



**Recent References (2016-Present) on the Administration of Estrogens
Using ALZET® Osmotic Pumps**

Q10613: N. Moskovits, *et al.* Palbociclib in Combination With Sunitinib Exerts a Synergistic Anti-Cancer Effect in Patient-Derived Xenograft Models of Various Human Cancers Types. *Cancer Letters* 2022;536(215665

Agents: Estradiol **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 28 days;

ALZET Comments: Dose (1.08 mg/pellet); animal info (5–8 weeks old immunodeficient NRG or NSG mice (NSG, NOD.Cg-25 PrkdcscidIl2rgtm1Wjl/SzJl; NRG, NOD.Cg-Rag1tm1Mom Il2rgtm1Wjl/SzJl) female or male according to the patient's sex.); cancer (Breast);

Q10817: K. Kaster, *et al.* A Novel Assay to Assess the Effects of Estrogen on the Cardiac Calmodulin Binding Equilibrium. *Life Sciences* 2022;290(120247

Agents: Estradiol, 17B **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Dose (Estradiol 30 ug/day); animal info Sprague-Dawley (9 weeks old; Female ovariectomized); replacement therapy (Estrogen);

Q10538: E. E. Handley, *et al.* Estrogen Enhances Dendrite Spine Function and Recovers Deficits in Neuroplasticity in the prpTDP-43(A315T) Mouse Model of Amyotrophic Lateral Sclerosis. *Molecular Neurobiology* 2022;59(5):2962-2976

Agents: Estradiol **Vehicle:** Saline; DMSO; **Route:** SC; **Species:** Mice; **Pump:** 2004; **Duration:** 60 days;

ALZET Comments: Dose (10 mg/ml); 50% DMSO used; Controls received mp w/ vehicle; animal info (Female; Wild-type and TDP-43; Ovariectomy); wound clips used; pumps replaced every 4 wk; replacement therapy (Estrogen); neurodegenerative (ALS)

Q10324: Z. L. Sebo, *et al.* Testosterone metabolites differentially regulate obesogenesis and fat distribution. *molecular Metabolism* 2021;44(101141

Agents: Testosterone; Dihydrotestosterone; Estradiol; Letrozole; Bicalutamide **Vehicle:** 2-hydroxypropyl-B-cyclodextrin; PBS; DMSO; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** Not Stated;

ALZET Comments: Dose: Testosterone (2 mg/kg body weight/day); Estradiol (2 ug/kg body weight/day); Letrozole (0.4 mg/kg body weight/day); Dutasteride (0.5 mg/kg body weight/day); 10% DMSO vehicle used Controls received mp w/ vehicle; animal info: ARdY mice and mTmG mice 3 weeks of age; replacement therapy; (Testosterone)dependence;

Q10311: A. Ribon-Demars, *et al.* Lung oxidative stress and transcriptional regulations induced by estradiol and intermittent hypoxia. *Free Radical Biology and Medicine* 2021;164(119-129

Agents: Estradiol, 17-B **Vehicle:** Propylene glycol; DMSO; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 21 days;

ALZET Comments: Dose: (0.5 mg/kg/day); (50% Propylene glycol and 50% dimethyl sulfoxide) vehicle used; animal info: Sprague-Dawley female rats (57–70 days old - initial body weight 250–300 g); post op. care: All animals received systemic (buprenorphine - 0.01mg/kg – sc) and local analgesia (lidocaine + bupivacaine – total dose 7 and 3.5 mg/kg at the sites of incision) immediately before surgery and 2 consecutive days of carprofen (20 mg/kg) starting immediately after surgery; 17β-Estradiol aka (E2)"

Q9363: F. Marcouiller, *et al.* Metabolic responses to intermittent hypoxia are regulated by sex and estradiol in mice. *American Journal of Physiology Endocrinology and Metabolism* 2021;320(2):E316-E325

Agents: 17 B-Estradiol **Vehicle:** DMSO; Propylene Glycol; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Dose (0.5 ug/day); 50% DMSO used; Controls received mp w/ vehicle; animal info (C57BL/6 mice, 2-3 months old); 17 B-Estradiol aka E2; replacement therapy (estradiol);

Q9355: J. Liu, *et al.* Maternal Diabetes-Induced Suppression of Oxytocin Receptor Contributes to Social Deficits in Offspring. *Frontiers in Neuroscience* 2021;15(634781

Agents: Estrogen receptor beta; Oxytocin; Lentivirus **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Animal info (Male mice, 6 weeks old); behavioral testing (Animal Behavior Test); Brain coordinates (anteroposterior (AP) = –1.4, mediolateral (ML) = ±3.5, dorsoventral (DV) = –5.1); neurodegenerative (Autism spectrum disorders);



Q10203: X. Jin, *et al.* Oestrogen inhibits salt-dependent hypertension by suppressing GABAergic excitation in magnocellular AVP neurons. *Cardiovascular Research* 2021;117(10):2263-2274

Agents: Oestrogen; ICI 182780 **Vehicle:** Hydroxypropyl-b-cyclodextrin; **Route:** CSF/CNS (intracerebral); **Species:** Rat; **Pump:** 2002; **Duration:** Not Stated;

ALZET Comments: 20% hydroxypropyl-b-cyclodextrin used; Controls received mp w/ vehicle; animal info: Sprague-Dawley rats, 6–7weeks of age; post op. care: antibiotic (ubacillin); Blood pressure measured via: Tail cuff; Telemetry method; Blood pressure results (see pg.11); Oestrogen aka E2; ICI182780 aka (ICI); Brain Infusion Kit 2 used; Brain coordinates ((AP: 1.0mm from the bregma, ML: 1.6mm from the midline, DV: 4mm below the surface of the skull); cardiovascular;

Q10318: H. S. Huang, *et al.* Insuline-Like Growth Factor-2 (IGF2) and Hepatocyte Growth Factor (HGF) Promote Lymphomagenesis in p53-null Mice in Tissue-specific and Estrogen-signaling Dependent Manners. *Journal of Cancer Research and Clinical Oncology* 2021;12(20):6021-6030

Agents: Estrogen **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 28 days;

ALZET Comments: Dose: (80 nM); Controls received mp w/ vehicle; animal info: male Trp53-/- mice, wild type strain C57BL6/J; cancer (Lymphoma); dependence;

Q10317: H. Huang, *et al.* Liraglutide via Activation of AMP-Activated Protein Kinase-Hypoxia Inducible Factor-1alpha-Heme Oxygenase-1 Signaling Promotes Wound Healing by Preventing Endothelial Dysfunction in Diabetic Mice. *Frontiers in Physiology* 2021;12(660263

Agents: Liraglutide; Compound C; 2-methoxyestradiol **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 4 wks

ALZET Comments: Dose: Lira (200 µg/kg/day); Cpd C (1.5 mg/kg/day); 2-ME (40 mg/kg/day); Controls received mp w/ vehicle; animal info: 8-week-old mice Diabetic db/db mice; Liraglutide aka (Lira); Liraglutide is a GLP-1 Receptor Agonist; Cpd C aka (Compound C); 2-ME aka 2-methoxyestradiol is an inhibitor of Hif-1a; dependence;

Q9246: E. Y. Gohar, *et al.* Activation of G protein-coupled estrogen receptor 1 ameliorates proximal tubular injury and proteinuria in Dahl salt-sensitive female rats. *American Journal of Physiology Regulatory, Integrative Comparative Physiology* 2021;320(3):R297-R306

Agents: G protein-coupled estrogen receptor 1 **Vehicle:** DMSO; Saline; **Route:** IP; **Species:** Rat; **Pump:** 2ML4; **Duration:** Not Stated;

ALZET Comments: Dose (400 µg/kg/day); 75% DMSO in Saline used; Controls received mp w/ vehicle; animal info (female Dahl SS rats, 12-14 weeks old); Blood pressure measured via telemetry; G protein-coupled estrogen receptor 1 aka GPER1; cardiovascular;

Q9441: W. Sakuma, *et al.* Antidepressant effect of BE360, a new selective estrogen receptor modulator, activated via CREB/BDNF, Bcl-2 signaling pathways in ovariectomized mice. *Behavioural Brain Research* 2020;393(112764

Agents: Estradiol, 17B-; Tamoxifen; Raloxifene; BE360 **Vehicle:** PEG 300; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 2wk

ALZET Comments: Dose (0.1 µg/day 17B-Estradiol; 1000 µg/day Tamoxifen; 1000 µg/day Raloxifene; 30 and 100 µg/day BE360); animal info (Female ddY mice (8 weeks old)); behavioral testing (Forced swimming test); 17B-Estradiol aka E2, Tamoxifen aka TAM, Raloxifene aka RAL; replacement therapy (estradiol);

Q10303: A. V. Prakapenka, *et al.* Intranasal 17beta-Estradiol Modulates Spatial Learning and Memory in a Rat Model of Surgical Menopause. *Pharmaceutics* 2020;12(12):

Agents: Estradiol, 17-B **Vehicle:** PEG300; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Dose: (0.04 mCi per kg body weight); Controls received mp w/ vehicle; animal info: 9–11-month-old (Study 1) and 40 9–10-month-old (Study 2) female Fischer-344CDF virgin rats; post op. care: carprofen (5 mg/mL/kg) for pain; behavioral testing: Water Radial-Arm Maze; Morris Water Maze; Visible Platform; Open Field 17 B-Estradiol aka (E2); neurodegenerative;

Q8646: S. K. Mamta, *et al.* Controlled release of sex steroids through osmotic pump alters brain GnRH1 and catecholaminergic system dimorphically in the catfish, *Clarias gariepinus*. *Brain Research Bulletin* 2020;164(325-333

Agents: Estradiol, 17B-; Testosterone, 17a-methyl **Vehicle:** Ethanol; Saline; **Route:** IP; **Species:** Fish; **Pump:** 1007D; **Duration:** 21 days;



ALZET Comments: Dose (0.48 ug/day); Controls received mp w/ vehicle; animal info (male and female catfish); functionality of mp verified by residual volume; 17B-estradiol aka E2, 17a-methyltestosterone aka MT; replacement therapy (testosterone; estradiol);

Q8873: Y. Lu, *et al.* Neuron-Derived Estrogen Is Critical for Astrocyte Activation and Neuroprotection of the Ischemic Brain. The Journal of Neuroscience 2020;40(38):7355-7374

Agents: Estradiol, 17B- **Vehicle:** Cyclodextrin; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 14 days;

ALZET Comments: Dose (0.0167 mg); 20% Cyclodextrin used; Controls received mp w/ vehicle; animal info (three-month-old ovariectomized female mice); behavioral testing (Barnes Maze; Novel Object Recognition Test); 17B-Estradiol aka E2; ischemia (Ischemic Brain);

Q8591: S. V. Koebele, *et al.* Characterizing the effects of tonic 17beta-estradiol administration on spatial learning and memory in the follicle-deplete middle-aged female rat. Hormones and Behavior 2020;126(104854

Agents: Estradiol, 17-beta- **Vehicle:** PEG; **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** 6 weeks;

ALZET Comments: Dose (3 ug/day); Controls received mp w/ vehicle; animal info (female, virgin, Fischer-344 rats, 11 months old); 17-beta-estradiol aka E2; replacement therapy (estradiol);

Q8584: Z. Z. Kirshner, *et al.* Impact of estrogen receptor agonists and model of menopause on enzymes involved in brain metabolism, acetyl-CoA production and cholinergic function. Life Sciences 2020;256(117975

Agents: 17 B-Estradiol; 4,4',4''-(4- Propyl-[1H]-pyrazole-1,3,5-triyl) trisphenol; Diarylpropionitrile; G-1 **Vehicle:** DMSO; Hydroxypropyl-B-cyclodextrin; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 30 days;

ALZET Comments: Dose (3 ug/day 17 B-Estradiol; 5 ug/day other agonists); 10% DMSO, 20% Hydroxypropyl-B-Cyclodextrin used; Controls received mp w/ vehicle; animal info (Female Sprague-Dawley rats, 11 weeks of age); 17 B-Estradiol aka E2; 4,4',4''-(4- Propyl-[1H]-pyrazole-1,3,5-triyl) trisphenol aka PPT; Diarylpropionitrile aka DPN; G-1 aka GPER1 agonist; replacement therapy (estradiol);

Q8542: R. Hornung, *et al.* Reduced activity of GAD67 expressing cells in the reticular thalamus enhance thalamic excitatory activity and varicella zoster virus associated pain. Neuroscience Letters 2020;736(135287

Agents: Estradiol benzoate, 17-beta- **Vehicle:** PEG; **Route:** SC; **Species:** Rat; **Pump:** Not stated; **Duration:** 28 days;

ALZET Comments: Dose (750 ng/6 ul/day); animal info (Transgenic male (300 g) and female Long Evans rats (260 g)); replacement therapy (estradiol);

Q8410: J. R. Chen, *et al.* Nox4 Expression Is Not Required for OVX-Induced Osteoblast Senescence and Bone Loss in Mice. JBMR Plus 2020;4(8):e10376

Agents: Estradiol, 17B- **Vehicle:** Not stated; **Route:** Intraovarian; **Species:** Mice; **Pump:** Not stated; **Duration:** 8 weeks;

ALZET Comments: Dose (20 ug/kg/day); animal info (Six-month-old WT C57Bl6 mice); 17B-Estradiol aka E2; replacement therapy (estradiol);

Q7504: Y. D. Wang, *et al.* 17beta-estradiol preserves right ventricular function in rats with pulmonary arterial hypertension: an echocardiographic and histochemical study. International Journal of Cardiovascular Imaging 2019;35(3):441-450

Agents: Estradiol, 17 beta- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 5 weeks;

ALZET Comments: Dose (75 µg/kg/d); Controls received mp w/ vehicle; animal info (Male 8 week old Sprague-Dawley rats (300–350 g)); cardiovascular; Therapeutic indication (Pulmonary arterial hypertension);

Q9067: K. Sharma, *et al.* Sexually dimorphic oxytocin receptor-expressing neurons in the preoptic area of the mouse brain. PLoS One 2019;14(7):e0219784

Agents: 17B-Estradiol **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** Not Stated;

ALZET Comments: Dose (13.9 mM); Controls received mp w/ vehicle; animal info (Female, 6-8 weeks old, 20-23 g); post op. care (Buprenorphine); gene therapy;



Q8831: A. Ribon-Demars, *et al.* Protective roles of estradiol against vascular oxidative stress in ovariectomized female rats exposed to normoxia or intermittent hypoxia. *Acta Physiologica* 2019;225(2):e13159

Agents: 17B Estradiol **Vehicle:** PEG/DMSO; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; 2006; **Duration:** 7 days; 35 days;
ALZET Comments: Dose (0.5 mg/kg/day); Controls received mp w/ vehicle; animal info (Sprague Dawley, 57-70 days old, Female); cardiovascular;

Q8937: Prokai-T.K., *et al.* A Novel Prodrug Approach for Central Nervous System-Selective Estrogen Therapy. *Molecules* 2019;24(22):

Agents: Estradiol, 17b- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 8 weeks;
ALZET Comments: Dose (2 ug/day); animal info (male non-transgenic (NTG) and DTG mice); behavioral testing (Water Maze Test); 17b-estradiol aka E2; neurodegenerative (neurodegeneration);

Q8772: M. Oydanich, *et al.* Mechanisms of sex differences in exercise capacity. *American Journal of Physiology. Regulatory, Integrative and Comparative Physiology* 2019;316(6):R832-R838

Agents: 17B-Estradiol **Vehicle:** Propylene Glycol; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 28 days;
ALZET Comments: Dose (0.2 mg//gkg/day); animal info (C57BL/6J, 5 months old); 17B-Estradiol aka Estrogen; dependence;

Q7424: E. Noirrit, *et al.* Effects of conjugated estrogen and bazedoxifene on hemostasis and thrombosis in mice. *Endocrine Connections* 2019;

Agents: Estrogen, conjugated; Bazedoxifene **Vehicle:** Cyclodextrin, hydroxypropyl-beta; HEPES buffer; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 3 weeks;

ALZET Comments: Dose (BZA (10 mg/kg/day), CE (3 mg/kg/day)); animal info (Female C57BL/6J mice 4 weeks old); replacement therapy (ovariectomized);

Q7576: Y. Lu, *et al.* Neuron-Derived Estrogen Regulates Synaptic Plasticity and Memory. *J Neurosci* 2019;39(15):2792-2809

Agents: Estradiol, 17 beta- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;
ALZET Comments: Dose (0.0167mg); Controls received mp w/ placebo; animal info (Chimera male); replacement therapy (ovariectomy);

Q7321: Y. Wu, *et al.* Downregulation of Gprotein coupled receptor 30 in the hippocampus attenuates the neuroprotection of estrogen in the critical period hypothesis. *Molecular Medicine Reports* 2018;17(4):5716-5725

Agents: Estradiol, 17b- **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Pump model not stated; **Duration:** 10 weeks;
ALZET Comments: Dose (0.025 mg/day); Controls received mp w/ vehicle; animal info (female, Sprague-Dawley, 12 weeks old, 250-300 g); neurodegenerative (Alzheimer's disease);

Q7935: T. Wada, *et al.* Impact of central and peripheral estrogen treatment on anxiety and depression phenotypes in a mouse model of postmenopausal obesity. *PLoS One* 2018;13(12):e0209859

Agents: Estradiol **Vehicle:** CSF, artificial; **Route:** SC; CSF/CNS (lateral ventricle); **Species:** Mice; **Pump:** 1004; **Duration:** 3 weeks;
ALZET Comments: Dose ((SC 50 µg/kg/day), (ICV 1 µg/kg/day)); Controls received mp w/ vehicle; animal info (16 weeks, female, C57BL/6); behavioral testing (Open field, Light-dark box, Tail suspension, Forced swim); Multiple pumps per animal (2 for SC group); comparison of SC mp vs ICV mp; ALZET brain infusion kit 3 used; Brain coordinates (0.3 mm posterior to the bregma, 0.9 mm lateral to the central sulcus, 2.5 mm below the skull); replacement therapy (estradiol); Therapeutic indication (mouse model of postmenopausal obesity that exhibited anxiety disorder and depression phenotypes were improved by E2 replacement.);

Q6903: A. Vinel, *et al.* Respective role of membrane and nuclear estrogen receptor (ER) alpha in the mandible of growing mice: Implications for ERalpha modulation. *J Bone Miner Res* 2018;33(8):1520-1531

Agents: Estrogen-dendrimer conjugate **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2004; **Duration:** 28 days;
ALZET Comments: Dose (240mg/kg/day); Controls received mp w/ vehicle; animal info (C57BL/6J mice);



Q7875: A. E. Tschiffely, *et al.* An exploratory investigation of brain-selective estrogen treatment in males using a mouse model of Alzheimer's disease. *Horm Behav* 2018;98(16-21

Agents: estradiol, 17-beta-; DHED **Vehicle:** PEG; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 8 weeks;
ALZET Comments: Dose ((E2 2 µg/day), (DHED 2 µg/day)); Controls received mp w/ vehicle; animal info (5.5-6 months, male, C57BL/6 and APPswe/PS1dE9); behavioral testing (radial-arm water maze); pumps replaced every 4 weeks;
10beta,17beta-dihydroxyestra-1,4-dien-3-one (DHED) is a brain-selective prodrug of E2; neurodegenerative (Alzheimer's); pump model not stated but flow rate listed as 0.025 µL/min; Therapeutic indication (DHED-based estrogen treatment shown to decrease APP and Abeta peptide levels concomitantly improving learning in male animals at an early stage of the neuropathology.);

Q7244: R. Thakkar, *et al.* 17beta-Estradiol Regulates Microglia Activation and Polarization in the Hippocampus Following Global Cerebral Ischemia. *Oxidative Medicine and Cellular Longevity* 2018;2018(4248526

Agents: Estradiol, 17b **Vehicle:** Cyclodextrin, B-; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 14 days;
ALZET Comments: Dose (0.0167 mg); 20% β-cyclodextrin used; animal info (3 month old, female, Sprague Dawley); ischemia (Cerebral);

Q7856: M. J. Ronis, *et al.* EB 2017 Article: Soy protein isolate feeding does not result in reproductive toxicity in the pre-pubertal rat testis. *Experimental Biology and Medicine* 2018;243(8):695-707

Agents: estradiol, 17-beta- **Vehicle:** PEG; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 13 days;
ALZET Comments: Dose (10 µg/kg/d); Controls received mp w/ vehicle; animal info (PND 21, male, Sprague-Dawley); comparison of soy protein isolate vs mp;

R0393: C. Physiology. Mechanisms of Sex Disparities in Cardiovascular Function and Remodeling. *Compr Physiol* 2018;9(1):375-411

Agents: Estradiol; Estrogen-dendrimer conjugate **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Not Stated; **Pump:** Not Stated; **Duration:** 2 weeks;
ALZET Comments: ischemia (placental); replacement therapy (ovarectomy);

Q8131: S. M. J. MohanKumar, *et al.* Chronic estradiol exposure - harmful effects on behavior, cardiovascular and reproductive functions. *Reproduction* 2018;156(5):R169-R186

Agents: 17B-Estradiol **Vehicle:** Not stated; **Route:** SC; **Species:** Rat; **Pump:** Not stated; **Duration:** 1, 3, 7 days;
ALZET Comments: animal info (Female, Wistar); dependence;

Q7181: B. L. Hoh, *et al.* Estrogen Deficiency Promotes Cerebral Aneurysm Rupture by Upregulation of Th17 Cells and Interleukin-17A Which Downregulates E-Cadherin. *J Am Heart Assoc* 2018;7(8):

Agents: Angiotensin II, estradiol, 17beta- **Vehicle:** PBS, Ethanol; **Route:** SC; **Species:** Mice;
ALZET Comments: Ang-II (1000 ng/kg/min), Estradiol (0.25 ug/hr); Beta-estradiol reconstituted in a PBS-ethanol solution [9:1]; animal info (8- to 12-week-old female C57BL/6 mice);

Q7143: E. Guivarc'h, *et al.* Predominant Role of Nuclear Versus Membrane Estrogen Receptor alpha in Arterial Protection: Implications for Estrogen Receptor alpha Modulation in Cardiovascular Prevention/Safety. *J Am Heart Assoc* 2018;7(13):

Agents: Estrogen-dendrimer conjugate, angiotensin II, Estetrol **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; **Pump:** 2004;
Duration: 28 days;
ALZET Comments: Dose (80 ug/kg/day-EDC, 0.5 mg/kg/day- Ang II, 6 mg/kg/day -estetrol); Controls received mp w/ vehicle; animal info (C57BL/6); cardiovascular;

Q7779: M. Buscato, *et al.* The antagonist properties of Bazedoxifene after acute treatment are shifted to stimulatory action after chronic exposure in the liver but not in the uterus. *Mol Cell Endocrinol* 2018;472(87-96

Agents: Estrogen, Conjugated Equine; Bazedoxifene **Vehicle:** Hydroxypropyl-beta-cyclodextrin; HEPES buffer; **Route:** SC;
Species: Mice; **Pump:** Not Stated; **Duration:** 14 days;
ALZET Comments: Dose (CE- 3 mg/kg/day, BZA- 10 mg/kg/day); animal info (Female, C57BL/6J); Conjugated Equine Estrogen aka CE, Bazedoxifene aka BE; replacement therapy (Estrogen);



Q5727: Y. Zhu, *et al.* Protective Effect of 17beta-Estradiol Upon Hippocampal Spine Density and Cognitive Function in an Animal Model of Vascular Dementia. *Sci Rep* 2017;7(42660

Agents: Estradiol, 17b- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** Not Stated;

ALZET Comments: Controls received mp w/ 20% cyclodextrin; animal info (male, Sprague Dawley, 250-300g, adult); functionality of mp verified by serum levels; behavioral testing (Morris water maze); replacement therapy (estradiol infusion); long-term study; cardiovascular; Dose (0.05 ug/h); "exogenous E2 replacement produced E2 levels of 25-33pg/ml" (pg 2);

Q6521: S. Ucer, *et al.* The Effects of Aging and Sex Steroid Deficiency on the Murine Skeleton Are Independent and Mechanistically Distinct. *J Bone Miner Res* 2017;32(3):560-574

Agents: Estradiol **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Pump:** 2006; **Duration:** 6 weeks;

ALZET Comments: Dose (6 µg/d); animal info (5-month-old C57BL/6 male mice); replacement therapy (orchiectomy);

Q6763: A. L. Russell, *et al.* The interaction of dietary isoflavones and estradiol replacement on behavior and brain-derived neurotrophic factor in the ovariectomized rat. *Neurosci Lett* 2017;640(53-59

Agents: Estradiol, 17b- **Vehicle:** Cyclodextrin, 2-hydroxypropyl-b- ; water; **Route:** SC; **Species:** Rat; **Pump:** 2002 **Duration:** 14d

ALZET Comments: Dose (0.25 mg/kg body weight); 27% hydroxypropyl-β-cyclodextrin used; animal info (ovariectomized (OVX) female Sprague Dawley rats, weighing between 200–225 g.); replacement therapy (estradiol);

Q6232: S. F. Rosen, *et al.* T-Cell Mediation of Pregnancy Analgesia Affecting Chronic Pain in Mice. *J Neurosci* 2017;37(41):9819-9827

Agents: Estradiol, 17b-; Progesterone sulfate **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 14 days;

ALZET Comments: Dose (17b-estradiol : 0.1 mg/kg/d, progesterone sulfate: 0.25 mg/kg/d, 0.1 mg/kg/d estradiol + 0.25 mg/kg/d progesterone); Controls received mp w/ vehicle; animal info (7-12 week old female C57BL/6J mice); replacement therapy (estradiol, ovariectomy); Therapeutic indication

Q6603: S. Menazza, *et al.* Non-nuclear estrogen receptor alpha activation in endothelium reduces cardiac ischemia-reperfusion injury in mice. *J Mol Cell Cardiol* 2017;107(41-51

Agents: Estradiol; Dendrimer; Estrogen-dendrimer conjugate; ICI182,780 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;

ALZET Comments: Dose (Estradiol (6µg/day); (Dendrimer 6µg/day), Estrogen-dendrimer conjugate (6µg/day); ICI182,780 (2mg/kg/day0); Controls received mp w/ vehicle; animal info (11 week old C57BL/6J female mice); Estrogen-dendrimer conjugate aka EDC; ischemia (Cardiac);

Q6143: S. Laouafa, *et al.* Estradiol Protects Against Cardiorespiratory Dysfunctions and Oxidative Stress in Intermittent Hypoxia. *Sleep* 2017;40(8):

Agents: Estradiol **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2ML4; **Duration:** 28 days;

ALZET Comments: Dose (0.5 mg/kg/d); Controls received mp w/ vehicle; animal info (Sprague-Dawley female rats weighing 230–250 g); post op. care (3.5 mg/kg bupivacaine and 7 mg/kg lidocaine SC injections for 48 hours after); functionality of mp verified by measuring residual volume at the end of the study; replacement therapy (estradiol);

Q6307: T. Jover-Mengual, *et al.* Molecular mechanisms mediating the neuroprotective role of the selective estrogen receptor modulator, bazedoxifene, in acute ischemic stroke: A comparative study with 17beta-estradiol. *J Steroid Biochem Mol Biol* 2017;171(296-304

Agents: Bazedoxifene; Estradiol, 17b- **Vehicle:** DMSO; **Route:** IP; **Species:** Rat; **Pump:** 2ML1; **Duration:** Not Stated;

ALZET Comments: Dose (Bazedoxifene: 3 mg/kg/day; Estradiol: 100 µg/kg/day); 100% DMSO used; Controls received mp w/ vehicle; animal info (male Wistar rats weighing 300–350g); Resultant plasma level (at 4 hours Bazedoxifene : 20.7 ± 2.1 ng/mL and Estradiol: 45.6 ± 7.8 pg/mL); Therapeutic indication (stroke);



Q6325: H. Gao, *et al.* ESR1 and its antagonist fulvestrant in pituitary adenomas. *Mol Cell Endocrinol* 2017;443(32-41)
Agents: Estradiol, 17 beta- **Vehicle:** Glycerol, DMSO; **Route:** SC; **Species:** Rat; **Pump:** 2006; **Duration:** 8 weeks;
ALZET Comments: Dose (10 mg); 50% (v/v) glycerol/50% (v/v) DMSO solution used; animal info (Female Fisher 344 rats);

Q6373: A. L. Frump, *et al.* Estrogen receptor-dependent attenuation of hypoxia-induced changes in the lung genome of pulmonary hypertension rats. *Pulm Circ* 2017;7(1):232-243
Agents: Estradiol, 17b- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 weeks;
ALZET Comments: Dose (75 mg/kg/day); animal info (male Sprague-Dawley rats weighing 250–300g); cardiovascular; Therapeutic indication (Pulmonary arterial hypertension);

Q5809: H. H. Farman, *et al.* Extra-nuclear effects of estrogen on cortical bone in males require ERalphaAF-1. *J Mol Endocrinol* 2017;58(2):105-111
Agents: Estradiol **Vehicle:** DMSO, PBS, Ethanol; **Route:** IP; **Species:** mice; **Pump:** 1004; **Duration:** 3.5 weeks;
ALZET Comments: Controls received mp w/ vehicle; animal info (5 months old) (15% EtOH, 43% DMSO, 42% PBS) replacement therapy (Estradiol); Therapeutic indication (Estrogen); Dose (6 ug/day);

Q6382: M. C. El Hajj, *et al.* Estrogen receptor antagonism exacerbates cardiac structural and functional remodeling in female rats. *American Journal of Physiology Heart and Circulatory Physiology* 2017;312(1):H98-H105
Agents: Estrogen receptor antagonist ICI 182,780 **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2004; 2002; **Duration:** 6 week;
ALZET Comments: Dose (0.1 mg/kg/day); animal info (9- to 10-wk-old female Sprague-Dawley rats weighing ~190–200 g); cardiovascular;

Q4778: S. Abid, *et al.* 17β-Estradiol Dysregulates Innate Immune Responses to Pseudomonas aeruginosa Respiratory Infection and Is Modulated by Estrogen Receptor Antagonism. *Infection and Immunity* 2017;85(10):1-15
Agents: Estrogen receptor agonist **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice; **Pump:** 2006; **Duration:** Not Stated;
ALZET Comments: Dose (0.5 ug/d); Controls received mp w/ vehicle;

Q4911: J. Yang, *et al.* Inhibiting HIF-1alpha Decreases Expression of TNF-alpha and Caspase-3 in Specific Brain Regions Exposed Kainic Acid-Induced Status Epilepticus. *Cellular Physiology and Biochemistry* 2016;38(1):75-82
Agents: Estradiol, 2-methoxy; entanercept **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 1003D; **Duration:** 3d
ALZET Comments: Controls received mp w/ vehicle; animal info (male, Wistar, 200-250g); ALZET brain infusion kit used; Cannula placement verified via histologic analysis;

Q5079: S. Uchida, *et al.* Sympathetic regulation of ovarian functions under chronic estradiol treatment in rats. *Autonomic Neuroscience: Basic and Clinical* 2016;197(19-24)
Agents: Estradiol, 17B- **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2004; **Duration:** 28 days;
ALZET Comments: Controls received mp w/ saline; animal info (female, Wistar, 5-6 months old); functionality of mp verified by estrogen-mediated phenomena (cutaneous infusion of 17β-estradiol (5 µg/day) for 4 weeks demonstrated the well-known estrogen-mediated phenomena of acyclic conditions and uterine hypertrophy... This indicates that estradiol was definitely administered to our study rats) pg 23; Dose (5 ug/day);

Q5081: A. E. Tschiffely, *et al.* A comparative evaluation of treatments with 17beta-estradiol and its brain-selective prodrug in a double-transgenic mouse model of Alzheimer's disease. *Horm Behav* 2016;83(39-44)
Agents: DHED; estradiol, 17B- **Vehicle:** Propylene glycol; **Route:** SC; **Species:** Mice (transgenic); **Pump:** 2004; **Duration:** 8 wks
ALZET Comments: Controls received mp w/ vehicle; animal info (female, APPswe/PS1dE9, 6 months old); functionality of mp verified by plasma levels (see figure S1 - E2 only; no assay for DHED); pumps replaced every 4 weeks; neurodegenerative (Alzheimer's); replacement therapy (estradiol infusion); DHED aka 10β,17β-dihydroxyestra-1,4-dien-3-one; Dose (2 ug/day); Industry authored (AgyPharma LLC);



Q5689: R. Thakkar, *et al.* NLRP3 Inflammasome Activation in the Brain after Global Cerebral Ischemia and Regulation by 17beta-Estradiol. *Oxid Med Cell Longev* 2016;2016(8309031

Agents: Estradiol, 17B- **Vehicle:** Cyclodextrin, B-; **Route:** SC; **Species:** Rat; Mice; **Pump:** 2002; **Duration:** 14 days;

ALZET Comments: animal info (Rats female, Sprague Dawley, 3 months old, OVX; Mice C27BL/6 PELP1, young adult, OVX); 20% Cyclodextrin used; ischemia (cerebral); replacement therapy (estradiol infusion); immunology; Resultant plasma level (10-15 pg/mL);

Q4865: Osamu Nakagawasaia, *et al.* BE360, a new selective estrogen receptor modulator, produces antidepressant and antidementia effects through the enhancement of hippocampal cell proliferation in olfactory bulbectomized mice. *Behavioural Brain Research* 2016;297(315-322

Agents: BE360; estradiol, 17b-; tamoxifen; raloxifen hydrochloride **Vehicle:** PEG 300; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (female, ddY, 10 weeks old, bulbectomized); dose-response (pg 317-318); neurodegenerative (dementia); behavioral testing (sucrose preference; y-maze); BE360 is a novel selective estrogen receptor modulator; Dose (100 ug/day);

Q10265: O. Nakagawasai, *et al.* BE360, a new selective estrogen receptor modulator, produces antidepressant and antidementia effects through the enhancement of hippocampal cell proliferation in olfactory bulbectomized mice. *Behavioural Brain Research* 2016;297(315-22

Agents: Estradiol, 17-B; Tamoxifen; Raloxifen hydrochloride; BE360 **Vehicle:** PEG 300; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info: Female ddY mice, 8 weeks of age; behavioral testing (sucrose preference test and Y-maze test); Carborane Compound aka BE360 is a novel selective estrogen receptor modulator; neurodegenerative (depression and memory impairment);

Q8904: O. Nakagawasai, *et al.* BE360, a new selective estrogen receptor modulator, produces antidepressant and antidementia effects through the enhancement of hippocampal cell proliferation in olfactory bulbectomized mice. *Behavioural Brain Research* 2016;297(315-22

Agents: 17 B-Estradiol; Tamoxifen; Raloxifen hydrochloride; Carborane compound **Vehicle:** Ethylene Glycol; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Animal info (Female ddY mice, 8 weeks of age); behavioral testing (Sucrose preference test, Y Maze Test); Carborane Compound aka BE360; neurodegenerative (Depression and Memory-Impairment);

Q4860: E. Maggioli, *et al.* Estrogen protects the blood-brain barrier from inflammation-induced disruption and increased lymphocyte trafficking. *Brain, Behavior, and Immunity* 2016;51(212-222

Agents: Estradiol **Vehicle:** Cyclodextrin, B-; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (C57BL6 or AnxA1 -/-, 2 months old, OVX); replacement therapy (estradiol infusion); immunology; dose: 100nM

Q4842: A. Kimura, *et al.* Exaggerated arsenic nephrotoxicity in female mice through estrogen-dependent impairments in the autophagic flux. *Toxicology* 2016;339(9-18

Agents: Estrogen-17B **Vehicle:** Ethanol; PBS; **Route:** Not Stated; **Species:** Mice; **Pump:** 1002; **Duration:** 1 week;

ALZET Comments: Controls received no mp; Controls received no mp; Controls received no mp; replacement therapy (estrogen infusion); Dose (0.2 mg/kg/day);

Q4788: Jeffrey A. Blair, *et al.* Luteinizing hormone downregulation but not estrogen replacement improves ovariectomy-associated cognition and spine density loss independently of treatment onset timing. *Horm. Behav* 2016;78(60-66

Agents: Estradiol, 17b; leuprolide acetate **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 2 months;

ALZET Comments: Controls received mp w/ vehicle; animal info (C57BL6J, 9 months old, OVX); pumps replaced every month; behavioral testing (morris water maze); replacement therapy (estradiol infusion); Dose (E2 1.1 ng/day; leuprolide 3.6 ug/day);



Q5547: E. Jeffery, *et al.* The Adipose Tissue Microenvironment Regulates Depot-Specific Adipogenesis in Obesity. *Cell Metabolism* 2016;24(1):142-50

Agents: Estrogen, cyclodextran-coated **Vehicle:** Water; **Route:** Not Stated; **Species:** Mouse; **Pump:** 1004; **Duration:** Not Stated;

ALZET Comments: animal info (8 weeks old); Cyclodextran-coated estrogen (Sigma E4389); Mice were allowed to recover for 2 weeks after pump implantation prior to experiment initiation; Therapeutic indication (obesity); Dose (2 ug/kg/day);

Q5377: A. Ichikawa, *et al.* Ketoconazole-induced estrogen deficiency causes transient decrease in placental blood flow associated with hypoxia and later placental weight gain in rats. *Reprod Toxicol* 2016;63(62-9

Agents: Estradiol, 17-beta- **Vehicle:** Ethanol, Propylene Glycol; **Route:** SC; **Species:** Rat; **Pump:** 1003D; **Duration:** 3 days;

ALZET Comments: animal info (Female Crl:CD (SD) rats, 11-12 weeks old); functionality of mp verified by plasma levels; 0.5% ethanol, 99.5% Propylene glycol used; dose-response (pg 63); E2 aka estradiol-17beta; hypoxia and later placental weight gain in rats; Dose (0, 0.1, or 1 ug/rat/day); Plasma Level: Lower limit of sensitivity (measured by double-antibody radioimmunoassay (RIA); 5 pg/mL);

Q6040: B. Gerby, *et al.* High-throughput screening in niche-based assay identifies compounds to target preleukemic stem cells. *J Clin Invest* 2016;126(12):4569-4584

Agents: Methoxyestradiol, 2- **Vehicle:** DMSO, PEG; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (C57BL6/J ; 50% DMSO; 50% PEG400 ; cancer (Leukemia); 2-methoxyestradiol (2-ME2) is an estrogen derivative ; Therapeutic indication (Cancer, chemotherapy); Dose (40 mg/kg/day);