *Cells* 2022;11(4):  
**Agents:** Isoproterenol **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** Msk1/2; WT; **Pump:** Not Stated; **Duration:** 1 week;  
**ALZET Comments:** Dose (10 mg/kg/day); animal info (Male; 8-10 weeks old); cardiovascular;
- Q10617:** D. Murashige, *et al.* Extra-Cardiac BCAA Catabolism Lowers Blood Pressure and Protects From Heart Failure. *Cell Metabolism* 2022;34(11):1749-1764 e7  
**Agents:** Isoproterenol **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice; **Strain:** BCKDK cKO; **Pump:** 1002; **Duration:** 14 days;  
**ALZET Comments:** Dose (30 mg/kg/day.); Controls received mp w/ vehicle; animal info ( mice); cardiovascular; Therapeutic indication (Heart failure);



**Q11207:** B. Moukette, *et al.* MiR-150 blunts cardiac dysfunction in mice with cardiomyocyte loss of beta(1)-adrenergic receptor/beta-arrestin signaling and controls a unique transcriptome. *Cell Death Discovery* 2022;8(1):504

**Agents:** Isoproterenol **Vehicle:** Ascorbic acid; saline; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** Dose (3 mg/kg/day); 0.002% ascorbic acid used; Controls received mp w/ vehicle; animal info: 8–16- week-old mice

**Q10816:** J. Li, *et al.* Targeting miR-30d Reverses Pathological Cardiac Hypertrophy. *EBioMedicine* 2022;81(104108)

**Agents:** Angiotensin II; Isoproterenol **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Not Stated; **Pump:** 2004; 2002; **Duration:** 4 weeks; 2 weeks;

**ALZET Comments:** Dose (1.3 mg/kg/day Ang II, 30 mg/kg/day ISO); Controls received mp w/ vehicle; animal info(Male; 8-10 weeks old); peptides; cardiovascular; Therapeutic indication (Cardiac hypertrophy);

**Q10935:** X. Han, *et al.* Syringic acid mitigates isoproterenol-induced cardiac hypertrophy and fibrosis by downregulating Ereg. *Journal of Cellular and Molecular Medicine* 2022;26(14):4076-4086

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

**ALZET Comments:** Dose (25 mg/kg bodyweight/day); 0.1% ascorbic acid and 0.9% saline used; Controls received mp w/ vehicle; animal info (Male; 8 weeks old; Weighed about 33 g); cardiovascular; (Cardiac hypertrophy; Fibrosis);

**Q10383:** L. Gao, *et al.* Schisandrin A protects against isoproterenol induced chronic heart failure via miR155. *Molecular Medical Reports* 2022;25(1):

**Agents:** Isoproterenol hydrochloride **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Not Stated; **Pump:** 2ML2; **Duration:** 2 weeks;

**ALZET Comments:** Dose (30 mg/kg/day); 0.9% normal saline used; Controls received mp w/ vehicle; animal info (Male; 50 total; 10 weeks old; 22-25 g); cardiovascular; Therapeutic indication (Chronic heart failure);

**Q10676:** M. Abdullah Shamim, *et al.* Topical Carvedilol Delivery Prevents UV-Induced Skin Cancer with Negligible Systemic Absorption. *International Journal of Pharmaceutics* 2022;611(121302)

**Agents:** Isoproterenol **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** SKH-1; **Pump:** 1004; **Duration:** 28 days;

**ALZET Comments:** Dose (20 ug/kg/day); animal info (; Female; Hairless; 7-8 weeks old); Blood pressure measured via tail-cuff method; cancer (Skin);

**Q10892:** T. Zhao, *et al.* Selective HDAC8 Inhibition Attenuates Isoproterenol-Induced Cardiac Hypertrophy and Fibrosis via p38 MAPK Pathway. *Frontiers in Pharmacology* 2021;12(677757)

**Agents:** Isoproterenol **Vehicle:** DMSO; Saline; Ascorbic acid; **Route:** IP; **Species:** Mice; **Strain:** CD-1; **Pump:** Not Stated; **Duration:** 5 days;

**ALZET Comments:** Dose: (25 mg/kg/day); 0.9% Saline; 0.1% Ascorbic acid vehicle used; Controls received mp w/ vehicle; animal info: Male mice (7 weeks old and with an average weight of 33 g); cardiovascular; Cardiac Hypertrophy and Fibrosis

**Q10734:** L. Yanez-Bisbe, *et al.* Aging Impairs Reverse Remodeling and Recovery of Ventricular Function after Isoproterenol-Induced Cardiomyopathy. *International Journal of Molecular Sciences* 2021;23(1):

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1004; **Duration:** 28 days;

**ALZET Comments:** Dose (30 mg/kg/day); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (young 10-weeks old; elderly 22-month old Female); cardiovascular (cardiomyopathy)

**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; **Strain:** C57Bl6/J; **Pump:** 1004; **Duration:** 21 days;

**ALZET Comments:** Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (mice, 8 weeks old); Isoproterenol aka Iso; dependence;



**Q10695:** H. Tao, *et al.* Loss of Ten-Eleven Translocation 2 Induces Cardiac Hypertrophy and Fibrosis Through Modulating ERK Signaling Pathway. *Human Molecular Genetics* 2021;30(10):865-879

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** Not Stated; **Duration:** 14 days; **ALZET Comments:** Dose: (5 mg/kg/day) Controls received mp w/ vehicle; animal info: Hypertrophy model, adult male mice; Isoproterenol aka (ISO); cardiovascular; (cardiac hypertrophy and fibrosis)

**Q10694:** M. A. Tanner, *et al.* Immune Cell Beta(2)-Adrenergic Receptors Contribute to the Development of Heart Failure. *American Journal of Physiology* 2021;321(4):H633-H649

**Agents:** Isoproterenol **Vehicle:** PBS; Ascorbic acid; **Species:** Mice; **Strain:** Wild-type C57BL/6J; **Duration:** 1 week; **ALZET Comments:** Dose: (30mg/kg/day); 0.001% Ascorbic acid vehicle used; Controls received mp w/ vehicle; animal info: mice (8–12wk) and b2ARKO mice backcrossed; cardiovascular;

**Q10349:** M. Tajas, *et al.* Neurohormonal activation induces intracellular iron deficiency and mitochondrial dysfunction in cardiac cells. *Cell & Bioscience* 2021;11(1):89

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1004; **Duration:** 28 days; **ALZET Comments:** Dose: (30 mg/kg/day); Controls received mp w/ vehicle; animal info: Sixteen 10-week-old male mice; post op. care: Buprenorphine (0.3 mg/kg, i.p.); Isoproterenol aka (ISO); cardiovascular;

**Q10688:** A. M. Syed, *et al.* A review on Herbal Nrf2 Activators with Preclinical Evidence in Cardiovascular Diseases. *Phytotherapy Research* 2021;35(9):5068-5102

**Agents:** Isoproterenol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Not Stated; **Pump:** Not Stated; **Duration:** 14 days; **ALZET Comments:** Dose: (5 mg/kg/day) animal info: Male rats; Isoproterenol aka (ISO) cardiovascular;

**Q10348:** X. Sun, *et al.* Paroxetine Attenuates Cardiac Hypertrophy Via Blocking GRK2 and ADRB1 Interaction in Hypertension. *Journal of American Heart Association* 2021;10(1):e016364

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** SHRs; **Pump:** 2002; **Duration:** 2 weeks; **ALZET Comments:** Dose: Isoproterenol (5 mg/kg per day); Controls received mp w/ vehicle; animal info: 6 weeks; Blood pressure measured via: Tail cuff; 18.88 mmHg - 74.06 mmHg;

**Q10659:** T. Rehmani, *et al.* Specific Deletion of the FHA Domain Containing SLMAP3 Isoform in Postnatal Myocardium Has No Impact on Structure or Function. *Cardiogenetics* 2021;11(4):164-184

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 2001D; **Duration:** 7 days; **ALZET Comments:** Dose (30 ug/g/d per animal); 0.9% saline used; Controls received mp w/ vehicle; animal info (8-weeks old); gene therapy;

**Q10046:** D. Mukherjee, *et al.* PARIS–DJ-1 Interaction Regulates Mitochondrial Functions in Cardiomyocytes, Which Is Critically Important in Cardiac Hypertrophy. *Molecular and Cellular Biology* 2021;

**Agents:** Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** Not Stated; **Duration:** 14 days; **ALZET Comments:** Dose (5 mg/kg/day); 0.9% Saline used; Controls received mp w/ vehicle; animal info Rat (24-week-old male

**Q11131:** J. Y. Li, *et al.* Upregulation of miR-128 Mediates Heart Injury by Activating Wnt/beta-catenin Signaling Pathway in Heart Failure Mice. *Organogenesis* 2021;17(3-4):27-39

**Agents:** Isoproterenol hydrochloride **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1002; 1004; **Duration:** 14 days; **ALZET Comments:** Dose (30 mg/kg/d); Controls received mp w/ vehicle; animal info (8-10 weeks old; male 20-25 g); cardiovascular; Therapeutic indication (Heart failure);

**Q10224:** J. S. Kwon, *et al.* In Vivo Stimulation of alpha- and beta-Adrenoceptors in Mice Differentially Alters Small RNA Content of Circulating Extracellular Vesicles. *Cells* 2021;10(5):

**Agents:** Isoproterenol; Phenylephrine **Vehicle:** Ascorbic acid; PBS; **Species:** Mice; **Strain:** C57/BL6; **Pump:** 1007D; **Duration:** 1w **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 mice



**Q10391:** A. Ishikita, *et al.* GFAT2 mediates cardiac hypertrophy through HBP-O-GlcNAcylation-Akt pathway. *iScience* 2021;24(12):103517

**Agents:** Isoproterenol; 6-diazo-5-oxo-L-norleucine crystalline; Phenylephrine; Angiotensin II **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Not Stated; **Pump:** 1007D; **Duration:** 1 week;

**ALZET Comments:** Dose (ISO 15 mg/kg body weight/day; DON 0.05 ug/kg/day; AngII 1.44 mg/kg body weight/day; PE 100 mg/kg body weight/day); dose-response (see p. 18); animal info (Male; 8-10 weeks old); Blood pressure measured via tail cuff system; peptides; cardiovascular; Therapeutic indication (Cardiac hypertrophy);

**Q10486:** X. Gao, *et al.* Nociceptive nerves regulate haematopoietic stem cell mobilization. *Nature* 2021;589(7843):591-596

**Agents:** Peptide, calcitonin gene related; Substance P; Isoproterenol **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6 CD45.1,CD45.2; **Pump:** 1007D; **Duration:** 1 week;

**ALZET Comments:** "Dose: CGRP (14 ug/day, 2.4 µg/day); Substance P (5 ug/day); Isoproterenol (40 µg per day); Controls received mp w/ vehicle; animal info: mice

8-10-week-old congenic mice of both gender; Calcitonin gene-related peptide also (CGRP); Isoproterenol aka (ISO)

**Q10159:** M. Flamant, *et al.* Early activation of the cardiac CX3CL1/CX3CR1 axis delays beta-adrenergic-induced heart failure. *Scientific Reports* 2021;11(1):17982

**Agents:** Isoproterenol **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not Stated; **Duration:** 14; 28 days;

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

**Q9196:** D. Coquerel, *et al.* Galphai-biased apelin analog protects against isoproterenol-induced myocardial dysfunction in rats. *American Journal of Physiology Heart & Circulatory Physiology* 2021;320(4):H1646-H1656

**Agents:** Apelin-13; Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **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 rats, 3 months old, 400 g); 96.8 mmHg - 105.1 mmHg; Apelin-13 aka APLN-13, Isoproterenol aka ISO; cardiovascular;

**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; **Strain:** Not Stated; **Pump:** 1007D; 1002; **Duration:** 7 days; 14 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;

**Q10100:** L. Bai, *et al.* Protocatechuic acid attenuates isoproterenol-induced cardiac hypertrophy via downregulation of ROCK1-Sp1-PKCγ axis. *Scientific Reports* 2021;11(1):17343

**Agents:** Isoproterenol **Vehicle:** Ascorbic acid; Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** CD-1; **Pump:** Not Stated; **Duration:** 5 days;

**ALZET Comments:** Dose: Isoproterenol (25 mg/kg/day); Protocatechuic acid (100 mg/kg/day); 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 (age, 7 weeks; average weight 33 g); cardiovascular; (Cardiac Hypertrophy)

**Q8684:** A. Ahmed, *et al.* Maternal obesity persistently alters cardiac progenitor gene expression and programs adult-onset heart disease susceptibility. *Mol Metab* 2021;43(101116

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

**ALZET Comments:** Dose (60 mg/kg/day); Controls received mp w/ vehicle; animal info (8 weeks old); cardiovascular;



### Ketanserin

**Q8138:** E. A. Moya, *et al.* Serotonin and Adenosine G-protein Coupled Receptor Signaling for Ventilatory Acclimatization to Sustained Hypoxia. *Front Physiol* 2018;9(860)

**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 (Bupenorphirine, Enrofloxacin); Ketanserin tartrate aka antagonist of serotonin 5HT2 receptors, MSX-3 aka antagonist adenosine A2A receptors ; dependence;

**P9838:** O. Lairez, *et al.* Genetic deletion of MAO-A promotes serotonin-dependent ventricular hypertrophy by pressure overload. *Journal of Molecular and Cellular Cardiology* 2009;46(4):587-595

**Agents:** Ketanserin; M100907 **Vehicle:** DMSO; saline; hydrochloric acid; **Route:** IP; **Species:** Mice (transgenic) **Duration:** 4 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Tg8 MAO-A KO, wt, 10 wks old); 10% DMSO used;

**P5895:** H. Jorgensen, *et al.* Serotonergic involvement in stress-induced vasopressin and oxytocin secretion. *European Journal of Endocrinology* 2002;147(6):815-824

**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

**P4222:** Q. Gu, *et al.* Involvement of serotonin in developmental plasticity of kitten visual cortex. *European Journal of Neuroscience* 1995;7(1146-1153)

**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;

**P2499:** G. Balasubramaniam, *et al.* Differences in the chronic hypotensive mechanism of action of ketanserin in spontaneously hypertensive and wistar-kyoto rats. *J. Hypertens* 1994;12(7-14)

**Agents:** Ketanserin **Vehicle:** Dextrose; **Route:** IV (femoral); **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

**ALZET Comments:** controls received mp w/ vehicle; antihypertensive

**P2173:** G. Balasubramaniam, *et al.* Differences in the acute and chronic antihypertensive mechanism of action of ketanserin in spontaneously hypertensive rats. *J. Pharmacol. Exp. Ther* 1993;264(1):129-134

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

**ALZET Comments:** antihypertensive

### Losartan (2020-Present)

**Q11030:** D. Ye, *et al.* Antisense oligonucleotides targeting hepatic angiotensinogen reduce atherosclerosis and liver steatosis in hypercholesterolemic mice. *Global Translational Medicine* 2023;2(1):

**Agents:** Losartan **Vehicle:** Water; **Route:** SC; **Species:** Mice; **Strain:** LDL receptor -/-; **Pump:** 2006; **Duration:** 12 weeks;

**ALZET Comments:** Dose: Losartan 15 mg/kg/day; Controls received mp w/ vehicle; animal info: Male ~8 weeks old; pumps replaced after 6 weeks; Blood pressure measured via: Tail cuff; Blood pressure measurement results (see pg. 3) fig. 1;

**Q10964:** J. M. Motherwell, *et al.* Effects of Adjunct Antifibrotic Treatment within a Regenerative Rehabilitation Paradigm for Volumetric Muscle Loss. *International Molecular of Life Sciences* 2023;24(4):

**Agents:** Losartan potassium **Vehicle:** DMSO; saline; **Route:** SC; **Species:** Rat; **Strain:** Lewis; **Pump:** 2ML4; **Duration:** 56 days;

**ALZET Comments:** Dose (10 mg/kg/day); (1:1 solution of DMSO and 0.9% normal saline used; animal info: Adult male Lewis rats (343 +- 25.1 g; behavioral testing (running wheel activity); pumps replaced after 28 days; fibrosis, volumetric muscle loss





**Q10660:** L. Rezacova, *et al.* Both Central Sympathoexcitation and Peripheral Angiotensin II-Dependent Vasoconstriction Contribute to Hypertension Development in Immature Heterozygous Ren-2 Transgenic Rats. *Hypertension Research* 2022;45(3):414-423

**Agents:** Losartan **Route:** IP; CSF/CNS (lateral ventricle); **Species:** Rat (transgenic); **Pump:** 2004;

**ALZET Comments:** Dose (1 or 2 mg/kg/day); animal info (immature Male heterozygous (mRen-2)<sup>27</sup> transgenic; 6 weeks old; Fed Sniff diet); Blood pressure measured via pressure transducer and multichannel recorder; Brain coordinates: (AP = -1.0, L = 1.5, V = 4.1); polyethylene catheter used; antihypertensive; cardiovascular;

**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, oxidized low density; AngII; Losartan; LOX-1 neutralizing antibody; Enalapril **Route:** SC; **Species:** Mice;

**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, oxidized low density aka (ox-LDL);

**Q10594:** Z. Ma, *et al.* beta-Arrestin-Mediated Angiotensin II Type 1 Receptor Activation Promotes Pulmonary Vascular Remodeling in Pulmonary Hypertension. *JACC Basic Translational Science* 2021;6(11):854-869

**Agents:** Angiotensin II; Losartan; TRV023 **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; 2ML2; **Duration:** 4 weeks;

**ALZET Comments:** Dose (Ang II 1 mg/kg/d; Losartan 10 mg/kg/d, 14.4 mg/kg/d TRV023); animal info (Male Sprague Dawley; 5-6 weeks old; 150-200 g); peptides; 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; **Duration:** 4 wk

**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)

**Q9228:** N. D. Fried, *et al.* Angiotensin II type 1 receptor mediates pulmonary hypertension and right ventricular remodeling induced by inhaled nicotine. *American Journal of Physiology Heart Circulatory Physiology* 2021;320(4):H1526-H1534

**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;

**Q9164:** D. M. Bovee, *et al.* Dietary salt modifies the blood pressure response to renin-angiotensin inhibition in experimental chronic kidney disease. *American Journal of Physiology Renal Physiology* 2021;320(4):F654-F668

**Agents:** Dexamethasone; Losartan **Vehicle:** Ethanol; DMSO; PEG; **Route:** SC; **Species:** Rat; **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;

**Q9555:** P. Wu, *et al.* Effect of Angiotensin II on ENaC in the Distal Convoluted Tubule and in the Cortical Collecting Duct of Mineralocorticoid Receptor Deficient Mice. *Journal of the American Heart Association* 2020;9(7):e014996

**Agents:** Angiotensin II; Losartan **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **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;



**Q8409:** Y. M. Chao, *et al.* Anomalous AMPK-regulated angiotensin AT1R expression and SIRT1-mediated mitochondrial biogenesis at RVLM in hypertension programming of offspring to maternal high fructose exposure. *Journal of Biomedical Science* 2020;27(1):68

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

### Metoprolol (2017-Present)

**Q8463:** A. K. Evans, *et al.* Beta-adrenergic receptor antagonism is proinflammatory and exacerbates neuroinflammation in a mouse model of Alzheimer's Disease. *Neurobiology of Disease* 2020;146(105089)

**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;

**Q8014:** L. A. Grisanti, *et al.* Prior beta-blocker treatment decreases leukocyte responsiveness to injury. *JCI Insight* 2019;5(5) **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); cardiovascular;

**Q6485:** J. Skrzypecki, *et al.* Renal denervation decreases blood pressure and renal tyrosine hydroxylase but does not augment the effect of hypotensive drugs. *Clinical and Experimental Hypertension* 2017;39(3):290-294

**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;

**Q6264:** T. Feridooni, *et al.* Effects of beta-adrenergic receptor drugs on embryonic ventricular cell proliferation and differentiation and their impact on donor cell transplantation. *American Journal of Physiology Heart and Circulatory Physiology* 2017;312(5):H919-H931

**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

**P1899:** Y.-J. Kuo, *et al.* Captopril increases norepinephrine spillover rate in conscious spontaneously hypertensive rats. *J. Pharmacol. Exp. Ther* 1991;258(1):223-231

**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)

**Q5529:** N. Honda, *et al.* Moxonidine-induced central sympathoinhibition improves prognosis in rats with hypertensive heart failure. *J Hypertens* 2013;31(11):2300-8; discussion 2308

**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);

**Q0906:** A. M. Stabile, *et al.* Functional and molecular effects of imidazoline receptor activation in heart failure. *LIFE SCIENCES* 2011;88(11-12):493-503

**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

**Q11077:** A. G. George, *et al.* Sudden unexpected death in epilepsy is prevented by blocking postictal hypoxia. *Neuropharmacology* 2023;231(109513)

**Agents:** Nicardipine **Vehicle:** DMSO; PEG; EtOH; **Route:** CSF/CNS (left lateral ventricle); **Species:** Mice; **Strain:** Kcna1<sup>-/-</sup>; **Pump:** 2006; **Duration:** 42 days;

**ALZET Comments:** Dose (2 mg/mL); 50:40:10 DMSO:PEG:EtOH; Controls received mp w/ vehicle; animal info (Male and female; 4-10 weeks old; Weighed 23-31 g); post op. care: buprenorphine injection (0.05 mg/kg) every 12 h for 3 days; Cannula placement verified via methylene blue dye; Brain coordinates: (AP) +0.3, (ML) -1.0, (DV) -3.0; epilepsy

**Q9267:** F. Herisson, *et al.* Posterior reversible encephalopathy syndrome in stroke-prone spontaneously hypertensive rats on high-salt diet. *Journal of Cerebral Blood Flow & Metabolism* 2019;39(7):1232-1246

**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;

**Q0062:** P. Fossat, *et al.* Knockdown of L Calcium Channel Subtypes: Differential Effects in Neuropathic Pain. *Journal of Neuroscience* 2010;30(3):1073-1085

**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

**Q0590:** E. A. Ingram, *et al.* Prolonged infusion of inhibitors of calcineurin or L-type calcium channels does not block mossy fiber sprouting in a model of temporal lobe epilepsy. *Epilepsia* 2009;50(1):56-64

**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

**P9054:** Q. Hao, *et al.* Increased tissue perfusion promotes capillary dysplasia in the ALK1-deficient mouse brain following VEGF stimulation. *American Journal of Physiology Heart and Circulatory Physiology* 2008;295(6):H2250-H2256

**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

**P4055:** M. Kurooka, *et al.* High incidence of esophageal cancer in esophageal achalasia by the oral administration of N-amyl-N-methylnitrosamine and its prevention by nicardipine hydrochloride in mice. *Cancer Letters* 1998;127(55-61)

**Agents:** Nicardipine HCl **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** Not Stated;

**ALZET Comments:** Calcium-channel blocker; cancer; antihypertensive

**P1991:** K. Hewitt, *et al.* Combined treatment with MK-801 and nicardipine reduces global ischemic damage in the gerbil. *Stroke* 1992;23(1):82-86

**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, PhD. 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)); ;

**Q8403:** S. M. C. Cardenas, *et al.* 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); 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;

**Q9135:** S. Ali, MD, *et al.* Elevated Testosterone Secondary to Leydig Cell Hyperplasia in Bilateral Ovaries. *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));

**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

**P3418:** S. Kawamura, *et al.* Protective effect of nilvadipine on focal cerebral ischemia in spontaneously hypertensive rats. *Neurol. Med. Chir* 1996;36(151-155

**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)

**Q11054:** H. Ma, *et al.* Angiotensin-(1-9) attenuates adriamycin-induced cardiomyopathy in rats via the angiotensin type 2 receptor. *Molecular and Cellular Biochemistry* 2023;

**Agents:** Angiotensin (1-9); PD123319 **Vehicle:** Saline; **Route:** Not Stated; **Species:** Rat; **Strain:** Wistar; **Duration:** 28 days;

**ALZET Comments:** Dose: 200 ng/kg/min; controls received mp w/ vehicle; animal info: (8-10 weeks, 250-300g); blood pressure measured via noninvasive tail-cuff system (Table 1); receptor antagonist (PD123319 is angiotensin type 2 receptor antagonist)

**R0374:** C. Shimbori, *et al.* The Role of Mast Cells in the Pathophysiology of Pulmonary Fibrosis. *Not Stated* 2019;135-173

**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;

**Q7364:** M. E. Arce, *et al.* Age-Related Changes in Ang II Receptor Localization and Expression in the Developing Auditory Pathway. *Neurochem Res* 2019;44(2):412-420

**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 KS-Kir4.1 KO);

**Q7782:** A. Chakrabarty, *et al.* Inflammatory Renin-Angiotensin System Disruption Attenuates Sensory Hyperinnervation and Mechanical Hypersensitivity in a Rat Model of Provoked Vestibulodynia. *J Pain* 2018;19(3):264-277

**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);

**Q5654:** B. A. Kemp, *et al.* AT2 Receptor Activation Prevents Sodium Retention and Reduces Blood Pressure in Angiotensin II-Dependent Hypertension. *Circulation Research* 2016;119(4):532-43

**Agents:** Dextrose, C21, PD-123319, Ang II **Vehicle:** Water; **Route:** SC; **Species:** Rat; **Pump:** 1007D, 2001; **Duration:** 1 week;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (12 weeks); good methods (p. 546); Multiple pumps per animal (2); Therapeutic indication (Hypertension); Dose (C21 60ng/kg/min, PD-123319 10 ng/kg/min, Dextrose/AngII: 200 ng/kg/min);

**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(-/-));

## Perindopril

**Q10925:** F. Alam, *et al.* The single-chain relaxin mimetic, B7-33, maintains the cardioprotective effects of relaxin and more rapidly reduces left ventricular fibrosis compared to perindopril in an experimental model of cardiomyopathy. *Biomedicine & Pharmacotherapy* 2023;160(114370)

**Agents:** Relaxin, recombinant H2; B7-33; Perindopril; **Species:** Mice; **Strain:** 129sv; **Pump:** 1007D; **Duration:** 7 days;

**ALZET Comments:** Dose: RLX 0.5 mg/kg/day; B7-33 0.25 mg/kg/day; perindopril 1 mg/kg/day); animal info (14–16 week old male mice); Blood pressure measured via Tail cuff 115–120 mmHg – 70–75 mmHg; see fig. 1 (pg.4); cardiovascular

**Q4275:** Z. Qu, *et al.* Effects of angiotensin-converting enzyme inhibition and bradykinin peptides in rats with myocardial infarction. *INTERNATIONAL JOURNAL OF CLINICAL AND EXPERIMENTAL PATHOLOGY* 2015;8(3410-3417)

**Agents:** Perindopril; bradykinin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 4 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Wistar, 8-12 weeks old, 200-250 g); cardiovascular;

**P4534:** J. Higaki, *et al.* In vivo evidence of the importance of cardiac angiotensin-converting enzyme in the pathogenesis of cardiac hypertrophy. *Arteriosclerosis, Thrombosis, and Vascular Biology* 2000;20(428-434)

**Agents:** Perindopril **Vehicle:** Saline; PEG 400; **Route:** IP; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 days;

**ALZET Comments:** Controls received mp w/vehicle; cardiovascular

**P3146:** Y. Tokita, *et al.* Role of the tissue renin-angiotensin system in the action of angiotensin-converting enzyme inhibitors. *P. S. E. B. M* 1995;208(391-396)

**Agents:** Captopril; Perindopril **Vehicle:** Saline; **Route:** IP; **Species:** Rat; **Pump:** Not Stated; **Duration:** 6 days;

**ALZET Comments:** controls received mp with saline; antihypertensive

**P2387:** J. M. Mathews, *et al.* B-adrenoceptor subtypes in the atrioventricular conducting system and myocardium of spontaneously hypersensitive rats: effects of angiotensin-converting enzyme inhibition by perindopril. *J. Cardiovasc. Pharmacol* 1994;23(691-697)

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

**ALZET Comments:** antihypertensive



### Pindolol

**P4963:** N. Haddjeri, *et al.* Effects of sustained (+/-)pindolol administration on serotonin neurotransmission in rats. *Journal of Psychiatry & Neuroscience* 2000;25(378-388

**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;

**P4052:** N. Haddjeri, *et al.* Effect of the reversible monoamine oxidase-A inhibitor befloxtone on the rat 5-hydroxytryptamine neurotransmission. *European Journal of Pharmacology* 1998;343(179-192

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

**ALZET Comments:** controls received mp w/vehicle; agents infused separately or concomitantly;

**P4647:** N. Haddjeri, *et al.* Acute and long-term actions of the antidepressant drug mirtazapine on central 5-HT neurotransmission. *Journal of Affective Disorders* 1998;51(255-266

**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.

**P1826:** C. Nanoff, *et al.* Desensitization pattern of cardiac B-adrenoceptor subtypes by prolonged in vivo infusion of pindolol and celiprolol in rats. *Basic Research in Cardiology* 1990;85(88-95

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

**ALZET Comments:** antihypertensive

### Prazosin (2014-Present)

**Q9551:** G. Weselek, *et al.* Norepinephrine is a negative regulator of the adult periventricular neural stem cell niche. *Stem Cells* 2020;38(9):1188-1201

**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  $\beta$ -AR antagonist, Propranolol aka  $\beta$ -AR antagonist; dependence;

**Q8710:** W. Cao, *et al.* Adipocytes initiate an adipose-cerebral-peripheral sympathetic reflex to induce insulin resistance during high-fat feeding. *Clinical Science* 2019;133(17):1883-1899

**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. 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;

**Q4103:** M. J. Skelly, *et al.* Chronic treatment with prazosin or duloxetine lessens concurrent anxiety-like behavior and alcohol intake: evidence of disrupted noradrenergic signaling in anxiety-related alcohol use. *Brain and Behavior* 2014;4(468-483

**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)

**Q11101:** M. Falcinelli, *et al.* Propranolol reduces IFN-gamma driven PD-L1 immunosuppression and improves anti-tumour immunity in ovarian cancer. *Brain Behavior and Immunity* 2023;110(1-12)

**Agents:** Propranolol **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** Not Stated;

**ALZET Comments:** Dose (2 mg/kg/d); Controls received mp w/ vehicle; animal info (Female; 6-8 weeks old); cancer (Epithelial ovarian); immunology;

**Q9551:** G. Weselek, *et al.* Norepinephrine is a negative regulator of the adult periventricular neural stem cell niche. *Stem Cells* 2020;38(9):1188-1201

**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  $\beta$ -AR antagonist, Propranolol aka  $\beta$ -AR antagonist; dependence;

**Q7425:** X. Zhi, *et al.* Adrenergic modulation of AMPKdependent autophagy by chronic stress enhances cell proliferation and survival in gastric cancer. *Int J Oncol* 2019;54(5):1625-1638

**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, 5wks, ~20 g); cancer

**Q9786:** A. A. Frame, *et al.* Sympathetic regulation of NCC in norepinephrine-evoked salt-sensitive hypertension in Sprague-Dawley rats. *American Journal of Physiology Renal Physiology* 2019;317(6):F1623-F1636

**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 wks old);

**Q6697:** Q. Long, *et al.* Chronic stress accelerates the development of endometriosis in mouse through adrenergic receptor beta2. *Hum Reprod* 2016;31(11):2506-2519

**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

**P3734:** M. S. Fernandez-Alfonso, *et al.* Early induction of angiotensin I-converting enzyme in rat carotid artery after balloon injury. *Hypertension* 1997;30(pt 1):272-277

**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

**Q7929:** S. B. Vasamsetti, *et al.* Sympathetic Neuronal Activation Triggers Myeloid Progenitor Proliferation and Differentiation. *Immunity* 2018;49(1):93-106 e7

**Agents:** ICI-118,551 hydrochloride; Toxin, Diphtheria; 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), (Diphtheria 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; Diphtheria 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; Methyllycaconitine **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

**P8751:** J. E. Ghia, *et al.* Impaired parasympathetic function increases susceptibility to inflammatory bowel disease in a mouse model of depression. *Journal of Clinical Investigation* 2008;118(6):2209-2218

**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; cyanoacrylate adhesive; animal info (male, female, C57BL/6, op/op, wt, 7-9 wks old, colitis, vagotomy); animal model of depression;

**P5124:** S. Shafi, *et al.* Long-term low-dose treatment with reserpine of cholesterol-fed rabbits reduces cholesterol in plasma, non-high density lipoproteins and arterial walls. *Journal of Cardiovascular Pharmacology* 2002;40(67-79)

**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

**P0429:** M. Girgis. A combined histochemical-neurophysiological technique for investigating the extent of diffusion of intracerebrally injected drugs. *Cells Tissues Organs* 1983;117(248-256)

**Agents:** Physostigmine; Reserpine **Route:** CSF/CNS (limbic) **Species:** Cat; Guinea pig; Monkey; Rabbit; **Duration:** 3, 5, 7 days;

**ALZET Comments:** Comparison of injec by microsyringe vs. mp infusion, infused hippocampus, septum, hypothalamus, caudate-putamen; chemitrode, mp advant. for icv admin; antihypertensive

### Rilmenidine

**Q5047:** K. L. Jackson, *et al.* Actions of rilmenidine on neurogenic hypertension in BPH/2J genetically hypertensive mice. *J Hypertens* 2014;32(3):575-86

**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; antihypertensive; Dose: 15ug/hr of rilmenidine

**P9686:** S. L. Burke, *et al.* Cardiac and renal baroreflex control during stress in conscious renovascular hypertensive rabbits: effect of rilmenidine. *Journal of Hypertension* 2009;27(1):132-141

**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.)

**P9041:** I. L. Signolet, *et al.* Improvement of cardiac Diastolic function by long-term centrally mediated sympathetic inhibition in one-kidney, one-clip hypertensive rabbits. *American Journal of Hypertension* 2008;21(1):54-60

**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

**P6378:** L. Monassier, *et al.* Chronic treatment with rilmenidine in spontaneously hypertensive rats: Differences between two schedules of administration. *Journal of Cardiovascular Pharmacology* 2004;43(3):394-401

**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);





**P5646:** M. L. Parkin, *et al.* Importance of imidazoline-preferring receptors in the cardiovascular actions of chronically administered moxonidine, rilmenidine and clonidine in conscious rabbits. *Journal of Hypertension* 2003;21(1):167-178

**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 & rilmenidine are imidazoline receptor agonists

**P4955:** Z. J. Sun, *et al.* Central imidazoline and angiotensin II receptors in cardiovascular responses to chronic cold exposure in rats. *Journal of Thermal Biology* 2001;26(5):513-518

**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  $\alpha$ -2 receptor blocker; cold-induced hypertension; pump implanted IP and connected to brain cannula;

**P2311:** C. A. Hamilton, *et al.* Do centrally-acting antihypertensive drugs act at non-adrenergic as well as alpha-2 adrenoceptor sites? *Clinical and Experimental Hypertension* 1992;A14(5):815-835

**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

### Tertatolol

**P3658:** Y. Y. Tan, *et al.* B-adrenoceptor regulation in rat heart, lung and skin after chronic treatment with (-)-tertatolol or (-)-propranolol. *J. Auton. Pharmac* 1995;15(4):421-436

**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)

**Q10459:** E. O. Cruz-Lopez, *et al.* Blood pressure-independent renoprotective effects of small interference RNA targeting liver angiotensinogen in experimental diabetes. *British Pharmacological Society* 2023;180(1):80-93

**Agents:** Valsartan; Captopril **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 3 weeks;

**ALZET Comments:** "Dose: Valsartan (4 mg/kg/day); Captopril (6 mg/kg/day); animal info: Male, heterozygous Ren2 rats (10-week-old; weight 300–500 g); Blood pressure measured via: radiotelemetry transmitters; Blood pressure results see (pg.5)antihypertensive; antisense (Oligonucleotides); dependence; "

**Q9418:** I. Polina, *et al.* Differential effects of low-dose sacubitril and/or valsartan on renal disease in salt-sensitive hypertension. *American Journal of Physiology Renal Physiology* 2020;319(1):F63-F75

**Agents:** Sacubitril; Valsartan **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 3 days;

**ALZET Comments:** Dose (75  $\mu$ 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(3):26-335

**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;

**Q3218:** M. Zeniya, *et al.* Dietary Salt Intake Regulates WNK3-SPAK-NKCC1 Phosphorylation Cascade in Mouse Aorta Through Angiotensin II. *Hypertension* 2013;62(5):872-878

**Agents:** Valsartan; angiotensin II; aldosterone **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice;

**ALZET Comments:** Animal info (C57BL/6J. male); peptides