Neuroscience Research Using ALZET® Osmotic Pumps: Mental Disorders
Mood, Anxiety, Psychiatric Disorders

ALZET Osmotic Pumps are a valuable tool in neuroscience research, as evidenced by the thousands of publications describing their use in studies on neurodegeneration, ischemia, brain cancers, and more. Researchers have used ALZET pumps to analyze the mechanisms behind various mental disorders and to investigate potential treatments and therapies.

Highlighted below are some mental disorders that have been studied using the pumps, as well as recent research applications. The following list of references is a more extensive compilation of research within the last few years. The short abstract following each reference in the attached list details the substance(s) infused, route of administration, animal model studied, solvent(s), model of pump, duration of infusion, and relevant notes. To obtain a complete listing of earlier references or additional technical information, please contact ALZET Technical Support by email at techsupport@alzet.com.

Mental Disorders Studied

- Anxiety
- Bipolar disorder
- Depression
- Eating disorders (anorexia)
- Panic disorder
- Schizophrenia

Recent Research Applications on Mental Disorders

COMPOUND	ANIMAL	DURATION	APPLICATION	REFERENCE
CNO	Rat	2 weeks	Showing two modes of dopamine release in the prefrontal cortex of a schizophrenia-like model are disrupted by different mechanisms	H. Sotoyoma. Putative neural mechanisms underlying release-mode-specific abnormalities in dopamine neural activity in a schizophrenia-like model: The distinct roles of glutamate and serotonin in the impaired regulation of dopamine neurons. Eur J Neurochem; 2024;59(6):1194-1212
Interferon alpha	Mice	17 days	Administration of IFNa to induce depressive-like symptoms and observing effects of Kallikrein-1	P.S. Bhoj *et al.* Tissue Kallikrein-1 Suppresses Type I Interferon Responses and Reduces Depressive-Like Behavior in the MRL/lpr Lupus-Prone Mouse Model. Int J Mol Sci; 2024;25(18):10080
Lypd6; Lypd6b	Mice	2 weeks	Intracerebroventricular delivery of recombinant protein analogs to study to anxiety and cognitive decline	A.B. Isaev *et al.* Upregulation of cholinergic modulators Lypd6 and Lypd6b associated with autism drives anxiety and cognitive decline. Cell Death Discov; 2024;10(1):444
PBMC supernatant	Mice	25 days	Intraventricular infusion of secretomes to transgenic mice and analyzing schizophrenic phenotypes	I. Ballasch *et al.* Alterations of the IKZF1-IKZF2 tandem in immune cells of schizophrenia patients regulate associated phenotypes. 2024;21(1):326
Lysophosphatidic acid; OMPT	Mice	2 weeks	Direct hippocampal infusion to investigate whether OMPT induces antidepressant-like effects	N. Kajitani *et al.* G protein-biased LPAR1 agonism of prototypic antidepressants: Implication in the identification of novel therapeutic target for depression. Neuropsychopharmacology; 2024;49(3):561-572

*If you are interested in a specific agent not listed, please request it at techsupport@alzet.com

Surgical Protocols:
Written protocols are available on our website. A surgical implantation video is also available, which describes proper preparation of the ALZET pump and surgical techniques for implantation in mice and rats. These can be found on https://www.alzet.com/resources/downloads/

References (2019-Present) on Mental Disorders Using ALZET® Osmotic Pumps
Mood, Anxiety, Psychiatric Disorders

Q11970: M. N. Wojtas*, et al.* Interplay between hippocampal TACR3 and systemic testosterone in regulating anxiety-associated synaptic plasticity. Molecular Psychiatry 2024;29(3):686-703
Agents: Osanetan **Vehicle:** Saline; **Route:** CSF/CNS (intracerebroventricular); **Species:** Rat; **Strain:** Wistar; **Pump:** 2004; **Duration:** Not Stated;
ALZET Comments: Dose: (100 nM) 0.9% NaCl used; controls received mp w/ vehicle; animal info (male 3 months, isoflurane anesthesia); post op. care (buprenorphine 0.65 mg/kg)ALZET brain infusion kit II used; brain coordinates (AP, −0.8 mm; ML, +1.6 mm; and DV, −4.0 mm.); behavioral testing (elevated plus-maze);

Q11916: H. Sotoyama. Putative neural mechanisms underlying release-mode-specific abnormalities in dopamine neural activity in a schizophrenia-like model: The distinct roles of glutamate and serotonin in the impaired regulation of dopamine neurons. European Journal of Neuroscience 2024;59(6):1194-1212
Agents: Clozapine N-oxide **Vehicle:** DMSO; saline; citric acid; **Route:** SC; **Species:** Rat; **Strain:** Sprague- Dawley; **Pump:** 2002; **Duration:** 2 weeks;
ALZET Comments: Dose: (50 µg/µL); 20-mM citric acid used; animal info (12–16 weeks old); behavioral testing (social interaction test);

Q11323: N. Kajitani*, et al.* G protein-biased LPAR1 agonism of prototypic antidepressants: Implication in the identification of novel therapeutic target for depression. Neuropsychopharmacology 2024;49(3):561-572
Agents: Lysophosphatidic acid; OMPT **Vehicle:** PBS; **Route:** CSF/CNS (hippocampus); **Species:** Mice; **Strain:** C57BL/6J; LPAR1-heterozygous; **Pump:** 1004; **Duration:** 2 weeks;
ALZET Comments: dose-response (see graphs on pg 8); controls received mp w/ vehicle; animal info (Male; 7-8 weeks old); post op. care: penicillin G, carprofen; brain coordinates (-2.2 mm posterior to bregma, 1.5 mm lateral to midline, -2 mm ventral to skull surface); bilateral cannula used; behavioral testing (Swim test; Open field test); multiple pumps (2) per animal; "...long-term infusion of mouse hippocampus with the potent G protein-biased LPAR agonist OMPT, but not the non-biased agonist LPA, induced antidepressant-like behavior, indicating that G protein-biased agonism might be necessary for the antidepressant like effects."

Q12005: A. B. Isaev*, et al.* Upregulation of cholinergic modulators Lypd6 and Lypd6b associated with autism drives anxiety and cognitive decline. Cell Death Discovery 2024;10(1):444
Agents: WS-LYPD6; WS-LYPD6B **Vehicle:** PBS; DMSO; **Route:** CSF/CNS (intracerebroventricular); **Species:** Mice; **Strain:** C57BL/6Ncrl; **Pump:** 2004; **Duration:** 2 weeks;
ALZET Comments: Dose (5 mg/ml); 30% DMSO used; controls received mp w/ vehicle; animal info (male 16-week-old); stability verified at 37deg prior to study; ALZET brain infusion kit 2 used; behavioral testing (open field test; elevated plus maze test; hypophagia; novel objective recognition; novel odor recognition; rotarod test); immunology;

Q11647: P. S. Bhoj*, et al.* Tissue Kallikrein-1 Suppresses Type I Interferon Responses and Reduces Depressive-Like Behavior in the MRL/lpr Lupus-Prone Mouse Model. International Journal of Molecular Sciences 2024;25(18):
Agents: Interferon alpha, recombinant **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Strain:** MRL/lpr; **Pump:** 2004; **Duration:** 17 d;
ALZET Comments: Dose (5 x 10^5 U/mouse); controls received mp w/ saline; animal info (9 week old); behavioral testing (rotarod); immunology;

Q12051: I. Ballasch*, et al.* Alterations of the IKZF1-IKZF2 tandem in immune cells of schizophrenia patients regulate associated phenotypes. Journal of Neuroinflammation 2024;21(1):326
Agents: Supernatant, peripheral blood mononuclear cells **Vehicle:** Not Stated; **Route:** CSF/CNS (left lateral ventricle); **Species:** Mice; **Strain:** Egr1-CreERT2xR26RCE transgenic; **Pump:** 1004; **Duration:** 25 days;
ALZET Comments: Dose (0.2064 ug/ul); animal info (adult, isoflurane anesthesia) ALZET brain infusion kit 2 used; brain coordinates (0.1 mm posterior to bregma,+/- 0.8 mm lateral to the midline, and−2.5 mm ventral to the parenchyma surface); cyanoacrylate adhesive; behavioral testing (open field; sociability; novel object recognition test); neurodegenerative (schizophrenia);

Q11892: A. Rodriguez-Vega*, et al.* Nicotine Exposure in a Phencyclidine-Induced Mice Model of Schizophrenia: Sex-Selective Medial Prefrontal Cortex Protein Markers of the Combined Insults in Adolescent Mice. International Journal of Molecular Sciences 2023;24(19):
Agents: Nicotine **Vehicle:** Water, milliQ; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1007D; **Duration:** Not Stated;
ALZET Comments: Dose: (24 mg/kg); controls received mp w/ vehicle; post op. care (flunixin 2.5 mg/kg; enrofloxacin 2.5 mg/kg)dependence; "As for nicotine exposure, a subcutaneous osmotic minipump is an established model that has the advantage of being less stressful than other routes of administration, in addition to allowing for a constant dose and a controlled period of administration" pg. 3;

Q10922: R. C. N. Marchette*, et al.* Heroin- and Fentanyl-Induced Respiratory Depression in a Rat Plethysmography Model: Potency, Tolerance, and Sex Differences. Journal of Pharmacology and Experimental Therapeutics 2023;385(2):117-134
Agents: Fentanyl citrate **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Long Evan; **Pump:** 2ML1; **Duration:** 7 days;
ALZET Comments: Dose (0.06 mg/kg/d); 0.9% sterile saline used; animal info (Male and females; 8 weeks old); dependence

Q11050: Y. Y. Kuo*, et al.* Glibenclamide promotes FGF21 secretion in interscapular BAT and attenuates depression-like behaviors in male mice with HFD-induced obesity. Life Sciences 2023;328(121900
Agents: Fibroblast growth factor 21, recombinant **Vehicle:** PEG 400; DMSO; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6N;
Pump: 1002; **Duration:** 2 weeks;
ALZET Comments: Dose: (3 mg/kg); 88% PEG 400, 10% DMSO; 2% Tween 80 used; controls received mp w/ vehicle; animal info: Eight-week-old male mice; obesity; depression; "This treatment regimen reduced signs of metabolic dysfunction, attenuated depressive-like behaviors and restored mesolimbic dopaminergic projections in HFD-fed animals." p. 12

Q11343: K. L. Kooij*, et al.* Intranasal administration of olanzapine has beneficial outcome in a rat activity-based anorexia model. European Neuropsychopharmacology 2023;71(65-74
Agents: Olanzapine **Vehicle:** Acetic acid, glacial; saline; **Route:** SC; **Species:** Rat; **Strain:** WU; **Pump:** 2001; **Duration:** 7 days;
ALZET Comments: Dose-response: (1, 2.75, 7.5 mg/kg); animal info (Female outbred 50 & 175 g); post op. care (Carprofen); comparison of intranasal administration vs mp; "To establish constant plasma levels in the chronic experiment, we used osmotic minipumps." p. 67

Q10722: K. Wallace*, et al.* Evidence of Anxiety, Depression and Learning Impairments following Prenatal Hypertension. Behavioral Sciences (Basel) 2022;12(2):
Agents: Tyrosine kinase 1 **Vehicle:** Not Stated; **Route:** IP; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** 2002; **Duration:** Not Stated;
ALZET Comments: Dose (4.7 µg/kg); animal info (Female; Weighed 230-250 g; Pregnant); behavioral testing (Maternal Pup Interaction; Forced Swim Test; Novel Object Recognition; Elevated Zero Maze; Barnes Maze; Sucrose Preference); cardiovascular (hypertensive preeclampsia, hemolysis, elevated liver enzyme, and low platelet syndrome)

Q10693: W. Q. Tang*, et al.* Virus-Mediated Decrease of LKB1 Activity in the mPFC Diminishes Stress-Induced Depressive-Like Behaviors in Mice. Biochemical Pharmacology 2022;197(114885
Agents: Virus, adeno-associated **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Strain:** CD1; **Pump:** Not Stated;
Duration: 14 days;
ALZET Comments: Dose (0.2 ul/min); animal info (8 weeks old; Male; Weighed 23-25 g; 50 weeks old mice male and female); behavioral testing (Forced swim test; Tail suspension test; Sucrose preference test; Social interaction test); bilateral cannula used; dental cement used; gene therapy; Therapeutic indication (Depression);

Q10427: Y. M. Chen*, et al.* Hippocampal F3/Contactin plays a role in chronic stress-induced depressive-like effects and the antidepressant actions of vortioxetine in mice. Biochemical Pharmacology 2022;202(115097
Agents: Virus, adeno-associated **Vehicle:** Not Stated; **Route:** CSF/CNS (hippocampus); **Species:** Mice; **Strain:** C57BL/6J; CD1;
Pump: Not Stated; **Duration:** 2 weeks;
ALZET Comments: animal info (Male; 8 weeks old; Weighed 23-25 g; Male and Female; 50 weeks old; Weighed 35--38 g); behavioral testing (Chronic social defeat stress; Chronic restraint stress; Forced swim test; Tail suspension test; Sucrose preference test; Social interaction test); Brain coordinates (Hippocampus -2.3 mm anteroposterior; 1.6 mm mediolateral; 1.8 mm dorsoventral); bilateral cannula used; dental cement used; toxicology; Therapeutic indication (Depression);

Q10414: L. Bourhy, *et al.* Silencing of amygdala circuits during sepsis prevents the development of anxiety-related behaviours. Brain 2022;145(4):1391-1409
Agents: Levetiracetam **Vehicle:** Saline; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Strain:** C57Bl/6JRj; **Pump:** 1003D; **Duration:** 3 days;
ALZET Comments: Dose: (1 µl/h); Controls received mp w/ vehicle; animal info: Adult 2–5months old wild-type male mice and adult male and female FOS-CreERT2; post op. care: treated with (0.1 mg/kg) buprenorphine 30 mins. before surgery; behavioral testing (Morris water maze; novel object location/recognition; Open field test; Light/dark box test; olfactory habituation; fear conditioning); Levetiracetam aka (LEV); ALZET brain infusion kit 3 used; Brain coordinates (stereotaxic coordinates relative to bregma, antero-posterior: −0.5 mm; medial lateral: 1 mm; dorsoventral: 2.5 mm); dental cement used; liquid bonding resin; dental acrylic; neurodegenerative (anxiety; PTSD); immunology

Q10342: H. Sotoyama, *et al.* Resting-state dopaminergic cell firing in the ventral tegmental area negatively regulates affiliative social interactions in a developmental animal model of schizophrenia. Translational Psychiatry 2021;11(1):236
Agents: Clozapine-N-oxide **Vehicle:** DMSO; **Route:** SC; **Species:** Rat; **Strain:** EGF; **Pump:** 2002; **Duration:** 10 days; 13 days;
ALZET Comments: Dose: (1.5 mg/kg/day); Controls received mp w/ vehicle; animal info: model rats; (postnatal week 10–12); behavioral testing: locomotion test in an open field chamber; social interaction; Clozapine-N-oxide aka (CNO); neurodegenerative

Q10256: C. M. Mecca, *et al.* Dynamic Change of Endocannabinoid Signaling in the Medial Prefrontal Cortex Controls the Development of Depression After Neuropathic Pain. Journal of Neuroscience 2021;41(35):7492-7508
Agents: Gabapentin **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** Not Stated; **Duration:** Not Stated;
ALZET Comments: Controls received mp w/ vehicle; animal info: Male and female weighing 170-200; behavioral testing: Sensory behavioral tests; von Frey test; Open field test; Sucrose-preference test; Novelty-suppressed feeding; Forced swim test; Gabapentin aka (GBP); Brain coordinates from 151 bregma, anteroposterior, +3.2 mm; mediolateral, ±1.0 mm; dorsoventral, -3.5 mm; dental cement used;

Q10276: L. S. Kalinichenko, *et al.* Neutral sphingomyelinase mediates the co-morbidity trias of alcohol abuse, major depression and bone defects. Molecular Psychiatry 2021;26(12):7403-7416
Agents: GW4869; Osteocalcin **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice; **Strain:** C57BL6J; **Pump:** Not Stated; **Duration:** Not Stated;
ALZET Comments: Dose (GW4869 2 mg/kg/day, osteocalcin 0.03 ug/h); dose-response (reduced alcohol consumption Fig. 4b pg 7409, antidepressant effect in NSF Fig. 4d pg 7409); animal info (female mice); behavioral testing (open field, elevated plus maze, novelty suppressed feeding test); GW4869 is a selective NSM inhibitor; Therapeutic indication (targeting NSM and osteocalcin signaling may provide a new systems approach in the treatment of a mental-physical co-morbidity trias);

Q10377: A. C. Dutra-Tavares, *et al.* Does nicotine exposure during adolescence modify the course of schizophrenia-like symptoms? Behavioral analysis in a phencyclidine-induced mice model. PLoS One 2021;16(9):e0257986
Agents: Nicotine **Vehicle:** Water, milli-Q; NaOH; **Route:** SC; **Species:** Mice; **Strain:** Not Stated; **Pump:** 1007D; **Duration:** Not Stated;
ALZET Comments: Dose (24 mg/kg/day); Controls received mp w/ vehicle; animal info (Male; Female); behavioral testing (Open field; Novel object recognition; Memory task; 3-chamber sociability); toxicology;

Q9815: L. J. Zhu, *et al.* Dentate nNOS accounts for stress-induced 5-HT1A receptor deficiency: Implication in anxiety behaviors. CNS Neuroscience & Therapeutics 2020;26(4):453-464
Agents: Spironolactone **Vehicle:** Not Stated; **Route:** CSF/CNS (dentate gyrus); **Species:** Mice; **Strain:** homozygous nNOS-deficient; **Pump:** Not Stated; **Duration:** 7 days; 28 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (Young adult 6- to 7-week-old male; behavioral testing (open-field test); Brain coordinates (2.3 mm posterior to bregma, 1.3 mm lateral to the midline, and 2.0 mm below dura); dependence;

Q9861: X. Zhang, *et al.* Low catechol-O-methyltransferase and stress potentiate functional pain and depressive behavior,

especially in female mice. Pain 2020;161(2):446-458
Agents: Catechol-O-methyltransferase inhibitor **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1002; **Duration:** 2 weeks;
ALZET Comments: 0.9% Saline used; Controls received mp w/ vehicle; animal info (8-12 weeks old, 18-30 g,); behavioral testing (Forced Swim Test); Catechol-O-methyltransferase aka COMT inhibitor; dependence;

Q9926: B. Xue*, et al.* Predator Scent-Induced Sensitization of Hypertension and Anxiety-like Behaviors. Cellular and Molecular Neurobiology 2020;
Agents: Angiotensin II **Vehicle:** Not stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** 2002; **Duration:** 2 weeks;
ALZET Comments: Dose (120 ng/kg/min); animal info (rats, 9 weeks old); behavioral testing (Elevated plus maze test); cardiovascular;

Q9444: E. H. Sanchez-Mendoza*, et al.* Compromised Hippocampal Neuroplasticity in the Interferon-alpha and Toll-like Receptor-3 Activation-Induced Mouse Depression Model. Molecular Neurobiology 2020;57(7):3171-3182
Agents: Interferon, alpha **Vehicle:** PBS; **Route:** CSF/CNS (left ventricle); **Species:** Mice; **Strain:** Not Stated; **Pump:** 1002; **Duration:** 14 days;
ALZET Comments: Dose (250 IU/day); Controls received mp w/ vehicle; animal info (male 8–12-week-old mice); post op. care (buprenorphine); Interferon, alpha aka IFN-α; ALZET brain infusion kit 3 used; Brain coordinates (0.2 mm anterior and 0.9 mm lateral to bregma); dependence;

Q10055: H. S. Park*, et al.* Chronically infused angiotensin II induces depressive-like behavior via microglia activation. Scientific Reports 2020;10(1):22082
Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated; **Duration:** 7 days; 21 d;
ALZET Comments: Dose (1000 ng/min/kg); Controls received mp w/ vehicle; animal info: male; behavioral testing (Tail suspension test; Forced swimming test; Social Interaction Test; Open field test); dependence

Q8921: E. C. Onwordi*, et al.* Synaptic density marker SV2A is reduced in schizophrenia patients and unaffected by antipsychotics in rats. Nature Communications 2020;11(1):246
Agents: Haloperidol; Olanzapine **Vehicle:** Cyclodextrin, B-Hydroxypropyl; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML4; **Duration:** 28 days;
ALZET Comments: Dose (0.5 or 2 mg/kg/day; 7.5 mg/kg/day); 20% B-Hydroxypropylcyclodextrin used; Controls received mp w/ vehicle; animal info (Male 240–270 g, 6–10 weeks of age); Haloperidol aka HAL; Olanzapine aka OLZ; neurodegenerative (Schizophrenia);

Q8133: A. I. Molosh*, et al.* Panic results in unique molecular and network changes in the amygdala that facilitate fear responses. Mol Psychiatry 2020;25(2):442-460
Agents: GABA synthesis inhibitor **Vehicle:** Not stated; **Route:** CSF/CNS (perifornical hypothalamus); **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** Not stated; **Duration:** 7 days;
ALZET Comments: Dose (2.5 mg/kg); Controls received mp w/ vehicle; animal info (Male 250-300 g); post op. care (Buprenorphine); GABA synthesis inhibitor aka 1-allyglycine (1-AG); Brain coordinates (−2.9 mm anterior-posterior, ±3.18 mm medial-lateral, and −8.2 mm dorsal ventral); neurodegenerative (Panic disorder);

Q8563: N. Kajitani*, et al.* Prefrontal cortex infusion of beta-hydroxybutyrate, an endogenous NLRP3 inflammasome inhibitor, produces antidepressant-like effects in a rodent model of depression. Neuropsychopharmacology Reports 2020;40(2):157-165
Agents: Butyrate, B-hydroxy- **Vehicle:** PBS; **Route:** CSF/CNS (frontal cortex); **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2006; **Duration:** 21 days;
ALZET Comments: Dose (80 mg/mL); Controls received mp w/ vehicle; animal info (Male 7-8 weeks of age); post op. care: Antibacterial penicillin G; Analgesic carprofen; behavioral testing (forced swim test; open field test); Multiple pumps per animal (2 pumps); Beta-hydroxybutyrate aka BHB; Brain coordinates (coordinates: anteroposterior + 3.2 mm, dorsolateral ± 0.6 mm from bregma, ventral 4.0 mm from the skull surface); bilateral cannula used; neurodegenerative (Depression);

Q8760: Z. Hai-Na*, et al.* Atorvastatin ameliorates depressive behaviors and neuroinflammatory in streptozotocin-induced

diabetic mice. Psychopharmacology (Berl) 2020;237(3):695-705
Agents: Atorvastatin **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Mice; **Strain:** C57BL/6; **Pump:** Not Stated **Duration:** 3w;
ALZET Comments: Dose (1 ug or 5 ug); animal info (Male 25-30 g, 2 months old); behavioral testing (Open Field Test, Tail Suspension Test, Sucrose Preference Test, Novelty Suppressed Feeding Test); Brain coordinates (– 0.7 mm posterior to the bregma; ± 1.2 mm lateral to the sagittal; 2.0 mm below dura); bilateral cannula used; immunology;

Q8468: A. Fraga*, et al.* Temperature but not leptin prevents semi-starvation induced hyperactivity in rats: implications for anorexia nervosa treatment. Scientific Reports 2020;10(1):5300
Agents: Leptin, recomb. rat **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2001; **Duration:** 14 days;
ALZET Comments: Dose (1.29 mg/ml); Controls received mp w/ vehicle; animal info (Male rats (130–190 g)); dependence;

Q8848: R. J. Flores*, et al.* Estradiol promotes and progesterone reduces anxiety-like behavior produced by nicotine withdrawal in female rats. Psychoneuroendocrinology 2020;119(104694
Agents: Nicotine **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Strain:** Wistar; **Pump:** 2ML2; **Duration:** 14 days;
ALZET Comments: Dose (3.2 mg/kg/day); animal info (Male and female); behavioral testing (physical signs test, Anxiety-like behavior assessments); replacement therapy (Estradiol, progesterone);

Q8190: C. M. Duan*, et al.* SRT2104 attenuates chronic unpredictable mild stress-induced depressive-like behaviors and imbalance between microglial M1 and M2 phenotypes in the mice. Behav Brain Res 2020;378(112296
Agents: SRT2104 **Vehicle:** Cyclodextrin, Hydroxypropyl; **Route:** CSF/CNS (hippocampus); **Species:** Mice; **Strain:** C57BL/6;
Pump: 1002; **Duration:** 12 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (Adult male mice (age: 6 weeks; weight: 18–22 g)); behavioral testing (swim test); Sirtuin 1 agonist aka SRT2104; dependence;

Q8394: C. A. Browne*, et al.* Behavioral effects of the kappa opioid receptor partial agonist nalmefene in tests relevant to depression. Eur J Pharmacol 2020;872(172948
Agents: Nalmefene **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2004; **Duration:** 14 days;
ALZET Comments: Dose (5 mg/kg/day); Controls received mp w/ vehicle; animal info (Male and female 8 weeks old); behavioral testing (forced swim test, Conditioned place aversion, Marble burying, Dark-light emergence test); Nalmefene aka NMF; neurodegenerative (Depression);

Q8686: I. A. Akkouh*, et al.* Exploring lithium's transcriptional mechanisms of action in bipolar disorder: a multi-step study. Neuropsychopharmacology 2020;45(6):947-955
Agents: Lithium chloride **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2ML4; **Duration:** 4 d;
ALZET Comments: Dose (84.8 mg/kg/day); Controls received mp w/ vehicle; animal info (Female, Sprague Dawley); gene therapy;

Q8972: P. Zanos*, et al.* Chronic nicotine administration restores brain region specific upregulation of oxytocin receptor binding levels in a G72 mouse model of schizophrenia. European Journal of Neuroscience 2019;50(3):2255-2263
Agents: Nicotine, (-) hydrogen tartrate salt **Vehicle:** Saline, Physiological; **Route:** SC; **Species:** Mice; **Strain:** CD-1; G72 transgenic; **Pump:** Not Stated; **Duration:** 14 days;
ALZET Comments: Dose (24 mg/kg/day); Controls received mp w/ vehicle; animal info (10-12 weeks, female, 31-35g); dependence; pump model not stated;

Q9041: W. Xiong*, et al.* Astrocytic Epoxyeicosatrienoic Acid Signaling in the Medial Prefrontal Cortex Modulates Depressive-like Behaviors. Journal of Neuroscience 2019;39(23):4606-4623
Agents: TPPU **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 1007D; **Duration:** 7 days;
ALZET Comments: Dose (1 uM); Controls received mp w/ vehicle; animal info (Male, 10-12 weeks old); TPPU aka Soluble epoxide hydrolase (sEH) inhibitor; enzyme inhibitor (Soluble epoxide hydrolase inhibitor); Brain coordinates (anteroposterior=-0.6 mm, mediolateral=1.5 mm dorsoventral= 2.0 mm); neurodegenerative (Depressive Disorder);

Q9086: S. Thomson*, et al.* Reduced expression of synapsin II in a chronic phencyclidine preclinical rat model of schizophrenia.

Synapse 2019;73(5):e22084
Agents: Phencyclidine **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** 2ML2; **Duration:** 14 days;
ALZET Comments: Dose (5 mg/kg/day); 0.9% Saline used; Controls received mp w/ vehicle; animal info (Male, 250-300 g, 3 months old); Phencyclidine aka PCP; neurodegenerative (schizophrenia)

Q9047: H. Suzuki, *et al.* Helicobacter pylori Vacuolating Cytotoxin A Causes Anorexia and Anxiety via Hypothalamic Urocortin 1 in Mice. Scientific Reports 2019;9(1):6011
Agents: Vacuolating cytotoxin A **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Mice; **Strain:** C57BL/6J; **Pump:** 2004; **Duration:** Not Stated;
ALZET Comments: Dose (0.06, 0.18, or 0.6 pmol/kg); Controls received mp w/ vehicle; animal info (7 weeks old, 20-25 g, Male); Vacuolating Cytotoxin A aka VacA; Brain coordinates (0.5 mm posterior to the bregma, 1.0 mm right lateral to the midline, and 2.5 mm below the outer surface of the skull); bilateral cannula used; dental cement used; dependence;

Q8367: C. S. Piao, *et al.* Depression following traumatic brain injury in mice is associated with down-regulation of hippocampal astrocyte glutamate transporters by thrombin. J Cereb Blood Flow Metab 2019;39(1):58-73
Agents: Fasudil **Vehicle:** Not stated; **Route:** CSF/CNS; **Species:** Mice; **Strain:** CD1; **Pump:** 2001; **Duration:** 7 days;
ALZET Comments: Dose (25 gm/kg/day); Controls received mp w/ vehicle; animal info (Male, 25-30 g); Fasudil aka selective ROCK inhibitor; enzyme inhibitor (Rho kinase inhibitor); neurodegenerative (Traumatic Brain Injury);

Q7610: T. Odaira, *et al.* Mechanisms underpinning AMP-activated protein kinase-related effects on behavior and hippocampal neurogenesis in an animal model of depression. Neuropharmacology 2019;150(121-133
Agents: Peptide, zeta-inhibitor **Vehicle:** Saline; **Route:** CSF/CNS; **Species:** Mice **Strain:** Not Stated **Pump:** 2002 **Duration:** 14d;
ALZET Comments: Dose (5 ug/12 uL/day); animal info (6- weeks old, 26-28 g); behavioral testing (Forced Swim Test, Tail-Suspension Test); ZIP aka zeta-inhibitory peptide; enzyme inhibitor (zeta-inhibitor); ALZET brain infusion kit 3 used; Brain coordinates (1.00 L, 0.22 P, 3.00 to bregma); bilateral cannula used; cyanoacrylate adhesive; dependence;

Q8240: T. A. Lanz, *et al.* Postmortem transcriptional profiling reveals widespread increase in inflammation in schizophrenia: a comparison of prefrontal cortex, striatum, and hippocampus among matched tetrads of controls with subjects diagnosed with schizophrenia, bipolar or major depressive disorder. Transl Psychiatry 2019;9(1):151
Agents: Haloperidol or Risperidone **Vehicle:** Acetic Acid; **Route:** CSF/CNS; **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** Not stated; **Duration:** 21 days;
ALZET Comments: Dose (haloperidol-0.25 mg/kg/day or risperidone-5 mg/kg/day); 1% Acetic Acid used; Controls received mp w/ vehicle; animal info (2 months old, Male); neurodegenerative (Psychiatric Disorder);

R0431: M. Janecek, *et al.* Oxytocin facilitates adaptive fear and attenuates anxiety responses in animal models and human studies-potential interaction with the corticotropin-releasing factor (CRF) system in the bed nucleus of the stria terminalis (BNST). Cell and Tissue Research 2019;375(1):143-172
Agents: Oxytocin; atosiban **Vehicle:** Not Stated; **Route:** CSF/CNS (lateral ventricle); **Species:** Mice; Rat; **Strain:** Not Stated; **Pump:** Not Stated; **Duration:** 15 days; 14 days;
ALZET Comments: Dose (Oxytocin 1, 10 ng/h), (atosiban 600µg/kg/day)); animal info (adult, male); behavioral testing (elevated plus maze, light-dark box, chronic subordinate colony stress); Atosiban is an inhibitor of the hormones oxytocin and vasopressin; review: author lists studies where oxytocin was administered to mice and atosiban was administered to rats;

Q8039: H. J. Huang, *et al.* MGCD0103, a selective histone deacetylase inhibitor, coameliorates oligomeric Abeta25-35 -induced anxiety and cognitive deficits in a mouse model. CNS Neurosci Ther 2019;25(2):175-186
Agents: MGCD0103 **Vehicle:** Not Stated; **Route:** CSF/CNS (Intrathecal); **Species:** Mice; **Strain:** C57BL/6J; **Pump:** Not stated; **Duration:** 4 weeks;
ALZET Comments: Dose (30 or 60 nmol/day); Selective histone deacetylase inhibitor aka MGCD0103; enzyme inhibitor (selective histone deacetylase inhibitor); neurodegenerative (Alzheimer's Disease);

Q8016: D. Gupta, *et al.* beta1-adrenergic receptors mediate plasma acyl-ghrelin elevation and depressive-like behavior

induced by chronic psychosocial stress. Neuropsychopharmacology 2019;44(7):1319-1327
Agents: Acyl Ghrelin, Growth hormone releasing peptide 2 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6N; **Pump:** 1002; **Duration:** 2 weeks;
ALZET Comments: Dose (400 ug/kg/day- GHRP-2, 4 mg/kg/day- acyl ghrelin); Controls received mp w/ vehicle; animal info (Male, 8-10 weeks old); behavioral testing (Chronic Social Defeat Stress Test and Social Interaction Test); Growth hormone releasing peptide 2 aka GHRP-2; dependence;

Q7475: C. Fourrier, *et al.* Brain tumor necrosis factor-alpha mediates anxiety-like behavior in a mouse model of severe obesity. Brain, Behavior, and Immunity 2019;77(25-36
Agents: Tumor necrosis factor-a **Vehicle:** CSF, artificial; **Route:** CSF/CNS (third cerebral ventricle); **Species:** Mice; **Strain:** Not Stated; **Pump:** 1004; **Duration:** 28 days;
ALZET Comments: Dose (5 ug/kg/day); Controls received mp w/ vehicle; animal info (5 week old, Male); behavioral testing (); Brain coordinates (A= 0.3 mm, L= 1 mm, D= 2.8 mm); bilateral cannula used; dependence;

Q7472: K. Farrell, *et al.* Systemic Inhibition of Soluble Tumor Necrosis Factor with XPro1595 Exacerbates a Post-Spinal Cord Injury Depressive Phenotype in Female Rats. J Neurotrauma 2019;
Agents: XPro1595 **Vehicle:** Saline; **Route:** CSF/CNS (left lateral ventricle); **Species:** Rat; **Strain:** Sprague Dawley; **Pump:** 2004; **Duration:** 28 days;
ALZET Comments: Dose (10 mg/kg); Controls received mp w/ vehicle; animal info (Female, 223-250 g); post op. care (); behavioral testing (Sucrose Preference, Novel Object Recognition, Open Field, Social Exploration, Modified forced swim test, Basso Beattie Bresnahan open field, Automated von Frey, Hargreaves' Thermal Testing,); ALZET brain infusion kit 2 used; Brain coordinates (AP: -1.0 ML, +2.0, DV: -4.0- to -3.5); bilateral cannula used; cyanoacrylate adhesive; spinal cord injury.

Q9782: M. S. D'Souza, *et al.* Regulator of G-protein signaling 5 protein protects against anxiety- and depression-like behavior. Behavioural Pharmacology 2019;30(8):712-721
Agents: Angiotensin II **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Strain:** C57BL/6; **Pump:** 2004; **Duration:** 3 weeks;
ALZET Comments: Dose (1 mg/kg/day); Controls received mp w/ vehicle; animal info (26 weeks old); behavioral testing (Elevated Plus Maze Test, Tail Suspension Test); Blood pressure measured via Tail Cuff Method; dependence;)

Q5552: T. Cassano, *et al.* Early intrathecal infusion of everolimus restores cognitive function and mood in a murine model of Alzheimer's disease. Experimental Neurology 2019;311(88-105
Agents: Everolimus **Vehicle:** DMSO; CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Strain:** 3×Tg-AD; wild type Non-Tg; **Pump:** 1002; **Duration:** 2 weeks;
ALZET Comments: Dose (0.167 µg/µl/day); 10% DMSO used; Controls received mp w/ vehicle; animal info (6-month-old); Brain coordinates (0.5mm anterior-posterior, 1.1mm medio-lateral, and 2.5mm dorso-ventral to the skull); neurodegenerative (Alzheimer's disease);

Q8175: K. Buzgoova, *et al.* Antidepressant effects of valproic acid in an animal model of depression. European Pharmaceutical Journal 2019;66(2):1-3
Agents: Aldosterone, d- **Vehicle:** Not stated; **Route:** SC; **Species:** Rat; **Strain:** Sprague-Dawley; **Pump:** 2002; **Duration:** 14 days;
ALZET Comments: animal info (Forty male adult rats); D-aldosterone aka aldosterone; dependence;