



### References on the Administration of Epinephrine Using ALZET® Osmotic Pumps

**Q5605:** X. P. Duan, *et al.* Norepinephrine-Induced Stimulation of Kir4.1/Kir5.1 Is Required for the Activation of NaCl Transporter in Distal Convolutated Tubule. *Hypertension* 2019;73(1):112-120

**ALZET Comments:** Norepinephrine; SC; Mice; Mice (knockout); 7 days; Dose (2.5 mg/kg/d); Controls received mp w/ vehicle; animal info (C57BL/6 mice (either sex, 12 weeks old); kidney-specific conditional Kcnj10<sup>-/-</sup> or Kir4.1 knockout (Ks-Kir4.1 KO) mice);

**Q5926:** J. Xu, *et al.* Clinical Relevance and Role of Neuronal AT1 Receptors in ADAM17-Mediated ACE2 Shedding in Neurogenic Hypertension. *Circ Res* 2017;121(1):43-55

**ALZET Comments:** Norepinephrine; SC; Mice (transgenic); 1002; 14 days; Controls received mp w/ vehicle; animal info (male, AT1aR knockdown, 14-16 weeks old, 25-30g); cardiovascular; Dose (3.8ug/kg/min);

**Q6076:** M. D. Montgomery, *et al.* An Alpha-1A Adrenergic Receptor Agonist Prevents Acute Doxorubicin Cardiomyopathy in Male Mice. *PLoS One* 2017;12(1):e0168409

**ALZET Comments:** A61603; Norepinephrine; Vitamin C; NaCl; SC; Mice; 1002; 7 days; Dose (A61603 10 µg/kg/d, NE 2.5 mg/kg/d); vitamin C 100 µM in 0.9% NaCl; animal info (12 w male mice); A61603 aka N-[5-(4,5-dihydro-1H-imidazol-2-yl)-2-hydroxy-5,6,7,8-tetrahydronaphthalen-1-yl]methanesulfonamide); cardiovascular;

**Q6408:** Caesar C, *et al.* Cyclic Strain and Hypertension Increase Osteopontin Expression in the Aorta. *Cell Mol Bioeng* 2017;10(2):144-152

**ALZET Comments:** Angiotensin II; Norepinephrine; Mice (knockout); 2004; Dose (Ang II: 0.75 mg/kg/day; Norepinephrine: 5.6 mg/kg/day); animal info (C57BL/6 (Wildtype, WT) or Osteopontin Knockout (OPN KO) mice); cardiovascular;

**Q4898:** J. T. K. Kathryn R. Walsh, Joon W. Shim, and Richard D. Wainford. Norepinephrine-evoked salt-sensitive hypertension requires impaired renal sodium chloride cotransporter activity in Sprague-Dawley rats. *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);

**Q4799:** Kathrin Broekmans, *et al.* Angiotensin II-Induced Hypertension Is Attenuated by Reduction of Sympathetic Output in NO-Sensitive Guanylyl Cyclase 1 Knockout Mice. *The Journal of Pharmacology and Experimental Therapeutics* 2016;356):191-199

**ALZET Comments:** Angiotensin II; norepinephrine; Saline; SC; Mice; 1002; 2 weeks; animal info (male, NO-GC1 KO, 2-3 months old); cardiovascular; peptides; bp measured using tail cuff or radiotelemetry (DSI); Dose (Ang II 1.44 mg/kg/day; NE 2.88 mg/kg/day); good bp graph;

**Q4577:** B. M. Schmit, *et al.* Hypertension overrides the protective effect of female hormones on the development of aortic aneurysm secondary to Alk5 deficiency via ERK activation. *AMERICAN JOURNAL OF PHYSIOLOGY-HEART AND CIRCULATORY PHYSIOLOGY* 2015;308(H115-H125)

**ALZET Comments:** Norepinephrine; Mice; 2004; 28 days; Animal info (Alk5 iko or Alk5 f/f or C57BL6, 7-15 weeks old, OVX or ORX); cardiovascular; bp measured using tail cuff;

**Q4972:** T. Nakashima, *et al.* TLR4 is a critical regulator of angiotensin II-induced vascular remodeling: the roles of extracellular SOD and NADPH oxidase. *Hypertens Res* 2015;38(10):649-55

**ALZET Comments:** Angiotensin II; norepinephrine; Saline; SC; Mice; 1002; 2 weeks; Controls received mp w/ vehicle; animal info (male, WT, 12-16 weeks old); cardiovascular; peptides; bp measured using tail cuff; Dose (Angiotensin II 1.1 mg/kg/day; norepinephrine 5.6 mg/kg/day);



**Q5231:** Matsuda S, *et al.* Angiotensin II Activates MCP-1 and Induces Cardiac Hypertrophy and Dysfunction via Toll-like Receptor 4. *Journal of Atherosclerosis and Thrombosis* 2015;228(8):833-844

**ALZET Comments:** Angiotensin II, Norepinephrine; Saline, physiological; SC; mice; 1002; 2 weeks; Controls received mp w/ vehicle; animal info (male, 12-16 wks, WT Balb/c mice); functionality of mp verified by ECG; cardiovascular; peptides; peptides; Dose (Ang II – 1.1 mg/kg/day, Norepinephrine – 5.6 mg/kr/day);.

**Q4501:** J. Liu, *et al.* The effect of chronic stress on anti-angiogenesis of sunitinib in colorectal cancer models. *PSYCHONEUROENDOCRINOLOGY* 2015;52(130-142

**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);.

**Q4491:** Y. H. Lee, *et al.* Cellular origins of cold-induced brown adipocytes in adult mice. *FASEB JOURNAL* 2015;29(286-299

**ALZET Comments:** Norepinephrine; uridine, 5-bromo-2'-deoxyuridine; Ascorbic acid; Mice; 7 days; Controls received mp w/ vehicle; animal info (C57BL6J or tdTomato);.

**Q5150:** J. L. Fry, *et al.* Vascular Smooth Muscle Sirtuin-1 Protects Against Aortic Dissection During Angiotensin II-Induced Hypertension. *J Am Heart Assoc* 2015;4(9):e002384

**ALZET Comments:** Angiotensin II; Norepinephrine; Saline; Ascorbate; SC; mice; 1007D; 1002; 1 week; 2 weeks; animal info: WT, SMKO, and SMTg mice aged 8 weeks (C57Bl/6J genetic background); functionality of mp verified by radiotelemetry; 1 mmol/L ascorbate; cardiovascular; antihypertensive, norepinephrine; Dose: 1 mg/kg per day of AngII; 10 mg/kg per day of norepinephrine.

**Q4375:** M. J. Choi, *et al.* hTERT mediates norepinephrine-induced Slug expression and ovarian cancer aggressiveness. *ONCOGENE* 2015;34(3402-3412

**ALZET Comments:** Norepinephrine; Saline; Ascorbic acid; SC; Mice (nude); 1004; 7 weeks; Controls received mp w/ vehicle; animal info (female, nude, 4 weeks old); cancer (ovarian);.

**Q3828:** A. J. Case, *et al.* Redox-Regulated Suppression of Splenic T-Lymphocyte Activation in a Model of Sympathoexcitation. *Hypertension* 2015;65(916+

**ALZET Comments:** Norepinephrine; SC; Mice; 1002; 14 days; Controls received mp w/ saline; animal info (male, C57BL6, 20-25g, 8-12 weeks old); functionality of mp verified by plasma levels; good methods (see supplement); post op. care (incision cleaned with iodine); cardiovascular; immunology; bp measured using radiotelemetry (DSI);.

**Q3654:** D. L. Xiao, *et al.* Inhibition of DNA methylation reverses norepinephrine-induced cardiac hypertrophy in rats. *Cardiovascular Research* 2014;101(3):373-382

**ALZET Comments:** Norepinephrine; Rat; 2ML4; 28 days; Controls received mp w/saline; animal info (male, Sprague Dawley, 6 months old); functionality of mp verified by plasma levels pg.375; dose-response (pg735, table 1); cardiovascular; arterial blood pressure measured using catheter in femoral artery;.

**Q6787:** D. Xiao, *et al.* Inhibition of DNA methylation reverses norepinephrine-induced cardiac hypertrophy in rats. *Cardiovasc Res* 2014;101(3):373-82

**ALZET Comments:** Norepinephrine; Cytidine, 5-aza-2'-deoxy-; Saline; SC; Rat; 2ML4; 28 days; Dose (norepinephrine 100 mg/kg/h; norepinephrine 200 mg/kg/h; 1 mg/kg/day 5-aza-2'-deoxycytidine); Controls received mp w/ vehicle; animal info (Six-month-old Sprague–Dawley male rats); cardiovascular;.

**Q4059:** D. L. Rateri, *et al.* Angiotensin II Induces Region-Specific Medial Disruption during Evolution of Ascending Aortic Aneurysms. *American Journal of Pathology* 2014;184(2586-2595

**ALZET Comments:** Angiotensin II; norepinephrine; Saline; Ascorbic acid; SC; Mice; 2004; 28 days; Controls received mp w/ vehicle; animal info (male, C57BL6J or Ldlr-/-); post op. care (topical anesthetic cream); cardiovascular; peptides; bp measured using tail cuff;.



**Q4766:** Mohan R Dasu, *et al.* Crosstalk Between Adrenergic and Toll-Like Receptors in Human Mesenchymal Stem Cells and Keratinocytes: A Recipe for Impaired Wound Healing. *STEM CELLS TRANSLATIONAL MEDICINE* 2014;3(3):745-759

**ALZET Comments:** epinephrine, macrophage-activating lipopeptide-2; ICI-118,551; SC; mice; 1002; 7 days; 11 days; animal info (Jax Mice, male, 8-10 weeks of age); peptides; macrophage-activating lipopeptide-2 aka MALP-2; Dose (7mg/kg body weight/day EPI; .7 mg/kg body weight/day ICI);.

**Q3234:** M. H. Kim, *et al.* Catecholamine Stress Alters Neutrophil Trafficking and Impairs Wound Healing by beta(2)-Adrenergic Receptor-Mediated Upregulation of IL-6. *Journal of Investigative Dermatology* 2014;134(3):809-817

**ALZET Comments:** Epinephrine; antagonist, beta adrenergic receptor; Saline; SC; Mice (transgenic); 1002; 8 days; Controls received mp w/ vehicle; animal info (female, EGFP-lys); functionality of mp verified by plasma levels; dose-response (pg. 810); immunology;.

**Q3477:** Y. X. Gao, *et al.* ADAMTS-7 Expression Increases in the Early Stage of Angiotensin II-Induced Renal Injury in Elderly Mice. *KIDNEY & BLOOD PRESSURE RESEARCH* 2014;38(121-131

**ALZET Comments:** Angiotensin II; norepinephrine; Saline; SC; Mice; 3 days; Controls received mp w/ vehicle; animal info (male, C57BL6, 36 weeks old); functionality of mp verified by increased bp; cardiovascular; immunology; peptides; bp measured using tail-cuff;.

**Q3184:** G. H. Deng, *et al.* Exogenous norepinephrine attenuates the efficacy of sunitinib in a mouse cancer model. *JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH* 2014;33(;):U1-U12

**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.

**Q4819:** M. R. DASU, *et al.* Crosstalk Between Adrenergic and Toll-Like Receptors in Human Mesenchymal Stem Cells and Keratinocytes: A Recipe for Impaired Wound Healing. *STEM CELLS TRANSLATIONAL MEDICINE* 2014;3(3):745-759

**ALZET Comments:** Epinephrine; macrophage-activating lipopeptide-2; ICI-118,551; SC; mice; 1002; 7 days; 11 days; animal info (Jax Mice, male, 8-10 weeks of age); peptides; macrophage-activating lipopeptide-2 aka MALP-2; Dose (7mg/kg body weight/day EPI; .7 mg/kg body weight/day ICI);.

**Q3291:** J. Chen, *et al.* Neuronal over-expression of ACE2 protects brain from ischemia-induced damage. *Neuropharmacology* 2014;79(;):550-558

**ALZET Comments:** Norepinephrine; A-779; CSF, artificial; CSF/CNS; Mice (transgenic); 7 days; Controls received mp w/ vehicle; animal info (male, SARA or RA transgenic, 6-10 weeks); ALZET brain infusion kit used; ischemia (cerebral); cardiovascular; Pumps primed overnight in 37C saline;.

**Q2875:** Q. Lin, *et al.* Effect of Chronic Restraint Stress on Human Colorectal Carcinoma Growth in Mice. *PLoS One* 2013;8(4):U1127-U1137

**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, S5); 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.

**Q1835:** Q. Wu, *et al.* Ablation of neurons expressing agouti-related protein, but not melanin concentrating hormone, in leptin-deficient mice restores metabolic functions and fertility. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 2012;109(8):3155-3160

**ALZET Comments:** Norepinephrine; Ascorbate; SC; Mice; 1002; 14 days; Animal info (Lep Ob+, 55 g, 14 wks old).



**Q2697:** T. Kurihara, *et al.* Neutrophil-Derived Matrix Metalloproteinase 9 Triggers Acute Aortic Dissection. *Circulation* 2012;126(25):3070-U532

**ALZET Comments:** Angiotensin II; norepinephrine; SC; Mice; 24 hours; Animal info (MMP9 -/-, 7 wks old); peptides.

**Q1244:** S. Mu, *et al.* Epigenetic modulation of the renal beta-adrenergic-WNK4 pathway in salt-sensitive hypertension. *Nature Medicine* 2011;17(5):573-U92

**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).

**Q1137:** N. Ishizaka, *et al.* Liver lipid content is reduced in rat given 7-day administration of angiotensin II. *JOURNAL OF THE RENIN-ANGIOTENSIN-ALDOSTERONE SYSTEM* 2011;12(4):462-468

**ALZET Comments:** Angiotensin II, [Val 5]; norepinephrine; SC; Rat; 7 days; animal info (male, Sprague Dawley, 10 wks old); peptides.

**Q1759:** F. C. Beasley, *et al.* Staphylococcus aureus Transporters Hts, Sir, and Sst Capture Iron Liberated from Human Transferrin by Staphyloferrin A, Staphyloferrin B, and Catecholamine Stress Hormones, Respectively, and Contribute to Virulence. *Infection and Immunity* 2011;79(6):2345-2355

**ALZET Comments:** Epinephrine; Saline, buffered; SC; Mice; 2001; 4 days; Controls received mp w/ vehicle; animal info (BALB/c).

**Q1256:** A. Penn, *et al.* Dose-Response Relationship between Norepinephrine and Erythropoiesis: Evidence for a Critical Threshold. *Journal of Surgical Research* 2010;163(2):E85-E90

**ALZET Comments:** Norepinephrine bitartrate;; Saline; IP; Rat; 1007D; 5 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 300-350 g).

**Q0026:** A. I. Owens, *et al.* Angiotensin II Induces a Region-Specific Hyperplasia of the Ascending Aorta Through Regulation of Inhibitor of Differentiation 3. *Circulation Research* 2010;106(3):611-U108

**ALZET Comments:** Angiotensin II; norepinephrine; losartan; Saline; Mice; 4 weeks; 28 days; Controls received mp w/vehicle; peptides; cardiovascular; animal info (male, C57BL/6, AT1aR -/-, p47phox -/-, Id3 -/-); functionality of mp verified by systolic blood pressure.

**Q3033:** P. J. Marvar, *et al.* Central and Peripheral Mechanisms of T-Lymphocyte Activation and Vascular Inflammation Produced by Angiotensin II-Induced Hypertension. *Circulation Research* 2010;107(2):263-U186

**ALZET Comments:** Angiotensin II; norepinephrine; Mice; 2002; 14 days; Controls received mp w/ vehicle; animal info (C57BL/6, RAG1 -/-, OVA-specific, OT-II tg); peptides; blood pressure measured via telemetry or tail cuff.

**Q1545:** K. Kimura, *et al.* Norepinephrine-induced nerve growth factor depletion causes cardiac sympathetic denervation in severe heart failure. *Autonomic Neuroscience-Basic & Clinical* 2010;156(1-2):27-35

**ALZET Comments:** Norepinephrine; Saline; ascorbate; SC; Rat; mice; 2004; 1, 3, 7, 14, 28 days; Controls received mp w/ vehicle; animal info (Wistar, male, 240-260 g, 7 wks old; 5 wks old, DBH-Cre/Floxed-EGFP); functionality of mp verified by plasma NE levels.

**P9592:** H. R. Mobine, *et al.* Encapsulated Pheochromocytoma Cells Secrete Potent Noncatecholamine Factors. *Tissue Engineering Part A* 2009;15(7):1719-1728

**ALZET Comments:** Norepinephrine; Saline; Ascorbic acid; IP; Rat; 2004; 28 days; Controls received mp w/vehicle; animal info (female, Sprague-Dawley, 8 wks, 230g).

**Q0531:** H. R. Mobine, *et al.* Pheochromocytoma-Induced Cardiomyopathy is Modulated by the Synergistic Effects of Cell-Secreted Factors. *Circulation-Heart Failure* 2009;2(2):121-128

**ALZET Comments:** Norepinephrine; Ascorbic acid; saline; IP; Mice; Rat; 2004; 1004; Controls received mp w/ vehicle; animal info (female, Sprague-Dawley, 8 wks old, 250 g; female, black-6, 7-8 wks old, 15-20 g).



**P9553:** H. Meier, *et al.* Crucial Role of Interleukin-6 in the Development of Norepinephrine-induced Left Ventricular Remodeling in Mice. *CELLULAR PHYSIOLOGY AND BIOCHEMISTRY* 2009;23(4-6):327-334

**ALZET Comments:** Norepinephrine; SC; Mice; 1, 3 days; 4 hours; Controls received unfilled mp; animal info (IL-6<sup>-/-</sup>, IL-6<sup>+/+</sup>).

**Q0775:** S. G. Khasar, *et al.* Sound Stress-Induced Long-Term Enhancement of Mechanical Hyperalgesia in Rats Is Maintained by Sympathoadrenal Catecholamines. *JOURNAL OF PAIN* 2009;10(10):1073-1077

**ALZET Comments:** Epinephrine; SC; Rat; 2004; 14 days; Animal info (adrenal medullectomy, adult, male, Sprague Dawley, 300-400 g); functionality of mp verified by plasma drug levels.

**P9494:** M. Hongo, *et al.* Administration of angiotensin II, but not catecholamines, induces accumulation of lipids in the rat heart. *European Journal of Pharmacology* 2009;604(1-3):87-92

**ALZET Comments:** Angiotensin II, [Val 5]; norepinephrine; SC; Rat; Peptides; animal info (male, Sprague Dawley, 250-300 g.).

**P8857:** C. von Montfort, *et al.* Contribution of the sympathetic hormone epinephrine to the sensitizing effect of ethanol on LPS-induced liver damage in mice. *American Journal of Physiology-Gastrointestinal and Liver Physiology* 2008;294(5):G1227-G1234

**ALZET Comments:** Epinephrine; Saline; SC; Mice; 5 days; Half-life (p. G1227) "very short"; animal info (male, C57BL/6, 4-6 wks old); "Owing to the very short half-life of epinephrine, the hormone was infused instead of injected to maintain a low-grade elevated plasma level over a prolonged period which better mimics the effect of ethanol." pg. G1227.

**P9252:** Z. Y. Qin, *et al.* Role of Menkes ATPase in Angiotensin II-Induced Hypertension A Key Modulator for Extracellular Superoxide Dismutase Function. *Hypertension* 2008;52(5):945-U556

**ALZET Comments:** Angiotensin II; norepinephrine; tempol; Saline; SC; Mice; 2002; 14 days; Controls received sham surgery with no mp or empty mp; functionality of mp verified by blood pressure; cardiovascular; peptides; multiple pumps per animal (2); animal info (female, C57BL/6EJ blotchy MNK mut, 8-12 wks old).

**P8832:** O. A. Dina, *et al.* Alcohol-induced stress in painful alcoholic neuropathy. *European Journal of Neuroscience* 2008;27(1):83-92

**ALZET Comments:** Epinephrine; Saline; Ascorbic acid; SC; Rat; 2004; 3 weeks; Replacement therapy (adrenal medullectomy); animal info (male, Sprague Dawley, 250-450g.).

**P9158:** O. A. Dina, *et al.* Neurotoxic catecholamine metabolite in nociceptors contributes to painful peripheral neuropathy. *European Journal of Neuroscience* 2008;28(6):1180-1190

**ALZET Comments:** Epinephrine; Saline; Ascorbic acid; Rat; Animal info (male, Sprague Dawley, 270-450 g.).

**P7990:** W. Vongpatanasin, *et al.* C-reactive protein causes downregulation of vascular angiotensin subtype 2 receptors and systolic hypertension in mice. *Circulation* 2007;115(8):1020-1028

**ALZET Comments:** Angiotensin II; norepinephrine; SC; Mice; 2002; 14 days; Blood pressure taken; cardiovascular; peptides; animal info (CF1-CRP).

**P8607:** X. U. Ming, *et al.* Alpha 1-adrenergic receptors activate AMP-activated protein kinase in rat hearts. *Acta Physiologica Sinica* 2007;59(2):175-182

**ALZET Comments:** Norepinephrine; phenylephrine; Vitamin C; SC; Rat; 2002; 7 days; Controls received mp w/ vehicle; cardiovascular; animal info (male, Sprague-Dawley, 330-440 grams, 12 weeks old).

**P8523:** E. A. Ko, *et al.* Resistance artery remodeling in deoxycorticosterone acetate-salt hypertension is dependent on vascular inflammation: evidence from m-CSF-deficient mice. *American Journal of Physiology-Heart and Circulatory Physiology* 2007;292(4):H1789-H1795

**ALZET Comments:** Norepinephrine; Mice; 2 weeks; Replacement therapy (nephrectomy); dose-response (fig 3); cardiovascular; animal info (OP+, 3-4 months old, 20-35 g).





**P8451:** H. Ideura, *et al.* Angiotensin II provokes podocyte injury in murine model of HIV-associated nephropathy. *American Journal of Physiology-Renal Physiology* 2007;293(4):F1214-F1221

**ALZET Comments:** Angiotensin II; norepinephrine; SC; Mice (transgenic); 2004; 16 days; Functionality of mp verified by blood pressure; cardiovascular; peptides; animal info (FVB/N Podocin/rt TA tg, 7-8 wks old, 20-25g) nephrology.

**P8582:** P. Garg, *et al.* Effect of the Na-K-2Cl cotransporter NKCC1 on systemic blood pressure and smooth muscle tone. *American Journal of Physiology- Heart and Circulatory Physiology* 2007;292(5):H2100-H2105

**ALZET Comments:** Norepinephrine; SC; Rat; 2001; 7 days; Functionality of mp verified by mean arterial blood pressure; cardiovascular; animal info (male, Sprague-Dawley, 360 grams).

**P8395:** W. Y. Zhao, *et al.* Reactive oxygen species impair sympathetic vasoregulation in skeletal muscle in angiotensin II-dependent hypertension. *Hypertension* 2006;48(4):637-643

**ALZET Comments:** Angiotensin II; norepinephrine; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle, or sham surgery; cardiovascular; peptides; animal info (Sprague-Dawley, 200-300g., unilateral renal artery stenosis).

**P8061:** G. Wolf, *et al.* Angiotensin II upregulates toll-like receptor 4 on mesangial cells. *Journal of the American Society of Nephrology* 2006;17(6):1585-1593

**ALZET Comments:** Angiotensin II; norepinephrine; IP; Rat; 2002; 7 days; Controls received mp w/ PBS; peptides; animal info (male, Wistar, 200g.); nephrology.

**P7800:** D. Palm, *et al.* The norepinephrine-driven metastasis development of PC-3 human prostate cancer cells in BALB/c nude mice is inhibited by betablockers. *International Journal of Cancer* 2006;118(11):2744-2749

**ALZET Comments:** Norepinephrine; propranolol; Saline, physiological; Ascorbic acid; SC; Mice (nude); 1002; 4 weeks; Controls received mp w/ vehicle; pumps replaced after 2 weeks; half-life (pg. 2745) short, quickly metabolized; cancer (prostate carcinoma); animal info (female, BALB/C nude, athymic, 6 wk. old, 15g.).

**P8897:** N. Ishizaka, *et al.* Expression and localization of PDGF-B, PDGF-D, and PDGF receptor in the kidney of angiotensin II-infused rat. *LABORATORY INVESTIGATION* 2006;86(12):1285-1292

**ALZET Comments:** Angiotensin II, [Val 5]; norepinephrine; SC; Rat; 2001; 7 days; Controls received no treatment; functionality of mp verified by systolic blood pressure; cardiovascular; peptides; animal info (male, Sprague Dawley, 250-300 g.); nephrology.

**P8057:** M. J. Eagleton, *et al.* Early increased MT1-MMP expression and late MMP-2 and MMP-9 activity during angiotensin II induced aneurysm formation. *Journal of Surgical Research* 2006;135(2):345-351

**ALZET Comments:** Angiotensin II; norepinephrine; Saline; SC; Mice; 2004; 7, 14, 21, 28 days; Controls received mp w/ vehicle; cardiovascular; peptides; animal info (C57BL/6J wt or ApoE -/-, male, 8-6 months old).

**P7440:** N. Ayabe, *et al.* Transiently heightened angiotensin II has distinct effects on atherosclerosis and aneurysm formation in hyperlipidemic mice. *Atherosclerosis* 2006;184(2):312-321

**ALZET Comments:** Angiotensin II; norepinephrine; SC; Mice; 1002; 2 weeks; Controls received mp w/ saline; dose-response (fig.1); stress/adverse reaction: (see pg. 313) 2 animals of 105 had mp extrusion; cardiovascular; peptides; animal info (female, C57BL/6, 8 weeks old).

**P7530:** K. Saito, *et al.* Lipid accumulation and transforming growth factor-beta upregulation in the kidneys of rats administered angiotensin II. *Hypertension* 2005;46(5):1180-1185

**ALZET Comments:** Angiotensin II, [Val 5]; norepinephrine; SC; Rat; 2001; 7 days; Controls received no treatment; functionality of mp verified by systolic blood pressure; cardiovascular; peptides; animal info (male, Sprague-Dawley, 250-300 g); lipotoxicity.

**P7739:** K. Saito, *et al.* Iron chelation and a free radical scavenger suppress angiotensin II- induced upregulation of TGF-beta 1 in the heart. *American Journal of Physiology-Heart and Circulatory Physiology* 2005;288(4):H1836-H1843



**ALZET Comments:** Angiotensin II, [Val 5]; norepinephrine; SC; Rat; 7 days; Controls received no treatment; cardiovascular; animal info (male, Sprague-Dawley).

**P7594:** S. G. Khasar, *et al.* Repeated sound stress enhances inflammatory pain in the rat. *Pain* 2005;116(1-2):79-86

**ALZET Comments:** Epinephrine bitartrate; Saline; Ascorbic acid; SC; Rat; 1007D; 7 days; Controls received no treatment; animal info (male, Sprague-Dawley 250-380 g); pain.

**P7253:** S. G. Khasar, *et al.* Estrogen regulates adrenal medullary function producing sexual dimorphism in nociceptive threshold and beta<sub>2</sub>-adrenergic receptor-mediated hyperalgesia in the rat. *European Journal of Neuroscience* 2005;21(12):3379-3386

**ALZET Comments:** Epinephrine; Saline; Ascorbic acid; SC; Rat; 1007D; 2002; 7, 14 days; Functionality of mp verified by plasma epinephrine levels; replacement therapy (adrenal medullectomy, adrenal gland denervation); dose-response (Fig 3).

**P7599:** N. Ishizaka, *et al.* Iron chelation suppresses ferritin upregulation and attenuates vascular dysfunction in the aorta of angiotensin II - Infused rats. *ARTERIOSCLEROSIS THROMBOSIS AND VASCULAR BIOLOGY* 2005;25(11):2282-2288

**ALZET Comments:** Angiotensin II, [Val 5]; norepinephrine; SC; Rat; 2001; 4 weeks; 7 days; Controls received no treatment; dose-response (fig. 1); cardiovascular; peptides; animal info (male, Sprague-Dawley).

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

**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).

**P6465:** J. A. Oben, *et al.* Hepatic fibrogenesis requires sympathetic neurotransmitters. *Gut* 2004;53(3):438-445

**ALZET Comments:** Isoprenaline; norepinephrine; SC; Mice; 4 weeks; Controls received mp w/ vehicle.

**P7080:** Z. P. Li, *et al.* Norepinephrine regulates hepatic innate immune system in leptin-deficient mice with nonalcoholic steatohepatitis. *Hepatology* 2004;40(2):434-441

**ALZET Comments:** Norepinephrine; Saline, pyrogen-free; Mice; 3,4 weeks; Controls received mp w/ vehicle.

**P6492:** Y. Chen, *et al.* Heat shock treatment protects against angiotensin II-induced hypertension and inflammation in aorta. *CELL STRESS & CHAPERONES* 2004;9(1):99-107

**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.

**P6408:** F. K. H. Van Landeghem, *et al.* Differential concentration-dependent effects of prolonged norepinephrine infusion on intraparenchymal hemorrhage and cortical contusion in brain-injured rats. *Journal of Neurotrauma* 2003;20(12):1327-1337

**ALZET Comments:** Norepinephrine; Saline; IV; Rat; 2001; 44 hours; Controls received mp w/ vehicle; blood pressure taken; dose-response (p. 1329); brain injury.

**P6087:** K. Saito, *et al.* Iron chelation and a free radical scavenger suppress angiotensin II-induced downregulation of klotho, an anti-aging gene, in rat. *FEBS Letters* 2003;551(1-3):58-62

**ALZET Comments:** Angiotensin II; Norepinephrine; SC; Rat; 2001; 1 week; Peptides.

**P6051:** K. Mardon, *et al.* Uptake-1 carrier downregulates in parallel with the beta<sub>2</sub>-adrenergic receptor desensitization in rat hearts chronically exposed to high levels of circulating norepinephrine: Implications for cardiac neuroimaging in human cardiomyopathies. *Journal of Nuclear Medicine* 2003;44(9):1459-1466

**ALZET Comments:** Norepinephrine; Saline; IV (jugular); Rat; 2001; 5 days; Controls received mp w/ vehicle; cardiovascular; silastic catheter used.



**P6079:** P. Li, *et al.* Gene expression profile of cardiomyocytes in hypertrophic heart induced by continuous norepinephrine infusion in the rats. *CELLULAR AND MOLECULAR LIFE SCIENCES* 2003;60(10):2200-2209

**ALZET Comments:** Norepinephrine; Ascorbic acid; IV (jugular); Rat; 2002; 7 days; Functionality of mp verified by liquid chromatography; cardiovascular.

**P5984:** Y. Kitano, *et al.* Epinephrine inhibits tracheal occlusion induced lung growth in fetal sheep. *Fetal Diagnosis and Therapy* 2003;18(5):333-337

**ALZET Comments:** Epinephrine; Saline; Ascorbic acid; SC; Sheep (fetus); 2ML1; 4 days; Teratology.

**P5711:** S. G. Khasar, *et al.* Vagal modulation of nociception is mediated by adrenomedullary epinephrine in the rat. *European Journal of Neuroscience* 2003;17(4):909-915

**ALZET Comments:** ICI-118,551; epinephrine; Saline; Ascorbic acid; ethanol; SC; Rat; 1007D; 2004; 3, 7, 14 days; Controls received mp w/ vehicle; dose-response (p. 911); ICI-118, 55 dissolved in ethanol and saline and infused for 7 days via 1007D pumps; epinephrine dissolved in saline and ascorbic acid and delivered for 3, 7, or 14 days via 2004 pumps.

**P5663:** W. T. L. Festuccia, *et al.* Expression of glycerokinase in brown adipose tissue is stimulated by the sympathetic nervous system. *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 2003;284(6):R1536-R1541

**ALZET Comments:** Norepinephrine; dobutamine; isoproterenol; Saline; sodium metabisulfite; SC; Rat; 2002; 3 days; 6, 12, 24, 72 hours; Controls received mp w/ vehicle; the norepinephrine vehicle solution contained sodium metabisulfite as an antioxidant; the b-adrenergic agonists (isoproterenol, dobutamine, and CL316243) were dissolved in saline and infused over 3 days.

**P5834:** T. Caprile, *et al.* Reissner fiber binds and transports away monoamines present in the cerebrospinal fluid. *MOLECULAR BRAIN RESEARCH* 2003;110(2):177-192

**ALZET Comments:** Serotonin, binoxaiate; Norepinephrine; serotonin trifluoroacetate; Serotonin creatinin sulfate; L-DOPA; CSF, artificial; radio-isotopes; 3H tracer; CSF/CNS; Rat; 2001; 7 days;

**P5728:** W. Briest, *et al.* Significance of matrix metalloproteinases in norepinephrine-induced remodelling of rat hearts. *Cardiovascular Research* 2003;57(2):379-387

**ALZET Comments:** Norepinephrine; Saline; Ascorbic acid; IV (jugular); Rat; 14 days; Controls received mp w/ vehicle; cardiovascular; Norepinephrine is also called Noradrenalin; ascorbic acid added to vehicle solution to prevent oxidation.

**P5744:** G. V. R. Born, *et al.* Factors influencing the uptake of atherogenic plasma proteins by artery walls. *Biorheology* 2003;40(1-3):13-22

**ALZET Comments:** Epinephrine; Angiotensin II; SC; Rat; 6 days; Controls received mp w/ saline; plasma levels reported; cardiovascular; pump rate 0.5 ul hr (p.15).

**P5068:** U. O. Wenzel, *et al.* Angiotensin II infusion ameliorates the early phase of a mesangioproliferative glomerulonephritis. *Kidney International* 2002;61(1020-1029)

**ALZET Comments:** Angiotensin II; Norepinephrine; SC; Rat; 2002; 6-10 days; peptides; all animals received either Ang II or NE.

**P5067:** C. Vecchione, *et al.* Cardiovascular influences of alpha 1b-adrenergic receptor defect in mice. *Circulation* 2002;105(14):1700-1707

**ALZET Comments:** Angiotensin II; Norepinephrine; Phenylephrine; Saline; Ascorbic acid; SC; mice (transgenic); 2004; 18 days; controls received mp w/ vehicle; cardiovascular; peptides; Ang II infused in saline, NE and PHE in 0.2% ascorbic acid.

**P5159:** L. Moser, *et al.* Predominant activation of endothelin-dependent cardiac hypertrophy by norepinephrine in rat left ventricle. *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 2002;282(R1389-R1394)

**ALZET Comments:** Angiotensin II; Norepinephrine; SC; Rat; 2001; 7 days; cardiovascular.





**P5230:** H. Mitani, *et al.* In vivo klotho gene transfer ameliorates angiotensin II-induced renal damage. *Hypertension* 2002;39(4):838-843

**ALZET Comments:** Angiotensin II, [Val 5]; Norepinephrine; Rat; 7 and 14 days; Peptides.

**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.

**P5223:** N. Ishizaka, *et al.* Regulation and localization of HSP70 and HSP25 in the kidney of rats undergoing long-term administration of angiotensin II. *Hypertension* 2002;39(1):122-128

**ALZET Comments:** Angiotensin II; Norepinephrine; SC; Rat; 2001; 7 days; Peptides.

**P5574:** K. L. Golden, *et al.* Norepinephrine regulates the in vivo expression of the L-type calcium channel. *MOLECULAR AND CELLULAR BIOCHEMISTRY* 2002;236(1-2):107-114

**ALZET Comments:** Isoproterenol; Norepinephrine; Phenylephrine; HCl; SC; Rat; 3, 7 days; controls received mp with vehicle; alpha & beta adrenergic agonist.

**P5473:** C. Erami, *et al.* Alpha 1-adrenoceptor stimulation directly induces growth of vascular wall in vivo. *American Journal of Physiology-Heart and Circulatory Physiology* 2002;283(4):H1577-H1587

**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.

**R0161:** G. V. Born, *et al.* Endothelial factors in the flux of atherogenic plasma proteins into artery walls. *Clin. Hemorheol. Microcirc* 2002;26(2):107-116

**ALZET Comments:** Epinephrine; Angiotensin II; Saline; SC; Rat; 1007D; 6 days; Controls received mp w/ vehicle; functionality of mp verified by epinephrine plasma levels; cardiovascular; peptides; various methods of inducing hypertension explored.

**P5396:** D. Bonnefont-Rousselot, *et al.* Catecholamine effects on cardiac remodelling, oxidative stress and fibrosis in experimental heart failure. *REDOX REPORT* 2002;7(3):145-151

**ALZET Comments:** Norepinephrine; Saline; SC; Rat; 2 weeks; Controls received mp w/ vehicle; functionality of mp verified by norepinephrine plasma levels (p.148); cardiovascular; also called noradrenalin (a catecholamine).

**P5221:** T. Aizawa, *et al.* Angiotensin II and catecholamines increase plasma levels of 8-epi- prostaglandin F(2alpha) with different pressor dependencies in rats. *Hypertension* 2002;39(1):149-154

**ALZET Comments:** Angiotensin II, [Val 5]; Norepinephrine; Rat; 2001; up to 7 days; Dose-response (p. 151); cardiovascular; peptides.