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

1. Atenolol


Agents: Isoproterenol; propranolol; carvedilol; atenolol; ICI-118551 Vehicle: saline; ascorbic acid, buffered; Route: SC; Species: Mice; Pump: 2001; Duration: 1 day; 2 days; 7 days;

ALZET Comments: Dose (ISO 0.6, 6, 20 mg/kg/d), (Prop 2 mg/kg/d), (Carv 2 mg/kg/d), (AT 2 mg/kg/d), (ICI 1 mg/kg/d)); saline with 0.4 mM ascorbic acid used; Controls were non-transgenic and received mp w/ vehicle; animal info (12-16 weeks, Male, (C57BL/6J, beta2-TG, Mst1-TG, or dnMst1-TG)); ICI-118551 is a beta2-antagonist with the structure (2R,3S)-1-[[7-methyl-2,3-dihydro-1H-inden-4-yl]oxy]-3-(propan-2-ylamino)butan-2-ol; cardiovascular; Minipumps were removed to allow for washout of ISO overnight prior to imaging;


Agents: Isoprotenerol, Atenolol, ICI-118551 Vehicle: Saline, ascorbic acid; Route: SC; Species: Mice; Pump: Not Stated; Duration: 48 Hours;

ALZET Comments: Dose: ISO (2, 6 or 30 mg/kg/day; atenolol (2 mg/kg/day), ICI-118551 (1 mg/kg/day); 0.4 mM ascorbic used; animal info (12-14 week-old C57Bl/6 mice); cardiovascular;


Agents: Atenolol Vehicle: PEG 200; DMSO; Route: SC; Species: Rat; Pump: 2001D; Duration: 4 hours;

ALZET Comments: Dose (0.25 mg/kg/h); 50% PEG 200 used, 50% DMSO used; animal info (19 month old Fischer rats); Resultant plasma level (p.10);


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

ALZET Comments: Dose (10 mg/kg/d); 50% PEG 300/50% DMSO used; animal info (8 to 10-week-old male Wistar-Kyoto rats); Atenolol is a selective beta1-blocker;

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

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

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

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, OVX); 50% DMSO used; dose (5 ug/kg/d).

P6345: S. Yagi, et al. Combined treatment with an AT 1 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; HCl; 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; petides; 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.

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


**Agents:** Candesartan  
**Vehicle:** Dextrose;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001D;  
**Duration:** 24 hours;  
**ALZET Comments:** Dose (0.01 mg/kg/min); 5% dextrose used; animal info (12-week-old female Sprague-Dawley rats ); Candesartan aka CAND; dependence;


**Agents:** candesartan  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001D;  
**Duration:** 24 hours;  
**ALZET Comments:** Dose (0.01 mg/kg/min); Controls received mp w/ agent; animal info (4 weeks, male and female, Wistar-Kyoto (WKY) and spontaneously hypertensive (SHR)); enzyme inhibitor (Ang type-1 receptor); all animals received pump with candesartan 24h prior to experiments to block systemic AT1Rs.;


**Agents:** Candesartan  
**Vehicle:** DMSO;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 1004;  
**Duration:** 2 months;  
**ALZET Comments:** Dose (1 mg/kg per day,); 25% DMSO used; 25% DMSO used; animal info (male and female,C57BL6 mice with APP mutations, 3–4 months old); behavioral testing (Morris water maze); pumps replaced at 34 days; comparison of oral delivery via drinking water vs mp; neurodegenerative (Alzheimer disease); “It is thus possible that delivery of candesartan through osmotic minipumps (cohort 1) compared with drinking water (cohort 2) allowed for better control of drug concentration and steady-state levels that conferred a better drug efficacy despite a shorter treatment,” pg. 1224;
Agents: Angiotensin II, Candesartan Vehicle: Not Stated; Route: SC; Species: Rat; Pump: Not Stated; Duration: 4 weeks;
ALZET Comments: Dose (Ang II 200 ng/kg/min, Candesartan 1mg/kg/day); animal info (Male, Wistar, 6 weeks old); Candesartan aka Ang II type 1 receptor antagonist; gene therapy;

Agents: Amlodipine or Candesartan Vehicle: Saline; Route: SC; Species: Mice; Pump: Not stated; Duration: 2 weeks;
ALZET Comments: Dose (Amlodipine- 5 mg/kg/day, Candesartan-0.5 mg/kg/day); animal info (ATP2B1 loxP/loxP); cardiovascular;

8. Captopril
Agents: ICI-118,551 hydrochloride; Toxin, Diptheria; reserpine; captopril; norepinephrine Vehicle: PBS; Route: Intrasplenic; Species: Mice; Pump: 1002; Duration: 1, 2, 3 weeks;
ALZET Comments: "Dose ((ICI-118,551 12 mg/kg/hr), (Diptheria Toxin 5 mg/kg/day), (reserpine 5mg/kg/day), (captopril 6mg/kg/day), (norepinephrine 5mg/kg/day)); Controls received mp w/ vehicle; animal info (10-12 weeks, Apoe(-/-)); comparison of intrasplenic injection vs mp; ICI-118,551 hydrochloride is a selective antagonist of the beta2 adrenergic receptor. angiotensin converting enzyme (ACE) inhibitor. Reserpine blocks the uptake of catecholamines into synaptic vesicles; Reserpine is an enzyme inhibitor (vesicular monoamine transporter 2); immunology; Diptheria toxin used to deplete TH+ leukocytes. Splenic nerves were depleted by intrasplenic DT using mp for 7 days; Therapeutic indication (ICI-118,551 reduced splenic GMP proliferation and inflammatory myeloid cell generation); "

Agents: Captopril Vehicle: PEG 300; DMSO; Route: SC; Species: Rat; Pump: 2002; Duration: 2 weeks;
ALZET Comments: Dose (30 mg/kg/d); Controls received mp w/ vehicle; enzyme inhibitor (ACE);

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

Agents: Captopril; losartan; CGP42112A Vehicle: Not Stated; Route: SC; Species: Guinea pig; Pump: 2ML4; Duration: 4 weeks; 6 weeks;
ALZET Comments: Animal info (male, Hartley, 9 weeks old, 500-650g); pumps replaced every 3 weeks; cardiovascular; long-term study;

Q3953: S. Lankhorst, et al. Treatment of Hypertension and Renal Injury Induced by the Angiogenesis Inhibitor Sunitinib Preclinical Study. Hypertension 2014;64(1282-U260
Agents: Captopril Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2ML2; Duration: 8 days;
9. Clonidine


**Agents:** Losartan; Tempol; Clonidine

**Vehicle:** CSF, artificial; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** Not Stated; **Duration:** Not Stated;

**ALZET Comments:** Dose (1 mg/kg/day losartan; 4.5 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? Autonomic Neuroscience: Basic and Clinical 2017;204(112-118

**Agents:** Clonidine

**Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Pump:** 2006; **Duration:** Not Stated;

**ALZET Comments:** Dose (125 μg/kg/day); animal info (Male SHR); antihypertensive;

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

**Agents:** Bupivacaine; clonidine; dexamethasone

**Vehicle:** Saline; **Route:** CSF/CNS (sciatic nerve); **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, albino, CD[SD]); no stress (see pg. 192); post op. care (IM butorphanol tartrate 0.05 mg/kg, ceftiofur sodium 5 mg/kg); stability verified by (pg. 195); used polyurethane catheter 0.5mm ID 0.9 mmOD; pumps removed after 1 week; dose (66.6 μg/mL)


**Agents:** Losartan; clonidine; tempol; hydralazine

**Vehicle:** PBS; CSF, artificial; **Route:** CSF/CNS; intragastric; **Species:** Rat; **Pump:** Not Stated; **Duration:** 2 weeks;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 5 weeks old, 5/6x nephrectomy); dose-response (pg 1627); cardiovascular; bp measured using catheter;

**P6722:** A. Quartilho, et al. Production of paradoxical sensory hypersensitivity by alpha 2-adrenoreceptor agonists. Anesthesiology 2004;100(6):1538-1544

**Agents:** Clonidine; MK-801; dexmedetomidine; idazoxan

**Vehicle:** Not Stated; **Route:** CSF/CNS (intrathecal, lumbar); SC; **Species:** Rat; **Pump:** 2001; **Duration:** 6 days;

**ALZET Comments:** Comparison of IT injections vs. IT and SC mp; idazoxan and MK-801 infused intrathecally in a separate infusion

10. Digotoxin and digoxin

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

**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);

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

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/mL), 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.

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); KD3-671 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: 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; 2002; 2ML2; 1,3,5,7,11,14 days; Controls received empty mp for 7 days; functionality of mp verified by SBP; cardiovascular; peptides.
15. Felodipin

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

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


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

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.

19. Hydrochlorothiazide


**ALZET Comments**: Norepinephrine; hydrochlorothiazide; losartan; Saline; DMSO; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; animal info (male, Sprague Dalway, 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).

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; Guinea 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; saline; 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

Q8614: S. Kumari, et al. Musa balbisiana Fruit Rich in Polyphenols Attenuates Isoproterenol-Induced Cardiac Hypertrophy in Rats via Inhibition of Inflammation and Oxidative Stress. Oxid Med Cell Longev 2020;2020(7147498

Agents: Isoproterenol Vehicle: saline; Route: SC; Species: rat; Pump: not stated; Duration: 14 days

ALZET Comments: Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (Male Sprague- Dawley rats 250 g); cardiovascular.

Agents: Isoproterenol  
Vehicle: Not stated;  
Route: SC;  
Species: Mice;  
Pump: 1004;  
Duration: 28 days;  
ALZET Comments: Dose (30 mg/kg per day); animal info (male C57BL/6J mice); cardiovascular;


Agents: Isoproterenol  
Vehicle: PBS;  
Route: SC;  
Species: Mice;  
Pump: 2004;  
Duration: 28 days;  
ALZET Comments: Dose (50 mg/kg/day); Controls received mp w/ vehicle; animal info (8–12-week-old male C57BL/6 mice); Isoproterenol aka ISO; cardiovascular;


Agents: Isoproterenol  
Vehicle: Not stated;  
Route: SC;  
Species: Mice;  
Pump: 2004;  
Duration: 4 weeks;  
ALZET Comments: Dose (30 mg/kg/day); animal info (adult (10-week-old) PLN-R14Δ/+ mice); cardiovascular;

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, isotonic; 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


**Agents:** Losartan  
**Vehicle:** CSF, Artificial;  
**Route:** CSF/CNS (cistern magna);  
**Species:** Rat;  
**Pump:** 1007D;  
**Duration:** 4 weeks;  

**ALZET Comments:** Dose (3 μg·μL− 1·h− 1); Controls received mp w/ vehicle; animal info (Sprague-Dawley rats at age of 10 weeks); functionality of mp verified by drainage of cerebrospinal fluid; Blood pressure measured via tail-cuff method;130 mmHg - 160 mmHg;cardiovascular;


**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).

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; antihypertensive;

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

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);.

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.

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

Agents: Nifedipine Vehicle: Saline; Route: SC; Species: Mice; Pump: 2002; Duration: 14 days;
ALZET Comments: Dose (10 mg/kg/day); Controls received mp w/ vehicle; animal info (9-10 weeks, C57BL/6J); Nifedipine aka L-type Ca2+ blocker; gene therapy;

Agents: Nifedipine Vehicle: Not Stated; Route: Not Stated; Species: Not Stated; Pump: Not Stated; Duration: Not Stated;
ALZET Comments: Dose (30 mg, 60 mg); dependence;

Agents: Nifedipine; calcitonin Vehicle: Not Stated; Route: CSF/CNS (sciatic nerve); Species: Rat; Pump: 2006; Duration: 4 weeks;
ALZET Comments: 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;

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


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

30. PD123319


**Agents:** TY-51469, H4R antagonist, MK-571, PD123319

**Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;

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


**Agents:** Angiotensin II, AT2 antagonist PD123319

**Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 1 week;

**ALZET Comments:** Dose (1.0 mg/kg/day); Controls received mp w/ vehicle; animal info (Pregnant Wistar, 230-250 g); PD123319 aka AT2 antagonist; enzyme inhibitor (PD123319); neurodegenerative (Brain development);


**Agents:** PD123319 difluoroacetate

**Vehicle:** Water, distilled; **Route:** IP; **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (Sprague Dawley rats, ~60 days, 190-200 g); behavioral testing (perivagal mechanical sensitivity via Semmes-Weinstein monofilaments); PD123319 difluoroacetate aka PD; enzyme inhibitor (PD is an angiotensin II antagonist);


**Agents:** Dextrose, C21, PD123319

**Vehicle:** Water; **Route:** SC; **Species:** Rat; **Pump:** 1007D, 2001; **Duration:** 1 week;

**ALZET Comments:** Dose (5 mg/kg/day); 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

**Agents:** Angiotensin II, PD123319

**Vehicle:** Not Stated; **Route:** IP; **Species:** Mice; **Pump:** 2002; **Duration:** 7 days;

**ALZET Comments:** Dose (12 μg/kg/hr Ang II, 10mg/kg/day PD123319); Controls received mp w/ vehicle; animal info (9-week-old male C57BL/6 and apoE(-/-)); PD123319 is a AT2R antagonist; cardiovascular;
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; befoxatone is an antidepressant; agents infused separately or concomitantly; antihypertensive.

ALZET Comments: Mirtazapine; Pindolol; NaCl; Ascorbic acid; SC; Rat; 2, 21 days; controls received mp w/ vehicle; comparison of iv injections vs mp; 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
Agents: Atenolol; digoxin; prazosin Vehicle: PEG 200; DMSO; Route: SC; Species: Rat; Pump: 2001D; Duration: Not Stated;
ALZET Comments: Animal info (male, Fisher F344, 8 weeks old, 180-250g); 50% PEG 200 used; 50% DMSO used;

Agents: Prazosin; propranolol; duloxetine
Vehicle: DMSO; saline, sterile; Route: SC; Species: Rat; Pump: 2ML4; Duration: 4 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, Long Evans, adult, 300g); functionality of mp verified by residual volume; 10% DMSO used; stress/adverse reaction: (see pg. 472); post op. care (ketoprofen 3 mg/kg SC); behavioral testing (ethanol intake, open field test, locomotor activity, elevated plus maze); dependence; "Drug doses were calculated based on the estimated mean weights 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;


Agents: Silodosin; prazosin
Vehicle: Hartmann's solution; saline; Route: SC; Species: Rat; Pump: 2002; Duration: 2 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (12 wks old, male, Sprague--Dawley)


Agents: Prazosin
Vehicle: Not Stated; Route: IP; Species: Mice; Pump: Not Stated; Duration: Not Stated;
ALZET Comments: Animal info (male, C57BL/6 Aoah -/-, uMT Aoah -/-); 100 ul sized pump used


Agents: Prazosin; yohimbine
Vehicle: Water, distilled; Route: SC; Species: Rat; Pump: 2004; Duration: 4 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (Sprague Dawley, female, 12 wks old)

34. Propranolol


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


Agents: Isoprotenerol; propranolol; carvedilol; atenolol; ICI-118551
Vehicle: saline; ascorbic acid, buffered; Route: SC; Species: Mice; Pump: 2001; Duration: 1 day; 2 days; 7 days;
ALZET Comments: Dose ((ISO 0.6, 6, 20 mg/kg/d), (Prop 2 mg/kg/d), (Carv 2 mg/kg/d), (AT 2 mg/kg/d), (ICI 1 mg/kg/d)); saline with 0.4 mM ascorbic acid used; Controls were non-transgenic and received mp w/ vehicle; animal info (12-16 weeks, Male, (C57BL/6, beta2-TG, Mst1-TG, or dnMst1-TG)); ICI-118551 is a beta2-antagonist with the structure (2R,3S)-1-[(7-methyl-2,3-dihydro-1H-inden-4-yl)oxy]-3-(propan-2-ylamino)butan-2-ol; cardiovascular; Minipumps were removed to allow for washout of ISO overnight prior to imaging;


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

Agents: Propranolol hydrochloride; ICI-118,551  
Vehicle: Not Stated  
Route: SC  
Species: Mice (nude)  
Pump: 1004  
Duration: 35 days  
ALZET Comments: Animal info (male, BALB/C nu/nu, 4 weeks old); cancer (colon, HT-29);


Agents: TGX-221; AS605240; Propranolol; SR59230A  
Vehicle: PBS; Tween 20  
Route: SC; CSF/CNS (right cerebral ventricle)  
Species: Mice  
Pump: Not Stated  
Duration: 10 days; 14 days  
ALZET Comments: 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).

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


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; 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.

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

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

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

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

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

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


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

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


**Agents:** Valsartan  
**Vehicle:** Not Stated; **Route:** SC; **Species:** Mice (knockout); **Pump:** Not Stated; **Duration:** 14 days;  
**ALZET Comments:** Dose (5 mg/kg per day); animal info (CDAC6 KOmice);