



**References on the Administration of Drugs of Abuse
(including Amphetamines, Barbiturates, Cocaine, GHB, Heroin, Nicotine, and PCP)
Using ALZET® Osmotic Pumps**

1. Amphetamines

Q7057: P. Petschner, V. Tamasi, C. Adori, E. Kirilly, R. D. Ando, L. Tothfalusi and G. Bagdy. Gene expression analysis indicates reduced memory and cognitive functions in the hippocampus and increase in synaptic reorganization in the frontal cortex 3 weeks after MDMA administration in Dark Agouti rats. *BMC Genomics* 2018;19(1):580

ALZET Comments: Methamphetamine, 3,4-methylenedioxy-; Saline; SC; Rat; 2001; Controls received mp w/ vehicle; animal info (8-week old Dark Agouti rats weighing 152 +/- 3.58 g); 3,4-methylenedioxymethamphetamine aka MDMA or ecstasy;.

Q7002: P. Petschner, V. Tamasi, C. Adori, E. Kirilly, R. D. Ando, L. Tothfalusi and G. Bagdy. Gene expression analysis indicates reduced memory and cognitive functions in the hippocampus and increase in synaptic reorganization in the frontal cortex 3 weeks after MDMA administration in Dark Agouti rats. *BMC Genomics* 2018;19(1):580

ALZET Comments: Methamphetamine, 3,4-methylenedioxy-; Saline; SC; Rat; 2001; Controls received mp w/ vehicle;.

Q6700: D. Moller, A. Banerjee, T. C. Uzuneser, M. Skultety, T. Huth, B. Plouffe, H. Hubner, C. Alzheimer, K. Friedland, C. P. Muller, M. Bouvier and P. Gmeiner. Discovery of G Protein-Biased Dopaminergics with a Pyrazolo[1,5-a]pyridine Substructure. *J Med Chem* 2017;60(7):2908-2929

ALZET Comments: Amphetamine; DMSO; acetic acid; water; SC; Rat; 2ML1; 7 days; Dose (1.5 mg/kg/day); 2% acetic acid, 25% DMSO used; Controls received mp w/ vehicle; animal info (Male Sprague-Dawley rats weighing 300-350 g); dependence.

Q6443: S. V. Kyosseva and W. D. Wessinger. Chronic administration of MDMA ("ECSTASY") increases insulin-regulated glucose transporter GLUT4 in rat brain and heart. 2017;

ALZET Comments: Methamphetamine, 3,4-methylenedioxy; Saline; SC; Rat; 2ML2; 10 days; Dose (0.3 or 3 mg/kg/day); animal info (Sprague-Dawley rats);.

Q6649: E. E. Reichard, N. Nanaware-Kharade, G. A. Gonzalez, 3rd, S. Thakkar, S. M. Owens and E. C. Peterson. PEGylation of a High-Affinity Anti-(+)-Methamphetamine Single Chain Antibody Fragment Extends Functional Half-Life by Reducing Clearance. *Pharm Res* 2016;33(12):2954-2966

ALZET Comments: Methamphetamine; Saline; SC; Rat; 2 weeks; Dose (3.2 mg/kg/day); animal info (Adult male Sprague-Dawley rats (275-320 g)); Methamphetamine aka METH; dependence; Industry authored (InterveXion Therapeutics, LLC);.

Q4545: N. Nanaware-Kharade, S. Thakkar, G. I. Gonzalez, E. C. Peterson and E. C. Peterson. A Nanotechnology-Based Platform for Extending the Pharmacokinetic and Binding Properties of Anti-methamphetamine Antibody Fragments. *SCIENTIFIC REPORTS* 2015;5(U1-U10)

ALZET Comments: Methamphetamine; SC; Rat; 10 days; Animal info (male, Sprague Dawley, adult, 280-310g); functionality of mp verified by blood levels; dependence; cardiovascular;.

Q4443: A. C. Harris, M. G. LeSage, D. Shelley, J. L. Perry, P. R. Pentel, S. M. Owens and A. C. Harris. The Anti-(+)-Methamphetamine Monoclonal Antibody mAb7F9 Attenuates Acute (+)-Methamphetamine Effects on Intracranial Self-Stimulation in Rats. *PLoS One* 2015;10(U408-U420)

ALZET Comments: Methamphetamine hydrochloride; Saline; SC; Rat; 2ML2; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 275-300g); functionality of mp verified by elevations in ICSS; behavioral testing (ICSS); dependence; pumps removed after 7 days;.

Q4390: P. W. Czoty, P. Tran, L. N. Thomas, T. J. Martin, A. Grigg, B. E. Blough, T. J. R. Beveridge and P. W. Czoty. Effects of the dopamine/norepinephrine releaser phenmetrazine on cocaine self-administration and cocaine-primed reinstatement in rats. *PSYCHOPHARMACOLOGY* 2015;232(2405-2414)



ALZET Comments: Amphetamine, D-; phenmetrazine; Saline; SC; Rat; 2001; 14 days; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley, 300-350g); pumps replaced every 7 days; behavioral testing (cocaine self-administration, food self-administration); dependence;.

Q3632: B. A. Zimmer, K. A. Chiodo and D. C. S. Roberts. Reduction of the reinforcing effectiveness of cocaine by continuous D-amphetamine treatment in rats: importance of active self-administration during treatment period. *Psychopharmacology* 2014;231(5):949-954

ALZET Comments: Amphetamine, D-; Saline, sterile; SC; Rat; 2001; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 12 week old, 350g); behavioral testing (cocaine self-administration); dependence; pumps removed on day 7; used amphetamine concentration of approx 73ug/ul.

Q3319: T. F. Rau, A. S. Kothiwal, A. R. Rova, D. M. Brooks, J. F. Rhoderick, A. J. Poulsen, J. Hutchinson and D. J. Poulsen. Administration of low dose methamphetamine 12 h after a severe traumatic brain injury prevents neurological dysfunction and cognitive impairment in rats. *Experimental Neurology* 2014;253(;):31-40

ALZET Comments: Methamphetamine; IV (femoral); Rat; 2001D; 24 hours; Controls received mp w/ vehicle; animal info (male, Wistar, 350-500g); functionality of mp verified by plasma serum levels; dose-response (pg.33); behavioral testing (foot fault assessment, morris water maze); pumps implanted in inguinal crease; catheter preloaded with 50% dextrose/50% heparin; pumps removed after 61-65hours;.

Q3814: I. D. Blum, L. Zhu, L. Moquin, M. V. Kokoeva, A. Gratton, B. Giros, K. F. Storch and K. F. Storch. A highly-tunable dopaminergic oscillator generates ultradian rhythms of behavioral arousal. *ELIFE* 2014;3(U146-U189

ALZET Comments: Methamphetamine; Saline; SC; Mice; 1002; 2 weeks; Animal info (Bmal1 -/-,); behavioral testing (locomotor activity running wheels); dependence; delayed delivery; catheter filled with saline for 4 day recovery; used plastics one catheter;.

Q3416: C. T. Bauer, M. L. Banks, S. S. Negus and S. S. Negus. The effect of chronic amphetamine treatment on cocaine-induced facilitation of intracranial self-stimulation in rats. *Psychopharmacology* 2014;231(2461-2470

ALZET Comments: Amphetamine; Saline; SC; Rat; 2ML4; 14 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 311-406g); post op. care (Ketoprofen 5 mg/kg); behavioral testing (cocaine self administration); dependence; pumps removed after 14 days;.

Q5002: M. Iijima, H. Koike and S. Chaki. Effect of an mGlu2/3 receptor antagonist on depressive behavior induced by withdrawal from chronic treatment with methamphetamine. *Behav Brain Res* 2013;246(24-8

ALZET Comments: methamphetamine (MAP); saline; SC; Rat; 2ML1; 5 days; animal info: male, Sprague-Dawley, 5 wks old; tolerance studies; dependence; behavioral testing: forced swimming test, locomotor activity; mp used to infuse methamphetamine to induce a withdrawal-like effect in rats to study the effect of LY341495 (mGlu2/3 receptor antagonist) on withdrawal-induced depressive behavior; dose: 2.5, or 5 mg/kg/day.

Q2909: G. L. Ding, M. Chopp, D. J. Poulsen, L. Li, C. S. Qu, Q. J. Li, S. P. Nejad-Davarani, J. S. Budaj, H. T. Wu, A. Mahmood and Q. Jiang. MRI of Neuronal Recovery after Low-Dose Methamphetamine Treatment of Traumatic Brain Injury in Rats. *PLoS One* 2013;8(4):U175-U183

ALZET Comments: Methamphetamine; IV; Rat; 24 hours; Controls received mp w/ saline; animal info. (male, wistar rats, 200-300 g); functionality of mp verified by MRI measurement of fractional anisotropy.

2. Cocaine

R0335: R. M. Post. Epigenetic basis of sensitization to stress, affective episodes, and stimulants: implications for illness progression and prevention. *Bipolar Disord* 2016;18(4):315-24

ALZET Comments: Cocaine;



Q4278: A. K. Radke, N. E. Zlebnik, M. E. Carroll and A. K. Radke. Cocaine withdrawal in rats selectively bred for low (LoS) versus high (HiS) saccharin intake. PHARMACOLOGY BIOCHEMISTRY AND BEHAVIOR 2015;129(51-55)

ALZET Comments: Cocaine hydrochloride; Saline, sterile; SC; Rat; 2ML2; 2 weeks; Controls received mp w/ vehicle; animal info (male, Holtzman/Harlan Sprague Dawley); no stress (see pg.53); post op. care (topical antibiotic ointment); behavioral testing (saccharin intake); dependence; pumps removed after 2 weeks;.

Q3606: C. M. Pudiak, R. KuoLee, M. A. Bozarth and C. M. Pudiak. Tolerance to cocaine in brain stimulation reward following continuous cocaine infusions. Pharmacology Biochemistry and Behavior 2014;122(246-252)

ALZET Comments: Cocaine; Saline; sodium metabisulfate; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; animal info (male, Long-Evans, 275-350g); functionality of mp verified by residual volume; 0.3% sodium metabisulfate used to prevent degradation; stress/adverse reaction: (see pg.294); post op. care (neosporin); dependence; "Cocaine delivered continuously via osmotic minipump may better mimic the high drug-plasma concentrations maintained by an addict during a binge than daily administered cocaine injections." pg 250; pumps removed after 14 days; pumps primed at 37C for at least 4 hours;.

Q3579: P. A. Narayana, J. J. Herrera, K. H. Bockhorst, E. Esparza-Coss, Y. Xia, J. L. Steinberg and F. G. Moeller. Chronic cocaine administration causes extensive white matter damage in brain: Diffusion tensor imaging and immunohistochemistry studies. PSYCHIATRY RESEARCH-NEUROIMAGING 2014;221(3):220-230

ALZET Comments: Cocaine; Saline; SC; Rat; 2ML4; 28 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 280-300g); behavioral testing (fine motor movement; ambulation; rearing activities; general motor behavior); dependence; MRI; pumps primed for 24 hours in 37C saline;.

Q3428: F. F. Caputi, M. Di Benedetto, D. Carretta, S. B. D. Candia, C. D'Addario, C. Cavina, S. Candeletti and P. Romualdi. Dynorphin/KOP and nociceptin/NOP gene expression and epigenetic changes by cocaine in rat striatum and nucleus accumbens. PROGRESS IN NEURO-PSYCHOPHARMACOLOGY & BIOLOGICAL PSYCHIATRY 2014;49(;):36-46

ALZET Comments: Cocaine; SC; Rat; 2001; 7 days; Controls received mp w/ saline; animal info (male, Sprague Dawley, 200-250g); dependence; pumps primed overnight in 37C saline;.

Q2161: A. K. Stoker, B. Olivier and A. Markou. Involvement of metabotropic glutamate receptor 5 in brain reward deficits associated with cocaine and nicotine withdrawal and somatic signs of nicotine withdrawal. Psychopharmacology 2012;221(2):317-327

ALZET Comments: Nicotine; cocaine hydrochloride; Saline, sterile; SC; IP; Mice; 2004; 1003D; 3, 28 days; Controls received mp w/ vehicle; animal info (mGlu5 KO, wt).

Q1704: A. K. Stoker and A. Markou. Withdrawal from chronic cocaine administration induces deficits in brain reward function in C57BL/6J mice. Behavioural Brain Research 2011;223(1):176-181

ALZET Comments: Cocaine hydrochloride; Saline, sterile; IP; Mice; 1003D; 3 days; Controls received mp w/ saline; animal info (C57BL/6, male, 7-8 wks old) withdrawal; "continuous cocaine administration via intraperitoneal osmotic minipumps is an excellent tool for the assessment of the effects of cocaine administration and withdrawal on various behavioral measures." pg 180.

P9733: P. A. Narayana, P. hobila-Vajjula, J. Ramu, J. Herrera, J. L. Steinberg and F. G. Moeller. Diffusion tensor imaging of cocaine-treated rodents. PSYCHIATRY RESEARCH-NEUROIMAGING 2009;171(3):242-251

ALZET Comments: Cocaine; SC; Rat; 2ML4; 28 days; Controls received mp w/saline; good methods pg. 243; animal info (male, Sprague Dawley, 250-300 g); microdialysis fiber attached to exit port to prevent development of necrotic skin.

P8166: M. Di Benedetto, C. D'Addario, S. Candeletti and P. Romualdi. Alterations of CREB and DARPP-32 phosphorylation following cocaine and monoaminergic uptake inhibitors. Brain Research 2007;1128(1):33-39

ALZET Comments: Cocaine; fluoxetine; GBR12909; nisoxetine; Water, sterile; SC; CSF/CNS; Rat; 2001; 2ML1; 7 days; Controls received mp w/ vehicle; no stress (see pg. 37); animal info (male, Sprague-Dawley, 200-250 grams).



P8233: C. D'Addario, M. Di Benedetto, S. Izenwasser, S. Candeletti and P. Romualdi. Role of serotonin in the regulation of the dynorphinergic system by a kappa-opioid agonist and cocaine treatment in rat CNS. *Neuroscience* 2007;144(1):157-164
ALZET Comments: Cocaine; Water, sterile; CSF/CNS; Rat; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague-Dawley, 200-250 grams).

P6682: M. S. Matell, G. R. King and W. H. Meck. Differential modulation of clock speed by the administration of intermittent versus continuous cocaine. *Behavioral Neuroscience* 2004;118(1):150-156
ALZET Comments: Cocaine, hydrochloride; Saline; SC; Rat; 2ML2; 2 weeks; Controls received mp w/ vehicle; functionality of mp verified by residual volume; comparison of IP injections vs. SC mp; tolerance; "The cocaine pumps were slightly modified by adding a microdialysis fiber to the output portal to minimize tissue necrosis from the cocaine." p. 151; behavioral study.

P7061: G. R. King, C. Hillburn, G. Pinto and J. Konen. The effects of continuous cocaine dose, treatment, and withdrawal duration on the induction of behavioral tolerance and dopamine autoreceptor function. *Pharmacology Biochemistry and Behavior* 2004;78(2):293-300

ALZET Comments: Cocaine HCL; Saline, isotonic; SC; Rat; 2ML2; 3,7 days; Controls received mp w/ vehicle; dose-response; tolerance; "mp slightly modified by adding a microdialysis fiber to the output portal to eliminate tissue necrosis from the cocaine." (pg. 294); mp primed in 37 degree Celsius water for 4 hours.

P5441: G. R. King, G. Pinto, J. Konen, C. Hillburn, S. Tran, W. Love, R. Cayse and G. Castro. The effects of continuous cocaine duration on the induction of behavioral tolerance and dopamine autoreceptor function. *European Journal of Pharmacology* 2002;446(1-3):111-118

ALZET Comments: Cocaine HCl; Saline, isotonic; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; tolerance; dependence; "The pumps were slightly modified by adding a microdialysis fiber to the output portal to eliminate tissue necrosis from the cocaine." (p. 112).

P5446: S. Izenwasser and D. French. Tolerance and sensitization to the locomotor-activating effects of cocaine are mediated via independent mechanisms. *Pharmacology Biochemistry and Behavior* 2002;73(4):877-882

ALZET Comments: Cocaine; SC; Rat; 2001; 7 days; Tolerance.

P5488: E. H. Ellinwood, C. Davidson, G. Z. Yu, G. R. King and T. H. Lee. Effect of daily dosing duration of direct and indirect dopamine receptor agonists: cocaine cross-tolerance following chronic regimens. *European Neuropsychopharmacology* 2002;12(5):407-415

ALZET Comments: Cocaine; pramipexole; Saline; SC; Rat; 2ML2; 14 days; Functionality of mp verified by measuring residual volume; pulsed delivery - drugs administered either continuously or for 16 or 20 hrs per day (p. 409); study included behavioral testing; pramipexole is a direct dopamine agonist; microdialysis fiber attached to pump via catheter to minimize tissue necrosis caused by the cocaine (p. 408); intermittent delivery made possible by disconnecting and reconnecting an externalized catheter.

P6339: S. L. Collins, P. M. Kunko, B. Ladenheim, J. L. Cadet, F. I. Carroll and S. Izenwasser. Chronic Cocaine Increases k-Opioid Receptor Density: Lack of Effect by Selective Dopamine Uptake Inhibitors. *Synapse* 2002;45(153-158)

ALZET Comments: Cocaine; RTI-117; GBR 12909; Saline; DMSO; water, sterile; SC; Rat; 2ML1; 2ML2; 7, 14 days; Controls received mp w/ vehicle; brain tissue distribution; 50% DMSO used for GBR12909.

P4779: L. L. Howell, K. F. Schama, J. E. Ellis, P. J. Grimley, A. J. Kitchens and L. D. Byrd. Fetal development in rhesus monkeys exposed prenatally to cocaine. *Neurotoxicol. Teratol* 2001;23(133-140)

ALZET Comments: Cocaine;; Saline;; SC;; monkey (pregnant);; 2ML4;; ~ 180 days;; Controls received mp w/ vehicle; functionality of mp verified by cocaine serum levels; dose-response (table 4 p. 136); long-term study, pumps replaced every 28 days for up to 180 days (until birth); teratology;.

P4882: E. H. Ellinwood, G. R. King, C. Davidson and T. H. Lee. The dopamine D-2/D-3 antagonist DS121 potentiates the effect of cocaine on locomotion and reduces tolerance in cocaine tolerant rats. *Behavioural Brain Research* 2000;116(169-175)



ALZET Comments: Cocaine HCl; Saline; SC; Rat; 2ML2; 14 days; controls received mp w/ vehicle; functionality of mp verified by residual volume; "The pumps were modified by adding a microdialysis fiber to the output portal to eliminate cocaine-induced tissue necrosis". p. 170.

3. GHP (Gamma-hydroxybutyrate)

P6690: S. T. Szabo, M. S. Gold, B. A. Goldberger and P. Blier. Effects of sustained gamma-hydroxybutyrate treatments on spontaneous and evoked firing activity of locus coeruleus norepinephrine neurons. *Biological Psychiatry* 2004;55(9):934-939

ALZET Comments: Hydroxybutyrate, gamma-; Saline; SC; Rat; 2,10 days; Controls received mp w/ vehicle; dependence; agent is a drug of abuse, known as "liquid ecstasy" or GHB (sodium oxybate); pump model not listed.

4. Heroin

Q4818: S. Daniels, P. Marshall and F. Leri. Alterations of naltrexone-induced conditioned place avoidance by pre-exposure to high fructose corn syrup or heroin in Sprague–Dawley rats. *Psychopharmacology* 2016;233):425-433

ALZET Comments: Heroin; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; animal info (male, Spargue Dalwley, 175-200g); behavioral testing (place conditioning); used wound clips; Dose (3.5 mg/kg/day);.

Q2457: A. M. Williams, D. J. Reis, A. S. Powell, L. J. Neira, K. A. Nealey, C. E. Ziegler, N. D. Kloss, J. L. Bilimoria, C. E. Smith and B. M. Walker. The effect of intermittent alcohol vapor or pulsatile heroin on somatic and negative affective indices during spontaneous withdrawal in Wistar rats. *Psychopharmacology* 2012;223(1):75-88

ALZET Comments: Heroin; Saline; SC; Rat; 2ML4; 30 days; Control animals received mp w/ vehicle; animal info (Wistar, male, 70 days old); pulsatile delivery; "By filling the pumps with saline and attaching polyethylene (PE60) tubing to the pump, based on the tubing inner diameter and pump flow rate characteristics, the volume needed for different infusion periods (e.g., 14- or 10-h periods) could be determined"; "the tubing was filled with alternating heroin solution and mineral oil"; pulsatile delivery; good methods, pg 78; image of pump with connected Lynch coil; wound clips used; post op. care (Baytril); behavioral testing (elevated plus mazel forced swim test).

P9748: G. Klein, G. C. Rossi, A. R. Waxman, C. Arout, A. Juni, C. E. Inturrisi and B. Kest. The contribution of MOR-1 exons 1-4 to morphine and heroin analgesia and dependence. *Neuroscience Letters* 2009;457(3):115-119

ALZET Comments: Heroin hydrochloride; morphine sulfate; Saline; SC; Mice; 2001; Controls received mp w/vehicle; dependence; animal info (adult, male, CD-1).

Q0587: B. Kest, S. B. Smith, A. Schorscher-Petcu, J. S. Austin, J. Ritchie, G. Klein, G. C. Rossi, A. Fortin and J. S. Mogil. Gnao1 (G- α_o PROTEIN) IS A LIKELY GENETIC CONTRIBUTOR TO VARIATION IN PHYSICAL DEPENDENCE ON OPIOIDS IN MICE. *Neuroscience* 2009;162(4):1255-1264

ALZET Comments: Morphine; heroin; Saline; SC; Mice; 2001; 7 days; Animal info (Naive, adult, 7-12 wks old, male, AcB/BcA).

P6278: M. R. Azar, S. H. Ahmed, R. Lintz, T. Gutierrez, L. Stinus and G. F. Koob. A non-invasive gating device for continuous drug delivery that allows control over the timing and duration of spontaneous opiate withdrawal. *Journal of Neuroscience Methods* 2004;135(1-2):129-135

ALZET Comments: Heroin; Saline; SC; Rat; 2ML2; 192 hours; Comparison of sc injections & pellet vs. mp; dependence; 3 day recovery period; pumps connected to a novel gating device to allow on-off delivery; assembly schematic (p. 131); infusions were delivered in 48 hour intervals; animal info (m, wistar, 300-380 grams).

P3132: Y. Shaham, H. Rajabi and J. Stewart. Relapse to heroin-seeking in rats under opioid maintenance: the effects of stress, heroin priming, and withdrawal. *J. Neurosci* 1996;16(5):1957-1963

ALZET Comments: Heroin; SC; Rat; 2002; no duration posted; controls received mp with saline or sham operation; dependence.



P0588: W. K. Schmidt, S. W. Tam, G. S. Shatzberger, D. H. Smith Jr, R. Clark and V. G. Vernier. Nalbuphine. *Drug Alcohol Depend* 1985;14(339-362)

ALZET Comments: Ethylketocyclazocine; Heroin; Meperidine; Oxymorphone; Pentazocine; Propoxyphene; Bremazocine; Buprenorphine; Butorphanol; Methadone; Morphine; Nalbuphine; U-50,488H; SC; mice; 3 days; comparison of sc morphine pellets vs. mp infusion; comparison of agents effects; controls received unspecified placebo infusion.

5. Nicotine

Q6791: R. Saravia, M. Ten-Blanco, M. T. Grande, R. Maldonado and F. Berrendero. Anti-inflammatory agents for smoking cessation? Focus on cognitive deficits associated with nicotine withdrawal in male mice. *Brain Behav Immun* 2019;75(228-239)

ALZET Comments: Nicotine hydrogen tartate salt; Saline; SC; Mice; 2002; 14 days; Dose (25 mg/kg/day); animal info (8-weeks old male C57BL/6J mice (Charles River).); dependence;

Q6064: R. F. Keller, T. Kazemi, A. Dragomir, Y. M. Akay and M. Akay. Comparison between dopaminergic and non-dopaminergic neurons in the VTA following chronic nicotine exposure during pregnancy. *Sci Rep* 2019;9(1):445

ALZET Comments: Nicotine hydrogen tartrate salt; Saline; SC; Rat (pregnant); 28 days; Dose (6 mg/kg/d); Controls received mp w/ vehicle; animal info (Pregnant female Sprague–Dawley (SD) rats); dependence;

Q6079: D. DiPalma, A. H. Rezvani, B. Willette, C. Wells, S. Slade, B. J. Hall and E. D. Levin. Persistent attenuation of nicotine self-administration in rats by co-administration of chronic nicotine infusion with the dopamine D1 receptor antagonist SCH-23390 or the serotonin 5-HT2C agonist lorcaserin. *Pharmacol Biochem Behav* 2019;176(16-22)

ALZET Comments: Nicotine; Saline; SC; Rat; 2ML4; 4 weeks; Dose (2.5 mg/kg/day); Controls received mp w/ vehicle; animal info (young adult female Sprague-Dawley rats, aged 66–72 days with an average weight of 210 g); post op. care (ketoprofen (5 mg/kg, s.c.); topical bupivacaine); behavioral testing (lever press);.

Q6978: R. D. Cole, C. Wolsh, M. Zimmerman, E. Harrington, T. J. Gould and V. Parikh. Adolescent and adult nicotine exposure differentially impacts oral nicotine and oral saccharin self-administration in mice. *Behav Brain Res* 2019;359(836-844)

ALZET Comments: nicotine hydrogen tartrate; Saline; SC; Mice; 1002; 2 weeks; Dose (3.0 mg/kg/d - adolescent, 6.3 mg/kg/d-adult); Controls received mp w/ vehicle; animal info (adolescent, adult); stability verified by (measuring the residual volume following surgical removal at the end of the exposure period for each time point); half-life 10 min (p.841); dependence;

Q6986: R. B. Basse and M. C. Gondre-Lewis. Combined early life stressors: Prenatal nicotine and maternal deprivation interact to influence affective and drug seeking behavioral phenotypes in rats. *Behav Brain Res* 2019;359(814-822)

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Rat (pregnant); 2004; 14 days; Dose (4 mg/kg/day); 0.9% saline used; Controls received mp w/ vehicle; animal info (Timed-pregnant Sprague-Dawley rats 250 g- 300 g); pumps implanted during gestation); behavioral testing (open field test, forced swim test); dependence;

Q6905: L. B. Wollman, R. B. Levine and R. F. Fregosi. Developmental plasticity of GABAergic neurotransmission to brainstem motoneurons. *J Physiol* 2018;596(23):5993-6008

ALZET Comments: Nicotine bitartrate; Saline; SC; Rat (pregnant); 1007D; (6 mg/kg/day); Controls received mp w/ vehicle; animal info (pregnant dams on gestational day 5); post op. care (buprenorphine sc 0.5 mg/kg); dependence;

Q7154: S. R. Subramaniam, I. Magen, N. Bove, C. Zhu, V. Lemesre, G. Dutta, C. J. Elias, H. A. Lester and M. F. Chesselet. Chronic nicotine improves cognitive and social impairment in mice overexpressing wild type alpha-synuclein. *Neurobiol Dis* 2018;117(170-180)



ALZET Comments: Nicotine; Saline; SC; Mice; 2004; 1 or 6 months; Dose (0.4 mg/kg/h and 2.0 mg/kg/h); dose-response (); dose-response (); pumps replaced every 4 weeks; long-term study; stress/adverse reaction: Mice treated with the higher nicotine dose (2.0 mg/kg/h) lost weight after surgery and 50% died after one week. This was as a result of combined toxic effects of isoflurane and a higher dose of nicotine. Therefore, pentobarbital was used instead of isoflurane for induction of anesthesia, which reduced the mortality rate and improved weight gain in the higher dose group. (see pg. 172);

Q7051: S. Semenova, X. Jin, T. D. McClure-Begley, M. P. Tadman, M. J. Marks and A. Markou. Differential effects of withdrawal from intermittent and continuous nicotine exposure on reward deficit and somatic aspects of nicotine withdrawal and expression of alpha4beta2* nAChRs in Wistar male rats. *Pharmacol Biochem Behav* 2018;171(54-65)

ALZET Comments: Nicotine; Saline; SC; Rat; 2ML4; 20 days; Dose (1.2, 3.16, or 6.32 mg/kg/dau); animal info (male Wistar rats weighing 320-360g); dependence;

Q6963: D. H. Malin, M. M. Henceroth, J. Elayoubi, J. R. Campbell, A. Anderson, P. Goyarzu, J. Izygon, C. A. Madison, C. P. Ward and E. S. Burstein. A subtype-specific neuropeptide FF receptor antagonist attenuates morphine and nicotine withdrawal syndrome in the rat. *Neurosci Lett* 2018;684(98-103)

ALZET Comments: Morphine sulfate, Nicotine bitartrate; Saline, isotonic; SC; Rat; 2ML1; 7 days; Dose (morphine at 0.3 and 0.6 mg/kg/hr, nicotine at 9 mg/kg/day); Controls received mp w/ vehicle; animal info (male Sprague-Dawley rats averaging 234 g); dependence;

Q7073: C. Li, H. Sun, G. Xu, K. D. McCarter, J. Li and W. G. Mayhan. Mito-Tempo prevents nicotine-induced exacerbation of ischemic brain damage. *J Appl Physiol (1985)* 2018;125(1):49-57

ALZET Comments: Nicotine; Saline; SC; Rat; 7 days; Dose (2 mg/kg/day); Controls received mp w/ vehicle; animal info (Male Sprague-Dawley rats);

Q6922: S. Y. Lee, C. M. Sirieix, E. Nattie and A. Li. Pre- and early postnatal nicotine exposure exacerbates autoresuscitation failure in serotonin-deficient rat neonates. *J Physiol* 2018;596(23):5977-5991

ALZET Comments: Nicotine; Saline; SC; Rat (pregnant); 2ML4; Dose (6 mg/kg/day); Controls received mp w/ vehicle; animal info (female Sprague-Dawley dams);

Q7199: C. Lee, S. Lee, C. Woo, S. J. Kang, Y. Kim Kwon and K. S. Shin. Differential regulation of neuronal excitability by nicotine and substance P in subdivisions of the medial habenula. *Anim Cells Syst (Seoul)* 2018;22(3):165-171

ALZET Comments: Nicotine; Sodium Chloride; SC; Mice; 1004; 14 days; Dose (1 mg/kg/hr); animal info (5 weeks old, Male, C57BL/6); dependence;

Q7152: C. Lee, S. Lee, C. Woo, S. J. Kang, Y. Kim Kwon and K. S. Shin. Differential regulation of neuronal excitability by nicotine and substance P in subdivisions of the medial habenula. *Anim Cells Syst (Seoul)* 2018;22(3):165-171

ALZET Comments: Nicotine; Saline; SC; Mice; 1004; 14 days; Dose (1 mg/kg/hr); 9% NaCl used; animal info (male C57BL/6 mice, 6–8 weeks of age);

Q7013: R. F. Keller, A. Dragomir, F. Yantao, Y. M. Akay and M. Akay. Investigating the genetic profile of dopaminergic neurons in the VTA in response to perinatal nicotine exposure using mRNA-miRNA analyses. *Sci Rep* 2018;8(1):13769

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Rat (pregnant); 4 weeks; Dose (6 mg/kg/day); Controls received mp w/ vehicle; animal info (pregnant female Sprague-Dawley rats); minipumps released nicotine for 4 weeks from gestational day 6 to postnatal day 14;

Q7020: A. Jackson, R. L. Papke and M. I. Damaj. Pharmacological modulation of the alpha7 nicotinic acetylcholine receptor in a mouse model of mecamylamine-precipitated nicotine withdrawal. *Psychopharmacology (Berl)* 2018;235(7):1897-1905

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Mice; 2002; 14 days; Dose (24 mg/kg/day); Controls receive Jacksod mp w/ vehicle; animal info (8 week old ICR male mice);

Q7028: V. G. Garcia, E. C. J. Gualberto, E. Ervolino, M. J. H. Nagata, J. M. de Almeida and L. H. Theodoro. aPDT for periodontitis treatment in ovariectomized rats under systemic nicotine. *Photodiagnosis Photodyn Ther* 2018;22(70-78)



ALZET Comments: Nicotine; Saline; SC; Rat; 2006; Controls received mp w/ vehicle; animal info (3-month old Wistar rats);.

Q7030: C. C. J. Frye, J. M. Rung, R. W. Nall, A. Galizio, J. M. Haynes and A. L. Odum. Continuous nicotine exposure does not affect resurgence of alcohol seeking in rats. *PLoS One* 2018;13(8):e0202230

ALZET Comments: Nicotine; Saline; SC; Rat; 2ML4; 28 days; Dose (3 mg/kg/day); 0.9% sterile saline solution used; Controls received mp w/ vehicle; animal info (male Long Evans rats); post op. care (NSAID analgesic, an antibiotic);.

Q7125: N. D. d'Adesky, J. P. de Rivero Vaccari, P. Bhattacharya, M. Schatz, M. A. Perez-Pinzon, H. M. Bramlett and A. P. Raval. Nicotine Alters Estrogen Receptor-Beta-Regulated Inflammation Activity and Exacerbates Ischemic Brain Damage in Female Rats. *Int J Mol Sci* 2018;19(5):

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Rat; 2ML2; 16 days; Dose (4.5 mg/kg/day); animal info (Adult female, Sprague-Dawley, 290 g, 6-7 months old); ischemia (Nicotine-induced);.

Q5615: N. D. d'Adesky, J. P. de Rivero Vaccari, P. Bhattacharya, M. Schatz, M. A. Perez-Pinzon, H. M. Bramlett and A. P. Raval. Nicotine Alters Estrogen Receptor-Beta-Regulated Inflammation Activity and Exacerbates Ischemic Brain Damage in Female Rats. *Int J Mol Sci* 2018;19(5):

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Rat; 2ML2; 16-21 days; Dose (4.5 mg/kg/day); Controls received mp w/ vehicle; animal info (adult female Sprague-Dawley rats); ischemia (brain);.

Q7111: Y. H. Chen, T. T. Kuo, E. Y. Huang, B. J. Hoffer, J. H. Kao, Y. C. Chou, Y. H. Chiang and J. Miller. Nicotine-Induced Conditional Place Preference Is Affected by Head Injury: Correlation with Dopamine Release in the Nucleus Accumbens Shell. *Int J Neuropsychopharmacol* 2018;21(10):949-961

ALZET Comments: Nicotine; Saline; SC; Rats; 2ML1; 1 week; Dose (9 mg/kg/day); 0.9% Saline used; Controls received mp w/ vehicle; animal info (Male, Sprague-Dawley, 6 weeks old, 200-250 g); behavioral testing (Open Field Test); Brain coordinates (3.8 mm posterior to bregma, 2.5 mm lateral to midline,); neurodegenerative (Concussion);.

Q7106: L. M. Carcoba, R. J. Flores, L. A. Natividad and L. E. O'Dell. Amino acid modulation of dopamine in the nucleus accumbens mediates sex differences in nicotine withdrawal. *Addict Biol* 2018;23(5):1046-1054

ALZET Comments: Nicotine hydrogen tartrate salt; Saline; Saline; 2ML2; 1004; 14 days; 0.9% saline used; animal info (Adult, male and female, Wistar rats); post op. care (analgesic flunixin- 2.5 mg/kg); dependence; .

Q7100: J. K. Brynildsen, B. G. Lee, I. J. Perron, S. Jin, S. F. Kim and J. A. Blendy. Activation of AMPK by metformin improves withdrawal signs precipitated by nicotine withdrawal. *Proc Natl Acad Sci U S A* 2018;115(16):4282-4287

ALZET Comments: Nicotine, Metformin; Saline; CSF/CNS (lateral ventricle); Mice; 1002; 2 weeks; Dose (18 mg/kg/day-nicotine, 50 ug/day-metformin); 0.85% saline used; Controls received mp w/ vehicle; behavioral testing (Marble Burying Test, Novelty-Induced Hypophagia Test); Brain coordinates (anteroposterior, -0.8 mm; mediolateral, +1.5 mm); dependence;.

Q5935: M. Yuan, A. M. Malagon, D. Yasuda, J. D. Belluzzi, F. M. Leslie and N. T. Zaveri. The alpha3beta4 nAChR partial agonist AT-1001 attenuates stress-induced reinstatement of nicotine seeking in a rat model of relapse and induces minimal withdrawal in dependent rats. *Behav Brain Res* 2017;333(251-257)

ALZET Comments: Nicotine; SC; Rat; 2ML1; 7 days; animal info (male, Sprague Dawley, 300-350g, adult); behavioral testing (open field chambers); dependence; Dose (3.15 mg/kg/day);.

Q5336: J. Yang, A. Y. Liu, B. Tang, D. Luo, Y. J. Lai, B. L. Zhu, X. F. Wang, Z. Yan and G. J. Chen. Chronic nicotine differentially affects murine transcriptome profiling in isolated cortical interneurons and pyramidal neurons. *BMC Genomics* 2017;18(1):194

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Mice; 2002; 14 days; Controls received mp w/ vehicle; animal info (male mice 20 g, 5-7 weeks old); Dose (48 mg/kg/d);.

Q5715: Y. Xu and L. O. Cardell. Long-term nicotine exposure dampens LPS-induced nerve-mediated airway hyperreactivity in murine airways. *Am J Physiol Lung Cell Mol Physiol* 2017;313(3):L516-L523



ALZET Comments: Nicotine tartrate; PBS; SC; Mice; 2004; 28 days; Controls received mp w/ vehicle; animal info (female, BALB/c, 10 weeks old); post op. care (clips were removed 7-10 days post operation); immunology; "Subcutaneous osmotic pumps containing nicotine tartrate salt produces a stable plasma nicotine concentration that has long been utilized in the field of neuroscience for the study of chronic nicotine effects" pg L517; Used Reflex wound clips (2-3 per mouse); Dose (24 mg/kg/day); Used Reflex clips; wound clips removed 7-10 days postop;

Q6539: F. Wichern, M. M. Jensen, D. Z. Christensen, J. D. Mikkelsen, M. C. Gondre-Lewis and M. S. Thomsen. Perinatal nicotine treatment induces transient increases in NACHO protein levels in the rat frontal cortex. *Neuroscience* 2017;346(278-283

ALZET Comments: Nicotine Hydrogen Tartate; SC; Rat (pregnant); 2006; 6 weeks; Dose (4 mg/kg/day); animal info (timed-pregnant Sprague Dawley (SD) rats); comparison of injections vs mp;

Q5905: M. von Chamier, L. Reyes, L. F. Hayward and M. B. Brown. Impact of gestational nicotine exposure on intrauterine and fetal infection in a rodent model. *Biol Reprod* 2017;96(5):1071-1084

ALZET Comments: Nicotine tartrate; Saline; SC; Rat (pregnant); 2ML4; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, GD6); post op. care (single housed; heating pads); teratology; "To test our hypothesis, we combined a maternal nicotine infusion model that achieves high levels of plasma nicotine and cotinine without causing fetal loss or changes in birth weight." pg 1072; Used wound clips; Dose (6 mg/kg/day);

Q6526: A. Vivekanandarajah, A. Aishah, K. A. Waters and R. Machaalani. Intermittent hypercapnic hypoxia effects on the nicotinic acetylcholine receptors in the developing piglet hippocampus and brainstem. *Neurotoxicology* 2017;60(23-33

ALZET Comments: Nicotine Hydrogen Tartate Salt; Water (sterile); IP; Pig (neonate); 2ML2; 14 days; Dose (2.0 mg/kg/day); animal info (mixed-breed miniature piglets); comparison of patch vs mp; Resultant plasma level (serum cotinine: 23.1 +17.3 ng/mL); "The use of an osmotic minipump as opposed to a skin patch was chosen as the method of nicotine delivery given it provides a steady state, same dose, infusion over our 14 day study whereas patches result in sudden spikes in plasma levels and require replacement of patches every 1–2 days dependent on chosen patch " pg. 2 ;

Q6517: S. Tolu, F. Marti, C. Morel, C. Perrier, N. Torquet, S. Pons, R. de Beaurepaire and P. Faure. Nicotine enhances alcohol intake and dopaminergic responses through beta2* and beta4* nicotinic acetylcholine receptors. *Sci Rep* 2017;7(45116

ALZET Comments: Nicotine; Saline; SC; Mice (knockout); 2004; 26 days; Dose (10 mg/kg/d); 0.9% saline used; Controls received mp w/ vehicle; animal info (8–16 week old male C57BL/6J wild-type, $\beta 2^{-/-}$ 18 and $\beta 4^{-/-}$ mice); pumps replaced every 4 weeks; Resultant plasma level (10 to 50 ng/ml); dependence;

Q5985: M. V. Singh, M. Z. Cicha, S. Kumar, D. K. Meyerholz, K. Irani, M. W. Chapleau and F. M. Abboud. Abnormal CD161(+) immune cells and retinoic acid receptor-related orphan receptor gamma-mediated enhanced IL-17F expression in the setting of genetic hypertension. *J Allergy Clin Immunol* 2017;140(3):809-821 e3

ALZET Comments: Nicotine; Saline; SC; Rat; 2001D; 24 hours; Controls received mp w/ vehicle; animal info (1-38 weeks) ; dependence; Dose (15 mg/kg);

Q6768: R. Saravia, A. Flores, A. Plaza-Zabala, A. Busquets-Garcia, A. Pastor, R. de la Torre, V. Di Marzo, G. Marsicano, A. Ozaita, R. Maldonado and F. Berrendero. CB1 Cannabinoid Receptors Mediate Cognitive Deficits and Structural Plasticity Changes During Nicotine Withdrawal. *Biol Psychiatry* 2017;81(7):625-634

ALZET Comments: Nicotine hydrogen tartrate salt; Saline; SC; Mice (knockout); 2002; 14 days; Dose (25 mg/kg/day); animal info (CB1R constitutive knockout (KO) mice; conditional KO mice and their wild-type (WT) littermates (8–12 weeks old)); dependence;

Q6365: Q. Liu, P. Whiteaker, B. J. Morley, F. D. Shi and R. J. Lukas. Distinctive Roles for alpha7*- and alpha9*-Nicotinic Acetylcholine Receptors in Inflammatory and Autoimmune Responses in the Murine Experimental Autoimmune Encephalomyelitis Model of Multiple Sclerosis. *Front Cell Neurosci* 2017;11(287

ALZET Comments: Nicotine salt; PBS; SC; Mice; 1004; Dose (13 mg of nicotine free base/kg/day); Controls received mp w/ vehicle; animal info (C57BL/6J mice); Resultant plasma level (~49 ng/ml or ~300 nM,);



Q6439: J. Lee, A. Luria, C. Rhodes, H. Raghu, N. Lingampalli, O. Sharpe, B. Rada, D. H. Sohn, W. H. Robinson and J. Sokolove. Nicotine drives neutrophil extracellular traps formation and accelerates collagen-induced arthritis. *Rheumatology (Oxford)* 2017;56(4):644-653

ALZET Comments: Nicotine; PBS; SC; Mice; 2006; 42 days; Dose (15 mg/kg/day); Controls received mp w/ vehicle; animal info (male DBA/1J mice);

Q2873: Ke J, Dong N, Wang L, Li Y, Dasgupta C, Zhang L and X. D. Role of DNA methylation in perinatal nicotine-induced development of heart ischemia-sensitive phenotype in rat offspring. *Oncotarget* 2017;8(44):76865-76880

ALZET Comments: Nicotine; Saline; SC; Rat (pregnant); 2ML4; 6 days; Dose (4 ug/kg/min); Controls received mp w/ vehicle; animal info (pregnant Sprague-Dawley rats); cardiovascular;

Q6433: P. Kanlikilicer, D. Zhang, A. Dragomir, Y. M. Akay and M. Akay. Gene expression profiling of midbrain dopamine neurons upon gestational nicotine exposure. *Med Biol Eng Comput* 2017;55(3):467-482

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Rat (pregnant); 4 weeks; Dose (0.6 mg/kg/day); Controls received mp w/ vehicle; animal info (E2 Sprague-Dawley rats);

Q6305: H. Kanamori, Y. Nakade, T. Yamauchi, K. Sakamoto, T. Inoue, T. Yamamoto, Y. Kobayashi, N. Ishii, T. Ohashi, K. Ito, Y. Sumida, H. Nakao, Y. Fukuzawa and M. Yoneda. Influence of nicotine on choline-deficient, L-amino acid-defined diet-induced non-alcoholic steatohepatitis in rats. *PLoS One* 2017;12(6):e0180475

ALZET Comments: Nicotine; Saline; SC; Rat; 2006; 6 weeks; Dose (12 mg/kg/day); Controls received mp w/ vehicle; animal info (Six-week-old male Wistar rats);

Q6451: O. O. Kalejaiye and M. C. Gondre-Lewis. Enhanced susceptibility of CA3 hippocampus to prenatal nicotine exposure. *J Dev Orig Health Dis* 2017;8(2):155-160

ALZET Comments: Nicotine; Saline; SC; Rat (pregnant); 2004; Dose (4 mg/kg/d.); Controls received mp w/ vehicle; animal info (Timed-pregnant Sprague-Dawley rats weighing 250–300 g); dependence;

Q6313: A. Jackson, S. Silk, Y. Buhidma and M. Shoaib. Varenicline, the clinically effective smoking cessation agent, restores probabilistic response reversal performance during withdrawal from nicotine. *Addict Biol* 2017;22(5):1316-1328

ALZET Comments: Nicotine hydrogen tartrate; Saline; SC; Rat; 2ML2; 7 days; Dose (3.16 mg/kg/day); 0.9% saline used; animal info (Male hooded Lister rats weighing 280-300g); post op. care (carprofen 5 mg/kg IP); dependence;

Q6455: A. Jackson, D. Bagdas, P. P. Muldoon, A. H. Lichtman, F. I. Carroll, M. Greenwald, M. F. Miles and M. I. Damaj. In vivo interactions between alpha7 nicotinic acetylcholine receptor and nuclear peroxisome proliferator-activated receptor-alpha: Implication for nicotine dependence. *Neuropharmacology* 2017;118(38-45)

ALZET Comments: Nicotine; Saline; Mice; Dose (24 mg/kg/day); Controls received mp w/ vehicle; animal info (ICR male mice); dependence;

Q6137: J. Huang, K. A. Waters and R. Machaalani. Hypoxia and nicotine effects on Pituitary adenylate cyclase activating polypeptide (PACAP) and its receptor 1 (PAC1) in the developing piglet brainstem. *Neurotoxicology* 2017;62(30-38)

ALZET Comments: Nicotine; Water; IP; Pig; 2ML2; 14 days; Dose (2 mg/kg/day); Controls received mp w/ vehicle; "The delivery of nicotine via the minipump provides a steady state infusion over our 14 day study whereas other methods result in sudden spikes in plasma levels (reviewed by Shiffman et al., 2005) and require more animal handling and stress." pg. 31;

Q6256: T. E. Grieder, O. George, M. Yee, M. A. Bergamini, M. Chwalek, G. Maal-Bared, H. Vargas-Perez and D. van der Kooy. Deletion of alpha5 nicotine receptor subunits abolishes nicotinic aversive motivational effects in a manner that phenocopies dopamine receptor antagonism. *Eur J Neurosci* 2017;46(1):1673-1681

ALZET Comments: Nicotine; SC; Mice; 1002; 12 days; Dose (7 mg/kg/day); animal info (Adult male C57BL/6 mice); dependence;



Q6150: X. Gao, L. Zhao, J. Zhuang, N. Zang and F. Xu. Prenatal nicotinic exposure prolongs superior laryngeal C-fiber-mediated apnea and bradycardia through enhancing neuronal TRPV1 expression and excitation. *FASEB J* 2017;31(10):4325-4334

ALZET Comments: Nicotine; Saline; SC; Rat; 2004; 28 days; Dose (6 mg/kg/d); Controls received mp w/ vehicle; animal info (adult female Sprague-Dawley rats weighing 250–350 g); Resultant plasma level (free nicotine 24 ng/ml in neonates and 18 ng/ml in pregnant dams);.

Q6375: M. L. Fisher, R. M. LeMaeftant, L. Zhou, G. Huang and J. R. Turner. Distinct Roles of CREB Within the Ventral and Dorsal Hippocampus in Mediating Nicotine Withdrawal Phenotypes. *Neuropsychopharmacology* 2017;42(8):1599-1609

ALZET Comments: Nicotine; Saline; SC; Mice; 2002; 12 days; Dose (18 mg/kg/day); 0.9% saline used; Controls received mp w/ vehicle; animal info (8-10 week old Male and female CREBloxP/loxP mice); Resultant plasma level (~0.3 µM);.

Q6269: S. Elhassan, D. Bagdas and M. I. Damaj. Effects of Nicotine Metabolites on Nicotine Withdrawal Behaviors in Mice. *Nicotine Tob Res* 2017;19(6):763-766

ALZET Comments: Nicotine; Saline; SC; Mice; 2002; 14 days; Dose (24 mg/kg/day); Controls received mp w/ vehicle; animal info (Male adult ICR mice weighing 20–25 g); dependence;.

Q6100: D. A. Connor and T. J. Gould. Chronic fluoxetine ameliorates adolescent chronic nicotine exposure-induced long-term adult deficits in trace conditioning. *Neuropharmacology* 2017;125(272-283

ALZET Comments: Nicotine; Saline; SC; Mice; 12 days; Dose (12.6 mg/kg/day and 6.3 mg/kg/day); animal info (Male C57BL/6J mice); behavioral testing (mice were trained in trace fear conditioning after 24 h abstinence and tested 24 h after training);.

Q6397: M. Cholanian, J. Wealing, R. B. Levine and R. F. Fregosi. Developmental nicotine exposure alters potassium currents in hypoglossal motoneurons of neonatal rat. *J Neurophysiol* 2017;117(4):1544-1552

ALZET Comments: Nicotine bitartrate; Saline; SC; Rat (pregnant); 1007D; Dose (6 mg/kg/day); Controls received mp w/ vehicle; animal info (Sprague-Dawley dams); Resultant plasma level (60 to 92 ng/ml); dependence;.

Q5769: M. Cholanian, G. L. Powell, R. B. Levine and R. F. Fregosi. Influence of developmental nicotine exposure on glutamatergic neurotransmission in rhythmically active hypoglossal motoneurons. *Exp Neurol* 2017;287(Pt 2):254-260

ALZET Comments: Nicotine; Saline; SC; Rat; 1007D; 28 days; Controls received mp w/ vehicle; animal info (Implanted at gestational day 5); half-life 20-24 hrs (p.255); Therapeutic indication (AMPA, Hypoglossal nucleus, Nicotine, Desensitization, developmental nicotine exposure); Dose (6 mg/kg/day);.

Q6422: Bade AN, Gendelman HE, Boska MD and L. Y. MEMRI is a biomarker defining nicotine-specific neuronal responses in subregions of the rodent brain. *Am J Transl Res* 2017;9(2):601-610

ALZET Comments: Nicotine; Saline; SC; Rat; 2ML1; 1 week; Dose (3.0 mg/kg/day); Controls received mp w/ vehicle; animal info (250-300g male Wistar rats); dependence;.

Q3891: Y. Alkhlaif, D. Bagdas, A. Jackson, A. J. Park and I. M. Damaj. Assessment of nicotine withdrawal-induced changes in sucrose preference in mice. *Pharmacol Biochem Behav* 2017;161(47-52

ALZET Comments: Nicotine hydrogen tartrate; Saline, physiological; SC; Mice; 2002; 14 days; Dose (12 and 24 mg/kg/day); animal info (8-week-old male C57BL/6J and beta2 KO mice);.

6. Pentobarbital

P5450: Y. Kim and S. Oh. Changes of the level of G protein alpha-subunit mRNA by tolerance to and withdrawal from pentobarbital in rats. *Neurochemical Research* 2002;27(6):527-533

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2001; 7 days; Controls received mp w/ vehicle; tolerance; dependence; one week recovery period after cannula placement.



P4317: C.-G. Jang, S. Oh, H. Zho and I. K. Ho. Autoradiography of [³H] glutamate binding during pentobarbital tolerance and withdrawal in the rat. *Brain Research Bulletin* 1999;48(1):99-102

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2ML1; 6 days; Controls received mp with vehicle; tolerance; dependence; animals allowed one week recovery after cannula placement.

P4177: S. Oh, S. E. Wellman and I. K. Ho. Changes in (3H)forskolin binding to adenylate cyclase and (3H)phorbol dibutyrate binding to protein kinase c in pentobarbital tolerant/dependent rats. *Neurochem. Res* 1998;23(4):463-467

ALZET Comments: Pentobarbital; CSF/CNS; Rat; 2ML1; 7 days; guide cannula implanted; rats were allowed 1 week recovery before implantation of pump; tolerance; dependence.

P4188: C.-G. Jang, S. Oh and I. K. Ho. Changes in NMDAR2 subunit mRNA levels during pentobarbital tolerance/withdrawal in the rat brain: an in situ hybridization study. *Neurochem. Res* 1998;23(11):1371-1377

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2ML1; 6 days; controls received mp w/saline; tolerance.

P3852: S. Oh, K. Hoshi and I. K. Ho. Role of NMDA receptors in pentobarbital tolerance/dependence. *Neurochem. Res* 1997;22(7):767-774

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2ML1; 7 days; controls received mp w/saline; tolerance; dependence.

P3421: T. Suzuki, T. Ito, S. E. Wellman and I. K. Ho. An autoradiographic study of [3H]flunitrazepam binding sites in the brain of rat made tolerant to and dependent on pentobarbital. *Eur. J. Pharmacol* 1996;295(169-179)

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2ML1; 6 days; controls received vehicle infusion; tolerance; dependence; recipe for equithesin anesthesia provided on p. 170.

P3422: T. Ito, T. Suzuki, S. E. Wellman and I. K. Ho. Chronic pentobarbital administration alters g-aminobutyric acid(A) receptor a(6)-subunit mRNA levels and diazepam-insensitive [3H]Ro15-4513 binding. *Synapse* 1996;22(106-113)

ALZET Comments: Pentobarbital; CSF/CNS; Rat; 2ML1; 6 days; tolerance; dependence.

P3351: T. Suzuki, T. Ito, S. E. Wellman and I. K. Ho. Changes in [3H] Flunitrazepam binding in the brain of rats made tolerant to and dependent upon pentobarbital. *Life Sci* 1995;57(5):L-69

ALZET Comments: Pentobarbital; CSF/CNS; Rat; 2ML1; 6 days; controls received mp w/saline; tolerance; dependence; animals allowed 1 week recovery after cannula placement.

P3112: Y. T. Tseng, S. E. Wellman and I. K. Ho. In situ hybridization evidence of differential modulation by pentobarbital of GABAA receptor a1- and B3-subunit mRNAs. *J. Neurochem* 1994;63(301-309)

ALZET Comments: Pentobarbital; CSF/CNS; Rat; 2ML1; 6 days; tolerance.

P3173: T. Miyaoka, T. Kimura, P. A. Saunders, Y. T. Tseng and I. K. Ho. Binding characteristics of [3H]flunitrazepam in pentobarbital-withdrawal rats. *Neurochem. Res* 1994;19(1):37-42

ALZET Comments: Pentobarbital; CSF/CNS; Rat; 2ML1; 6 days; controls received mp with saline; animals allowed 1 week recovery after cannula placement.

P3111: Y. T. Tseng, S. E. Wellman and I. K. Ho. Differential effects on GABAA receptor γ2-subunit messenger RNA by tolerance to and withdrawal from pentobarbital -- an in situ hybridization study. *Life Sci* 1993;53(L321-L326)

ALZET Comments: Pentobarbital; CSF/CNS; Rat; no duration posted; tolerance.

P3113: Y. T. Tseng, T. Miyaoka and I. K. Ho. Region-specific changes of GABAA receptors by tolerance to and dependence upon pentobarbital. *Eur. J. Pharmacol* 1993;236(23-30)

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2ML1; 6,7 days; controls received mp with saline; tolerance; dependence; animals allowed 1 week recovery after cannula placement; brain and serum samples taken at 0, 2, 4, 7 days during infusion & 6, 24, 48 hrs. after withdrawal.



P2338: K. Toshiyuki, T. Miyaoka, P. A. Saunders, M. L. Baker, A. S. Hume, I. Yamamoto and I. K. Ho. Induction of tolerance to and physical dependence on phentobarbital continuous intracerebroventricular administration. *J. Pharmacol. Exp. Ther* 1993;266(3):1300-1305

ALZET Comments: Pentobarbital; Saline; CSF/CNS; Rat; 2ML1; 6 days; tolerance; dependence.

P3675: T. Kimura, T. Miyaoka, P. A. Saunders, M. L. Baker, A. S. Hume, I. Yamamoto and I. K. Ho. Induction of tolerance to and physical dependence on pentobarbital continuous intracerebroventricular administration. *J. Pharmacol. Exp. Ther* 1993;266(3):1300-1305

ALZET Comments: Pentobarbital, sodium; Saline, normal; CSF/CNS; Rat; 2ML1; 6 days; controls received mp w/ filtered, normal saline; tolerance; dependence; good illustration of pump placement (p. 1301).

7. Phencyclidine

Q2590: A. Balla, S. Schneider, H. Sershen and D. C. Javitt. Effects of novel, high affinity glycine transport inhibitors on frontostriatal dopamine release in a rodent model of schizophrenia. *European Neuropsychopharmacology* 2012;22(12):902-910

ALZET Comments: Phencyclidine hydrochloride; Saline, sterile, physiological; SC; Rat; 2ML4; Control animals received mp w/ vehicle; animal info (Sprague Dawley, male, wks old, 160-200 g, 280-320 g).

Q0375: C. S. Pedersen, P. Goetghebeur and R. Dias. Chronic infusion of PCP via osmotic mini-pumps: A new rodent model of cognitive deficit in schizophrenia characterized by impaired attentional set-shifting (ID/ED) performance. *Journal of Neuroscience Methods* 2009;185(1):66-69

ALZET Comments: Phencyclidine; SC; Rat; 14 days; Controls received mp w/saline; animal info (Lister hooded, male); post op. care (Bairril, Rimadyl); "Using PCP mini-pump infusion instead of the well described intraperitoneal dosing bears the advantage of reducing the animal's stress levels, bypasses the risk of potential mis-dosing that could arise from multiple dosing events and consequently may reduce the number of animals needed." pg 69.

P7825: G. Pitas, E. M. Laurenzana, D. K. Williams, S. M. Owens and W. B. Gentry. Anti-phencyclidine monoclonal antibody binding capacity is not the only determinant of effectiveness, disproving the concept that antibody capacity is easily surmounted. *Drug Metabolism and Disposition* 2006;34(6):906-912

ALZET Comments: Phencyclidine HCL; Saline, sterile; SC; Rat; 2ML1; 4 days; Functionality of mp verified by serum PCP concentrations; half-life (pg. 907) 3.9 hours in rats; tolerance; animal info (male, Sprague-Dawley, 270-300g.).

P6979: F. Sams-Dodd. (+) MK-801 and phencyclidine induced neurotoxicity do not cause enduring behaviours resembling the positive and negative symptoms of schizophrenia in the rat. *BASIC & CLINICAL PHARMACOLOGY & TOXICOLOGY* 2004;95(5):241-246

ALZET Comments: MK-801; phencyclidine hydrochloride; Sodium chloride; SC; Rat; 2ML2; 6 days; Controls received mp w/ vehicle; dose-response; comparison of SC injections vs. mp; post op. care (wound plast); NMDA antagonists.

P5913: E. M. Laurenzana, M. G. Gunnell, W. B. Gentry and S. M. Owens. Treatment of adverse effects of excessive phencyclidine exposure in rats with a minimal dose of monoclonal antibody. *Journal of Pharmacology and Experimental Therapeutics* 2003;306(3):1092-1098

ALZET Comments: Phencyclidine; phencyclidine HCL;; Saline; sterile; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; serum levels taken; good methods p. 1093; half-life (p. 1093) =3.9 h in rats; dependence; behavioral study.

P6200: A. Balla, H. Sershen, M. Serra, R. Koneru and D. C. Javitt. Subchronic continuous phencyclidine administration potentiates amphetamine-induced frontal cortex dopamine release. *Neuropsychopharmacology* 2003;28(1):34-44

ALZET Comments: Phencyclidine, HCL; Saline, sterile physiological; SC; Rat; 2ML4; 3-14 days; Controls received mp w/ vehicle; functionality of mp verified by serum PCP levels.



P5135: A. K. Jebelli, N. Doan and G. Ellison. Prenatal phencyclidine induces heightened neurodegeneration in rats in some brain regions, especially during 2nd trimester, but possible anti-apoptotic effects in others. *Pharmacol Toxicol* 2002;90(20-25)

ALZET Comments: Phencyclidine; Saline; SC; Rat (pregnant); 2ML1; 5 days; controls received a saline pellet as a "sham minipump"; teratology.

P4816: S. V. Kyosseva, S. Owens, A. D. Elbein and C. N. Karson. Differential and region-specific activation of mitogen-activated protein kinases following chronic administration of phencyclidine in rat brain. *Neuropsychopharmacology* 2001;24(267-277)

ALZET Comments: Phencyclidine HCl; Saline; SC; Rat; 2ML2; 3, 10, or 20 days; Controls received mp w/ vehicle; dose-response p. 270-271;.

P4936: A. Balla, R. Koneru, J. Smiley, H. Sershen and D. C. Javitt. Continuous phencyclidine treatment induces schizophrenia-like hyperreactivity of striatal dopamine release. *Neuropsychopharmacology* 2001;25(2):157-164

ALZET Comments: Phencyclidine HCl; Saline, sterile; SC; Rat; 2ML4; 2-3 weeks; controls received mp w/ vehicle; functionality of mp verified by serum PCP levels; dose response (graphs p. 160); schizophrenia.

P5180: A. Balla, A. Hashim, S. Burch, D. C. Javitt, A. Lajtha and H. Sershen. Phencyclidine-induced dysregulation of dopamine response to amphetamine in prefrontal cortex and striatum. *Neurochem. Res* 2001;26(8-9):1001-1006

ALZET Comments: Phencyclidine HCl; Saline; SC; Rat; 2ML4; 2 weeks; Controls received mp w/ vehicle; functionality of mp verified by PCP serum levels; NMDA antagonist.

P4348: Z. A. Martinez, G. D. Ellison, M. A. Geyer and N. R. Swerdlow. Effects of sustained phencyclidine exposure on sensorimotor gating of startle in rats. *Neuropsychopharmacology* 1999;21(28-39)

ALZET Comments: Phencyclidine HCl; SC; Rat; 5 days; controls received silastic polymer pellets ~ the same size and shape as mps; comparison of repeated IP injections vs. mp;.

R0133: G. Ellison. The N-methyl-D-aspartate antagonists phencyclidine, ketamine and dizocilpine as both behavioral and anatomical models of the dementias. *Brain Res. Reviews* 1995;20(250-267)

ALZET Comments: Phencyclidine; MK-801; 1,5 days; schizophrenia models; brief mention of mp on p. 256.

P2961: T. F. Burke, S. Buzzard and W. D. Wessinger. [3H]MK-801 binding to well-washed rat brain membranes following cessation of chronic phencyclidine treatment. *Pharmacol. Biochem. Behav* 1995;51(2&3):435-438

ALZET Comments: Phencyclidine; SC; Rat; 2ML2; 10 days; controls received mp with saline; dependence.

P3907: G. Ellison. Competitive and non-competitive NMDA antagonists induce similar limbic degeneration. *NeuroReport* 1994;5(18):2688-2692

ALZET Comments: Phencyclidine HCl; MK-801; LY-235959; Rat; 1, 5 days; controls received empty mp; comparison of single injections vs. mp.

P2952: P. Saransaari, S. M. Lillrank and S. S. Oja. Phencyclidine treatment in mice: effects on phencyclidine binding sites and glutamate uptake in cerebral cortex preparations. *J. Neural Transm* 1993;93(47-59)

ALZET Comments: Phencyclidine HCl; SC; mice; 2001; 3 days; controls received empty mp.

P2840: M. S. Owens, M. Gunnell, E. M. Laurenzana and J. L. Valentine. Dose- and time-dependent changes in phencyclidine metabolite covalent binding in rats and the possible role of CYP2D1. *J. Pharmacol. Exp. Ther* 1993;265(3):1261-1266

ALZET Comments: Phencyclidine HCl; Saline; SC; Rat; 2ML2; 1, 2, 3, 4, 10, 20 days; controls received mp with saline, no treatment or sham surgery; pumps replaced at 10 days.

P3777: G. Ellison and R. C. Switzer III. Dissimilar patterns of degeneration in brain following four different addictive stimulants. *NeuroReport* 1993;5(17-20)

ALZET Comments: Phencyclidine HCl; SC; Rat; 5 days; comparison of pellets vs. mp.



P2714: S. M. Lillrank and S. S. Oja. Phencyclidine treatments differentially affect dopamine and D-aspartate release from frontal cortical and striatal slices from mice. *Int. J. Neurosci* 1992;64(69-81

ALZET Comments: Phencyclidine HCl; SC; mice; 2001; 3 or 7 days; controls received sham operations.

P2225: M. E. Bronson and J. Roberts. Withdrawal from chronic phencyclidine produces a pentylenetetrazol-like discriminative stimulus. *Life Sci* 1992;50(7):499-504

ALZET Comments: Phencyclidine; Water; SC; Rat; 2ML2; 10 days; controls received mp w/water; dependence; phencyclidine is PCP.

P1877: W. D. Wessinger and S. M. Owens. Chronic administration of phencyclidine: pharmacokinetic comparison of intravenous and subcutaneous infusions in Sprague-Dawley rats. *Drug Metab. Disp* 1991;19(3):719-721

ALZET Comments: Phencyclidine; Saline; SC; Rat; 2ML2; 10 days; comparison of iv infusion by external infusion pump vs. sc infusion by ALZET pump; sc infusion data were much more reproducible (p. 719).

P1767: B. W. Massey and W. D. Wessinger. Effects of terminating chronic phencyclidine on schedule-controlled behavior in rats. *Pharmacol. Biochem. Behav* 1990;36(117-121

ALZET Comments: Phencyclidine; Saline; SC; Rat; 2ML4; 10 days; dependence.

P1819: B. W. Massey and W. D. Wessinger. Alterations in rat brain [3H]-TCP binding following chronic phencyclidine administration. *Life Sci* 1990;47(L139-L143

ALZET Comments: Phencyclidine; Rat; 2ML2; 10 days; no comment posted.

P0225: T. Nabeshima, S. P. Sivam, C. Y. Tai and I. K. Ho. Development of dispositional tolerance to phencyclidine by osmotic minipump in the mouse. *J. Pharmacol. Methods* 1982;7(239-253

ALZET Comments: Phencyclidine; SC; mice; 1701; 1-5 days; no comment posted.

P0183: T. Nabeshima, S. P. Sivam, J. C. Norris and I. K. Ho. Calcium-dependent GABA release from mouse brain slices following acute and chronic phencyclidine administration. *Res. Commun. Substance Abuse* 1981;2(4):343-354

ALZET Comments: Phencyclidine HCl; Saline; SC; mice; 1701; 2-6 days; comparison of acute ip injections vs. chronic infusion.