



References on the Cell Proliferation Studies Using ALZET® Osmotic Pumps

1. BrdU

Q8564: K. Kawamoto, *et al.* Cell proliferation analysis is a reliable predictor of lack of carcinogenicity: Case study using the pyrethroid imiprothrin on lung tumorigenesis in mice. *Regul Toxicol Pharmacol* 2020;113(104646

Agents: uridine, bromodeoxy-; **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Dose (40 mg BrdU/mL); 10% DMSO used; animal info (Male mice aged 9 weeks); bromodeoxyuridine aka BrdU; cancer (carcinogenicity);

R0384: A. A. Pieper, *et al.* Benefits of Enhancing Nicotinamide Adenine Dinucleotide Levels in Damaged or Diseased Nerve Cells. *Cold Spring Harbor Symposia on Quantitative Biology* 2019;

Agents: Uridine, bromodeoxy-; aminopropylcarbazole **Vehicle:** Not stated; **Route:** CSF/CNS; **Species:** Mice; **Pump:** Not stated; **Duration:** 1 week;

ALZET Comments: neurodegenerative (missing NPAS3 impaired hippocampal neurogenesis); Therapeutic indication (Missing NPAS1 enhanced hippocampal neurogenesis);

Q6967: M. Kondo, *et al.* Involvement of peroxisome proliferator-activated receptor- α in liver tumor production by permethrin in the female mouse. *Toxicol Sci* 2019;

Agents: Uridine, Bromodeoxy **Vehicle:** DMSO; **Route:** SC; **Species:** Mice; Rat; **Pump:** 2001; 2ML2; **Duration:** 7 days; 14 days;

ALZET Comments: Dose (8.4 mgBrdU/mouse.; 33.6 mg BrdU/rat); 10% DMSO used; cancer (liver); stress/adverse reaction: One animal was dead due to anesthesia at implantation of osmotic pump;

Q8139: H. Mziaut, *et al.* miR-132 controls pancreatic beta cell proliferation and survival in mouse model through the Pten/Akt/Foxo3 signaling. *bioRxiv* 2018;

Agents: Uridine, Bromodeoxy- **Vehicle:** DMSO; **Route:** IP; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Dose (0.5 ul/hr/day); 50% DMSO used; animal info (C57Bl/6N mice with an age of 13-19 weeks and a body weight of 28-34 g); Bromodeoxyuridine aka BrdU ; cardiovascular;

Q8107: E. Magrinelli, *et al.* Simultaneous production of diverse neuronal subtypes during early corticogenesis. *bioRxiv* 2018;

Agents: Uridine, Bromodeoxy **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1003D; **Duration:** 3 days or 7 days;

ALZET Comments: Dose (16 mg/ml both 0.1 ul/hr); animal info (CD1); Bromodeoxyuridine aka BrdU ; neurodegenerative (Corticogenesis);

Q7027: S. Govindan, *et al.* In vivo pulse labeling of isochronic cohorts of cells in the central nervous system using FlashTag. *Nat Protoc* 2018;13(10):2297-2311

Agents: Uridine, bromodeoxy-, Deoxyuridine, 5-ethynyl-2' **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1003D; **Duration:** 3 days;

ALZET Comments: Dose (16 mg/ml BrdU or 10 mg/ml EdU);

Q7820: J. M. Gonzalez-Rosa, *et al.* Myocardial Polyploidization Creates a Barrier to Heart Regeneration in Zebrafish. *Developmental Cell* 2018;44(4):433-446 e7

Agents: uridine, bromodeoxy- **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** Not Stated;

ALZET Comments: Dose (16 mg/ml); animal info (12 weeks, MHC-ECT2; MHC-nLAC double transgenic or MHC-nLAC single transgenic); cardiovascular; mp used for BrdU labeling;

Q6551: E. Yulyaningsih, *et al.* Acute Lesioning and Rapid Repair of Hypothalamic Neurons outside the Blood-Brain Barrier. *Cell Reports* 2017;19(11):2257-2271

Agents: Uridine, bromodeoxy-; Fibroblast growth factor, basic **Vehicle:** CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;



ALZET Comments: Dose (3.2 mg/ml BrdU; 100 µg/ml bFGF); animal info (12- to 18-week-old Npy-GFP mice and Ai14(tdTomato) mice); Brain coordinates (anteroposterior -0.3 mm, lateral +1.0 mm to bregma and dorsoventral -2.5 mm below skull);

Q6357: I. R. Miousse, *et al.* Dose-response analysis of epigenetic, metabolic, and apical endpoints after short-term exposure to experimental hepatotoxicants. *Food Chem Toxicol* 2017;109(Pt 1):690-702

Agents: Uridine, bromodeoxy-; **Vehicle:** PBS; **Route:** Not Stated; **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: Dose (20 mg/ml); animal info (Ten-week old male F344/DuCrI rats); Bromodeoxyuridine is a structural analog of thymidine that incorporates into nuclear DNA and is used as a surrogate marker of cell proliferation);

Q6358: R. I. Menzies, *et al.* Transcription controls growth, cell kinetics and cholesterol supply to sustain ACTH responses. *Endocrine Connections* 2017;6(7):446-457

Agents: ACTH; Uridine, bromodeoxy-; **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Dose (ACTH: 3 µg/day; BrDU: 1mg/mL); 0.154 M NaCl used; animal info (25g male C57BL6 mice);

Q5831: M. A. Mandell, *et al.* Continual renewal and replication of persistent *Leishmania major* parasites in concomitantly immune hosts. *Proc Natl Acad Sci U S A* 2017;114(5):E801-E810

Agents: Uridine, Bromodeoxy **Vehicle:** Water; **Route:** Not Stated; **Species:** Mice; **Pump:** 2001D; **Duration:** Not Stated;

ALZET Comments: Controls received mp w/ vehicle; animal info (6-10 weeks old); comparison of drinking water administration, multiple IP injections every 3 hours for 18 hours, single IP injection and minipump infusion; Dose (7.2 mg);

Q6012: C. J. Choi, *et al.* Mode of action and human relevance of THF-induced mouse liver tumors. *Toxicol Lett* 2017;276(138-143)

Agents: Uridine, bromodeoxy **Vehicle:** PBS; **Route:** SC; **Species:** Mice (knockout); **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (6-7 weeks; 17-20g); Therapeutic indication (THF, Liver tumor); Dose (15 mg/mL);

Q6410: C. N. Bocker, *et al.* Hepatocyte-specific PPARA expression exclusively promotes agonist-induced cell proliferation without influence from nonparenchymal cells. *American Journal of Physiology Gastrointestinal and Liver Physiology* 2017;312(3):G283-G299

Agents: Uridine, bromodeoxy- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice (knockout); **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: animal info (8-10 week old Ppara wild-type (Ppara_{+/+}) and conventional Ppara-null (Ppara_{-/-}) mice);

Q5096: H. Williams, *et al.* Wnt2 and WISP-1/CCN4 Induce Intimal Thickening via Promotion of Smooth Muscle Cell Migration. *Arteriosclerosis, Thrombosis, and Vascular Biology* 2016;36(7):1417-24

Agents: Uridine, bromodeoxy- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice (transgenic); **Pump:** 2004; **Duration:** 3 days; 28 days;

ALZET Comments: animal info (Wnt2 +/-); cardiovascular;

Q6513: M. L. Thompson, *et al.* Preventing painful age-related bone fractures: Anti-sclerostin therapy builds cortical bone and increases the proliferation of osteogenic cells in the periosteum of the geriatric mouse femur. *Mol Pain* 2016;12

Agents: Uridine, bromodeoxy **Vehicle:** PBS, Dulbecco's; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: animal info (adult male C57BL/6 J mice.); Controls received mp w/ vehicle;

Q6652: S. Ribback, *et al.* The Epidermal Growth Factor Receptor (EGFR) Inhibitor Gefitinib Reduces but Does Not Prevent Tumorigenesis in Chemical and Hormonal Induced Hepatocarcinogenesis Rat Models. *Int J Mol Sci* 2016;17(10):

Agents: Uridine, bromodeoxy **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: animal info (inbred male and female Lewis rats); 5-Bromo-20-deoxyuridine AKA (BrdU); cancer (Hepatocellular carcinoma);

Q5340: P. Douvaras, *et al.* Abnormal corneal epithelial maintenance in mice heterozygous for the micropinna microphthalmia mutation Mp. *Experimental Eye Research* 2016;149(26-39)



Agents: Uridine, Bromodeoxy- **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (15-week old Mp/+ mice); functionality of mp verified by corneal imaging; Dose (50 mg/ml);

Q5303: S. Di Siena, *et al.* Activated c-Kit receptor in the heart promotes cardiac repair and regeneration after injury. *Cell Death & Disease* 2016;7(7):e2317

Agents: Uridine, Bromodeoxy **Vehicle:** Not Stated; **Route:** SC; **Species:** mice; **Pump:** Not Stated; **Duration:** 30 days;
ALZET Comments: post op. care (500 µl glucose solution (5% glucose/physiologic solution), analgesic Atradol (3 mg/kg); Dose (0.6 M);

Q5773: R. E. Cohen, *et al.* Adult Neurogenesis Leads to the Functional Reconstruction of a Telencephalic Neural Circuit. *J Neurosci* 2016;36(34):8947-56

Agents: Uridine, Bromodeoxy **Vehicle:** Saline, DMSO; **Route:** SC; **Species:** bird (sparrow); **Pump:** 1007D; **Duration:** 5 days;
ALZET Comments: Controls received mp w/ vehicle; animal info; 7.5% NaCl and 15% DMSO used; Therapeutic indication (Neurogenesis, plasticity); Dose (50 mg/kg);

2. edU

Q7941: I. Aquila, *et al.* c-kit Haploinsufficiency impairs adult cardiac stem cell growth, myogenicity and myocardial regeneration. *Cell Death Dis* 2019;10(6):436

Agents: Uridine, 5-bromo-2'-deoxy-; Uridine, 5-Ethynyl-2'-deoxy-; Uracil, 5-fluoro- **Vehicle:** Water, Deionized, DMSO buffered; **Route:** SC; **Species:** Mice; **Pump:** Not stated; **Duration:** 7, 25, 28 days;
ALZET Comments: Dose ((BrdU 50 mg/kg/day), (EdU 50 mg/kg/day), (5-FU 15 mg/kg/day)); 50% deionized water and 50% DMSO used; Controls received mp w/ vehicle; animal info (12 weeks, male, C57BL/6J, Tg-myh6(MCM), and Tg-myh6MCM: R26(mT-mG/+)); cardiovascular; mp used for BrdU and EdU labeling or for ISO + 5-FU induced cardiomyopathy;

Q7027: S. Govindan, *et al.* In vivo pulse labeling of isochronic cohorts of cells in the central nervous system using FlashTag. *Nat Protoc* 2018;13(10):2297-2311

Agents: Uridine, bromodeoxy-, Deoxyuridine, 5-ethynyl-2' **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1003D; **Duration:** 3 days;
ALZET Comments: Dose (16 mg/ml BrdU or 10 mg/ml EdU);

Q6236: M. Patterson, *et al.* Frequency of mononuclear diploid cardiomyocytes underlies natural variation in heart regeneration. *Nat Genet* 2017;49(9):1346-1353

Agents: Deoxyuridine, 5-ethynyl-2' **Vehicle:** DMSO; Saline; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 13 days;
ALZET Comments: Dose (5 mg); 50% DMSO, 50% saline used; cardiovascular;

Q6399: Y. T. Chen, *et al.* Low-Level MHC Class II Expression Leads to Suboptimal Th Cell Response, Increased Autoaggression, and Heightened Cytokine Inducibility. *J Immunol* 2017;198(5):1928-1943

Agents: Uridine, 5'-ethynyl-2'-deoxy **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;
ALZET Comments: immunology;

Q5259: K. C. Roche, *et al.* SOX9 maintains reserve stem cells and preserves radioresistance in mouse small intestine. *Gastroenterology* 2015;149(6):1553-1563 e10

Agents: Uridine, 5-ethynyl-2'-deoxy **Vehicle:** DMSO, PEG 300; **Route:** SC; **Species:** mice; **Pump:** Not Stated; **Duration:** 28 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (SOX9 knockout mice); functionality of mp verified by Click-it EdU flow cytometry kit; 50% DMSO used, 50% PEG 300; cell proliferation assays; Dose (1.15 mg/ul);

Q2778: S. C. Robins, *et al.* Evidence for NG2-glia Derived, Adult-Born Functional Neurons in the Hypothalamus. *PLoS One* 2013;8(10):U880-U890



Agents: Uridine, bromodeoxy; uridine, ethynyldeoxy **Vehicle:** CSF, artificial; **Route:** CSF/CNS; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Animal info (NG2-CreER:tdTomato); Plastics One cannula used; labeling of NG2 derived neurons

Q5258: S. C. Robins, *et al.* Evidence for NG2-glia derived, adult-born functional neurons in the hypothalamus. *PLoS One* 2013;8(10):e78236

Agents: Uridine, bromodeoxy; uridine, ethynyldeoxy **Vehicle:** CSF, artificial; **Route:** CSF/CNS (right lateral ventricle); **Species:** mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: animal info: NG2-CreER:tdTomato mice; functionality of mp verified post brain removal; Plastics One infusion kit used; brain tissue distribution; delayed delivery (2 days); delayed delivery (2 days); Dose: 30 ug/day (BrdU and EdU); Brain coordinates; 0.3 mm (anteroposterior), 1.0 mm (lateral), and 2.5 mm (dorsoventral, below skull)

Q3442: K. J. Christie, *et al.* ADULT HIPPOCAMPAL NEUROGENESIS, RHO KINASE INHIBITION AND ENHANCEMENT OF NEURONAL SURVIVAL. *Neuroscience* 2013;247(1):75-83

Agents: Uridine, 5-ethynyl-2'-deoxy; Y27632 **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days; 37 days;

ALZET Comments: Animal info (male, C57BL6, 8-9 weeks old); ALZET brain infusion kit used; behavioral testing (elevated plus maze; object recognition; y maze); ethynyldeoxyuridine aka EDU; Y27632 is a ROCK inhibitor;

Q2172: K. A. Criswell, *et al.* Pregabalin Induces Hepatic Hypoxia and Increases Endothelial Cell Proliferation in Mice, a Process Inhibited by Dietary Vitamin E Supplementation. *TOXICOLOGICAL SCIENCES* 2012;128(1):42-56

Agents: Uridine, bromodeoxy; uridine, 5-ethynyl-2'-deoxy **Vehicle:** Sodium carbonate; saline; **Route:** SC; **Species:** Mice; Rat; **Pump:** 2001; 2ML1; **Duration:** 4 days;

ALZET Comments: Animal info (B6C3F1, 9-11 wks old, 18.5-22 g, Wistar, 6-8 wks old, 151-250 g); labeling of endothelial cells

Q0680: N. Guo, *et al.* Short Telomeres Compromise beta-Cell Signaling and Survival. *PLoS One* 2011;6(3):U429-U438

Agents: Uridine, 5-ethynyl-2'-deoxy **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 14 days;

ALZET Comments: Animal info (mTR +/-); 5-ethynyl-2'-deoxyuridine also known as EdU

3. Thymidine

Q7269: A. Vujic, *et al.* Exercise induces new cardiomyocyte generation in the adult mammalian heart. *Nat Commun* 2018;9(1):1659

Agents: Thymidine, 15-; Radio-isotope **Vehicle:** 15N tracer; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 8 weeks; **ALZET Comments:** Dose (20 ug/h); animal info (2 months old, C57Bl/6, male); pumps replaced weekly for 8 weeks; cardiovascular;

Q7233: O. A. Mineyeva, *et al.* Spatial geometry of stem cell proliferation in the adult hippocampus. *Sci Rep* 2018;8(1):3444

Agents: Thymidine, 5-bromo-2'-deoxyuridine **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 5 days; **ALZET Comments:** Dose (3 mg); animal info (2.5 months old, Nestin-GFP mice);

Q4884: S. S. J. X. Z.-H. L. J. H. &, *et al.* Lack of JWA Enhances Neurogenesis and Long-Term Potentiation in Hippocampal Dentate Gyrus Leading to Spatial Cognitive Potentiation. *MOLECULAR NEUROBIOLOGY* 2016;53(355-368

Agents: Thymidine, 3'-azido-3'-deoxy-; cyclodextrin, methyl-b- **Vehicle:** Saline; PEG 400; **Route:** CSF/CNS (dentate gyrus); **Species:** Mice; **Pump:** Not Stated; **Duration:** 14 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (JWA-nKO); behavioral testing (morris water maze, rotarod test); used Plastics One cannula; used dental cement and screws; enzyme inhibitor (telomerase);



Q3694: C. E. Wood, *et al.* Comparative Time Course Profiles of Phthalate Stereoisomers in Mice. *TOXICOLOGICAL SCIENCES* 2014;139(21-34)

Agents: Thymidine, 3H- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 5 days;
ALZET Comments: Animal info (male, B6C3F1, 21-28 days old); toxicology; Thymidine used for imaging cells undergoing DNA replication;

Q4114: M. L. Steinhauser, *et al.* Quantifying cell division with deuterated water and multi-isotope imaging mass spectrometry (MIMS). *SURFACE AND INTERFACE ANALYSIS* 2014;46(161-164)

Agents: Thymidine, 15N- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 3 days;
ALZET Comments: Animal info (male, C57BL6, 8-10 weeks old); imaging;

Q3943: S. M. Kim, *et al.* Loss of White Adipose Hyperplastic Potential Is Associated with Enhanced Susceptibility to Insulin Resistance. *Cell Metabolism* 2014;20(1049-1058)

Agents: Thymidine, 15N- **Vehicle:** Water; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;
ALZET Comments: Animal info (male, C57BL6J, 4 weeks old); imaging;

Q2624: S. E. Senyo, *et al.* Mammalian heart renewal by pre-existing cardiomyocytes. *Nature* 2013;493(7432):433-U186

Agents: Thymidine, 15N- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice (transgenic); **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Animal info (MerCreMer/Zeg tg, male, adult, 4 wks old)

Q1802: M. L. Steinhauser, *et al.* Multi-isotope imaging mass spectrometry quantifies stem cell division and metabolism. *Nature* 2012;481(7382):516-U131

Agents: Thymidine, N- **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;
ALZET Comments: Animal info (adult, C57B6)

Q1953: Q. G. Zhou, *et al.* Hippocampal Telomerase Is Involved in the Modulation of Depressive Behaviors. *Journal of Neuroscience* 2011;31(34):12258-12269

Agents: Thymidine, 3'-azido-deoxy **Vehicle:** Not Stated; **Route:** CSF/CNS (hippocampus); **Species:** Mice; **Pump:** Not Stated;
Duration: 7, 28 days;

ALZET Comments: Animal info (C57BL/6, 18-22 g, adult); 3-azido-deoxythymidine also known as AZT aka azidothymidine

Q1618: R. T. Turner, *et al.* The Role of Mast Cells in Parathyroid Bone Disease. *Journal of Bone and Mineral Research* 2010;25(7):1637-1649

Agents: Parathyroid hormone, human, (1-34); thymidine, methyl-3H **Vehicle:** Ethanol; **Route:** SC; **Species:** Rat; mice; **Pump:** Not Stated; **Duration:** 12 days; 1 week;

ALZET Comments: Controls received mp w/ vehicle; animal info (Sprague Dawley, 6 wks to 6 mo; DBA, adult); 2% ethanol used

Q1255: M. Perez-Martin, *et al.* IGF-I stimulates neurogenesis in the hypothalamus of adult rats. *European Journal of Neuroscience* 2010;31(9):1533-1548

Agents: Insulin-like growth factor-1; thymidine, H3 **Vehicle:** Not Stated; **Route:** CSF/CNS; **Species:** Rat; **Pump:** 2001;
Duration: 7 days;

ALZET Comments: Controls received mp w/ saline; animal info (adult, male, Wistar, albino, male, female, 2 mo old); ALZET brain infusion kit used