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

1. Atenolol


**ALZET Comments:** Isoproterenol, Atenolol, ICI-118551; Saline, ascorbic acid; SC; Mice; 48 Hours; 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;


**ALZET Comments:** Atenolol; PEG 200; DMSO; SC; Rat; 2001D; 4 hours; 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);


**ALZET Comments:** Atenolol; DMSO, PEG 300; SC; Rat; 2002; 2 weeks; 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

**ALZET Comments:** Atenolol; digoxin; prazosin; PEG 200; DMSO; SC; Rat; 2001D; Animal info (male, Fisher F344, 8 weeks old, 180-250g); 50% PEG 200 used; 50% DMSO used;


**ALZET Comments:** Atenolol; nadolol; SC; Rat; 2006; 42 days; Animal info (male, Sprague Dawley, 7 weeks old); cardiovascular; antihypertensive; long-term study;


**ALZET Comments:** Nebivolol; atenolol; Rat; 8 weeks; Controls received mp w/ vehicle; animal info (Dahl salt sensitive, 6 weeks old); long-term study; cardiovascular; antihypertensive;


**ALZET Comments:** Epinephrine; atenolol; ICI-118,551; PBS; Ascorbic acid; SC; Mice (nude); 1002; 2 weeks; Controls received mp w/ PBS, PHE (2mg/kg/d) and PRO (2mg/kg/d), CRS PBS, CRS PHE (2mg/kg/d) and PRO (2mg/kg/d); animal info (nude); cancer (colorectal); dose-response (Fig.4, SS); ICI 118,551 is a specific B2-AR antagonist; "Considering the critical role of stress in regulating tumor growth and the fact that stress hormones and their antagonists could be quickly metabolized, we used microosmotic pumps instead of repeated injection to administer the stress hormones and antagonists to reduce the stress response as much as possible during manipulations of the animals." pg 9.


**ALZET Comments:** acetaminophen, cephalothin sodium salt, clindamycin hydrochloride, disopyramide phosphate salt, labetalol hydrochloride, nitrofurantoin +propranolol hydrochloride, terbutaline hemisulfate salt, verapamil hydrochloride, Acyclovir, alprazolam, atenolol, anhydrous caffeine, cefotaxime sodium salt, cepahpin sodium salt, diltiazem hydrochloride, metronidazole, nitrazepam, pradinosone, 6-propyl-2-thiouracil, trazadone hydrochloride, chloramphenicol, cimetidine, theophylline, fluconazole, metoprolol, mirtazapine, praziquantel, quetiapine fumarate, triprolidine
hydrochloride, metformin, moclobemide.; DMSO; water; IP; mice; 1003D; animal info: lactating mice, postnatal age of 14 days; functionality of mp verified by measurement of drug concentration in milk and plasma; mp were used to infuse study lactational drug transfer.


**ALZET Comments:** Atenolol; nebivolol; DMSO; PEG 300; SC; Rat; 2002; 10 days; Controls received mp w/ vehicle; animal info (Sprague Dawley, STZ-induced diabetes, 250-400 g); 50% DMSO used; 50% PEG 300 used.


**ALZET Comments:** Atenolol; isoproterenol; SC; Mice; 2002; Controls received mp w/ NaCl; animal info (males, inbred, 10-12 wks old).

**P9155:** B. Ablad, *et al.* Prevention of ventricular fibrillation requires central beta-adrenoceptor blockage in rabbits. SCANDINAVIAN CARDIOVASCULAR JOURNAL 2007;41(221-229

**ALZET Comments:** Atenolol; metoprolol tartrate; Saline; SC; Rabbit; 2002; 3 weeks; Controls received mp w/ vehicle; functionality of mp verified by plasma levels of metoprolol and atenolol; animal info (male, New Zealand, White, Rabbit, 2.8-3.7 kg.).


**ALZET Comments:** Sotalol; atenolol; saline; IV (jugular); intrapericardial; Rat; 2001; 7 days; Controls received mp w/ vehicle; cardiovascular; 2 day recovery period prior to attaching pumps to catheters.

**P4913:** G. Iaccarino, *et al.* Cardiac beta ARK1 upregulation induced by chronic salt deprivation in rats. Hypertension 2001;38(255-260

**ALZET Comments:** Atenolol; isoproterenol; carvedilol; ascorbic acid; DMSO; SC; Mice; 2002; 14 days; Controls received mp w/ vehicle; cardiovascular; atenolol and isoproterenol dissolved in 0.002% ascorbic acid; carvedilol dissolved in 60% DMSO.

2. 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
ALZET Comments: Estradiol, 17b-; benazepril; DMSO; SC; Rat; 2004; Controls received mp w/ vehicle or sham operation; animal info (male, female, Sprague Dawley, O VX); 50% DMSO used; dose (5 ug/kg/d).

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

ALZET Comments: Valsartan; benazepril; Potassium hydroxide; HCL; SC; Rat; Controls received mp w/ vehicle; dose-response (p131); pump model not stated.


ALZET Comments: Benazepril; candesartan; SC; Rat; 2ML4; Blood pressure taken.


ALZET Comments: Benazepril; Valsartan; Water, distilled; NaOH; HCI; IP; Rat; 2ML4; 12 weeks; controls received mp with saline; long-term study, pumps replaced every 28 days; valsartan is an angiotensin AT1 receptor antagonist; antihypertensive.

3. Benazeprilat

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

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


ALZET Comments: Insulin (Humulin N); aliskiren (renin inhibitor); benazeprilat (ACEi); valsartan (ARB); streptozotocin; Saline; SC; Mice; 1004; 10 weeks; 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;.


ALZET Comments: Valsartan; Hydrochlorothiazide; Benazeprilat; NaOH; SC; Rat; 2ML2; 2 weeks; controls received mp w/vehicle; functionality of mp verified by residual volume and plasma assays; dose-response; stability verified by pilot expt; antihypertensive; cardiovascular; agents administered alone and in combination.


ALZET Comments: Valsartan; Benazeprilat; NaOH; SC; Rat; 2ML2; 9.5 weeks; controls received mp w/vehicle; long-term study, pumps replaced every 2 weeks; radiotelemetric devices implanted concomitantly for blood pressure and heart rate measurement; antihypertensive; cardiovascular; ischemia (cerebral); long-term study.


ALZET Comments: CGS-21680C; CGS-22989; CGS-22492; Benazeprilat; DMSO; Sodium bicarbonate; IV (jugular); Rat; 2ML2; 2 weeks; controls received mp w/ vehicle; tolerance.
ALZET Comments: Benazeprilat; Water; IP; Rat; 2002; 4 weeks; controls received mp w/water; pumps replaced at 2 wks; antihypertensive.;

4. Bendroflumethiazide

ALZET Comments: Bendroflumethiazide; Furosemide; Lithium citrate; Ethanolamine; IP; Rat; 2ML1; 7 days; antihypertensive.

5. Bisoprolol

ALZET Comments: Isoproterenol HCL; Bisoprolol; Nebivolol; Metoprolol, CGP2712A; Saline; DMSO; Ascorbic acid; SC; Mice; 1007D; 2001; 7 days; Controls received mp w/ vehicle; animal info (FVB); 40% DMSO used for CGP20712A & nebivolol vehicle; post op. care (Carprofen 5 mg/kg); cardiovascular; antihypertensive.;

ALZET Comments: Norepinephrine HCl; Norepinephrine bitartrate; Bunazosin; Bisoprolol; SC; Rat; 2002; 7, 14 days; controls received mp w/ saline or norepinephrine; dose-response; antihypertensive; cardiovascular; 2 pumps implanted in each animal.

6. Bunazosin

ALZET Comments: Norepinephrine HCl; Norepinephrine bitartrate; Bunazosin; Bisoprolol; SC; Rat; 2002; 7, 14 days; controls received mp w/ saline or norepinephrine; dose-response; antihypertensive; cardiovascular; 2 pumps implanted in each animal.

7. Candesartan

ALZET Comments: Angiotensin II, Candesartan; PMC6015301; SC; Rat; Pump model not stated; 4 weeks; 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;.

ALZET Comments: Candesartan; Saline, Physiological; SC; mice; 1004; 30 days; Controls received IP injection; animal info (C57BL/6Ncr male mice weighing 20-25g); comparison of injection vs mp; comparison of injection vs mp; Dose (pg. 3301);.
ALZET Comments: Candesartan; SC; Rat; 14 days; Animal info (male, Wistar or PAN nephrotic, 200-250g); cardiovascular;.

Q4360: T. T. Chang, et al. Direct Renin Inhibition with Aliskiren Improves Ischemia-Induced Neovascularogenesis in Diabetic Animals via the SDF-1 Related Mechanism. PloS One 2015;10(U1637-U1653
ALZET Comments: Aliskiren; olmesartan; candesartan; PBS; Mice; 2006; 6 weeks; Controls received mp w/ vehicle; animal info (male, FVB/NJarl, 6 weeks old); ischemia (hind limb); diabetes;.

ALZET Comments: Candesartan; SC; Rat; 2001D; 24 hours; Animal info (Sprague Dawley, female, 12 wks old).

ALZET Comments: Candesartan; IP; Rat; 2001D; 24 hours; Animal info (Sprague Dawley, female, 12 wks old).

ALZET Comments: Candesartan; Na2CO3; saline; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (male, 12 wks old, Sprague Dawley).

ALZET Comments: Candesartan; IP; Rat; 2002; 2 weeks; Controls received mp w/ vehicle; animal info (male, OLETF, 4 wks old).

ALZET Comments: Angiotensin II; candesartan, ARB; SC; Rat; 2004; 3, 4 weeks; Animal info (Wistar, Ren2 Tg); peptides.

ALZET Comments: Candesartan; SC; Rat; 2004; 12 weeks; Animal info (Sprague Dawley, female, 8 wks old); long-term study.

Q1074: L. Fuetchbauer, et al. Angiotensin II Type 1 receptor (AT1) signaling in astrocytes regulates synaptic degeneration-induced leukocyte entry to the central nervous system. BRAIN BEHAVIOR AND IMMUNITY 2011;25(5):897-904
ALZET Comments: Candesartan; Saline, physiological; sodium carbonate; IP; Mice (transgenic); 1002; 14 days; Controls received mp w/ vehicle; animal info (adult. female, GFAP-lj-beta-alpha-dn, GFAP-EGFP-tg); wound clips used.

ALZET Comments: Candesartan; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle; animal info (Wistar Hannover, SHR, male, 9 wks old).

ALZET Comments: Aliskiren; candesartan; SC; Rat; 12 days; Controls received sham operation; animal info (dTGR, 5-6 wks old, 125-135g); MRI; ischemia (MCAO, cerebral); enzyme inhibitor (renin);.

**ALZET Comments**: Candesartan; vasopressin, 1-deamino-8-D arginine; Saline, physiological; SC; Rat; 2001; 4 days; Animal info (Munich Wistar, male).


**ALZET Comments**: S-Farnesylthiosalicylic acid; Z-DEVD-FMK; candesartan; DMSO; CSF, artificial; CSF/CNS; Rat; 1003D; 14 days; Controls received mp w/ vehicle; animal info (WYKO, 14-16 wks old).


**ALZET Comments**: Angiotensin II; candesartan; PD123319; Saline; SC; Mice; 2001; 4 weeks; Controls received mp w/vehicle; peptides; animal info (adult, C57BL/6, male, 9 months old); pump infused mixture of angiotensin II and candesartan; pump infused mixture of angiotensin II and PD123319.


**ALZET Comments**: Candesartan; SC; Rat; 14 days; Animal info (male, SHR, WKY, 12 wks old, 250-275 g); systolic blood pressure (SBP) measured using a noninvasive tail cuff (Ueda Electronics).


**ALZET Comments**: Candesartan; Na2CO3; saline; SC; Rat; 3 days; Controls received mp w/ vehicle; animal info (male, Munich-Wistar, Sprague Dawley, 240 g.); nephrology.


**ALZET Comments**: Hydralazine hydrochloride; candesartan cilexetil; Water, distilled; sodium carbonate; SC; Mice; 2004; 8 weeks; Controls received mp w/ vehicle; animal info (9-17 wks old, normally nourished); pumps replaced after 4 weeks; Figure 3b, image of pump implantation location.


**ALZET Comments**: Candesartan; SC; Rat; 2001D; 24 hours; Cardiovascular; animal info (Sprague-Dawley, 250 grams).

ALZET Comments: Candesartan; CSF, artificial; IV (jugular); CSF/CNS; Rat; 2001; 6 days; Controls received mp w/ vehicle; replacement therapy (subtotal nephrectomy, dorsal rhizotomy); antihypertensive; cyanoacrylate adhesive; animal info (male, SHR/Izumo, 8 wks old, 300-350g.); AT1 receptor antagonist.

ALZET Comments: Candesartan; Saline, physiological; Na2C03; SC; Pig; 2ML1; 7 days; Controls received mp w/ isotonic saline; no stress (see pg. F1774); animal info (female, Danish Landrace, 23 days old, partial left ureter obstruction); renal physiology.

ALZET Comments: Candesartan; Saline; Na2C03; SC; Mice; 1002; 2,4 months; 2,6 weeks; Cardiovascular; animal info (male, C57BL/6 apoE -/-; 8-8 wks old); long-term study.

ALZET Comments: Candesartan; SB-239063; Saline; water; PEG 400; NaHC03; DMSO; SC; Rat; 2004; 2ML4; 4 weeks; Controls received no treatment; functionality of mp verified by residual volume; enzyme inhibitor (p38 MAP Kinase); animal info (male, TGR (mRen2) 27, 7 wks old, male, Sprague-Dawley); 0.1% DMSO.

ALZET Comments: Candesartan; Sodium carbonate; saline; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle; animal info (male, Wistar Hanover, 10 wks old, 250-300g).

ALZET Comments: Candesartan; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; cardiovascular; animal info (SHR, Wistar Kyoto, 12 weeks old, 250-320 grams).

P7833: C. T. Zhang, et al. Blockade of angiotensin II type 1 receptor improves the arrhythmia morbidity in mice with left ventricular hypertrophy. CIRCULATION 2006;70(3):335-341
ALZET Comments: Candesartan; SC; Mice; 1002; 2, 4 weeks; Controls received mp w/ saline; dose-response (table 1); no stress (see pg. 336); cardiovascular; animal info (C57BL/6, 24-27g., 11-12 wk. old, male, transverse aorta constriction).

ALZET Comments: Candesartan; angiotensin II; lisinopril; Saline; SC; Rat; 3 days; Controls received mp w/ vehicle; cardiovascular; peptides; animal info (male, Sprague-Dawley, 224-250 grams).

ALZET Comments: Candesartan; Saline; sodium carbonate; SC; CSF/CNS; Rat; 14 days; Controls received mp w/ vehicle; animal info (Wistar, 8 weeks old).

ALZET Comments: Candesartan; Saline, physiological; Na2C03; SC; Rat; 2001; 48 hours; Controls received mp w/ vehicle; animal info (male, Munich-Wistar, 240g.); mp primed overnight in 37 celsius saline.

**ALZET Comments:** Candesartan; enalapril; IP; Mice; 1002; 10 days; Dose-response (fig.1); cardiovascular; ischemia (cerebral, induced by MCAO); animal info (male, C57BL/6J, 10 wks old); neurology.


**ALZET Comments:** Candesartan; Saline, physiological; SC; Pig (neonate); 7 days; Controls received mp w/ vehicle; no stress (see pg. F923); animal info (female, Danish Landrace; 2, 23 days old); congenital urinary tract obstruction model.

8. Captopril


**ALZET Comments:** Captopril; PEG 300; DMSO; SC; Rat; 2002; 2 weeks; Dose (30 mg/kg/d); Controls received mp w/ vehicle; enzyme inhibitor (ACE).


**ALZET Comments:** Losartan; captopril; CAS92-78-4; CSF, artificial; CSF/CNS; Mice; 1004; 3 weeks; Controls received mp w/ vehicle; animal info (C57BL6J); cardiovascular; CAS92-78-4 is a CREB-CBP interaction inhibitor.


**ALZET Comments:** Captopril; losartan; CGP42112A; SC; Guinea pig; 2ML4; 4 weeks; 6 weeks; Animal info (male, Hartley, 9 weeks old, 500-650g); pumps replaced every 3 weeks; cardiovascular; long-term study.

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

**ALZET Comments:** Captopril; SC; Rat; 2ML2; 8 days; Animal info (male, Wistar Kyoto, 280-300g); cardiovascular; antihypertensive; bp measured using radiotelemetry (DSI).


**ALZET Comments:** Fenofibrate nanosuspension; captopril; methylene blue; Hydroxypropylmethylcellulose; dioctyl sulfoxuccinate sodium salt; hydroxyethylcellulose; In vitro; 1007D; 7 days; Functionality of mp verified; effect of different osmolalities, viscosities, particle size, and pump orientation on release rate kinetics.


**ALZET Comments:** Captopril; IP; Rat; 24, 48, 168 hours; Controls received mp w/ saline; animal info (Sprague Dawley, male, 2 mo old, 25-300 g, nephrectomized); enzyme inhibitor (ACE).


**ALZET Comments:** Captopril; SC; Rat (pregnant); 2001; Controls received mp w/ saline; animal info (Wistar, female, 230-250 g); enzyme inhibitor (acetylcholinesterase, ACE).
ALZET Comments: Captopril; DMSO; SC; Rat; 14 days; Cardiovascular; enzyme inhibitor (ACE); animal info (male, Sprague-Dawley, 3 weeks old); functionality of mp verified by plasma ang I and ang II levels; right ventricular hypertrophy by pulmonary artery banding.

ALZET Comments: Captopril; Saline; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; animal info (Adult, male, Long Evans, 250-300 g); enzyme inhibitor (ACE); wound clips used; Research Diets.

ALZET Comments: Captopril; losartan; SC; Mice; 2 weeks; Functionality of mp verified by systolic blood pressure; enzyme inhibitor (ACE); cancer (melanoma); immunology; animal info (C56BL/6, wt, ACE 10/10, 8wks old).

ALZET Comments: Captopril; losartan; SC; Rat; 2ML4; 4 weeks; Cardiovascular; enzyme inhibitor (ACE); losartan is an AT1 receptor antagonist.

P6655: X. Li, et al. Increase in Cx45 gap junction channels in cerebral smooth muscle cells from SHR. Hypertension 2002;40(6):940-946
ALZET Comments: Angiotensin II; L-NAME; captopril; SC; Rat; 4 weeks; Enzyme inhibitor (nitric oxide synthase); cardiovascular; antihypertensive.

ALZET Comments: Norepinephrine; Captopril; Ascorbic acid; Saline; SC; Rat; 2ML4; 28 days; controls received vehicle infusion; antihypertensive; multiple pumps per animal (1 or 2).

ALZET Comments: Captopril; Perindopril; Saline; IP; Rat; 6 days; controls received mp with saline; antihypertensive.

ALZET Comments: Captopril; PD123319; CP-0597; Losartan; PBS; IP; Rat; 2ML2; 14 days; controls received mp w/PBS; antihypertensive; CP-0597 is a B2-receptor antagonist.

ALZET Comments: Losartan; Captopril; IP; Rat; 2ML4; 8 weeks; controls received no treatment; antihypertensive; cardiovascular; agents given singly and together; long-term study.

ALZET Comments: Losartan; Captopril; IP; Rat; 2ML4; 8 weeks; controls received mp w/ vehicle; long-term study, pumps replaced; agents infused separately and concomitantly; antihypertensive.

ALZET Comments: Captopril; Saline, sterile; SC; Rat; 2ML2; 14 days; controls received sham surgery; enzyme inhibitor; betadine applied topically and .2 ml gentamicin given IM to control post-surgical infection; antihypertensive.

ALZET Comments: Angiotensin II; Captopril; Saline, sterile; SC; CSF/CNS; 2001; 2002; 2ML2; 7, 12 days; controls received mp w/saline; peptides; antihypertensive; captopril rats allowed 1 week recovery after ventricular cannula placement.

ALZET Comments: Captopril; Saline, sterile; SC; Rat; 2ML1; 12 days; controls received mp w/ vehicle (pH lowered to 2); pumps replaced after 6 days; antihypertensive.

ALZET Comments: Captopril; Enalapril; SC; Rat; 2ML1; 48 hours; enzyme inhibitor (ace); antihypertensive.

ALZET Comments: Captopril; Hydralazine; Uridine, bromodeoxy-; SC; Rat; 2001; 1,7,14 days; pumps replaced at 7 days; toxicology; enzyme inhibitor (ACE); pumps used for drug admin. and cell labeling (1D and 7D labeling); multiple pumps per animal (2); antihypertensive.

ALZET Comments: Captopril; Uridine, bromodeoxy-; SC; Rat; 1,2,3 weeks; Multiple pumps per animal (2); antihypertensive.

ALZET Comments: Minoxidil HCl; Captopril; Enalaprilat; Acetic acid; Ethanol; Propylene glycol; Saline; Water; SC; Rat; 5 days; no comment posted; antihypertensive.

ALZET Comments: Captopril; Metoprolol; Hydralazine; Clonidine; Prazosin; Water; DMSO; Ethanol; PEG 400; Saline; IV; Rat; 2001; 2ML1; 4-6 days; controls received mp w/ vehicle; antihypertensive.

ALZET Comments: Captopril; Ethanol; IP; Rat (pregnant); 2001; 14 days; dose-response (graph); vehicle was 50% ethanol; antihypertensive.

ALZET Comments: ES-1005; Captopril; Saline; IP; monkey; 2001; 7 days; renin inhibitor; pump captopril infusion, but not acute administration, significantly increased kidney renin gene expression; antihypertensive.

ALZET Comments: Captopril; SC; Rat; 4 weeks; antihypertensive.

ALZET Comments: Captopril; Isoproterenol; SC; Guinea pig; 2 weeks; antihypertensive.
ALZET Comments: ACTH; Angiotensin II; Captopril; Dexamethasone; Insulin; Saline; SC; Rat; 2002; 2 weeks; dose-response (text); functionality of mp verified by plasma levels; replacement t; antihypertensive therapy (streptozotocin-induced diabetes); peptides; antihypertensive.

ALZET Comments: Captopril; Water; SC; Rat; 2002; 14 days; controls received mp w/ water; normal and RH rats used in this study; antihypertensive.

ALZET Comments: Captopril; IP; Rat; 2001; 3 days; antihypertensive.

ALZET Comments: Captopril; HCl; Saline; CSF/CNS; Rat; 2002; 4 weeks; controls received mp w/ vehicle; pump replaced after 2 weeks; antihypertensive.

ALZET Comments: Captopril; SC; Rat; 2001; 8 days; comparison of ip injections vs. mp infusion; antihypertensive.

ALZET Comments: Captopril; HCl; Saline; CSF/CNS; Rat; 2002; 4 weeks; controls received mp w/vehicle; mp connected to catheter in lateral ventricle; pumps replaced after 2 weeks; stability of captopril stated; antihypertensive.

ALZET Comments: Captopril; SC; rabbit; 2ML1; 6 days; no vehicle for Captopril specified; antihypertensive.

ALZET Comments: Captopril; Ethanol; Water; IV (jugular); Rat; 2001; 2002; 4,15,17 days; controls received sham op or mp w. ethanol; mp connected to cannula in jugular vein; SHR rats; functionality of mp verified in separate group of rats w/ mp filled w/ [51Cr] EDTA; antihypertensive.

9. Clonidine

ALZET Comments: Losartan; Tempol; Clonidine; CSF, artificial; CSF/CNS (lateral ventricle); Rat; Dose (1 mg/kg/day losartan; 4.5 μg/kg/day tempol; 5.76 μg/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? Auton Neurosci 2017;204(112-118
ALZET Comments: Clonidine; Rat; 2006; 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

ALZET Comments: Bupivacaine; clonidine; dexamethasone; Saline; CSF/CNS (sciatic nerve); Rat; 2ML1; 7 days; 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

ALZET Comments: Losartan; clonidine; tempol; hydralazine; PBS; CSF, artificial; CSF/CNS; intragastric; Rat; 2 weeks; Controls
received mp w/ vehicle; animal info (male, Sprague Dawley, 5 weeks old, 5/6x nephrectomy ); dose-response (pg 1627);
cardiocvascular; bp measured using catheter.;

Anesthesiology 2004;100(6):1538-1544

ALZET Comments: Clonidine; MK-801; dexmedetomidine; idazoxan; CSF/CNS (intrathecal, lumbar); SC; Rat; 2001; 6 days;
Comparison of IT injections vs. IT and SC mp; idazoxan and MK-801 infused intrathecally in a separate infusion.

P5646: M. L. Parkin, et al. Importance of imidazoline-preferring receptors in the cardiovascular actions of chronically

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

P4057: D. Mestivier, et al. Use of nonlinear methods to assess effects of clonidine on blood pressure in spontaneously

ALZET Comments: Clonidine; Saline; SC; Rat; 2ML1; 2ML2; 4 weeks, 24 hours; controls received mp w/vehicle;
antihypertensive; cardiovascular.

P4056: M. C. Grubb, et al. Antagonist precipitated clonidine withdrawal in rat: effects on locus coeruleus neurons,

ALZET Comments: Clonidine HCl; SC; Rat; 2002; 7-13 days; controls received mp w/saline; antihypertensive.

system. Brain Research 1997;764(81-92

ALZET Comments: Clonidine; SC; Rat; 2002; 7-10 days; controls received mp w/saline; antihypertensive; tolerance;
dependence.

spontaneously hypertensive rats. J. Cardiovasc. Pharmacol 1997;30(241-244

ALZET Comments: Clonidine; Flesinoxan; Saline; SC; Rat; 2ML1; 2ML4; 4 weeks; 24 hours; controls received mp w/vehicle;
antihypertensive.

Pharmacol 1995;67(407-410

ALZET Comments: Clonidine; SC; Rat; 2002; 5 weeks; controls received mp w/saline; functionality of mp verified by plasma
levels; pumps replaced weekly; half-life (p.409); antihypertensive; tolerance.
**ALZET Comments:** Clonidine HCl; Saline, sterile; SC; Sheep (lamb); 2ML4; 84 days; Controls received mp w/ vehicle; long-term study; pumps replaced at day 29 and day 57.

**ALZET Comments:** Dexmedetomidine; Clonidine; SC; Rat; 2002; 7 days; controls received mp with vehicle or sham operation; tolerance; antihypertensive.

**ALZET Comments:** Clonidine; Saline; Ascorbic acid; SC; Rat; 2002; no duration posted; controls received mp with vehicle; catheter used to delay infusion 1 day; antihypertensive.

**ALZET Comments:** Clonidine; SC; Rat; 2002; 8 days; controls received mp with saline; functionality of mp verified by plasma levels; dose-response; antihypertensive.

**ALZET Comments:** Dexmedetomidine; Clonidine; Enkephalin analog ST-91; Saline; CSF/CNS (intrathecal); Rat; 2001; 7 days; controls received mp with vehicle; tolerance; externalized loop of tubing allowed cessation of flow; dose-response (pg. 330); antihypertensive.

**ALZET Comments:** Clonidine HCl; Water, deionized; SC; mice; 2001; 5 days; controls received mp w/ saline; dependence; antihypertensive.

**ALZET Comments:** Clonidine; IP; Rat; 2ML1; 5, 7 days; no stress (see pg. 1494); good methods (see pg. 1494); antihypertensive.

**ALZET Comments:** Clonidine HCl; Saline; SC; dog; 2ML4; 4 weeks; tolerance; antihypertensive.

**ALZET Comments:** UK-14,304 tartrate; Clonidine HCl; Saline; SC; Rat; 2001; no duration posted; half-life (p.283); antihypertensive.

**ALZET Comments:** Clonidine HCl; SC; Rat; 2002; 7 days; controls received mp with saline; antihypertensive.

ALZET Comments: Guanabenz; Clonidine; Rilmenidine; Water, sterile; Ethanol; IV (femoral); rabbit; 6 days; controls received mp w/ vehicles; agents are antihypertensives; mp and catheter embedded in thigh muscle; antihypertensive.

ALZET Comments: Clonidine HCl; Saline; CSF/CNS (hypothalamus); IV (femoral); Rat; 2002; 20 days; pumps replaced after 2 weeks; 32 gauge cannula used; antihypertensive.

ALZET Comments: Captopril; Metoprolol; Hydralazine; Clonidine; Prazosin; Water; DMSO; Ethanol; PEG 400; Saline; IV; Rat; 2001; 2ML1; 4-6 days; controls received mp w/ vehicle; antihypertensive.

ALZET Comments: Clonidine; Fentanyl; U-50,488H; Saline; SC; Guinea pig; 2001; 2002; 6-14 days; controls received sham op; tolerance; dependence; antihypertensive.

ALZET Comments: Clonidine; Saline; IV (jugular); Rat; 2001; 7, 10 days; antihypertensive.

ALZET Comments: Clonidine HCl; Water; SC; sheep; 72 days; pump replaced at day 29 and 57; antihypertensive; long-term study.

ALZET Comments: Clonidine HCl; Isoproterenol HCl; Norepinephrine bitartrate; Phenylephrine HCl; Ascorbic acid; SC; Rat; 3 days; solubility limitations; antihypertensive.

ALZET Comments: Deprenyl HCl; Clonidine HCl; Clorgyline HCl; Saline; SC; Rat; 2002; 13 days; controls received mp w/vehicle; hypothalamic electrodes implanted for self-stimulation to further access agents effects; antihypertensive.

ALZET Comments: Clonidine; Lofexidine; S-3341; Saline; SC; Rat; 2002; 10 days; controls received mp w/vehicle; agents infused separately; antihypertensive.

ALZET Comments: Clonidine HCl; Water; SC; sheep (lamb); 2ML4; 85 days; controls rec’d mp w/ water; 2 doses of agent infused; stress/adverse reaction (mp expulsion); long-term study; mp replaced on days 29 and 57; antihypertensive.

ALZET Comments: Clonidine; Saline; SC; Rat; 2002; 10 days; controls received mp w/saline; SHR and WKY rats used in this study; antihypertensive.

ALZET Comments: Clonidine; Saline; SC; Rat; 2ML2; 14 days; controls received mp w/vehicle; antihypertensive.

ALZET Comments: Clonidine; Radio-isotopes; 3H tracer; Saline; IV (jugular); Rat; 2001; 5, 10 days, 16, 40, 64 hrs; controls received mp w/saline; mp connected to cannula in jugular vein; dose response; 3H-clonidine used in vitro to verify functionality of mp; no tolerance; pump not replaced or surgically removed; antihypertensive.

10. Digotoxin and digoxin

ALZET Comments: Digoxin; DMSO; saline; SC; Mice; 2002; 3 days; 7 days; 10 days; 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);

ALZET Comments: Digoxin; Promethylcellulose, Tween80, DMSO; SC; mice; 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
ALZET Comments: Atenolol; digoxin; prazosin; PEG 200; DMSO; SC; Rat; 2001D; Animal info (male, Fisher F344, 8 weeks old, 180-250g); 50% PEG 200 used; 50% DMSO used;

ALZET Comments: Digoxin; DMSO; saline; SC; Mice; 2002; 7 days; Control animals received mp w/ vehicle; animal info (C57BL/6, male, 8-13 wks old); 0.4% DMSO used.

ALZET Comments: Digoxin; ouabain; Saline; SC; Rat; 42 days; Controls received mp w/ vehicle; animal info (normal); blood pressure measured via tail cuff.

ALZET Comments: Ouabain; Ouabagenin; Digoxin; Digotoxin; PBS; SC; Rat; 2002; 5 weeks; 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.

ALZET Comments: Ouabain; Digoxin; PBS, sterile; SC; Rat; 5 weeks; Controls received mp w/ vehicle; functionality of mp verified by plasma levels of ouabain and digoxin; antihypertensive; ouabain and digoxin are sodium pump inhibitors.

ALZET Comments: Digoxin; Antibody, Fab fragments; Gamma globulin; SC; CSF/CNS; Rat; 2002; 2ML2; 12-14 days; 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.

11. Doxazosin

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

ALZET Comments: Doxazosin; DMSO; SC; Rat; 12 weeks; 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.

ALZET Comments: Doxazosin; DMSO; SC; Rat; 8,12 weeks; 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.

ALZET Comments: Angiotensin II, [val 5]; Doxazosin; Uridine, bromodeoxy-;; Saline; DMSO;; SC;; Rat;; 2002; 2ML1;; 2 weeks;; controls received mp w/vehicle; 2ML1 pumps replaced after 1 week; antihypertensive; cardiovascular; multiple pumps per animal (2) - 1 w/drug, 1 w/BrdU.

12. Enalapril

ALZET Comments: Enalapril maleate, Losartan, Tempol; CSF, artificial; CSF/CNS (ventricle); Rat; 1003D; 14 days; 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).

Q2220: S. Bae, et al. Preventing progression of cardiac hypertrophy and development of heart failure by paricalcitol therapy in rats. Cardiovascular Research 2011;91(4):632-639
ALZET Comments: Enalapril; SC; Rat; 4 weeks; Controls received vehicle injections; animal info (HSS, Harlan Sprague Dawley); post op. care (meloxicam); low-dose enalapril at 90 mg/day.
ALZET Comments: Candesartan; enalapril; IP; Mice; 1002; 10 days; Dose-response (fig.1); cardiovascular; ischemia (cerebral, induced by MCAO); animal info (male, C57BL/6J, 10 wks old); neurology.

ALZET Comments: Enalapril; Omapatrilat;; Saline;; SC;; Rat;; 1007D;; 5 days;; Controls received mp w/ vehicle; functionality of mp verified by serum ACE inhibition; cardiovascular; antihypertensive; omapatrilat is a vasopeptidase inhibitor; Enalapril is an Angiotensin Converting Enzyme (ACE) inhibitor.;

ALZET Comments: Enalapril; Hoe 140; SC; Rat; 2001; 7 days; comparison of oral dosing vs. mp; enzyme inhibitor; enalapril is an antihypertensive.

ALZET Comments: Captopril; Enalapril; SC; Rat; 2ML1; 48 hours; enzyme inhibitor (ace); antihypertensive.

ALZET Comments: Enalapril; Saline; CSF/CNS; IV (jugular); Rat; 2002; 15 days; functionality of mp verified by checking tubing connections, demonstrating reservoir depleted; antihypertensive.

ALZET Comments: Enalapril; PBS; SC; rabbit; 2ML4; 6 weeks; Dose: 5 ug/kg/hr; Animal info (Weight range: 2-3 Kg); renal cellophane wrapping to produce hypertension; pumps replaced periodically; long-term study; comparison of captopril by bolus or iv infusion vs. enalapril mp infusion; antihypertensive.;

13. Enalaprilat

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
ALZET Comments: Angiotensin II; enalaprilat; Saline; CSF, artificial; SC; CSF/CNS (paraventricular nucleus); Rat; 2004; 4 weeks; 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.

ALZET Comments: Enalaprilat; Lisinopril; Imidapril; Saline; IP; Guniea pig; 2ML1; 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;

ALZET Comments: Enalaprilat; Saline; Rat (pregnant); 1 week; Controls received mp w/ vehicle; enzyme inhibitor (ACE).
**ALZET Comments:** KD3-671; enalaprilat; Sodium phosphate; Sodium carbonate; IP; Guinea pig; 2ML1; functionality of mp verified by plasma drug levels; antihypertensive dose-response (fig 2. p. 50); KD-3-671 is an angiotensin II antagonist which causes persistent hypotension; enalaprilat is an angiotensin converting enzyme inhibitor, prevents inactivation of bradykinin.

**ALZET Comments:** Enalaprilat; PBS; SC; rabbit; 2ML4; 6 weeks; controls received "dummy pump"; pumps replaced after 4 weeks; cardiovascular; antihypertensive; dummy pump implanted in controls was PVC plastic balloon of the same size and shape as pump. Enalaprilat is an Angiotensin Converting Enzyme (ACE) inhibitor.

**ALZET Comments:** Losartan; Enalaprilat; Saline, isotonic; Sodium carbonate; Sodium bicarbonate; SC; Rat; 2002; 12 days; antihypertensive; cardiovascular.

**ALZET Comments:** Losartan; Enalaprilat; SC; Rat; 2002; 12 days; controls received sham operations; antihypertensive; pumps placed on flank; cardiovascular.

**ALZET Comments:** Enalaprilat; Saline, sterile; Ethanol; CSF/CNS; Rat; 2002; 2 weeks; controls received mp with saline or no treatment; enalaprilat maleate is MK-422; antihypertensive; ischemia (cerebral).

**ALZET Comments:** Minoxidil HCl; Captopril; Enalaprilat; Acetic acid; Ethanol; Propylene glycol; Saline; Water; SC; Rat; 5 days; no comment posted; antihypertensive.

**ALZET Comments:** Enalaprilat; Sodium phosphate; SC; Rat (pregnant); 40-44 hours; antihypertensive.

**ALZET Comments:** Enalaprilat; CSF, artificial; CSF/CNS; Rat; 2002; 4 weeks; comparison of injection vs. mp infusion; pump replaced after 2 weeks; controls received mp w/artificial CSF or MK-422 intravenously; antihypertensive.

14. Eprosartan

**ALZET Comments:** Moxonidine; eprosartan; Saline; NaOH; HCl; SC; Rat; 2004; 2ML4; 8 weeks; 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.
**ALZET Comments:** Spironolactone; eprosartan; PEG 400; sodium bicarbonate; IP; Rat; 2ML2; 2ML4; 14, 28 days; 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.

**ALZET Comments:** Candesartan; losartan; eprosartan; irbesartan; NaOH; IP; Rat; 2ML4; 4 weeks; 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).

**ALZET Comments:** Angiotensin II; eprosartan; norepinephrine; Saline; SC; IP; IV (jugular); Rat; 2001; 2ML2; 3, 7 days; Controls received mp w/ vehicle or sham HS surgery; cardiovascular; peptides; animal info (male, Sprague-Dawley 280-310 g).

**ALZET Comments:** Angiotensin II; eprosartan; norepinephrine; Saline; SC; IP; IV (vena cava); Rat; 2001; 2ML2; 1,3,5,7,11,14 days; Controls received empty mp for 7 days; functionality of mp verified by SBP; cardiovascular; peptides.

**ALZET Comments:** Eprosartan; Saline; IP; Rat; 2ML4; 4 weeks; Controls received mp w/ vehicle; cardiovascular.

**ALZET Comments:** Eprosartan; IP; Rat; 2ML4; 12 weeks; Controls received mp w/ vehicle; long-term study. pumps replaced every 28 days; cardiovascular; antihypertensive; angiotensin type 1 receptor antagonist; ischemia.

**ALZET Comments:** Eprosartan; Saline; IP; Rat; 2ML4; 20 weeks; Controls received mp w/ vehicle; long-term study, pumps replaced every 4 weeks; cardiovascular; antihypertensive; Eprosartan is an Angiotensin II Type 1 receptor antagonist, given at antihypertensive (6 mg/kg/day) or hypertensive (60 mg/kg/day) doses.

**ALZET Comments:** Eprosartan; Sodium bicarbonate; IP; Rat; 2001; 7 days; controls received mp w/vehicle; selective angiotensin II receptor antagonist; antihypertensive; cardiovascular.

15. Felodipin

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

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

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

16. Furosemide

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
ALZET Comments: Furosemide; DMSO; Saline; SC; Mice; 2001; 50% DMSO used; animal info (8–12-week-old C57BL6J male mice);

ALZET Comments: Uridine, bromodeoxy-; furosemide; DMSO; SC; Mice; 1007D; 2001; 7 days; Animal info (WT or Hsd1 1b2 -/-); 50% DMSO used; pumps primed overnight in 37C saline;

ALZET Comments: Furosemide; Angiotensin II; NaCl; Acetic Acid; SC; Mice; 1002; 7 days; Controls received mp w/ vehicle; animal info (male, C57BL6, 8-10 weeks); functionality of mp verified by increased arterial BP; cardiovascular; bp measured using tail-cuff;

ALZET Comments: Furosemide; Rat; 2ML1; Control animals received mp w/ vehicle; animal info (Sprague Dawley, male).

ALZET Comments: Furosemide; Ear (round window niche); Gerbil; 2004; 4 weeks; Controls were untreated; animal info (3-6 mo old, young adult); good methods, pg 421; tissue perfusion (round window).

ALZET Comments: Methylisothiourea, S-; PTIO, carboxy-; Coenzyme Q10; tempol; FeTMPyP; furosemide; PJ-34; CSF, artificial; sesame oil; CSF/CNS (spinal cord); Rat; 1003D; 3 days; Controls received mp w/ vehicle; multiple pumps per animal (2); post op. care (procaine penicillin); adult, male, specific pathogen free, 200-250 g.); spinal cord injury; PE-10 catheter used; PTIO is a NO trapping agent; enzyme inhibitor PJ-34 is poly(ADP-ribose) polymerase PARP inhibitor.

ALZET Comments: Furosemide; DMSO; SC; Rat; 2ML1; 5 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 210 g.); 50% DMSO used.
ALZET Comments: Furosemide; DMSO; Rat; 2ML1; 1, 5 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 200 g.); 50% DMSO used.

ALZET Comments: Furosemide; hydrochlorothiazide; Ethanolamine; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; no stress (see pg. F1703-4); animal info (male, Sprague-Dawley, 170-230 grams).

ALZET Comments: Isoproterenol; furosemide; SC; Rat; 2ML1; 2 days; Animal info (male, Sprague-Dawley, 180-200 grams, left renal artery stenosis); renovascular hypertension.

P8421: E. W. Lamont, et al. Restricted access to food, but not sucrose, saccharine, or salt, synchronizes the expression of period2 protein in the limbic forebrain. Neuroscience 2007;144(2):402-411
ALZET Comments: Furosemide; SC; Rat; 10 days; Controls received mp w/ saline; animal info (adult, male, Wistar, 300-400g.).

ALZET Comments: Furosemide; SC; Rat; 2ML1; 1 week;

ALZET Comments: Furosemide; Ear (round window niche); Gerbil; 2004; 3-7 days; Controls received a bulla vent tube (no mp); no stress (see pg. 2); animal info (young adult, Mongolian, 45-65g); dose-response; tissue perfusion (round window).

ALZET Comments: Furosemide; SC; Rat; 2ML1; 5 days; Functionality of mp verified by serum or urine furosemide levels via HPLC.

ALZET Comments: Furosemide; dexamethasone; diretanide; aldosterone; Hoe 140; Saline; SC; IP; Rat; 6 days; Controls received mp w/ vehicle; replacement therapy (adrenalectomy); solution was a pH 9.0; a third group was adrenalectomized and given dexamethasone and aldosterone by a SC ALZET pump; in a fifth set of experiments Hoe140 was infused SC.

ALZET Comments: Furosemide; SC; Mice (transgenic); 1003D; 3 days; Antihypertensive.

ALZET Comments: Furosemide; SC; Rat; 2ML1; 6 days;

ALZET Comments: Furosemide; Mice (knockout); 6 days; Controls received mp w/ saline; Furosemide is a loop diuretic.


ALZET Comments: Furosemide; hydrochlorothiazide; Ethanolamine; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; functionality of mp verified by daily urine analysis; no stress (see pg. F135); antihypertensive.


ALZET Comments: Furosemide; Ear (cochlea); Gerbil; 2004; 1 week; No stress (p. 165); tissue perfusion (cochlea).


ALZET Comments: Furosemide; hydrochlorothiazide; Ethanolamine; SC; Rat; 2ML1; 7 days; Agents dissolved in 1.7% ethanolamine.


ALZET Comments: Furosemide; SC; Rat; 2ML1; 7 days; Controls received empy mp.


ALZET Comments: Furosemide; SC; Rat; 2ML1; 7 days;


ALZET Comments: Furosemide; SC; Rat; 5 days; cardiovascular; antihypertensive; enzyme inhibitor (NOS).


ALZET Comments: Furosemide; Ear (round window); Gerbil; 2004; 28 days; Furosemide stability verified by HPLC for 28 days; cannula was fixed in place with dental cement; tissue perfusion (round window).


ALZET Comments: Furosemide; SC; Rat; 2ML1; 6 days; no comments posted.


ALZET Comments: Furosemide; SC; Rat; 2ML1; 6 days; no comments posted.


ALZET Comments: Furosemide; Saline; SC; Rat; 2ML1; 7 days; Dose (12 mg day); Controls received mp w/ vehicle; animal info (Male Sprague-Dawley rats);


ALZET Comments: Furosemide; Saline; SC; Rat; 7 days; Controls received mp w/ vehicle; functionality of mp verified; "In order to ensure a constant drug concentration...drug was administered via an osmotic pump." (p.152); "In all the cases the osmotic pump was found to work properly" (p.153); ischemia (kidney).
**ALZET Comments:** Furosemide; DMSO; NaOH; SC; Rat; 2ML1; 8 days; Controls received mp w/ vehicle; no stress (p.1336); 50% DMSO used; loop diuretic; spironolactone pellets used.

17. Guanabenz

**ALZET Comments:** Guanabenz acetate; Ethanol; water; propylene glycol; SC; Mice; 2004; 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).

**ALZET Comments:** Guanabenz; Clonidine; Rilmenidine; Water, sterile; Ethanol; IV (femoral); rabbit; 6 days; controls received mp w/ vehicles; agents are antihypertensives; mp and catheter embedded in thigh muscle; antihypertensive.

18. Hydralazine

**ALZET Comments:** SOL1, Losartan, Hydralazine; Saline; SC; Rat; 2ML4; 4 weeks; 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.

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

**ALZET Comments:** Losartan; clonidine; tempol; hydralazine; PBS; CSF, artificial; CSF/CNS; intragastric; Rat; 2 weeks; 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.

**ALZET Comments:** Hydralazine; lisinopril; valsartan; SC; Rat; 1 week; 14 days; 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
**ALZET Comments:** Olmesartan; hydralazine; SC; Rat; 2ML2; 14 days; Controls received mp w/ saline; animal info (male, Sprague-Dawley, 250-300 g); antihypertensive.
Q0389: S. W. M. van den Borne, et al. Mouse strain determines the outcome of wound healing after myocardial infarction. Cardiovascular Research 2009;84(2):273-282
ALZET Comments: Metaprolol; hydralazine; SC; Mice; 1007D; 7 days; Controls were sham operated; animal info (male, 10-12 wks old, 12956/SvEv); myocardial infarction by coronary artery ligation.

ALZET Comments: Hydralazine hydrochloride; candesartan cilexetil; Water, distilled; sodium carbonate; SC; Mice; 2004; 8 weeks; Controls received mp w/ vehicle; animal info (9-17 wks old, normally nourished); pumps replaced after 4 weeks; Figure 3b, image of pump implantation location.

ALZET Comments: Losartan; zVAD; valproate; hydralazine; SC; Rat; 2004; 4 weeks; Controls received mp w/ saline; enzyme inhibitor (glycogen synthase kinase 3B, GSK, pan caspase); animal info (WKY, SHR, 4-8 wks old).

ALZET Comments: Hydralazine; nicardipine; CSF/CNS; Mice; 1002; 14 days; Controls received mp w/ saline; animal info (adult, male, ALK1 +/-); fig. 1 illustrates cannula placement; cannula placement verified by CBF measurements.

ALZET Comments: Losartan; hydralazine; antibody, anti-TGF-B1; antibody, anti-IgG-K1; SC; Rat; 2004; 4 weeks; Controls received mp w/ saline; cardiovascular; antihypertensive; animal info (male, Wistar-Kyoto, SHR, 4 wks old).

ALZET Comments: Valsartan; hydralazine; SC; Mice; 2 weeks; Controls received mp w/ saline; nephrectomy; no stress (see pg. 156); cardiovascular; antihypertensive; animal info (male, C57BL/6, wt, AT1KO, 10 wks old); nephrology.

ALZET Comments: Hydralazine; olmesartan; IV (vena cava); Rat; 2ML4; 4 weeks; Controls received mp w/ saline; cardiovascular; antihypertensive; animal info (male, 10 weeks old, left coronary artery ligation; ischemia (cardiac).

ALZET Comments: Temocaprilat; olmesartan; hydralazine; IV (vena cava); Rat; 2ML4; 4 weeks; Controls received mp w/ saline; enzyme inhibitor (ACE); cardiovascular; antihypertensive; animal info (male, SHR, 50 weeks old, male, Wistar-Kyoto, 10 weeks old).

ALZET Comments: Valsartan; hydralazine; PEG 400; Rat; 4 weeks; Controls received mp w/ vehicle; dose-response (table 1, p. 608); cardiovascular; antihypertensive; animal info (10 weeks, male, SHR/Izm); valsartan is an angiotensin II receptor blocker; hydralazine is a vasodilator.

ALZET Comments: Losartan; hydralazine; SC; Rat; 2004; 4 weeks; Controls received mp w/ saline; cardiovascular; antihypertensive; animal info (Wistar-Kyoto, SHR, 1 month old); nephrology.


**ALZET Comments:** Hydralazine; SC; Rat; 14 days; Controls received vehicle per gavage; cardiovascular; antihypertensive.

**P5447:** N. Ishizaka, *et al.* Iron overload augments angiotensin II-induced cardiac fibrosis and promotes neointima formation. *Circulation* 2002;106(14):1840-1846

**ALZET Comments:** Angiotensin II; hydralazine; losartan; norepinephrine; SC; Rat; 2001; 7 days; Antihypertensive.

**P4845:** H. L. Keen, *et al.* Paradoxical regulation of short promoter human renin transgene by angiotensin II. *Hypertension* 2001;37(403-407)

**ALZET Comments:** Angiotensin II; Hydralazine; Saline; DMSO; SC; mice; 1007D; 5 days; controls received mp w/ vehicle; dose response (graphs p. 404-405); cardiovascular; peptides; antihypertensive; Ang II infused at both a pressor and subpressor dose; Hydralazine is a peripheral vasodilator and was infused either alone or in conjunction with ANG II to lower or normalize blood pressure.

**19. Hydrochlorothiazide**


**ALZET Comments:** Norepinephrine; hydrochlorothiazide; losartan; Saline; DMSO; SC; Rat; 2ML2; 14 days; 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);.


**ALZET Comments:** Hydrochlorothiazide; spironolactone; losartan; Saline; DMSO; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; animal info (male, cyp1a1-Ren2 TGR, Fischer 344, 12-14 wks old); 50% DMSO used.


**ALZET Comments:** Hydrochlorothiazide; Ethanolamine; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 6 wks old, 160-180 g.).


**ALZET Comments:** Furosemide; hydrochlorothiazide; Ethanolamine; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; no stress (see pg. F1703-4); animal info (male, Sprague-Dawley, pathogen-free, 170-230 grams).


**ALZET Comments:** Hydrochlorothiazide; PEG 300; SC; Mice; 7 days; Controls received mp w/ vehicle; comparison of IP injections vs. mp; antihypertensive.


**ALZET Comments:** Furosemide; hydrochlorothiazide; Ethanolamine; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; functionality of mp verified by daily urine analysis; no stress (see pg. F135); antihypertensive.
ALZET Comments: Furosemide; hydrochlorothiazide; Ethanalamine; SC; Rat; 2ML1; 7 days; Agents dissolved in 1.7% ethanolamine.

ALZET Comments: Valsartan; Hydrochlorothiazide; Benazeprilat; NaOH; SC; Rat; 2ML2; 2 weeks; controls received mp w/vehicle; functionality of mp verified by residual volume and plasma assays; dose-response; stability verified by pilot expt; antihypertensive; cardiovascular; agents administered alone and in combination.

ALZET Comments: Metolazone; Hydrochlorothiazide; PEG 300; SC; Rat; 2ML1; 3 days; controls received mp w/vehicle; dose-response; no stress (see pg. 1183); toxicology.

ALZET Comments: Hydrochlorothiazide; PEG 300; SC; Rat; 2ML1; 10-14 days; antihypertensive.

20. Imidapril

ALZET Comments: Imidapril hydrochloride; DMSO; IP; Rat; 2ML4; 1 month; Controls received mp w/vehicle; animal info (Sprague Dawley, male, 7 wks old); enzyme inhibitor (ACE, angiotensin converting enzyme).

ALZET Comments: Enalaprilat; Lisinopril; Imidapril; Saline; IP; Guniea pig; 2ML1; 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;

ALZET Comments: Imidapril; Saline; SC; Rat; 2ML4; 4 weeks; Controls received mp w/vehicle; cardiovascular; enzyme inhibitor; imidapril is an angiotensin-converting enzyme inhibitor.

ALZET Comments: Imidapril; SC; Rat; 2ML4; 4 weeks; Cardiovascular; enzyme inhibitor (ACE inhibitor).

ALZET Comments: Imidapril; Saline, sterile; SC; Rat; 2ML4; 4 weeks; controls received mp w/vehicle; dose-response (1 or 10 mg/kg); antihypertensive; cardiovascular.

21. Isoproterenol

ALZET Comments: Isoproterenol; PBS; Mice (tr; 2 weeks; Dose (60 mg/kg/day); Controls received mp w/ vehicle; animal info (Eight to eleven week-old Cardiomyocyte-specific transgenic mice); post op. care (buprenex, 0.05 mg/ml, SC); Therapeutic indication (cardiomyopathy);

**Q7060:** S. Park, et al. Genetic Regulation of Fibroblast Activation and Proliferation in Cardiac Fibrosis. Circulation 2018;138(12):1224-1235

ALZET Comments: Isoproterenol; Saline; IP; Mice; 14 days; 21 days; Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (C57BL/6J, C3H/HeJ, KK/HIJ mice); cardiovascular;

**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

ALZET Comments: Isoproterenol, Atenolol, ICI-118551; Saline, ascorbic acid; SC; Mice; 48 Hours; 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;


ALZET Comments: Isoproterenol; PBS; SC; Mice; 1002; 14 days; Dose (15 mg/kg/day); animal info (8-12 week old male C57/BL6 wildtype mice); cardiovascular;

**Q7070:** Y. Li, et al. Aldolase promotes the development of cardiac hypertrophy by targeting AMPK signaling. Exp Cell Res 2018;370(1):78-86

ALZET Comments: Isoproterenol; Saline; SC; Mice; 2004; 28 days; Dose (8 mg/kg/day); animal info (Wild-type C57BL/6J mice); cardiovascular;


ALZET Comments: Isoproterenol; SC; Mice; 14 days; Dose (15 mg/kg/day); animal info (C57BL/6J, CE/J, A/J, DBA/2J, FVB/NJ and BALB/cJ, Male, 9~12 wk old); cardiovascular;

**Q7014:** G. Katsuumi, et al. Catecholamine-Induced Senescence of Endothelial Cells and Bone Marrow Cells Promotes Cardiac Dysfunction in Mice. Int Heart J 2018;59(4):837-844

ALZET Comments: Isoproterenol; PBS; SC; Mice; 4 or 6 weeks; Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (C57BL/6 mice); cardiovascular;

**Q5579:** I. Bayindir-Buchhalter, et al. Cited4 is a sex-biased mediator of the antidiabetic glitazone response in adipocyte progenitors. EMBO Mol Med 2018;10(8):

ALZET Comments: Isoproterenol; Saline; SC; Mice; 1002; 14 days; Dose (30 mg/kg/d); Controls received mp w/ vehicle; animal info (p38α KO mice, Il1r1 KO mice);

**Q5550:** R. S. Baliga, et al. Phosphodiesterase 2 inhibition preferentially promotes NO/guanylyl cyclase/cGMP signaling to reverse the development of heart failure. Proc Natl Acad Sci 2018;115(31):E7428-E7437

ALZET Comments: Isoproterenol; Saline, ascorbic acid; SC; Mice; 1002; 14 days; Dose (20 mg/kg/d); 0.5% ascorbic acid used; animal info (Male WT, GC-1α−/−, and GC-A−/− mice);

**Q5400:** S. A. Bageghni, et al. Cardiac fibroblast-specific p38alpha MAP kinase promotes cardiac hypertrophy via a putative paracrine interleukin-6 signaling mechanism. FASEB J 2018;32(9):4941-4954

ALZET Comments: Isoproterenol; Saline; SC; Mice; 1002; 14 days; Dose (30 mg/kg/d); Controls received mp w/ vehicle; animal info (p38α KO mice, Il1r1 KO mice);

**Q5931:** K. Yang, et al. Knockout of the ATPase inhibitory factor 1 protects the heart from pressure overload-induced cardiac hypertrophy. Sci Rep 2017;7(1):10501
**ALZET Comments**: Isoproterenol; Saline; SC; Mice; 2002; animal info (FV); cardiovascular; Dose (30 μg/g/day);.

**ALZET Comments**: Isoproterenol; Saline; SC; Mice; 2002; animal info (IF1 KO or WT, 3 months old); cardiovascular; Dose (60 mg/kg/day);.

**ALZET Comments**: Isoproterenol; PBS, ascorbic acid; SC; Mice; 1002; 14 days; Dose (40 mg/kg/d); 1% ascorbic acid used; Controls received mp w/ vehicle; animal info (adult male C57BJ/6J mice); cardiovascular;.

Q6494: N. C. Surdo, *et al.* FRET biosensor uncovers cAMP nano-domains at beta-adrenergic targets that dictate precise tuning of cardiac contractility. *Nat Commun* 2017;8(15031
**ALZET Comments**: Isoproterenol; Ascorbic acid; SC; Rat; 2001; 7 days; Dose (3 mg/kg/day); 0.05% ascorbic acid used; Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats weighing 310–360 g); cardiovascular;.

**ALZET Comments**: Isoproterenol; PBS; SC; Mice; 2002; 14 days; Controls received mp w/ vehicle; animal info (IF1 KO or WT, 3 months old); cardiovascular;.

**ALZET Comments**: Isoproterenol; PBS; SC; Mice; 2002; 14 days; Dose (60 mg/kg/day); Controls received mp w/ vehicle; animal info (IF1 KO or WT, 3 months old); cardiovascular;.

**ALZET Comments**: Isoproterenol; PBS; SC; Mice; 7 days; Dose (15 mg/kg/day); animal info (4-month-old female mice);.

**ALZET Comments**: Isoproterenol; SC; Mice; 1002; 14 days; Dose (30 mg/kg/day); animal info (250-350 gram Sprague-Dawley rats); cardiovascular;.

Q6299: P. B. Katare, *et al.* Toll-Like Receptor 4 Inhibition Improves Oxidative Stress and Mitochondrial Health in Isoproterenol-Induced Cardiac Hypertrophy in Rats. *Front Immunol* 2017;8(719
**ALZET Comments**: TLR4 receptor inhibitor RS-LPS; agonist lipopolysaccharide; isoproterenol; Saline, pyrogen-free; SC; Rat; 14 days; Dose (RS-LPS: 5 μg/day; lipopolysaccharide: 3.12 μg/day); Controls received mp w/ vehicle; animal info (Male Sprague-Dawley rats weighing 200–250 g); comparison of sc injections vs mp; cardiovascular;.

**ALZET Comments**: Isoproterenol; SC; Mice (knockout); 1002; 14 days; Dose (30 mg/kg/day); animal info (2.5-month-old WT and TazKD mice); Isoproterenol is a β-adrenergic agonist; cardiovascular;.
**ALZET Comments:** Isoproterenol; Phenylephrine; Saline; SC; Mice; 14 days; Dose (Isoproterenol: 7.5 μg/g/day; Phenylephrine: 7.5 μg/g/day); Controls received mp w/ vehicle; animal info (8 week old male mice of the SV/129 strain); cardiovascular.;

**ALZET Comments:** Isoproterenol HCl; PBS; Ascorbic Acid; SC; Mice; 7 days; Dose (25 μg/g); 0.5 mmol/l ascorbic acid; Controls received mp w/ vehicle; post op. care (1 mg/ml ibuprofen for the following 48 h); cardiovascular.;

**ALZET Comments:** Isoproterenol; Saline; Ascorbic acid; SC; Mice (transgenic); 7 days; Dose (60 mg/kg/d); Saline with 0.1% ascorbic acid used; animal info (AC6mut mice and transgene negative siblings); cardiovascular.;

**ALZET Comments:** Isoproterenol; Saline; SC; Mice; 1007D; 5 weeks; Dose (40 mg.kg-1.d-1); 0.9% NaCl used; animal info (KLF15 transgenic mice (KLF15þ/þ) or knockout mice (KLF15-/-));

**ALZET Comments:** Isoproterenol; Metoprolol; SC; Mice; 2001; 3 days; Dose (Isoproterenol: 0.025 g/ml; Metoprolol: 0.0684 g/ml); animal info (CD1 and C57BL/6 (BL6) mice);

Q6407: L. Cai, et al. Protective Role for LPA3 in Cardiac Hypertrophy Induced by Myocardial Infarction but Not by Isoproterenol. Front Physiol 2017;8(356
**ALZET Comments:** Isoproterenol; PBS; SC; Mice (knockout); 1002; 2 weeks; Dose (60 mg/kg/day); Controls received mp w/ vehicle; animal info (8-10 week old male LPA−/− and wild-type mice); cardiovascular.;

**ALZET Comments:** Cardiotrophin 1, human; Isoproterenol; Phenylephrine; PBS; SC; Rat; Mice; 2002; 2ML4; 1002; 2 and 4 weeks; Dose (6 μg/kg/h); dose-response: (hCT1, 6 μg/kg/h), (Isoproterenol, 1 mg/kg/d), (Phenylephrine, 10 mg/kg/d); Controls received mp w/ vehicle; cardiovascular.;

**ALZET Comments:** Isoproterenol; KN93; Prop; Mdivi-1; SC; Mice (transgenic); 2002; 2 weeks; Controls received mp w/ sham surgery; cardiovascular; Dose (15 mg/kg/day Isoproterenol ; 10 uM/kg/day KN93; Prop 10 mg/kg/day ; Mdivi-1 50 mg/kg/day);

**ALZET Comments:** Isoproterenol; SC; Mice; 1002; 14 days; Controls received mp w/ saline; animal info (male, C57Bl6 or miR-223 KO, 8-10 weeks old); cardiovascular; pumps removed after 14 days; dose (45 mg/kg/day);

**ALZET Comments:** Isoproterenol; IP; Mice; 1004; 21 days; animal info (used 104 different mouse strains, see pg 4 for list); cardiovascular; Dose (30 mg/kg/day);

**ALZET Comments:** Angiotensin II; isoproterenol; PBS; SC; Mice; 10 days; Controls received mp w/ vehicle; animal info (male, C57BL-6N, 6 weeks old); cardiovascular; peptides; Dose (Iso 17 mg/kg/day; Ang II 1.8 mg/kg/day).


**ALZET Comments:** Isoproterenol; Saline; SC; Rat; 2ML2; 2 weeks; Dose (25 mg/kg/day or 50 mg/kg/day); Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats weighing 180–220 g); cardiovascular.


**ALZET Comments:** Isoproterenol; Saline; SC; Mice; 1002; 2 weeks; Controls received mp w/ vehicle; animal info (SLN mutants, male and female; 3-6 months old); functionality of mp verified by ECG (echocardiography); cardiovascular; antihypertensive; Isoflurane used; Dose (30 ug/g/day).


**ALZET Comments:** Isoproterenol; Saline; SC; Mice; 2001; 3 months; Controls received mp w/ vehicle; animal info (BACHD or WT, 2-3 months old); neurodegenerative (Huntington’s Disease); long-term study; cardiovascular; Dose (0.24, 0.48, 0.97 mg/day).


**ALZET Comments:** Isoproterenol; Ascorbic Acid; saline; SC; Mice; 2 weeks; Dose (25mg/kg/day); 0.1% ascorbic acid; 0.9% saline used; Controls received mp w/ vehicle; animal info (Male CD-1(ICR) mice); cardiovascular; Therapeutic indication (Cardiac hypertrophy).


**ALZET Comments:** Isoproterenol; Mice; 3 weeks; animal info (adult female mice, 8-10 weeks old); Hybrid Mouse Diversity Panel; isoproterenol is a beta-adrenergic agonist, used to model hypertrophy and heart failure; Dose (30 mg/kg/day).


**ALZET Comments:** Isoproterenol HCl; Saline, acidified isotonic; SC; Mice; 2002; 14 days; Controls received mp w/ vehicle; cardiovascular; Dose (30 ug/g/day).

Q6688: J. D. Li, et al. Bilateral Renal Denervation Ameliorates Isoproterenol-Induced Heart Failure through Downregulation of the Brain Renin-Angiotensin System and Inflammation in Rat. Oxid Med Cell Longev 2016;2016(3562634

**ALZET Comments:** Isoproterenol; Irbesartan; Etanercept; Saline; SC; CSF/CNS (right lateral ventricle); Rat; 2ML2; 2004; 2 weeks; Dose (Isoproterenol: 40 mg/kg/d; Irbesartan: 125 ug/d; Etanercept 10 10 ug/h); Controls received mp w/ vehicle; AT1-R antagonist Irbe; enzyme inhibitor (TNF- α); Brain coordinates (1.0 mm caudal and 1.5 mm lateral to bregma and 4.5 mm below the skull surface).


**ALZET Comments:** Isoproterenol; SC; Mice; 14 days; Dose (15 mg/kg/day); animal info (9-12 week old A/J, BALB/cJ, C57BL/6J, CE/J, DBA/2J, and FVB/NJ mice); cardiovascular.

Q6037: Q. Duan. Deregulation of XBP1 expression contributes to myocardial vascular endothelial growth factor-A expression and angiogenesis during cardiac hypertrophy in vivo. Aging Cell 2016;
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ALZET Comments: Isoproterenol hydrochloride; Mice; 1007D, 1002; 2 weeks; Controls received sham surgery; animal info (C57BL/6, 8 weeks old); Therapeutic indication (ER stress, Heart failure); Dose (15 mg/kg/day).

Q5752: Tetrodotoxin-sensitive Ca2+ Currents, but No T-type Currents in Normal, Hypertrophied, and Failing Mouse Cardiomyocytes. Journal of Cardiovascular Pharmacology 2016;68(6):
ALZET Comments: Isoproterenol; PBS; SC; Mice (knockout); 2002; 11 days; Controls received mp w/ vehicle; animal info (C57BL/6J, Cav3.1knockout, 2 months old); cardiovascular; Therapeutic indication (Cardiomyocytes, Cardiac Hypertrophy); Dose (60 mg/kg/day).

22. Ketanserin

ALZET Comments: Ketanserin; M100907; DMSO; saline; hydrochloric acid; IP; Mice (transgenic); 4 weeks; Controls received mp w/ vehicle; animal info (male, Tg8 MAO-A KO, wt, 10 wks old); 10% DMSO used; 5-HT2A receptor antagonists.

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

ALZET Comments: Dihydroxytryptamine, 5,7-; Methysergide; Ketanserin; Saline; Ascorbic acid; CSF/CNS (visual cortex); cat (kitten); 2001; 3,7 days; controls received mp w/saline; 5,7-dihydroxytryptamine is a neurotoxin; serotonin receptor blockers; antihypertensive.

ALZET Comments: Ketanserin; Dextrose; IV (femoral); Rat; 2ML1; 7 days; controls received mp w/ vehicle; antihypertensive.

ALZET Comments: Ketanserin; Dextrose, isotonic; IV (femoral); Rat; 2ML1; 7 days; antihypertensive.

23. Losartan

Q6949: T. Zera, et al. Microglia and brain angiotensin type 1 receptors are involved in desensitising baroreflex by intracerebroventricular hypertonic saline in male Sprague-Dawley rats. Auton Neurosci 2019;217(49-57
ALZET Comments: Minocycline, Losartan; Saline, iso-osmotic, Saline, hyperosmotic; CSF/CNS; Rat; 2ML2; 2 weeks; Dose (Minocycline-5 μg/h; Losartan- 12.5 μg/h); 0.9% isoosmotic saline with minocycline, 5% Hyperosmotic saline with Losartan used; animal info (Normotensive adult male Sprague-Dawley rats); enzyme inhibitor (microglia); ALZET brain infusion kit 2 used; Brain coordinates (1.2mm posterior to bregma, −1.8mm laterolateral from sagittal suture, diameter 0.5 mm) bilateral cannula used; cyanoacrylate adhesive; cardiovascular;.

ALZET Comments: Losartan; Saline; CSF/CNS (lateral ventricle); Rat; 2004; 3 weeks; Dose (0.5 mg/kg/day; 1.0 mg/kg/day; 3.0 mg/kg/day); Controls received mp w/ vehicle;.
ALZET Comments: Losartan, Butylhydroquinone, tert; CSF, artificial; CSF/CNS (lateral ventricle); Rat; 2002; 14 days; Dose (1 mg/kg/day-Losartan, 1mM -t-BHQ); Controls received mp w/ vehicle; animal info (Sprague-Dawley, 14-16 week old, 450-650 g, Male); Losartan is an AT1R blocker, tBHQ is a Nrf2 activator; cardiovascular;.

ALZET Comments: Losartan; Ringer’s solution; CSF/CNS (lateral ventricle), SC; CSF/CNS (lateral ventricle), SC; 1002; 7 days; Dose (22 nmol/h); animal info (BPH/2J mice); behavioral testing (MAP responses, dirty cage-switch stress); Brain coordinates (0.5mm posterior from bregma, 1.2mm lateral from the midline, and 2.2mm ventral to the skull surface); Right angle cannula (30G) used; 1.0 cheese-head screws and dental cement used ;

ALZET Comments: Losartan; Tempol; Clonidine; CSF, artificial; CSF/CNS (lateral ventricle); Rat; 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);.

ALZET Comments: Losartan; CSF, artificial; SC; Rat; 2002; 2 weeks; Dose (10 μg/h); animal info (Male Wistar rats weighing 150 g to 200 g); post op. care ((0.01 mg/kg sc buprenorphine); Brain coordinates (1.8 mm caudal to the bregma, 0.4 mm lateral to central line, and 7.9 mm below the skull surface);.

ALZET Comments: Losartan; Metoprolol; Indapamide; Saline; SC; Rat; 2ML2; 2ML4; 14 days; 28 days; Dose (Losartan: 10 mg/kg/day; Metoprolol: 10 mg/kg/day; Indapamide: 1 mg/kg/day); Controls received mp w/ vehicle;.

ALZET Comments: SOL1, Losartan, Hydralazine; Saline; SC; Rat; 2ML4; 4 weeks; 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;.

ALZET Comments: Losartan; CSF, artificial; CSF/CNS; Mice (pregnant); 1002; 14 days; Controls received mp w/ vehicle; animal info (C57BL/6); functionality of mp verified by blood pressure; bilateral cannula used; dose-response (pg. 94); post op. care (buprenorphine 0.04 mg/kg, sc); tissue perfusion (hypothalamic paraventricular nucleus); cardiovascular; antihypertensive; Dose (10 ug/hr TEL, 20 ug/hr LOS, 100 ug/hr GW); Brain coordinates (1.8mm posterior to bregma, 0.4mm from midline, and 7.9mm ventral to dura);

Q5390: H. B. Li, et al. TLR4/MyD88/NF-kappaB signaling and PPAR-gamma within the paraventricular nucleus are involved in the effects of telmisartan in hypertension. Toxicol Appl Pharmacol 2016;305(93-102
ALZET Comments: Telmisartan; Losartan; GW9662; CSF, artificial; CSF/CNS (Hypothalamic paraventricular nucleus); Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (12-week-old male normotensive Wistar-Kyoto); functionality of mp verified by blood pressure; bilateral cannula used; dose-response (pg. 94); post op. care (buprenorphine 0.04 mg/kg, sc); tissue perfusion (hypothalamic paraventricular nucleus); cardiovascular; antihypertensive; Dose (10 ug/hr TEL, 20 ug/hr LOS, 100 ug/hr GW); Brain coordinates (1.8mm posterior to bregma, 0.4mm from midline, and 7.9mm ventral to dura);

sodium chloride cotransporter activity in Sprague-Dawley rats. Am J Physiol Regul Integr Comp Physiol 2016;310(R115-R124

ALZET Comments: Norepinephrine; hydrochlorothiazide; losartan; saline; DMSO; SC; Rat; 2ML2; 14 days; 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).


ALZET Comments: Angiotensin (1-7); losartan; SC; Mice; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (male, ApoE -/-, 8 weeks old, 20-22g); cardiovascular; antihypertensive; peptides; bp measured using tail cuff.

Q4591: M. A. Song, et al. Chronic Losartan Treatment Up-Regulates AT(1)R and Increases the Heart Vulnerability to Acute Onset of Ischemia and Reperfusion Injury in Male Rats. PLoS One 2015;10(U1154-U1168

ALZET Comments: Losartan; SC; Rat; 2ML4; 14 days; Controls received mp w/ Saline; animal info (male, Sprague Dawley, 6 months old); ischemia (cardiac); cardiovascular; antihypertensive; bp measured using femoral catheter.


ALZET Comments: Vascular Endothelial Growth Factor, Angiotensin II, Losartan, Cyclosporine; Saline; SC; Mice; 21 days; Controls received mp w/ vehicle; animal info (Calcineurin (CN) B1 (Cnb1_/-) conditional knockout mice, C57BL/6 mice); dose-response; vegf aka vascular endothelial growth factor; Dose (VEGF 25 ug/kg/day, AngII 1 ug/kg/min, CsA 5 mg/kg/day, Losartan 10 mg/kg/day).


ALZET Comments: Losartan; captopril; CAS92-78-4; CSF, artificial; CSF/CNS; Mice; 1004; 3 weeks; Controls received mp w/ vehicle; animal info (C57BL6J); cardiovascular; CAS92-78-4 is a CREB-CBP interaction inhibitor.


ALZET Comments: Angiotensin II; losartan; saline; SC; Rat; 6 hours; 12 hours; 72 hours; 2 weeks; Controls received mp w/ vehicle; animal info (male, SHR or WKY, 12-20 months old); cardiovascular; peptides.

Q3782: M. Katsuki, et al. Decreased proportion of Foxp3(+)CD4(+) regulatory T cells contributes to the development of hypertension in genetically hypertensive rats. Journal of Hypertension 2015;33(773-783

ALZET Comments: Losartan; CSF, artificial; CSF/CNS; Rat; 2 weeks; Control animals received mp w/ vehicle; animal info (male, SHRSP, WKY); ALZET brain infusion kit 2 used.

Q4412: 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 COMPARATIVE PHYSIOLOGY 2015;309(R179-R188

ALZET Comments: Captopril; losartan; CGP42112A; SC; Guinea pig; 2ML4; 4 weeks; 6 weeks; Animal info (male, Hartley, 9 weeks old, 500-650g); pumps replaced every 3 weeks; cardiovascular; long-term study.

Q4442: B. Erdos, et al. Brain-derived neurotrophic factor modulates angiotensin signaling in the hypothalamus to increase blood pressure in rats. AMERICAN JOURNAL OF PHYSIOLOGY-HEART AND CIRCULATORY PHYSIOLOGY 2015;308(H612-H622

ALZET Comments: Losartan; Saline; CSF/CNS; Rat; 4 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 7 weeks old); pumps replaced every 2 weeks; cardiovascular; bp measured using radiotelemetry; used guide infusion cannula from Plastics One.

ALZET Comments: Losartan; clonidine; tempol; hydralazine; PBS; CSF, artificial; CSF/CNS; intragastric; Rat; 2 weeks; 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;.

ALZET Comments: Losartan; Saline; SC; Rat; 2 weeks; Controls received mp w/ vehicle or sham surgery; animal info (male, Wistar and Spontaneously hypertensive, adult, 200-250g); no stress (see pg. 135); behavioral testing (seizure intensity); cardiovascular; BP measured by tail cuff method;.

Q3993: P. J. Marvar, et al. Angiotensin Type 1 Receptor Inhibition Enhances the Extinction of Fear Memory. Biological Psychiatry 2014;75(864-872
ALZET Comments: Losartan; Saline, isotonic sterile; SC; Mice; 2002; 2 weeks; Controls received mp w/ vehicle; animal info (male, C57BL6J, 3-4 months old); behavioral testing (elevated plus maze); cardiovascular; bp measured using radiotelemetry;.

ALZET Comments: Losartan; interleukin-1, beta; CSF, artificial; CSF/CNS; rats; 2004; 4 weeks; Controls: sham rats w/ no treatment; rats given artificial CSF; animal info (Male Sprague–Dawley rats, 200–250 g); functionality of mp verified by echocardiography and plasma levels; bilateral cannula used; Plastics One double cannula; cardiovascular; heart failure; brain tissue distribution; Cannula placement verified via brain coordinates; LOS aka losartan; IL-1B aka interleukin-1B; Dose: LOS 200ug/day, IL-1B 1ug/day; Resultant plasma level (pg 872-874); Brain coordinates; pg. 871 (2.0mm posterior to the bregma and 8.5mm ventral from the skull surface).

ALZET Comments: SB203580; losartan; PBS; SC; Mice; 2002; 14 days; Controls received mp w/ saline; animal info (male, PPARy P467L, 4-5 months old); cardiovascular; bp measured using radiotelemetry;.

ALZET Comments: Losartan; SC; Mice (transgenic); 1002; 14 days; Controls received mp w/ saline; animal info (male, PPARy P467L, 4-5 months old); cardiovascular; bp measured using radiotelemetry (DSI); antihypertensive;.

ALZET Comments: Enalapril maleate, Losartan, Tempol; CSF, artificial; CSF/CNS (ventricle); Rat; 1003D; 14 days; 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/mL), losartan (2 mg/mL), tempol (50 mg/mL);.

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ALZET Comments: Losartan; pyrroldine dithiocarbamate; CSF, artificial; CSF/CNS; Rat; 4 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, adult, 250-275g); ischemia (coronary artery ligation); cardiovascular; antihypertensive; Used Plastics One double-cannula; bilateral infusion;.

ALZET Comments: Losartan; Saline; CSF/CNS; Rat; 2004; 28 days; Control animals received mp w/ vehicle; animal info (Sprague Dawley, male, adult, 250-350 g).

ALZET Comments: Angiotensin II; Losartan; Compound 21; PD123319; Saline; SC; Rat; 2006; 6 weeks; Animal info (Wistar, male, 8 wks old, 150-200 g); long-term study;.

ALZET Comments: Angiotensin II; losartan; TRV120023; Saline; SC; Rat; 3 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 7 weeks old); no stress (see pg.H859); cardiovascular; peptides; TRV120023 is a novel angiotensin II type 1 receptor (AT1R) ligand;.

Q3001: W. D. Knight, et al. Central losartan attenuates increases in arterial pressure and expression of FosB/DeltaFosB along the autonomic axis associated with chronic intermittent hypoxia. American Journal of Physiology-Regulatory Integrative and Comparative Physiology 2013;305(9):R1051-R1058
ALZET Comments: Losartan; Saline; CSF/CNS; Rat; 2004; 7 days; Animal info (male, Sprague-Dawley, 250-300g); cardiovascular; functionality of mp verified by (mean arterial pressure, heart rate, respiratory rate); cannulae secured via dental acrylic and jeweler’s screws. Paper examines the role of the CNS in the development and maintenance of chronic intermittent hypoxia induced hypertension; left lateral ventricle.

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ALZET Comments: Losartan; RB150; CSF, artificial; CSF/CNS; Rat; 2004; 4 weeks; Control animals received mp w/ vehicle; animal info (Wistar, 200-250 g); polyethylene tubing used; enzyme inhibitor (aminopeptidase A, APA).

ALZET Comments: Losartan; SC; Rat; 2004; 4 weeks; Animal info (Cyp1a1-Ren2); post op. care (buprenorphine HCl).

Q2497: J. Aro, et al. Regulation of cardiac melusin gene expression by hypertrophic stimuli in the rat. ACTA PHYSIOLOGICA 2013;207(3):470-484
ALZET Comments: Angiotensin II; losartan; Saline; SC; Rat; 2004; 4 weeks; 2 weeks; Control animals received mp w/ vehicle; animal info (Sprague Dawley); peptides.

ALZET Comments: Losartan; angiotensin II; Saline, isotonic; SC; Rat; 2002; 3, 9, 14 days; Controls received mp w/ vehicle; animal info (male, 9-11 mo old, Sprague Dawley, TGRCxM; R, wt); peptides.

ALZET Comments: Losartan; SC; Rat; 2001; 2002; 1, 2 weeks; Animal info (Sprague Dawley, male, 8 wks old).

ALZET Comments: Angiotensin II; losartan; Saline; SC; Rat; 2004; 3, 7, 10, 28 days; Control animals received mp w/ saline; animal info (GV DKO, male, 8-10 wks old); peptides.

ALZET Comments: Hydrochlorothiazide; spironolactone; losartan; Saline; DMSO; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; animal info (male, cyp1a1-Ren2 TGR, Fischer 344, 12-14 wks old); 50% DMSO used.

24. Metoprolol

ALZET Comments: Losartan; Metoprolol; Indapamide; Saline; SC; Rat; 2ML2; 2ML4; 14 days; 28 days; Dose (Losartan: 10 mg/kg/day; Metoprolol: 10 mg/kg/day; Indapamide: 1 mg/kg/day); Controls received mp w/ vehicle.

ALZET Comments: Isoproterenol; Metoprolol; SC; Mice; 2001; 3 days; Dose (Isoproterenol: 0.025 g/ml; Metoprolol: 0.0684 g/ml); animal info (CD1 and C57BL/6 (BL6) mice).

ALZET Comments: Metoprolol; SC; Mice; 4 weeks; Controls received mp w/ vehicle; animal info (SA or WT, 3 months old); cardiovascular; Dose (2.5 mg/kg/hr).
ALZET Comments: Metoprolol; Saline; SC; Mice; 1002; 2006; 11 weeks; Animal info (male, C57BL6J or ApoE-/-, 12 weeks old); functionality of mp verified by plasma levels with mass spectrometry; pumps replaced every 6 weeks; cardiovascular; immunology; anti-hypertensive;

ALZET Comments: Metoprolol; SC; Rat; 2ML4; 2006; Animal info (male, Wistar, 200-220 g).

ALZET Comments: Isoproterenol HCL; Bisoprolol; Nebivolol; Metoprolol, CGP2712A; Saline; DMSO; Ascorbic acid; SC; Mice; 1007D; 2001; 7 days; Controls received mp w/ vehicle; animal info (FVB); 40% DMSO used for CGP20712A & nebivolol vehicle; post op. care (Carpofen 5 mg/kg); cardiovascular; anti-hypertensive;

ALZET Comments: Dexamethasone; Atipamezole; Metoprolol; ICI118551; L748337; BRL44408; Imitoxan; Spiroxatrine; PBS; DMSO; IP; Mice; 10 days; Dose (dexamethasone (α1-AR antagonist, 12 mg/kg/d), atipamezole (α2-AR antagonist, 2.4mg/kg/d), metoprolol (β1-AR antagonist, 12 mg/kg/d), ICI118551 (β2-AR antagonist, 2.4 mg/kg/d), L748337 (β3-AR antagonist, 2.4 mg/kg/d), BRL44408 (α2A-AR antagonist, 12 mg/kg/d), imitoxan (α2B-AR antagonist, 12 mg/kg/d), spiroxatrine (α2C-AR antagonist, 12mg/kg/d)); 10% DMSO used; animal info (8-10 week old male 129S1/SvImJ mice);

ALZET Comments: acetaminophen, cephalothin sodium salt, clindamycin hydrochloride, disopyramide phosphate salt, labetalol hydrochloride, nitrofurantoin +/-propranolol hydrochloride, terbutaline hemisulfate salt, verapamil hydrochloride, Acyclovir, alprazolam, atenolol, anhydrous caffeine, cefotaxime sodium salt, cephapirin sodium salt, diltiazem hydrochloride, metronidazole, nitrazepam, prednisolone, 6-propyl-2-thiouracil, trazadone hydrochloride, chloramphenicol, cimetidine, theophylline, fluconazole, metoprolol, mirtazapine, praziquantel, quetiapine fumarate, triprolidine hydrochloride, mexiterin, moclobemide.; DMSO; water; IP; mice; 1003D; animal info: lactating mice, postnatal age of 14 days; functionality of mp verified by measurement of drug concentration in milk and plasma; mp were used to infuse study lactational drug transfer.

ALZET Comments: Metoprolol; SC; Rat; 2006; 6 weeks; Animal info (Wistar, male, 200-220 g).

ALZET Comments: Norepinephrine; isoproterenol; ICI-118,551; metoprolol; SC; Mice; Rat; 2 weeks; Controls received mp w/ vehicle; animal info (C57BL/6j, male, Sprague Dawley, 250-270 g, 8 wks old, nephrectomy).

Q0301: E. Mustonen, et al. Metoprolol Treatment Lowers Thrombospondin-4 Expression in Rats with Myocardial Infarction and Left Ventricular Hypertrophy. BASIC & CLINICAL PHARMACOLOGY & TOXICOLOGY 2010; 107(3):709-717
ALZET Comments: Metoprolol; SC; Rat; 2 weeks; Controls received sham operation; animal info (Male, 2 mo old, Sprague–Dawley, 250-300 g, male 12 mo old, SHR, 360–490 g).

ALZET Comments: Propranolol; phentolamine; metoprolol; Rat; 7 days; Controls received mp w/ saline; animal info (Sprague Dawley, female, 60 days old).

ALZET Comments: Nebivolol; metoprolol; DMSO; saline, sterile; SC; Rat; 4 weeks; Controls received mp w/ vehicle; 50% DMSO used; animal info (7-9 wks old, male, Wistar-Kyoto, SH, 250 g).

ALZET Comments: Nadolol; phenolamine; metoprolol; ICI-118,551; DMSO; saline; SC; Mice; Controls received mp w/vehicle; animal info (female, 6-8 wks old); 50% DMSO used.

ALZET Comments: Rilmenidine; metoprolol; SC; Rabbit; 2ML2; 6 weeks; Controls received mp w/ vehicle; animal info (New Zealand, White, 4-6 wks old, male, 0.7-0.9 kg., nephrectomized); long-term study.

ALZET Comments: Propranolol; metoprolol; isoproterenol; SC; Mice; 2002; 14 days; Controls received mp w/ vehicle; cardiovascular; animal info (male, C57BL/6, wt, B1 and B2-adrenoceptor double K/O; 12 wks old).

ALZET Comments: Isoproterenol; metoprolol; carvedilol, S-; carvedilol, R-; Polyethylene glycol; water, distilled; IP; Rat; 2ML4; 4 weeks; Animal info (male, Wistar, 200-230 g.).

ALZET Comments: Isoproterenol; metoprolol; carvedilol, S-; carvedilol, R-; Polyethylene glycol; water, distilled; IP; Rat; 2ML4; 4 weeks; Animal info (male, Wistar, 200-230 g.).

ALZET Comments: Metoprolol; atropine methylnitrate; SC; Rat; 3 days; Cardiovascular; post op. care (carprofen, cephalazolan); animal info (male, Sprague Dawley Flinders Resistive Line, Flinders Sensitive Line, 10-14 wks old).

ALZET Comments: Isoproterenol; metoprolol; Saline; Ascorbic acid; SC; Rat; 1003D; 3 days; Controls received mp w/ vehicle; dose-response (fig. 1); cardiovascular.
25. Minoxidil


**ALZET Comments:** Minoxidil HCl; Captopril; Enalaprilat; Acetic acid; Ethanol; Propylene glycol; Saline; Water; SC; Rat; 5 days; no comment posted; antihypertensive.

26. Moxonidine


**ALZET Comments:** Moxonidine; CSF, artificial; CSF/CNS (lateral ventricle); Rat; 2006; 42 days; 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

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


**ALZET Comments:** Moxonidine; eprosartan; Saline; NaOH; HCl; SC; Rat; 2004; 2ML4; 8 weeks; 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.


**ALZET Comments:** Moxonidine; Saline, acidified; SC; Rat; 2001; 21 days; Pumps replaced every 7 days; cardiovascular.


**ALZET Comments:** Moxonidine; Saline; SC; 2ML2; 2ML4; 1,4 days; Controls received mp w/ vehicle; dose-response (Fig.2); cardiovascular; antihypertensive; review.


**ALZET Comments:** Moxonidine; Saline, isotonic; NaOH; Rat; 2ML1; 2ML4; 1,4 weeks; Controls received mp w/ vehicle; dose-response (fig. 1); cardiovascular; antihypertensive.


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


**ALZET Comments:** Moxonidine; Saline; SC; Rat; 2001; 21 days; Pumps replaced every week; myocardial infarction; ischemia (cardiac).
ALZET Comments: Moxonidine; Saline, isotonic; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; dose-response (p. 806-807); cardiovascular; antihypertensive; imidazoline receptor agonist.

ALZET Comments: Moxonidine; Saline buffer; SC; Rat; 2001; 20 days; controls received sham surgery; cardiovascular; antihypertensive; Moxonidine is an imidazoline I receptor agonist; rats had received coronary artery ligation, myocardial infarction.

ALZET Comments: Moxonidine free base; Acetic acid; DMSO; Rat; 28 days; controls received mp w/ vehicle; comparison of moxonidine in drinking water vs. mp; cardiovascular.

27. Nicardipine

ALZET Comments: Nicardipine; CSF/CNS (intrathecal); Rat; 1007D; 5 days; Animal info (adult, Wistar, 250-300 g.); PE-10 catheter used.

ALZET Comments: Nicardipine; FK506; cyclosporin A; DMSO; ethanol; fluorescein; CSF/CNS (dorsal left dentate gyrus); Rat; 2004; 28 days; 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.

ALZET Comments: Hydralazine; nicardipine; CSF/CNS; Mice; 1002; 14 days; Controls received mp w/ saline; animal info (adult, male, ALK1 +/-); fig. 1 illustrates cannula placement; cannula placement verified by CBF measurements.

ALZET Comments: Nicardipine HCl; SC; mice; 2002; no duration posted; calcium-channel blocker; cancer; antihypertensive.

ALZET Comments: Nicardipine; SC; gerbil; 1003D; 3 days; no comment posted; antihypertensive; ischemia (cerebral).

28. Nifedipine

ALZET Comments: Nifedipine; calcitonin; CSF/CNS (sciatic nerve); Rat; 2006; 4 weeks; Controls received mp w/ saline or sham only; animal info (3 month old, male, Sprague-Dawley 250-300g); functionality of mp verified by decrease in calcium levels; peptides; Picture of MP p56, Fig1A. MP Pump setup p56, Fig1B;.

**ALZET Comments:** Nifedipine; PEG 400; ethanol; water; SC; Mice; 2002; 4 months; Controls received mp w/ vehicle; animal info (male, eNOS KO); 15% PEG 400 used; 15% ethanol used; long-term study.


**ALZET Comments:** Nifedipine; Ethanol; IV (jugular); Rat; 2ML4; 3 weeks; Controls received mp w/ vehicle; cardiovascular; animal info (male, Sprague-Dawley, 12 weeks old, balloon injury model).


**ALZET Comments:** Nifedipine; salmeterol xinafoate; PEG 400; ethanol; saline, physiologic; methanol; water; SC; Rat (pregnant); 2ML1; Controls received mp w/ vehicle; animal info (Sprague-Dawley, mature, female, 180-200 g, male, 240-260 g); multiple pumps per animal (2).


**ALZET Comments:** Nifedipine; DMSO; IP; Mice; 1002; >7 days; Controls received no treatment; functionality of mp verified by mp examination; cardiovascular; ischemia (cardiac); animal info (male, SUR2-/-, wt FVB, 12-18 weeks old).


**ALZET Comments:** Nifedipine; verapamil; IP; Mice; 1002; 7,14 days; Controls received mp w/ vehicle or no treatment; dose-response (fig. 1); cardiovascular; animal info (male, C57BL/6J, 10-12 weeks old).


**ALZET Comments:** PD123319; angiotensin II; nifedipine; SC; Rat; 7,14 days; Controls received no agent and/or sham renal ablation; replacement theraphy (nephrectomy); antihypertensive; peptides; AT2 receptor antagonist.


**ALZET Comments:** Isradipine; nifedipine; DMSO; ethanol; glucose; SC; Hamster; 4 weeks; Comparison of SC, IP (p.121) injections vs. SC mp; cardiovascular; vehicle solution contained 5% DMSO, 5% ethanol & 5% glucose; isradipine, also called PN200-110, is a calcium channel blocker.


**ALZET Comments:** Nifedipine; PEG 400; Ethanol; SC; Rat; 2002; 17 days; Controls received mp w/ vehicle; cardiovascular; antihypertensive; 15% ethanol : 85% PEG 400 used as vehicle.;


**ALZET Comments:** Dexmedetomidine; Nifedipine; SC; Rat; 1007D; 2001; 2002; 7,14 days; controls received mp w/vehicle or sham surgery; comparison of s.c. injections vs. mp; agents infused concomitantly in different pumps; antihypertensive; tolerance.

ALZET Comments: Isoproterenol; Nifedipine; Propranolol; PEG 400; Saline; IP; IV (jugular); Rat; 2ML1; 10, 20 days; controls received mp w/ vehicle; mp connected to cannula in jugular vein; concomitant infusion of agents: nifedipine w/ PEG 400 and isoproterenol w/ saline infused i.p.,propranol w/ saline infused IV; antihypertensive.

ALZET Comments: Nifedipine; Ethanol; Propylene glycol; Water; SC; Rat; 2001; 7-10 days; comparison of injection vs. mp infusion; pumps replaced after 7 days; antihypertensive.

29. Nilvadipine

ALZET Comments: Nilvadipine; PEG; SC; Rat; 2ML1; 7 days; controls received vehicle infusion; antihypertensive; ischemia (cerebral).

30. pd123319

ALZET Comments: TY-51469, H4R antagonist, MK-571, PD123319; SC; Mice; Dose: TY-51469 (0.1 or 1.0 mg/kg/day), H4R antagonist (40 mg/kg); PD123319 (0.5 or 5 mg/kg); animal info (ICR, C57BL/6 mice); TY-51469 is a Chymase inhibitor; enzyme inhibitor (Chymase); cardiovascular.;

ALZET Comments: Dextrose, C21, PD-123319, Angiotensin II; Water; SC; Rat; 1007D, 2001; 1 week; Controls received mp w/ vehicle; animal info (12 weeks); good methods (p. 546); Multiple pumps per animal (2); Multiple pumps per animal (2); Intrarenal infusion; 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
ALZET Comments: Angiotensin II, PD123319; IP; Mice; 2002; 7 days; Dose (12 μg/kg/hr Ang II, 10mg/kg/day PD123319); Controls received mp w/ vehicle; animal info (9-week-old male C57BL/6 and apoE(-/-)); PD123319 is a AT2R antagonist; cardiovascular.;

ALZET Comments: Angiotensin (1-9); PD123319; A-779; Water, distilled; SC; Rat; 4 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dawley STZ, 2 months old); cardiovascular; peptides; diabetes.;

ALZET Comments: A-779; angiotensin (1-7); PD123319; PBS; IP; Mice; 1002; 2 weeks; Controls received mp w/ vehicle; animal info (male, WT or AT2RKO, 8-10 weeks old); cardiovascular; peptides; bp measured using tail cuff.;

Q5225: Y. Liu, et al. Angiotensin-(1-7) Suppresses Hepatocellular Carcinoma Growth and Angiogenesis via Complex Interactions of Angiotensin II Type 1 Receptor, Angiotensin II Type 2 Receptor and Mas Receptor. Mol Med 2015;21(626-36
ALZET Comments: Angiotensin (1-7), A-779, PD123319; saline; SC; mice; 21 days; Controls received mp w/ vehicle; animal info: Male BALB/c mice (6–8 wks old); functionality of mp verified by measurement of tumor volumes; cancer.
ALZET Comments: Angiotensin (1-7); perindopril; A-779; PD123319; NaCl; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (male, Wistar, 200g, STZ); cardiovascular; peptides; diabetes.

ALZET Comments: PD123,319; CSF/CNS; Rat; 4 weeks; Control animal received mp w/ vehicle; animal info (male, female, 10-12 wks old, Wistar); ALZET brain infusion kit used.

ALZET Comments: Angiotensin II; PD123319; CGP42112; Mice; Animal info (C57BL/6, 8-10 wks old, male); peptides.

Q4189: J. Xu, et al. Effects of Cardiac Overexpression of the Angiotensin II Type 2 Receptor on Remodeling and Dysfunction in Mice Post-Myocardial Infarction. Hypertension 2014;63(1251+
ALZET Comments: PD123,319; Mice; 8 weeks; Controls received mp w/ vehicle; animal info (male, WT or AT2R trangenic, 11-12 weeks old); cardiovascular; myocardial infarction;

ALZET Comments: PD123319; Saline; SC; Mice; 1003D; 3 days; Dose (10 mg/kg/day);.

ALZET Comments: CGP42112A; PD 123319; Saline; SC; Mice; 1003D; 3 days; controls received mp w/ vehicle, dose-response (pg. 666); Dose (CGP 0.1, 1.0, 10.0 ng/kg/min; PD 10 mg/kg/day);.

ALZET Comments: Telmisartan; PD123319; Doxycycline; aliskiren; Saline; water; SC; mice; 2004; 2, 6 weeks; Controls received mp w/ vehicle; animal info : Tg26 mice; FVBN mice, Tg26 mice; Vpr transgenic mice (4 week old); immunology; Dose: Telmisartan (AT1R blocker, 300 μg/day), PD123319 (AT2R blocker, 3 μg/day); Doxycycline + aliskiren (50 mg/kg).

Q4058: P. Rai, et al. Renin angiotensin system modulates mTOR pathway through AT2R in HIVAN. Experimental and Molecular Pathology 2014;96(431-437
ALZET Comments: Aliskiren; telmisartan; PD123319; Saline; SC; Mice (transgenic); 2004; 2 weeks; 6 weeks; Controls received mp w/ vehicle; animal info (Tg26); antihypertensive; cardiovascular;

ALZET Comments: Angiotensin II; angiotensin (1-9); PD123319; A779; IV (jugular); Rat; 2002; 28 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley); functionality of mp verified by plasma levels; pumps replaced every 14 days; cardiovascular; antihypertensive; peptides; bp measured using CODA 2;


ALZET Comments: Compound 21; PD123319; CSF/CNS; Rat; 2002; 10 days; Controls received mp w/ vehicle; animal info (Sprague Dawley, 8 weeks old, 250-275g, MCAO); ALZET brain infusion kit 1 used; ischemia (cerebral); post op. care (buprenorphine 0.05 mg/kg SC); cannula implanted 7 days prior to pump implantation;


ALZET Comments: Relaxin, recombinant human; PD123319; SC; Mice; 1007D; 1003D; 7 days; 3 days; Controls received mp w/ vehicle; animal info (male, AT2R +/+ and AT2R -/-, 6-8 weeks old); functionality verified using plasma serum; cardiovascular; 0.5 mg/kg/day relaxin produces about 20 ng/ml plasma;


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

Q2924: F. M. Tavares, et al. Angiotensin II Type 2 Receptor (AT2R) is Associated with Increased Tolerance of the Hyperthyroid Heart to Ischemia-Reperfusion. Cardiovascular Drugs and Therapy 2013;27(5):393-402

ALZET Comments: PD123319; SC; Rat; Animal info (Wistar, male, 250-280g); angiotensin II receptor antagonist; ditrifluoroacetate;


ALZET Comments: Angiotensin II; Losartan; Compound 21; PD123319; Saline; SC; Rat; 2001; 1 week; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, adult, 320-360g); cardiovascular; peptides; diabetes; C21 is an AT2R agonist. PD123319 is an AT2R antagonist; bp measured using radiotelemetry (DSI);


ALZET Comments: CGP 42112A; PD123319; Saline; sterile; CSF/CNS (lateral ventricle); Rat; 2002; 14 days; Dose (12 µg/rat/day (CGP 42112A); 10 µg/rat/day (PD123319)); Controls received mp w/ vehicle; animal info (12 week old Adult male Wistar rats); comparison of injection vs mp; CGP 42112A is a selective peptide AT2 agonist; PD 123319 is a nonpeptide AT2 receptor antagonist; peptides; ALZET brain infusion kit 2 used; Brain coordinates (1 mm lateral and 3 mm posterior to Bregma and 4 mm deep from skull surface); cyanoacrylate adhesive;


ALZET Comments: Angiotensin (1-7); A-779; PD123319; CSF, artificial; CSF/CNS; Rat; 2004; 4 weeks; Controls received mp w/ aCSF; animal info (wistar-kyoto, SHR-spontaneous hypertensive rats);


ALZET Comments: PD123319; Saline; SC; Rat; 2 weeks; Animal info (male, lean, Zucker, 5 wks old);

ALZET Comments: Angiotensin II; PD123319; Saline; SC; Mice; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (male, C57BL/6 LDL-/-); cardiovascular; peptides; bp measured using tail-cuff;.

ALZET Comments: PD123319; Water, distilled; IP; Rat; 2001; 7 days; Controls received mp w/ DI water; animal info (female, 60 days, 190-200g); comparison of single IP injection vs mp; behavioral testing (Thermal sensitivity, mechanical sensitivity); PD123319 is an AT2 antagonist; Therapeutic indication (Inflammatory pain); Dose (5 mg/kg/d);.

ALZET Comments: Telmisartan; PD123319; SC; Mice (transgenic); 2004; 2 weeks; Controls received mp w/ saline; animal info (Tg26, FVBN, 3 wks old).

ALZET Comments: PD 123319; Rat (pregnant); 2ML1; Controls received mp w/ saline; animal info (Sprague Dawley, female, 225 g).

ALZET Comments: Angiotensin (1-7); A-779; PD123319; CSF, artificial; CSF/CNS; Rat; 1003D; Control animals received mp w/ vehicle; animal info (Sprague Dawley, male, 250-280 g); peptides; ALZET brain infusion kit II used.

ALZET Comments: Angiotensin (1-9); PD123319; SC; Rat; 4 weeks; Controls received mp w/ water; animal info (SHRSP, 11, 15, 17 wks old); peptides; one group contained angiotensin (1-9) and PD123319.

31. Perindopril

ALZET Comments: Perindopril; bradykinin; Saline; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (male, Wister, 8-12 weeks old, 200-250 g); cardiovascular; peptides;.

ALZET Comments: Perindopril;; Saline; PEG 400;; IP;; Rat;; 3 days;; controls received mp w/vehicle; cardiovascular;.

ALZET Comments: Captopril; Perindopril; Saline; IP; Rat; 6 days; controls received mp with saline; antihypertensive.

ALZET Comments: Perindopril; Water; SC; Rat; 2002; 14 days; antihypertensive.
32. Pindolol

**ALZET Comments**: Pindolol; Saline; SC; Rat; 2 weeks; controls received mp w/ vehicle; comparison of ip injections vs. mp;

**ALZET Comments**: Befloxatone; Pindolol; Water; Ethanol; SC; Rat; 2, 21 days; controls received mp w/ vehicle; befloxatone is an antidepressant; agents infused separately or concomitantly; antihypertensive.

**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
**ALZET Comments**: Mirtazapine; Pindolol; NaCl; Ascorbic acid; SC; Rat; 2, 21 days; controls received mp w/ vehicle; antidepressant; pindolol infused for 2 days; mirtazapine administered for 21 days.

**ALZET Comments**: Celiprolol; Pindolol; Isoprenaline; Propranolol; HCl; Saline; SC; Rat; 2001; 7 days; antihypertensive.

33. Prazosin

**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
**ALZET Comments**: Atenolol; digoxin; prazosin; PEG 200; DMSO; SC; Rat; 2001D; 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
**ALZET Comments**: Prazosin; propranolol; duloxetine; DMSO; saline, sterile; SC; Rat; 2ML4; 4 weeks; 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;

**ALZET Comments**: Silodosin; prazosin; Hartmann’s solution; saline; SC; Rat; 2002; 2 weeks; Controls received mp w/ vehicle; animal info (12 wks old, male, Sprague-Dawley).

**ALZET Comments**: Prazosin; IP; Mice; Animal info (male, C57BL/6 Aoah -/-, uMT Aoah -/-); 100 ul sized pump used.

**ALZET Comments**: Prazosin; yohimbine; Water, distilled; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (Sprague Dawley, female, 12 wks old).
ALZET Comments: Prazosin; Water, distilled; SC; Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (Wistar Kyoto, 12 wks old, female, SHR, 180-210 g).

ALZET Comments: Prazosin; SC; Mice (transgenic); mice; 7 days; Controls received mp w/ vehicle; antihypertensive; cardiovascular; animal info (male, C57BL/6, wt, VSM GRK2tg, 2-5 months old).

ALZET Comments: L-DOPA; benserazide; prazosin; IP; Rat; 2ML4; 4 weeks; Neurodegenerative (Parkinson's disease).

ALZET Comments: Norepinephrine; benoxathian; prazosin; KMD-3213; AH11110A; BMY-7378; propranolol; RX-821002; Ringer's, lactated; ascorbate; Perivascular; Rat; 2ML2; 14, 28 days; Tissue perfusion (left carotid wall); pumps replaced after 14 days for prazosin; catheter constructed from thin walled vinyl tubing and fenestrated at end placed near vessel; norepinephrine is a catecholamine; propranolol is a beta adrenoceptor antagonist; all other agents are antagonists alpha antagonists.

ALZET Comments: Prazosin; DMSO; SC; Rat; 2ML2; 2 weeks; controls received mp w/vehicle; antihypertensive; cardiovascular.

ALZET Comments: Norepinephrine; Prazosin;; Saline, physiological; DMSO;; SC;; Rat;; 2002; 2ML2;; 2 weeks;; controls received mp w/vehicle; antihypertensive; cardiovascular.

ALZET Comments: Angiotensin II; Prazosin; Uridine, bromodeoxy-; DMSO; Saline; Rat; 2001; 2ML1; 2 weeks; pumps replaced at one week; peptides; multiple pumps per animal (2); antihypertensive.

ALZET Comments: Prazosin; {Stoyanovitch, 2005 #7985}; CSF/CNS; Rat; 2001; 48 hours; antihypertensive.

ALZET Comments: Captopril; Metoprolol; Hydralazine; Clonidine; Prazosin; Water; DMSO; Ethanol; PEG 400; Saline; IV; Rat; 2001; 2ML1; 4-6 days; controls received mp w/ vehicle; antihypertensive.

ALZET Comments: Norepinephrine; Prazosin; DMSO; Water; CSF/CNS; Rat; 2002; 2ML2; 14 days; controls received mp w/ appropriate vehicle; mp connected to cannula in ventricle; DMSO used as vehicle for Prazosin; agents infused separately; antihypertensive.

ALZET Comments: Prazosin; Propranolol, d-; Propranolol, l-; Yohimbine; Saline; SC; mice; 2002; no duration posted; controls received mp w/ saline; LPC-1 tumor cells implanted sc; separate and simultaneous infusion of d- and l- propranolol; cancer; antihypertensive.

ALZET Comments: Flupenthixol, cis-; Flupenthixol, trans-; Amitriptyline; Amphetamine; Atropine; Chlorpromazine; Clozapine; Fluphenazine; Haloperidol; Morphine; Prazosin; SC; Rat; 2001; 2ML1; 1 week; comparison of agents effects; saline vehicle used w/ agents 1-8, saline and ascorbic acid used w/ agents 9-11, DMSO and saline used w/ agent 12; ST-587 is an adrenergic agonist; antihypertensive.

ALZET Comments: Isoproterenol, d-; Methoxamine; Phenylephrine, l-; ST-587; Clonidine; Epinephrine, l-; Isoproterenol, dl-; Isoproterenol, l-; Prazosin; Propranolol, dl-; Terbutaline; Ascorbic acid; DMSO; Saline; SC; Rat; 2001; 2ML1; 1 week; comparison of agents effects; saline vehicle used w/ agents 1-8, saline and ascorbic acid used w/ agents 9-11, DMSO and saline used w/ agent 12; ST-587 is an adrenergic agonist; antihypertensive.

34. Propranolol

ALZET Comments: Propranolol hydrochloride; PBS; SC; Mice; 2002; 14 days; Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (female Balb/C mice); enzyme inhibitor (ADRB antagonist); Therapeutic indication (endometriosis).

ALZET Comments: Propranolol hydrochloride; ICI-118,551; SC; Mice (nude); 1004; 35 days; Animal info (male, BALB/C nu/nu, 4 weeks old); cancer (colon, HT-29).

ALZET Comments: TGX-221; AS605240; Propranolol; SR59230A; PBS; Tween 20; SC; CSF/CNS (right cerebral ventricle); Mice; 10 days; 14 days; Controls received mp w/ vehicle; animal info (Knock-in mice with catalytically inactive p110gamma (encoded by KRgamma) or p110beta (encoded by KRbeta)); ALZET brain infusion kit 2 used; 0.1% Tween 20 used; Dental cement used; Obesity; Propranolol and SR59230A are Beta blockers; Therapeutic indication (obesity); Dose (700 nM TGX-221, 500 nM AS605240, 2 mg/kg/day Propranolol, 1 mg/kg/day SR59230A); Brain coordinates (anteriorposterior, +0; medial-lateral, +1; dorsal-ventral, −2),

ALZET Comments: Norepinephrine bitartrate hydrate; propranolol; Ascorbic acid; PBS; SC; Mice; 1004; 20 days; Animal info (female, BALB/c, 5-7 weeks old); cancer (colorectal carcinoma, human).

ALZET Comments: Propranolol; OR486; DMSO; ethanol; saline; SC; Rat; 2002; 14 days; Controls received mp w/ saline; animal info (male, Sprague-Dawley, 325-425g); behavioral testing (thermal place preference; light/dark preference; tactile allodynia); cardiovascular; "We attribute the overall differences in exploratory activity between the acute and chronic cohorts possibly due to the anxiety-provoking effects of repetitive i.p. injections in the acute but not the chronic cohort" pg 565.;

ALZET Comments: Propranolol; NaCl; Ascorbic acid; SC; Mice; 2004; 28 days; Controls received mp w/ vehicle; animal info (female, Mecp2 Null/+, 10 months old ); functionality of mp verified by serum levels; 2% ascorbic acid used; cardiovascular;.

ALZET Comments: Prazosin; propranolol; duloxetine; DMSO; saline, sterile; SC; Rat; 2ML4; 4 weeks; 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;.

ALZET Comments: Propranolol, r/s-; isoproterenol, s/s-; Water; HCl; SC; Mice (nude); 1002; 1004; 28 days; Controls received mp w/ vehicle; animal info (female, BALB/c Foxn1nu nude athymic, 6 weeks old); functionality of mp verified by drug plasma; pumps replaced every 14 days or 24 days; cancer (pancreatic); 1 mM HCl;.

ALZET Comments: Norepinephrine; propranolol; Ascorbic acid; saline; SC; Mice; 1004; 14 days; Controls received mp w/ vehicle; animal info (Female, C57BL6, 4-6 weeks old); cancer (melanoma; adenocarcinoma); immunology; "Seeing that microosmotic pumps (1004 type) are of the ability of pumping drugs contained incessantly for up to 4 weeks and exhibit reliable effects in mouse models, the pumps were taken into account in our research to deal with the short half life period of NE." pg 7; Primed pumps in 37C saline for 48 hours; Picture on pg 6 of pump and tumor on mouse.

ALZET Comments: acetyaminophen, cephalothin sodium salt, clindamycin hydrochloride, disopyramide phosphate salt, labetalol hydrochloride, nitrofurantoin +propranolol hydrochloride, terbutaline hemisulfate salt, verapamil hydrochloride, Acyclovir, alprazolam, atenolol, anhydrous caffeine, cefotaxime sodium salt, cephepirin sodium salt, diltiazem hydrochloride, metronidazole, nitrazepam, prednisonol, 6-propyl-2-thiouracil, trazadone hydrochloride, chloramphenicol, cimetidine, theophylline, fluoroxazole, metoprolol, mirtazapine, praziquantel, quetiapine fumarate, triprolidine hydrochloride, metformin, moclobemide.; DMSO; water; IP; mice; 1003D; animal info: lactating mice, postnatal age of 14 days; functionality of mp verified by measurement of drug concentration in milk and plasma; mp were used to infuse study lactational drug transfer.
ALZET Comments: Propranolol hydrochloride; PBS; SC; Mice (SCID); Controls received mp w/ vehicle; animal info (SCID, male, 6-8 wks old).

ALZET Comments: Propranolol; nadolol; Saline, endotoxin-free; SC; Rat; 2ML2; Control animals received mp w/ vehicle; animal info (Fischer 344, Sprague Dawley, 225-275 g); wound clips used; behavioral testing (exploration, social interaction).

Q1149: Y. D. Jiang, et al. Systemic Propranolol Reduces b-Wave Amplitude in the ERG and Increases IGF-1 Receptor Phosphorylation in Rat Retina. INVESTIGATIVE OPHTHALMOLOGY & VISUAL SCIENCE 2010;51(5):2730-2735
ALZET Comments: Propranolol; phentolamine; Saline; SC; Rat; 2ML4; 21 days; Controls received mp w/ vehicle; animal info (adult, male, Sprague Dawley, 180-200 g, 8 wks old).

ALZET Comments: Propranolol, DL; SC; Rat; 2ML1; 3 days; Controls received mp w/ saline; animal info (male, Sprague-Dawley); behavioral testing (omni-directional lever displacement, light turning on, bar pressing, pellet dispensing); propranolol is a beta-adrenoceptor antagonist.

ALZET Comments: Propranolol; phentolamine; metoprolol; Rat; 7 days; Controls received mp w/ saline; animal info (Sprague Dawley, female, 60 days old).

ALZET Comments: Propranolol; PBS; CSF/CNS (third ventricle); Rat; Animal info (Long-Evans male, 60 days old); cannula placement was verified by visual inspection of frozen brains during brain slicing; ALZET brain infusion kit used.

ALZET Comments: Propranolol; SC; Mice; 4 weeks; Animal info (male, C57BL/6J, 20-25 g, 9-12 wk old); functionality of mp verified by heart rate.

ALZET Comments: Propranolol hydrochloride, S-; SC; Mice (nude); 2004; Controls received mp w/ PBS; no stress (see pg. 2697) "no significant complications"; cancer (ovarian); animal info (female, athymic, Ncr-nu).

ALZET Comments: Propranolol; LY35510; Saline; SC; Rat; 28 days; Controls received mp w/ vehicle; animal info (adult, male, Sprague-Dawley).

35. Ramiprilat

ALZET Comments: Ramiprilat; HR 720; DMSO; Water; SC; Rat; 2ML2; 2ML4; 21 days; 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.

36. Reserpine

Q0550: J. E. Ghia, et al. Reactivation of Inflammatory Bowel Disease in a Mouse Model of Depression. Gastroenterology 2009;136(7):2280-2288
ALZET Comments: Reserpine; choline chloride; methyllycaconitine; Water; acetic acid; CSF/CNS; IP; Mice; 5, 10, 14 days; Controls received mp w/ vehicle; animal info (male, C57BL/6, 7-9 wks old, alpha 7nAchR -/-); post op. care (buprenorphine); Plastics One cannula used with PE60 tubing.

ALZET Comments: Reserpine; Acetic acid; CSF/CNS; Mice; 14 days; Controls received mp w/ vehicle; dose-response (Fig. 1); comparison of IP injection vs. mp; no stress (see pg. 2210); antihypertensive; cyanoacrylate adhesive; animal info (male, female, C57BL/6, op/op, wt, 7-9 wks old, colitis, vagotomy); animal model of depression; plastics one cannula used; PE-60 used.

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

ALZET Comments: Physostigmine; Reserpine; CSF/CNS (limbic system); cat; Guinea pig; monkey; rabbit; 3, 5, and 7 days; comparison of injec by microsyringe vs. mp infusion, infused hippocampus, septum, hypothalamus, caudate-putamen; chemitrode, mp advant. for icv admin; antihypertensive.

37. Rilmenidine

ALZET Comments: rilmenidine; Ringer’s solution; CSF/CNS (ventricles); mice; 1002; 1 week; 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 (pg 577-582, description and graphical representation); 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.

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

ALZET Comments: Rilmenidine; metoprolol; SC; Rabbit; 2ML2; 6 weeks; Controls received mp w/ vehicle; animal info (New Zealand, White, 4-6 wks old, male, 0.7-0.9 kg., nephrectomized); long-term study.
**ALZET Comments:** Rilmenidine; Saline; IP; Rat; 2002; 1 month; Comparison of IP injections vs. IP mp; pumps replaced at 15 days; stability verified (30 days at 37 degrees Celsius); cardiovascular; antihypertensive.

**ALZET Comments:** Moxonidine; clonidine; rilmenidine; Saline; HCl; Sodium hydroxide; SC; Rabbit; 2ML4; 4 weeks; Controls received mp w/ vehicle; functionality of mp verified by residual volume; pumps replaced after 2 weeks; antihypertensive; moxonidine dissolved in saline/HCl/NaOH; other agents dissolved in saline; moxonidine & rilmenidine are imidazoline receptor agonists.

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

**ALZET Comments:** Guanabenz; Clonidine; Rilmenidine; Water, sterile; Ethanol; IV (femoral); rabbit; 6 days; controls received mp w/ vehicles; agents are antihypertensives; mp and catheter embedded in thigh muscle; antihypertensive.

38. Tertaolol

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

39. Valsartan

Q3611: T. A. Ramirez, et al. Aliskiren and valsartan mediate left ventricular remodeling post-myocardial infarction in mice through MMP-9 effects. Journal of Molecular and Cellular Cardiology 2014;72(326-335  
**ALZET Comments:** Aliskiren; valsartan; Saline; SC; Mice; 2004; 28 days; Controls received mp w/ vehicle; animal info (MMP-9 null or WT); cardiovascular; bp measured using MC4000 bp analysis system;

**ALZET Comments:** Valsartan; angiotensin II; aldosterone; IP; Mice; Animal info (C57BL/6J. male); peptides.

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

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Bibliography

ALZET® Comments: Insulin (Humulin N); aliskiren (renin inhibitor); benazeprilat (ACEi); valsartan (ARB); streptozotocin; Saline; SC; Mice; 1004; 10 weeks; 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.

ALZET Comments: Valsartan; SC; Mice (knockout); 14 days; Dose (5 mg/kg per day); animal info (CDAC6 KO mice).

ALZET Comments: Hydralazine; lisinopril; valsartan; SC; Rat; 1 week; 14 days; Controls received sham mp w/ vehicle; animal info (SHRHP, 16 wks old).

ALZET Comments: Handle region peptide; valsartan; Kidney (renal cortex); Rat; 14 days; Controls received sham mp w/ saline; animal info (male, Sprague-Dawley, 230-260 g); tissue perfusion (renal cortex); peptides.

ALZET Comments: Angiotensin II; valsartan; Saline; BSA; Mice; 1002; 14 days; Peptides; animal info (male, 12 wks old, C57BL/6J).

ALZET Comments: Handle region peptide; valsartan; Saline; Kidney (renal cortical interstitium); Rat; 2002; 14 days; Controls received sham mp w/ vehicle; animal info (Sprague Dawley. STZ-induced diabetes, male 230-260 g); peptides; good methods, pg 278; tissue perfusion (interstitium); HRP, also known as handle region peptide, is the decapptide NH3-RILLKKMPSVCOOH; good methods, pg 278; "The osmotic minipump was implanted subcutaneously in the subscapular region of all rats. Thereafter, a midline laparotomy was performed and the left kidney was isolated. A PE-10 catheter connected to each minipump was tunnelled subcutaneously through a bevel-tipped stainless-steel tube to emerge into the abdominal cavity and the distal end of the catheter was placed under the left renal capsule and glued onto the surface of the kidney using Vetbond." pg 278.

ALZET Comments: Valsartan; DMSO; water; sodium hydroxide; SC; Mice; 1002; 14 days; Controls received sham operation; animal info (male, C57BL/6, lean, obese, 13 wks old); wound clips used; diabetes.

ALZET Comments: Valsartan; DMSO; sodium hydroxide; water; SC; Mice; 1002; 14 days; Lean controls received mp w/valsartan; animal info (male, C57BL/6 lean, Ob/ob, B6.V-Lepob/J); wound clips used.

ALZET Comments: Valsartan; losartan; Rat; 2002; 14 days; Cardiovascular; animal info (OLETF, LETO, 25-30 weeks old); ischemia (cardiac).
ALZET Comments: Aliskiren; valsartan; SC; Mice; 6 weeks; Controls received mp w/ vehicle; animal info (6 wks old, Balb/C, db/db); enzyme inhibitor (renin);

ALZET Comments: Valsartan; aliskiren; Mice; 4 weeks; Controls received mp w/ saline; animal info (male, eNOS -/-, wt); enzyme inhibitor (renin);

ALZET Comments: Valsartan; IP; Mice; 1002; Controls received mp w/ vehicle; animal info (adult C57BL/6, Agtr2-, Agtr2+, 3-4 mo old, male, female); behavioral testing (Morris water maze test); ischemia (cerebral).

ALZET Comments: Valsartan; Saline; SC; Rat; Controls received no mp; animal info (male, 8 wks old, Wistar, 225-285 g).

Q0380: T. Aoki, et al. Role of angiotensin II type 1 receptor in cerebral aneurysm formation in rats. INTERNATIONAL JOURNAL OF MOLECULAR MEDICINE 2009;24(3):353-359
ALZET Comments: Valsartan; Saline; methanol; ethanol; SC; Rat; 1 month; Controls received mp w/ vehicle; animal info (Sprague-Dawley, 7 wks old, cerebral aneurysm); 33% ethanol used.

P8877: J. M. Li, et al. Temporary pretreatment with the angiotensin II type 1 receptor blocker, valsartan, prevents ischemic brain damage through an increase in capillary density. Stroke 2008;39(7):2029-2036
ALZET Comments: Valsartan; IP; Mice; 1002; 2 weeks; Ischemia (cerebral); animal info (male, C57BL/6, 6 wks old, 20 g.); middle cerebral artery occlusion.

ALZET Comments: Angiotensin II; phenylephrine; Y-27632; valsartan; CSF, artificial; SC; CSF/CNS; Rat; 1002; 2001; 7 days; Controls received mp w/ vehicle; enzyme inhibitor (Rho-kinase); antihypertensive; peptides; animal info (male, Wistar-Kyoto, SHR, 280-340 g.); catheter tip placement and connection confirmed.

ALZET Comments: Valsartan; NAHCO3; IP; Mice; 1002; 5 days; Controls received mp w/ vehicle; replacement therapy (unilateral ureteral obstruction); animal info (female, C57/B6J, 7-8 wks old).

ALZET Comments: Valsartan; hydralazine; SC; Mice; 2 weeks; Controls received mp w/ saline; nephrectomy; no stress (see pg. 156); cardiovascular; animal info (male, C57BL/6, wt, AT1KO, 10 wks old); nephrology.

ALZET Comments: Valsartan; hydralazine; PEG 400; Rat; 4 weeks; Controls received mp w/ vehicle; dose-response (table 1, p. 608); cardiovascular; antihypertensive; animal info (10 weeks, male, SHR/IzM); valsartan is an angiotensin II receptor blocker; hydralazine is a vasodilator.
**ALZET Comments:** Valsartan; IP; Mice; 1002; 6 weeks; Cardiovascular; animal info (male, adult, ApoE -/-, 6 wk. old).

**ALZET Comments:** Valsartan; IP; Mice; 1002; 13 days; Cardiovascular; ischemia (cerebral); animal info (C57BL/6J, 10 weeks old, MCA occlusion).