



References (2018-Present) on Heart Failure Using ALZET® Osmotic Pumps

Q11347: M. Lenz, *et al.* Short-term toll-like receptor 9 inhibition leads to left ventricular wall thinning after myocardial infarction. *ESC Heart Failure* 2023;10(4):2375-2385

Agents: oligonucleotide 2088; control oligonucleotide **Vehicle:** DNase; **Route:** Not Stated; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2001D; **Duration:** 1 day;

ALZET Comments: Dose (66.667 ug/h); controls received mp w/ control ODN, saline; animal info (Male; 10-12 weeks old; Weighed 260-400 g); Toll-like receptor 9 antagonist

Q11346: C. Lee, *et al.* Inhibition of miR-25 Ameliorates Cardiac Dysfunction and Fibrosis by Restoring Kruppel-like Factor 4 Expression. *International Journal of Molecular Sciences* 2023;24(15):

Agents: Angiotensin II **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1002; **Duration:** 4 weeks;

ALZET Comments: Dose (3 mg/kg/day); animal info (Male; 8 weeks old; Weighed about 20-25 g); peptides; cardiovascular

Q11021: W. Wang, *et al.* Compound Kushen injection attenuates angiotensin II-mediated heart failure by inhibiting the PI3K/Akt pathway. *International Journal of Molecular Medicine* 2023;51(3):

Agents: Angiotensin II **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 2004; **Duration:** 3 weeks;

ALZET Comments: Dose Ang II (2 µg/kg/min); Controls received mp w/ vehicle; animal info: Male, 6 weeks; weight, 20-22 g; cardiovascular; (heart failure)

Q11016: P. Verdino, *et al.* Development of a long-acting relaxin analogue, LY3540378, for treatment of chronic heart failure. *British Pharmacological Society* 2023;180(15):1965-1980

Agents: Isoproterenol hydrochloride **Vehicle:** PBS; sodium ascorbate; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Dose Isoproterenol (15 mg/kg/day); Controls received mp w/ vehicle; animal info: Male, 11-week-old; post op. care: Postoperative analgesia was achieved with a single dose of meloxicam 4 mg/kg; ; half-life (p.13); cardiovascular (chronic heart failure)

Q11009: X. Tang, *et al.* Echinochrome Prevents Sulfide Catabolism-Associated Chronic Heart Failure after Myocardial Infarction in Mice. *Marine Drugs* 2023;21(1):

Agents: Echinochrome A **Vehicle:** Saline; **Route:** IP; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Dose: (0.2, 0.6, 2.0 mg/kg/day); dose dependent; Controls received mp w/ vehicle; animal info: 9-12 week old; Ech-A is an antioxidant; cardiovascular (ischemia, myocardial infarction, heart failure)

Q10998: W. Simonides, *et al.* Divergent Thyroid Hormone Levels in Plasma and Left Ventricle of the Heart in Compensated and Decompensated Cardiac Hypertrophy Induced by Chronic Adrenergic Stimulation in Mice. *Metabolites* 2023;13(308):

Agents: Isoproterenol; phenylephrine **Vehicle:** Water, sterile, distilled; ascorbic acid; **Route:** SC; **Species:** Mice;

Strain: C57BL6/J-Dio3fl/flMerCreMer+/- (cD3KO-CS); **Pump:** 1007D; 1002; **Duration:** 7 days; 14 days;

ALZET Comments: Dose: 30 mg/kg/d; 0.1% ascorbic acid used; Controls received mp w/ vehicle; animal info: 12 weeks; cardiovascular; (ventricular hypertrophy, heart failure)

Q10996: S. Shen, *et al.* Leonurine attenuates angiotensin II-induced cardiac injury and dysfunction via inhibiting MAPK and NF-kappaB pathway. *Phytomedicine* 2023;108(154519)

Agents: Angiotensin II **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1002; **Duration:** 4 weeks;

ALZET Comments: Dose (1000 ng/kg/min); Controls received mp w/ vehicle; animal info: non-hypertensive; Blood pressure measured via Tail cuff; Blood pressure measurement (p.2) Fig. 1C; cardiovascular; Therapeutic indication (Hypertensive heart failure);



Q10995: S. A. Shah, *et al.* Obesity-Induced Coronary Microvascular Disease Is Prevented by iNOS Deletion and Reversed by iNOS Inhibition. *JACC Basic to Translational Science* 2023;8(5):501-514

Agents: 1400W **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** Not Stated; **Pump:** 1004; **Duration:** Not Stated; **ALZET Comments:** Dose (30 mg/kg/day); animal info: mice, 8 weeks of age; Blood pressure measured via Radiotelemetry; Blood pressure measurement (see pg.9) table 2; 1400W is a highly selective iNOS inhibitor/antagonist; obesity; diabetes; cardiovascular (coronary microvascular disease, heart failure)

Q11183: J. Qian, *et al.* Toll-like receptor-2 in cardiomyocytes and macrophages mediates isoproterenol-induced cardiac inflammation and remodeling. *FASEB Journal* 2023;37(2):e22740

Agents: Isoproterenol **Vehicle:** Ascorbic acid; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; TLR2KO; **Pump:** 1002; **Duration:** 2 w **ALZET Comments:** Dose (30 mg/kg/day); animal info (8 weeks old); cardiovascular; Therapeutic indication (Heart failure);

Q11056: D. Matsiukevich, *et al.* Characterization of a robust mouse model of heart failure with preserved ejection fraction. *American Journal of Physiology Heart and Circulatory Physiology* 2023;325(2):H203-H231

Agents: Angiotensin II; phenylephrine **Vehicle:** Saline; **Route:** CSF/CNS; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2004; 1002; **Duration:** 28 days; 3 days; 10 days;

ALZET Comments: Dose (1.5 µg/g/day ang II); (50 µg/g/day PE), pumps primed in 0.9% saline 24h 37degC; controls received mp w/ vehicle; animal info: 8- to 10-wk old; blood pressure measured via Noninvasive Methods; blood pressure measurement results see (p.212) Fig.3 L; behavioral testing (Treadmill exercise); cardiovascular (heart failure)

Q10901: P. Zhong, *et al.* Mitochondrial Derived Peptide MOTS-c Prevents the Development of Heart Failure Under Pressure Overload Conditions in Mice. *Journal of Cellular and Molecular Medicine* 2022;26(21):5369-5378

Agents: MOTs-c **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1004; **Duration:** 4 weeks; **ALZET Comments:** Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info: (Male; 8-10 weeks old); MOTS-c is a mitochondrial-derived peptide; peptides; cardiovascular; Therapeutic indication (Heart Failure);

Q10872: X. L. Zhang, *et al.* HMGB1-Promoted Neutrophil Extracellular Traps Contribute to Cardiac Diastolic Dysfunction in Mice. *Journal of American Heart Association* 2022;11(4):e023800

Agents: Aldosterone **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 4 w **ALZET Comments:** Dose (0.3 µg/h); Controls received mp w/ vehicle; animal info (Male; 8 weeks old; Weighed about 20-22 g); post op. care: heat support; behavioral testing (Exercise exhaustion test); Blood pressure measured via noninvasive blood pressure system; cardiovascular; Therapeutic indication (Heart failure with preserved ejection fraction);

Q10737: R. Zhai, *et al.* Myocardial GRK2 Reduces Fatty Acid Metabolism and beta-Adrenergic Receptor-Mediated Mitochondrial Responses. *International Journal of Molecular Sciences* 2022;23(5):

Agents: Isoproterenol **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** Wild-type C57BL/6; **Pump:** Not Stated; **Duration:** 6, 7 days;

ALZET Comments: Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (Male; 10-13 weeks old; ; Crossed with transgenic GRK2-overexpressing mice); cardiovascular; Therapeutic indication (Heart failure);

Q10849: Y. Yoshida, *et al.* Brown Adipose Tissue Dysfunction Promotes Heart Failure Via a Trimethylamine N-Oxide-Dependent Mechanism. *Scientific Reports* 2022;12(1):14883

Agents: Isoproterenol; Trimethylamine N-oxide **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Dose: (ISO 30 mg/kg/day; TMAO 25 mg/kg/day); animal info (Male; 11 weeks old); cardiovascular; Therapeutic indication (Heart failure);



Q10847: A. Yin, *et al.* Exercise-Derived Peptide Protects Against Pathological Cardiac Remodeling. *EBioMedicine* 2022;82(104164)

Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 2004; **Duration:** 4 weeks;
ALZET Comments: Dose: (1.5mg/kg/day); Controls received mp w/ vehicle; animal info: Eight-week-old male mice (22-25 g); Blood pressure measured via: tail cuff (Male systolic) 118.7 - 5.7mmHg (Female systolic) 112.8 - 5.9 mmHg. (Male diastolic) 74.2 -7.2 mmHg (Female diastolic) 70.8 - 5.0 mmHg (see pg.4); cardiovascular; "The results provide new insights into exercise-afforded cardioprotection in pathological cardiac remodeling and highlight the therapeutic potential of CCDC80tide in heart failure treatment." (pg.1)

Q10798: Q. Q. Wu, *et al.* Tax1 Banding Protein 1 Exacerbates Heart Failure in Mice by Activating ITCH-P73-BNIP3-Mediated Cardiomyocyte Apoptosis. *Acta Pharmacologica Sinica* 2022;43(10):2562-2572

Agents: Angiotensin II **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2004; **Duration:** 4 weeks;
ALZET Comments: Dose (1.4 mg kg/day); 0.9% NaCl; Controls received mp w/ vehicle; animal info(Male; 8-10 weeks old); peptides; cardiovascular; heart failure;

Q10723: E. Walsh-Wilkinson, *et al.* Age and Sex Hormones Modulate Left Ventricle Regional Response to Angiotensin II in Male and Female Mice. *American Journal of Physiology* 2022;323(4):H643-H658

Agents: Ang II **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2004; **Duration:** 28 days; 14 days;
ALZET Comments: Dose (1.5 mg/kg/day); Controls received mp w/ vehicle; animal info (male female 7 wk old gonadectomized); peptides; cardiovascular (heart failure)

Q10701: C. Toledo, *et al.* Medullary Astrocytes Mediate Irregular Breathing Patterns Generation in Chronic Heart Failure Through Purinergic P2X7 Receptor Signaling. *EBioMedicine* 2022;80(104044)

Agents: Clozapine-N-oxide dihydrochloride **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley;
Pump: 2ML2; **Duration:** 2 weeks;
ALZET Comments: Dose (100 mg/kg); Controls received mp w/ vehicle; animal info (Male; 16 weeks old;)

R0436: D. Olivari, *et al.* Searching for Preclinical Models of Acute Decompensated Heart Failure: a Concise Narrative Overview and a Novel Swine Model. *Cardiovascular Drugs and Therapy* 2022;36(4):727-738

Agents: Serelaxin **Vehicle:** Saline; **Route:** IV; **Species:** Pig; **Strain:** Sus scrofa domesticus; **Pump:** Not Stated; **Duration:** 48 hr
ALZET Comments: Dose: (30 µg/kg/day); Controls received mp w/ vehicle; animal info: 17 male pig weighing 34 ± 4 kg; post op. care: Analgesia was performed with butorphanol; Cardiovascular

Q10617: D. Murashige, *et al.* Extra-Cardiac BCAA Catabolism Lowers Blood Pressure and Protects From Heart Failure. *Cell Metabolism* 2022;34(11):1749-1764 e7

Agents: Isoproterenol **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice; **Strain:** BCKDK cKO; **Pump:** 1002; **Duration:** 14 days;
ALZET Comments: Dose (30 mg/kg/day.); Controls received mp w/ vehicle; animal info (mice); cardiovascular; Therapeutic indication (Heart failure);

Q10615: M. Muller, *et al.* Right Heart Failure in Mice Upon Pressure Overload Is Promoted by Mitochondrial Oxidative Stress. *JACC Basic Translational Science* 2022;7(7):658-677

Agents: Mito-TEMPO **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6J; C57BL/6N; **Pump:** 1004;
Duration: 4 weeks;
ALZET Comments: Dose: (0.7 mg/kg bw/d)animal info: Male mice; Mito-TEMPO is a mitochondrial antioxidant; cardiovascular;

Q10924: M. Ji, *et al.* Vaspin Ameliorates Cardiac Remodeling by Suppressing Phosphoinositide 3-Kinase/Protein Kinase B Pathway to Improve Oxidative Stress in Heart Failure Rats. *Journal of Cardiovascular Pharmacology* 2022;80(3):442-452

Agents: Angiotensin II **Vehicle:** Saline; **Route:** IP; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2004; **Duration:** 4 weeks;
ALZET Comments: Dose: (500 ng/kg/minute); Controls received mp w/ vehicle; animal info (Male (SD) rats (160-180 g); comparison of _ vs mp; (i.p. injection); Blood pressure measurement results (see pg. 3 table 2); cardiovascular;



Q10549: T. Iijima, *et al.* Discovery of Apararenone (MT-3995) as a Highly Selective, Potent, and Novel Nonsteroidal Mineralocorticoid Receptor Antagonist. *Journal of Medicinal Chemistry* 2022;65(12):8127-8143

Agents: Aldosterone **Vehicle:** EtOH; PEG 400; Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** 2004; **Duration:** 4 weeks;

ALZET Comments: Dose (0.75 µg/h/animal); 10% EtOH, 50% PEG400, 40% saline used; Controls received mp w/ vehicle; animal info (Male 7 weeks old); Blood pressure measured via telemetry transmitter system; cardiovascular; Therapeutic indication (Hypertension; Kidney disease; Heart failure);

Q10540: B. Hegyi, *et al.* Diabetes and Excess Aldosterone Promote Heart Failure With Preserved Ejection Fraction. *Journal of The American Heart Association* 2022;11(23):e027164

Agents: Aldosterone **Vehicle:** Saline; Ethanol; **Route:** SC; **Species:** Mice; **Strain:** C57BL6/6; **Pump:** 2004; **Duration:** 4 weeks;

ALZET Comments: Dose (0.3µg/h); 5% ethanol in saline used; Controls received mp w/ vehicle; animal info (Male and female WT, db/db mice); post op. care: buprenorphine 0.05-0.1 mg/kg, SC); cardiovascular;

Q10536: Y. Hada, *et al.* Cilostazol Attenuates AngII-Induced Cardiac Fibrosis in apoE Deficient Mice. *International Journal of Molecular Sciences* 2022;23(16):

Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** apoE; **Pump:** 2004; **Duration:** 28 days;

ALZET Comments: Dose: (1000 ng/kg/1 min)Controls received mp w/ vehicle; animal info: Male, 8- to 12-week-old / mice; Blood pressure measured via: tail cuff system SBP (mmHg) measurements see (pg.2)Table 1; Angiotensin II aka (Ang II); cardiovascular (Heart failure)

Q10526: J. F. Garbincius, *et al.* Enhanced NCLX-dependent mitochondrial Ca(2+) efflux attenuates pathological remodeling in heart failure. *Journal of Molecular and Cellular Cardiology* 2022;167(52-66

Agents: Angiotensin II; Phenylephrine hydrochloride **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Mice;

Strain: TRE-NCLX x αMHC-tTA; **Pump:** 1004; 2004; **Duration:** 2 weeks; 4 weeks;

ALZET Comments: "Dose: Ang II (1.44 mg/kg/day) AngII/PE 10 mg/kg/day + 50 mg/kg/day); Controls received mp w/ vehicle; animal info: Adult male female mice and age-matched αMHC-tTA between 8 and 25 weeks of age; post op. care: cefazolin at a dose of 40 mg/kg;

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

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

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

Q10468: H. Dridi, *et al.* IP3 receptor orchestrates maladaptive vascular responses in heart failure. *Journal of Clinical Investigation* 2022;132(4):

Agents: Angiotensin II; Norepinephrine **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Dose (ATII 1.1 mg/kg/d; NE 2.5 mg/kg/d); Blood pressure measured via radiotelemetric transmitters; peptides; cardiovascular;

Q10463: T. Devarakonda, *et al.* Chronic treatment with serelaxin mitigates adverse remodeling in a murine model of ischemic heart failure and modulates bioactive sphingolipid signaling. *Scientific Reports* 2022;12(1):8897

Agents: Serelaxin **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** CD1; **Pump:** Not Stated; **Duration:** 28 days;

ALZET Comments: Dose: (10 µg/kg/day)Controls received mp w/ vehicle; animal info: adult male mice, of 6-8 weeks of age, post op. care: (buprenorphine SR LAB, 0.5 mg/kg, s.c) and antibiotic (gentamicin, 0.7 mg/kg)ischemia (ischemic heart failure.); cardiovascular;



Q10501: K. Bottermann, *et al.* Cardiomyocyte p38 MAPK α suppresses a heart-adipose tissue-neutrophil crosstalk in heart failure development. *Basic Research in Cardiology* 2022;117(1):48

Agents: Ang II **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** C57Bl/6; **Pump:** 1003D; **Duration:** 2 days;
ALZET Comments: Dose (1.5 mg/kg/d); animal info (Male; 12 weeks old, tamoxifen-inducible, cardiomyocyte specific p38 MAPK α KO mice); Blood pressure measured via pressure-sensing catheters; peptides; cardiovascular (cardiac hypertrophy)

Q10880: X. Zhang, *et al.* Chronic GPR30 Agonist Therapy Causes Restoration of Normal Cardiac Functional Performance in a Male Mouse Model of Progressive Heart Failure: Insights into Cellular Mechanisms. *Life Sciences* 2021;285(119955)

Agents: G1 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1004; **Duration:** 2 weeks;
ALZET Comments: Dose: (150 ug/kg/day); Controls received mp w/ vehicle; animal info: male mice (~4 months old) weighing 26–34 g; G-1 is a G-protein coupled estrogen receptor; cardiovascular;

Q10881: L. Zhang, *et al.* Resveratrol Ameliorates Cardiac Remodeling in a Murine Model of Heart Failure With Preserved Ejection Fraction. *Frontiers in Pharmacology* 2021;12(646240)

Agents: Aldosterone, D- **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 4 w
ALZET Comments: Dose: (0.15 mg/h); Controls received mp w/ vehicle; animal info: Male mice (8–10 weeks old) Resveratrol is a natural phytoalexin antioxidant factor in HFpEF; cardiovascular;

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

Agents: Isoproterenol **Vehicle:** PBS; Ascorbic acid; **Route:** Not Stated; **Species:** Mice; **Strain:** Wild-type C57BL/6J;
Pump: Not Stated; **Duration:** 1 week;
ALZET Comments: Dose: (30mg/kg/day); 0.001% Ascorbic acid vehicle used; Controls received mp w/ vehicle; animal info: mice (8–12wk) and b2ARKO mice backcrossed; cardiovascular;

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

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

Q10825: C. Li, *et al.* Prognostic Value of Elevated Levels of Plasma N-Acetylneuraminic Acid in Patients With Heart Failure. *Circulation Heart Failure* 2021;14(11):e008459

Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1004; **Duration:** 28 days;
ALZET Comments: Dose (2.16 mg/kg per day); animal info (8 to 10 weeks; weigh about 24 g; male); peptides; cardiovascular; Therapeutic indication (Heart failure);

Q10212: H. Kitakata, *et al.* Ipeglimin prevents heart failure with preserved ejection fraction by recovering the impaired unfolded protein response in mice subjected to cardiometabolic stress. *Biochemical Biophysical Research Communications* 2021;572(185-190)

Agents: Ipeglimin **Vehicle:** Saline; **Route:** IP; **Species:** Mice; **Strain:** C57BL/6 J; **Pump:** Not Stated; **Duration:** Not Stated;
ALZET Comments: Dose: (250 ug/kg/min); Controls received mp w/ vehicle; animal info: male mice; 10-16 weeks of age; cardiovascular; (Heart failure)

Q10392: M. M. T. Islam, *et al.* Enhanced Heart Failure in Redox-Dead Cys17Ser PKAR1 α Knock-In Mice. *Journal of the American Heart Association* 2021;10(19):e021985

Agents: Angiotensin II **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** 1002; **Duration:** 14 days;
ALZET Comments: Dose (1 mg/kg/d); Blood pressure measured via CODa mouse rat tail-cuff system; peptides; cardiovascular;



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

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

Duration: 14; 28 days;

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

Q9819: D. Zhu, *et al.* Exchange proteins directly activated by cAMP mediate cardiac repolarization and arrhythmogenesis during chronic heart failure

Didi. Canadian Journal of Physiology and Pharmacology 2020;

Agents: 8-pCPT **Vehicle:** Not Stated; **Route:** SC; **Species:** Guinea Pig; **Strain:** guinea; **Pump:** 2006; **Duration:** 6 weeks;

ALZET Comments: Dose (); Controls received mp w/ vehicle; animal info (adult male pigs, 250-280 g); dependence;

Q9820: Q. Zhou, *et al.* The anti-microbial peptide LL-37/CRAMP levels are associated with acute heart failure and can attenuate cardiac dysfunction in multiple preclinical models of heart failure. *Theranostics* 2020;10(14):6167-6181

Agents: Angiotensin II; Isoproterenol **Vehicle:** Saline; Acetic Acid; Ascorbic Acid; **Route:** Not Stated; **Species:** Mice;

Strain: C57BL/6; **Pump:** 2004; 2002; **Duration:** 4 weeks; 2 weeks;

ALZET Comments: Dose (1.3 mg/kg/day Angiotensin II; 30 mg/kg/day Isoproterenol); 0.006% Acetic Acid, 0.002% Ascorbic Acid used; Controls received mp w/ vehicle; animal info (Male C57BL/6 mice at 10-12 weeks old); Angiotensin II aka Ang II, Isoproterenol aka ISO; cardiovascular;

Q10875: M. Zhang, *et al.* CaMKII Exacerbates Heart Failure Progression By Activating Class I HDACs. *Journal of Molecular and Cellular Cardiology* 2020;149(73-81

Agents: Quisinostat **Vehicle:** DMSO; Saline; **Route:** IP; **Species:** Mice; **Strain:** CaMKII δ C-tg; **Pump:** Not Stated; **Duration:** 2 w

ALZET Comments: Dose: (10 mg/kg/day); 5% DMSO vehicle used Controls received mp w/ vehicle; animal info: mice at the age of 6–8 weeks; quisinostat is selective HDAC1 inhibitor; cardiovascular;

Q9903: Y. Yang, *et al.* Interleukin-9 Aggravates Isoproterenol-Induced Heart Failure by Activating Signal Transducer and Activator of Transcription 3 Signalling. *Canadian Journal of Cardiology* 2020;36(11):1770-1781

Agents: Isoproterenol **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 14 d

ALZET Comments: Dose (30 mg/kg/d); Controls received mp w/ vehicle; animal info (Male mice, aged 8-10 weeks and weighing 25.2 \pm 2 g); Isoproterenol aka ISO; cardiovascular;

Q9899: H. J. Yang, *et al.* MD1 deletion exaggerates cardiomyocyte autophagy induced by heart failure with preserved ejection fraction through ROS/MAPK signalling pathway. *Journal of Cellular and Molecular Medicine* 2020;24(16):9300-9312

Agents: D-Aldosterone **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6, MD1-KO; **Pump:** Not Stated; **Duration:** 4 w

ALZET Comments: Dose (0.15 mg/hr); Controls received mp w/ vehicle; animal info (8-10 weeks old, Male); cardiovascular;

Q9898: H. J. Yang, *et al.* Knockout of MD1 contributes to sympathetic hyperactivity and exacerbates ventricular arrhythmias following heart failure with preserved ejection fraction via NLRP3 inflammasome activation. *Experimental Physiology* 2020;105(6):966-978

Agents: Aldosterone, D- **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** MD1 knockout; **Pump:** Not Stated; **Duration:** 4 w

ALZET Comments: Dose (0.15 mg/hr); Controls received mp w/ vehicle; animal info (Male, 8 weeks); cardiovascular;

Q9536: L. Wang, *et al.* Treatment With Treprostinil and Metformin Normalizes Hyperglycemia and Improves Cardiac Function in Pulmonary Hypertension Associated With Heart Failure With Preserved Ejection Fraction. *Arteriosclerosis, Thrombosis, and Vascular Biology* 2020;40(6):1543-1558

Agents: Treprostinil **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat, Mice; **Strain:** ZSF1; **Pump:** 2ML4, 2006; **Duration:** 16 weeks;

ALZET Comments: Dose (40, 300, and 900 ng/kg/min); animal info (8-week old male obese ZSF1 rats; 8-week old male C57BL/6J mice); pumps replaced every 28 or 42 days; long-term study; cardiovascular;



Q9946: G. Wang, *et al.* MicroRNA-132 attenuated cardiac fibrosis in myocardial infarction-induced heart failure rats. *Bioscience Reports* 2020;40(9):

Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** 2004; **Duration:** 4 weeks; **ALZET Comments:** Dose (500 ng/kg/min); Controls received mp w/ vehicle; animal info (Male, 180-200 g); cardiovascular;

Q10067: S. Tannu, *et al.* Experimental model of congestive heart failure induced by transverse aortic constriction in BALB/c mice. *Journal of Pharmacological and Toxicological Methods* 2020;106(106935)

Agents: Enalapril **Vehicle:** DMSO; Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; BALB/c; **Pump:** 2006; **Duration:** 6 weeks; **ALZET Comments:** Dose (20 mg/kg/day); 50% DMSO, 50% Saline used; Controls received mp w/ vehicle; animal info (male 10-11 weeks old); 78 mmHg - 103 mmHg; cardiovascular;

Q9481: A. Soltani Hekmat, *et al.* Angiotensin (1-7) and Apelin co-therapy: New strategy for heart failure treatment of rats. *Anatol J Cardiol* 2020;23(4):209-217

Agents: Isoproterenol; Angiotensin (1-7); Apelin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2001; **Duration:** 10 days;

ALZET Comments: Dose (5 mg/kg Isoproterenol; 30 µg/kg/day Angiotensin (1-7); 20 µg/kg Apelin); Controls received mp w/ vehicle; animal info (Malerats weighing 180 to 250 g); Blood pressure measured via heparin saline filled catheter; 96.7±10.7 mmHg - 129.3±9.3 mmHg; cardiovascular;

Q9477: W. Shuai, *et al.* High-Choline Diet Exacerbates Cardiac Dysfunction, Fibrosis, and Inflammation in a Mouse Model of Heart Failure With Preserved Ejection Fraction. *Journal of Cardiac Failure* 2020;26(8):694-702

Agents: Aldosterone **Vehicle:** Saline; **Route:** IP; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 4 weeks; **ALZET Comments:** Controls received mp w/ vehicle; animal info (male mice, eight weeks old, weighing 22-26 g); 103.86 mmHg - 120.88 mmHg; cardiovascular;

Q9478: W. Shuai, *et al.* Loss of myeloid differentiation protein 1 promotes atrial fibrillation in heart failure with preserved ejection fraction. *ESC Heart Failure* 2020;7(2):626-638

Agents: Aldosterone **Vehicle:** Saline; **Route:** IP; **Species:** Mice; **Strain:** MD1-KO; **Pump:** Not Stated; **Duration:** 4 weeks; **ALZET Comments:** Dose (0.15-µg/h); 1% NaCl used; Controls received mp w/ vehicle; animal info (8-week-old mice); 113.18 mmHg - 127.1 mmHg; cardiovascular;

Q8945: Y. Sawa, *et al.* Pretreatment with KGA-2727, a selective SGLT1 inhibitor, is protective against myocardial infarction-induced ventricular remodeling and heart failure in mice. *Journal of Pharmacological Sciences* 2020;142(1):16-25

Agents: KGA-2727 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2006; **Duration:** 5 weeks; **ALZET Comments:** Dose (100 mg/ml); animal info (male mice, 9 weeks old, 25-30 g); KGA-2727 aka Selective SGLT1 inhibitor; cardiovascular;

R0410: S. Ren, *et al.* Implantation of an Isoproterenol Mini-Pump to Induce Heart Failure in Mice. *JoVE* 2020;

Agents: Isoproterenol **Vehicle:** Saline; **Route:** IP; **Species:** Mice; **Strain:** Not Stated; **Pump:** 1004; **Duration:** 3 weeks; 4 weeks; **ALZET Comments:** Dose (30 mg/kg/day); 0.9% saline used; Controls received mp w/ vehicle; animal info (9+ week old female, 18+ grams, no max body weight); post op. care (dedicated intubator to keep warm and dry, carprofen 5 mg/kg s.c. every 48 h as needed to minimize pain, 0.25 mg/ml amoxicillin in drinking water for 5 days to prevent surgical site infections); comparison of daily injections vs mp; cardiovascular (ISO administration induce cardiac failure); good methods (preparation, filling, priming, surgical implantation) pgs. 2-5; "The overall goal of this method is to induce heart failure in mice using an implanted mini pump that releases ISO continuously to mimic chronic sympathetic activation found in heart failure patients." pg. 2; "Continuous administration causes immediate hypotension on the day of pump implantation followed by normalization of blood pressure to mild hypertension by day 220. The overall hemodynamic trends more closely mimic chronically activated sympathetic hormones in heart failure patients." pg. 7; susceptibility to ISO is variable among mouse strains;



Q8913: C. Nofi, *et al.* Chronic dantrolene treatment attenuates cardiac dysfunction and reduces atrial fibrillation inducibility in a rat myocardial infarction heart failure model. *Heart Rhythm Society* 2020;1(2):126-135

Agents: Dantrolene **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** Not Stated; **Duration:** 4 w
ALZET Comments: Dose (10 mg/kg/d); Controls received mp w/ vehicle; animal info (Adult Male and Female rats); cardiovascular;

Q8669: M. Mishra, *et al.* Administration of apo A-I (Milano) nanoparticles reverses pathological remodelling, cardiac dysfunction, and heart failure in a murine model of HFpEF associated with hypertension. *Scientific Reports* 2020;10(1):8382

Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6 N; **Pump:** 2004; 2006; **Duration:** 4 weeks;
ALZET Comments: Dose (600 ng/kg/min); 1% NaCl used; Controls received mp w/ vehicle; animal info (male mice, 12 weeks old); cardiovascular;

Q8890: C. M. Lucero, *et al.* Cardiac remodeling and arrhythmogenesis are ameliorated by administration of Cx43 mimetic peptide Gap27 in heart failure rats. *Scientific Reports* 2020;10(1):6878

Agents: Peptide, Gap27 **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML4; **Duration:** 28 days;
ALZET Comments: Dose (1 µg/kg); animal info (Adult male rats (320 ± 9 g)); Gap27 aka Cx43 mimetic peptide; cardiovascular;

Q8643: M. Li, *et al.* Impact of Peripheral alpha7-Nicotinic Acetylcholine Receptors on Cardioprotective Effects of Donepezil in Chronic Heart Failure Rats. *Cardiovasc Drugs Ther* 2020;

Agents: Methyllycaconitine **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML4; **Duration:** 4 w
ALZET Comments: Dose (0.1 µg/kg/day Methyllycaconitine); Controls received mp w/ vehicle; animal info (male rats, 250-280 g, 8 weeks old); Methyllycaconitine aka MLA; ALZET brain infusion kit used; Brain coordinates (4–4.5 mm ventral, 1.4 mm lateral, and 0.8 mm posterior from the bregma); dental cement used; cardiovascular;

Q8623: T. Lapinskas, *et al.* Serelaxin Improves Regional Myocardial Function in Experimental Heart Failure: An In Vivo Cardiac Magnetic Resonance Study. *Journal of the American Heart Association* 2020;9(3):e013702

Agents: Serelaxin **Vehicle:** Acetate, Sodium; **Route:** Not Stated; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not Stated;
Duration: 4 weeks;
ALZET Comments: Dose (0.5 mg/kg/day); Controls received mp w/ vehicle; animal info (Eight- to 9-week-old male mice (weight 22–25 g)); cardiovascular;

Q8455: T. R. Eijgenraam, *et al.* The phospholamban p.(Arg14del) pathogenic variant leads to cardiomyopathy with heart failure and is unresponsive to standard heart failure therapy. *Scientific Reports* 2020;10(1):9819

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

Q8427: M. Ciccarelli, *et al.* Pharmacological inhibition of GRK2 improves cardiac metabolism and function in experimental heart failure. *ESC Heart Failure* 2020;7(4):1571-1584

Agents: Cyclic Peptide **Vehicle:** Isoproterenol; **Route:** SC; **Species:** Mice; **Strain:** C57/Bl6; **Pump:** 1004; **Duration:** 4 weeks;
ALZET Comments: Dose (2 mg/kg/day); Controls received mp w/ vehicle; animal info (male mice at the age of 12 weeks, 25-30 g); Blood pressure measured via tail-cuff method; Cyclic Peptide aka C7; peptides; cardiovascular;

Q8397: I. Cabrera-Aguilera, *et al.* The conventional isoproterenol-induced heart failure model does not consistently mimic the diaphragmatic dysfunction observed in patients. *PLoS One* 2020;15(7):e0236923

Agents: Isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1004; **Duration:** 30 days;
ALZET Comments: Dose (10 mg/kg/day); 0.9% NaCl used; Controls received mp w/ vehicle; animal info (adult male, 10 weeks old); cardiovascular;



Q7655: J. Zou, *et al.* Transient inhibition of neddylation at neonatal stage evokes reversible cardiomyopathy and predisposes the heart to isoproterenol-induced heart failure. *American Journal of Physiology Heart and Circulatory Physiology* 2019;316(6):H1406-H1416

Agents: isoproterenol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 1002; **Duration:** 14 days; **ALZET Comments:** Dose (30 mg/kg/day); animal info (3 months,); isoproterenol is a beta-adrenergic receptor agonist; cardiovascular; pump removed on day 14 of infusion. Cohort selected from previous group receiving IP injection;

Q7518: M. X. Zhang, *et al.* Exchange-protein activated by cAMP (EPAC) regulates L-type calcium channel in atrial fibrillation of heart failure model. *European Review for Medical and Pharmacological Sciences* 2019;23(5):2200-2207

Agents: isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL6; **Pump:** 1004; **Duration:** 3 weeks; **ALZET Comments:** Dose (30 mg/kg/day); Controls received mp w/ vehicle; animal info (8-week male mice); cardiovascular; Therapeutic indication (atrial fibrillation, heart failure);

Q7645: A. Yoshida, *et al.* (Pro)renin Receptor Blockade Ameliorates Heart Failure Caused by Chronic Kidney Disease. *J Cardiac Fail* 2019;25(4):286-300

Agents: handle region peptide **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not Stated; **Duration:** 4 w **ALZET Comments:** Dose (0.01, 0.3 mg/kg/d); Controls received sham surgery and mp w/ vehicle; animal info (8 weeks,); HRP competes with the handle region of prorenin for binding to (P)RR and inhibits nonproteolytic activation of prorenin.; enzyme inhibitor ((pro)renin receptor); peptides; cardiovascular; Therapeutic indication (candidate to treat heart failure in CKD due to inhibition of unfavorable signaling pathways via both AT1R and (P)RR);

R0387: A. A. Voors, *et al.* Adrenomedullin in heart failure: pathophysiology and therapeutic application. *European Journal of Heart Failure* 2019;21(2):163-171

Agents: Adrenomedullin **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Not Stated; **Pump:** Not Stated; **Duration:** 7 weeks; 3 days; 7 days; 4 weeks; **ALZET Comments:** Controls received mp w/ vehicle; cardiovascular;

Q7420: A. M. Schiller, *et al.* Increased Brain-Derived Neurotrophic Factor in Lumbar Dorsal Root Ganglia Contributes to the Enhanced Exercise Pressor Reflex in Heart Failure. *Int J Mol Sci* 2019;20(6):

Agents: Brain-derived neurotrophic factor, Anti- **Vehicle:** Vehicle not stated; **Route:** CSF/CNS; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 1007D; **Duration:** 1 Week; **ALZET Comments:** Dose (10 g/mL); Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats weighing 420 to 510 g); post op. care (Betadine, buprenorphine); cardiovascular;

Q8819: A. Raso, *et al.* Therapeutic Delivery of miR-148a Suppresses Ventricular Dilation in Heart Failure. *Molecular Therapy* 2019;27(3):584-599

Agents: Chronic cardiotrophin 1 or isoproterenol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** 2002; **Duration:** 2 weeks; **ALZET Comments:** Dose (Chronic cardiotrophin 1-20 ug/kg/day or isoproterenol- 60 mg/kg/day); Controls received mp w/ vehicle; animal info (2 months old); cardiovascular;

Q8363: H. Peng, *et al.* N-acetyl-seryl-aspartyl-lysyl-proline treatment protects heart against excessive myocardial injury and heart failure in mice. *Can J Physiol Pharmacol* 2019;97(8):753-765

Agents: N-acetyl-seryl-aspartyl-lysyl-proline **Vehicle:** Not stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not stated; **Duration:** 2 or 5 weeks; **ALZET Comments:** Dose (1.6 mg/kg/day); Controls received mp w/ vehicle; animal info (12 weeks old, Male,); N-acetyl-seryl-aspartyl-lysyl-proline aka AC-SDKP; peptides; cardiovascular;



- Q7614:** J. Nie, *et al.* Ranolazine prevents pressure overload-induced cardiac hypertrophy and heart failure by restoring aberrant Na(+) and Ca(2+) handling. *J Cell Physiol* 2019;234(7):11587-11601
Agents: Ranolazine **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 1004; **Duration:** 4 weeks;
ALZET Comments: Dose (40 mg/kg/d); Controls received mp w/ vehicle; animal info (, 8 week old, Male); enzyme inhibitor (sodium current inhibitor); cardiovascular;
- Q6956:** G. Naruse, *et al.* The Intestine Responds to Heart Failure by Enhanced Mitochondrial Fusion through Glucagon-like Peptide-1 Signaling. *Cardiovascular Research* 2019;
Agents: Exendin (9-39) **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Not Stated; **Pump:** Not Stated; **Duration:** 5 w
ALZET Comments: Dose (2.2 nmol/kg/day); cardiovascular;
- Q7374:** X. Ma, *et al.* A mouse model of heart failure exhibiting pulmonary edema and pleural effusion: Useful for testing new drugs. *J Pharmacol Toxicol Methods* 2019;96(78-86
Agents: Enalapril **Vehicle:** DMSO, Saline; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** 2006; **Duration:** 6 weeks;
ALZET Comments: Dose (20 mg/kg/day); 50% DMSO used; Controls received sham mp implantation; Controls received sham mp implantation;
- Q9769:** A. Kumar, *et al.* Alpha-calcitonin gene-related peptide prevents pressure-overload induced heart failure: role of apoptosis and oxidative stress. *Physiological Reports* 2019;7(21):e14269
Agents: Alpha-calcitonin gene-related peptide **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57/BL6; **Pump:** 1007D; **Duration:** 28 days;
ALZET Comments: Dose (4 mg/kg b.w/day per mouse); Controls received mp w/ vehicle; animal info (Eight-week-old male); pumps replaced every 7 days; Alpha-calcitonin gene-related peptide aka a-CGRP; cardiovascular;
- Q8035:** C. C. Hsieh, *et al.* Mitochondrial protection by simvastatin against angiotensin II-mediated heart failure. *Br J Pharmacol* 2019;176(19):3791-3804
Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** Not stated; **Duration:** 14 days;
ALZET Comments: Dose (1.5 mg/kg/day); Controls received mp w/ vehicle; animal info (Male, , 8 weeks old); cardiovascular;
- Q7996:** J. C. B. Ferreira, *et al.* A selective inhibitor of mitofusin 1-betaIIIPKC association improves heart failure outcome in rats. *Nat Commun* 2019;10(1):329
Agents: Global β IIIPKC inhibitor; TAT47-57-SAM β A peptide Mfn1- β IIIPKC inhibitor **Vehicle:** Not stated; **Route:** SC; **Species:** Rat; **Strain:** Not Stated; **Pump:** Not stated; **Duration:** 6 weeks;
ALZET Comments: Dose (3 mg/kg/day); animal info (Male); pumps replaced every 2 weeks; cardiovascular;
- Q7950:** W. Cai, *et al.* Translationally controlled tumor protein (TCTP) plays a pivotal role in cardiomyocyte survival through a Bnip3-dependent mechanism. *Cell Death Dis* 2019;10(8):549
Agents: Isoproterenol **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 2, 7 days;
ALZET Comments: Dose (60 mg/kg/day); animal info (2-3 months, male,); comparison of IP DOX injection and TAC vs mp; cardiovascular; mp used for ISO-induced heart failure model. mp model not stated.;
- Q7946:** M. Becirovic-Agic, *et al.* Quantitative trait loci associated with angiotensin II and high-salt diet induced acute decompensated heart failure in Balb/CJ mice. *Physiol Genomics* 2019;51(7):279-289
Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** Balb/CJ; C57BL/6J; **Pump:** 1007D; **Duration:** 4 days;
ALZET Comments: Dose (0.5 μ g/min/kg); Controls received mp w/ agent; animal info (7-10 or 20 weeks, male,); post op. care (Buprenorphine 0.05 mg/kg SC); cardiovascular;