



**Recent References (2014-2019) on the Administration of Endotoxins  
Using ALZET® Osmotic Pumps**

**Q6974:** Z. I. Grunewald, *et al.* Cannabinoid receptor type-1 partially mediates metabolic endotoxemia-induced inflammation and insulin resistance. *Physiol Behav* 2019;199(282-291

**ALZET Comments:** Endotoxin, LPS; Saline; IP; Rat; 2006; 6 weeks; Dose (12.5 µg/kg/hr); Controls received mp w/ vehicle; animal info (male Wistar rats; 200–220 g);.

**Q6984:** M. Bolos, *et al.* Maturation dynamics of the axon initial segment (AIS) of newborn dentate granule cells in young adult C57BL/6J mice. *J Neurosci* 2019;

**ALZET Comments:** Endotoxin, LPS; PBS; SC; Mice; 1002; 2 weeks; Dose (150 µg/kg/day); Controls received mp w/ vehicle; animal info (5week-old C57BL/6J Ola Hsd female mice);.

**Q6144:** D. Lana, *et al.* Alterations in the Interplay between Neurons, Astrocytes and Microglia in the Rat Dentate Gyrus in Experimental Models of Neurodegeneration. *Front Aging Neurosci* 2017;9(296

**ALZET Comments:** Endotoxin, LPS; CSF/CNS (fourth ventricle); Rat; 4 weeks; Dose (1.6 mg/ml); animal info (Male adult Wistar rats); post op. care (1% chloramphenicol applied to the exposed skull and scalp, Bupivacaine applied locally to the scalp, and 4 ml of sterile isotonic saline injected s.c. to prevent dehydration); Brain coordinates (-2.5 mm posterior to Lambda, 7 mm ventral to the dura); neurodegenerative (Alzheimer's);.

**Q5690:** B. Carusillo Theriault, *et al.* Cerebral microbleeds in a neonatal rat model. *PLoS One* 2017;12(2):e0171163

**ALZET Comments:** Endotoxin, LPS; IV (jugular); Rat (pregnant); 2001D; 24 hours; animal info (female, Wistar E19); ischemia (intrauterine); no stress (see pg. 4 “No mortality was experienced for dams undergoing the above protocol”); behavioral testing (Righting Reflex, negative geotaxis, open field, elevated plus maze, Morris water maze, balance beam); teratology; Dose (600 ng/hr); Resultant plasma level (4.5 EU/mL after 16 hours of infusion);.

**Q6112:** X. Brenachot, *et al.* Hepatic protein tyrosine phosphatase receptor gamma links obesity-induced inflammation to insulin resistance. *Nat Commun* 2017;8(1):1820

**ALZET Comments:** Endotoxin, LPS; Saline; SC; Mice; 2004; 28 days; Dose (300 µg/kg/day); animal info (8-week-old C57BL/6 J males); LPS treatment is an established model of inflammation/insulin resistance;.

**Q5097:** K. L. Wu, *et al.* Impaired Nrf2 regulation of mitochondrial biogenesis in rostral ventrolateral medulla on hypertension induced by systemic inflammation. *Free Radic Biol Med* 2016;97(58-74

**ALZET Comments:** Endotoxin, LPS; coenzyme Q10; tempole; Interleukin-1 receptor antagonist; butylhydroquinone, tert-; Saline; CSF, artificial; IP; ;CSF/CNS (cisterna magna); Rat; 1007D; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 8 weeks old, 250-280g); ALZET brain infusion kit 2 used; post op. care (IM procaine Penicillin 1000 IU); tissue perfusion (cisterna magna); cardiovascular; bp measured using tail cuff; Dose (LPS 1.2 mg/kg/day; coenzyme Q10 3.25 ug/ul/hr; tempol 5 ug/ul/hr; IL-1Ra 0.5 ug/ul/h);.

**Q5179:** N. Petitdant, *et al.* Cerebral radiofrequency exposures during adolescence: Impact on astrocytes and brain functions in healthy and pathologic rat models. *Bioelectromagnetics* 2016;37(5):338-50

**ALZET Comments:** Endotoxin, LPS; CSF, artificial; CSF/CNS; Rat; 2004; 28 days; Controls received mp w/ vehicle; animal info (male, Sprague Dalwey, P32); behavioral testing (Open Field test; elevated plus maze; fear conditioning); Cannula placement verified via methylene blue dye; used Plastics One cannula; used PEEK cannula; rats exposed to radio frequency electromagnetic fields while pump implanted; Dose (1.25 ug/h); Brain coordinates;.

**Q4867:** M. K. Nøhr, *et al.* LPS-Enhanced Glucose-Stimulated Insulin Secretion Is Normalized by Resveratrol. *PLoS One* 2016;11(1):1-15

**ALZET Comments:** Endotoxin, LPS; Saline; SC; Mice; 2004; 28 days; Controls received mp w/ vehicle; animal info (male, C57BL/6N, 12 weeks old); immunology; diabetes; Dose (600 ug/kg/day);.



**Q5395:** T. H. Lin, *et al.* NF-kappaB decoy oligodeoxynucleotide mitigates wear particle-associated bone loss in the murine continuous infusion model. *Acta Biomater* 2016;41(273-81

**ALZET Comments:** Ultra-high molecular weight polyethylene particles; oligodeoxynucleotide, decoy; oligodeoxynucleotide, scrambled; Endotoxin, LPS; Brain-derived neurotropic factor;; Saline; In Vitro (cell culture); Bone (Femur); Mice (nude); 2006; 4 weeks; Controls received mp w/ vehicle; animal info (Male athymic nude mice, 10-15 weeks old); stability verified by (in vitro experiment); dose-response (pg. 277); good methods (pg. 276); tissue perfusion (bone); Dose (15 mg/ml UHMWPE, 50uM decoy, 1 ug/ml LPS); Therapeutic indication (Bone loss, chronic inflammation);

**Q5609:** J. Li, *et al.* Akkermansia Muciniphila Protects Against Atherosclerosis by Preventing Metabolic Endotoxemia-Induced Inflammation in Apoe-/- Mice. *Circulation* 2016;133(24):2434-46

**ALZET Comments:** Endotoxin, LPS; PBS; SC; Mice (knockout); 1004; 4 weeks; Controls received mp w/ vehicle; cardiovascular; Therapeutic indication (atherosclerosis); Dose (252ug/kg);

**Q5384:** D. Lana, *et al.* The neuron-astrocyte-microglia triad involvement in neuroinflammation mechanisms in the CA3 hippocampus of memory-impaired aged rats. *Exp Gerontol* 2016;83(71-88

**ALZET Comments:** Endotoxin, LPS; CSF, artificial; CSF/CNS (fourth ventricle); Rat; 4 weeks; Controls received mp w/ vehicle; animal info (Male Wistar rats, 3 months & 20 months old); Plastics One cannula used; post op. care (chloramphenicol (1% solution) applied to exposed skull, scalp; bupivacaine applied topically); "A volume overload to the brain is minimal using this procedure because the 0.15 ul/h administered contributes only about 0.16% of the total CSF volume produced by the rat each hour and is only 0.09% of the rat's total CSF volume" pg 73; Memory/learning study; aging; Brain coordinates; 4th ventricle: 2.5 mm posterior to Lambda, on the midline, and 7mm ventral to the dura; Dose (1.6 ug/mL);

**Q5382:** D. B. Kurland, *et al.* The Sur1-Trpm4 channel regulates NOS2 transcription in TLR4-activated microglia. *J Neuroinflammation* 2016;13(1):130

**ALZET Comments:** Endotoxin, LPS; Saline, normal; CSF/CNS (striatum); Rat; 1007D; 7 days; Controls received mp w/ vehicle; animal info (Male Wistar rats aged 8-12 weeks); ALZET brain infusion kit 2 used; good methods (pg. 3); tissue perfusion (striatum); model to study TLR4 activation in vivo; nitrosative/oxidative stress and neuroinflammation; Brain coordinates; 1-mm burr hole was made over the right striatum [AP, +0.75 mm; ML, +1.7 mm relative to bregma]; Dose (5 ug/day);

**Q5362:** K. K. Gupta, *et al.* Plasminogen activator inhibitor-1 stimulates macrophage activation through Toll-like Receptor-4. *Biochem Biophys Res Commun* 2016;477(3):503-8

**ALZET Comments:** Endotoxin, LPS; Saline, isotonic; IP; mice; 1003D; 3 days; Controls received mp w/ vehicle; animal info (WT, PAI-1 deficient, & TLR4 deficient male mice); animal info (WT, PAI-1 deficient, & TLR4 deficient male mice); Strain/dose-specific reactions (pg. 505); "As expected, the sham and vehicle control (saline) showed no lethality in mice survival as compared to LPS-challenged mice" pg 504; Inflammation induction; Dose (10 ug/uL);

**Q4521:** G. Maneenil, *et al.* Oral, Nasal and Pharyngeal Exposure to Lipopolysaccharide Causes a Fetal Inflammatory Response in Sheep. *PLoS One* 2015;10(U1091-U1101

**ALZET Comments:** Endotoxin, LPS; Oral cavity; Sheep (ewe); 1 day; 6 days; Controls received mp w/ saline; animal info (Merino); teratology; immunology;

**Q3382:** M. Llorens-Martin, *et al.* Novel connection between newborn granule neurons and the hippocampal CA2 field. *Experimental Neurology* 2015;263(285-292

**ALZET Comments:** Endotoxin, LPS; PBS; SC; Mice; 1004; 8 weeks; Animal info (female, 8 wks old, C57BL/6JRcc); long-term delivery; pumps replaced after 4 weeks.

**Q3920:** S. C. Hopp, *et al.* Differential Neuroprotective and Anti-Inflammatory Effects of L-Type Voltage Dependent Calcium Channel and Ryanodine Receptor Antagonists in the Substantia Nigra and Locus Coeruleus. *Journal of Neuroimmune Pharmacology* 2015;10(35-44

**ALZET Comments:** Endotoxin, LPS; CSF, artificial; CSF/CNS (fourth ventricle); Rat; 2004; 28 days; Animal info (male, F-344, 3 months old); behavioral testing (rotarod; open field test; forced swim test); tissue perfusion (fourth ventricle); immunology;



**Q3921:** S. C. Hopp, *et al.* Calcium dysregulation via L-type voltage-dependent calcium channels and ryanodine receptors underlies memory deficits and synaptic dysfunction during chronic neuroinflammation. *Journal of Neuroinflammation* 2015;12(U1-U14)

**ALZET Comments:** Endotoxin, LPS; CSF/CNS (fourth ventricle); Rat; 2004; 28 days; Controls received mp w/ aCSF; animal info (male F-344, 3 months old); neurodegenerative (Alzheimer's disease); behavioral testing (Morris Water Maze); immunology;.

**Q4451:** Y. H. Ho, *et al.* Peripheral inflammation increases seizure susceptibility via the induction of neuroinflammation and oxidative stress in the hippocampus. *JOURNAL OF BIOMEDICAL SCIENCE* 2015;22(U1-U14)

**ALZET Comments:** Endotoxin, LPS; NS398; tempol; Saline; DMSO; IP; CSF/CNS; Rat; 1007D; 7 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 10 weeks old, 250-282g); ALZET brain infusion kit 2 used; 1% DMSO used; Multiple pumps per animal (2); post op. care (IM procaine penicillin 1000IU); immunology; used dental cement; NS398 is a COX-2 inhibitor and anti-inflammatory; tempol scavenges ROS;.

**Q4416:** C. W. Fischer, *et al.* Chronic lipopolysaccharide infusion fails to induce depressive-like behaviour in adult male rats. *ACTA NEUROPSYCHIATRICA* 2015;27(189-194)

**ALZET Comments:** Endotoxin, LPS; Saline; IP; Rat; 2ML4; 1 week; 4 weeks; Controls received mp w/ vehicle; animal info (male, Sprague Dalwey, 299.9g); post op. care (Rimadyl 50 mg/ml); behavioral testing (forced swim test, open field testing); "Osmotic minipumps allow a continuous slow infusion of LPS, whereas daily injections might induce stress because of the daily handling as well as local inflammation due to the needle. Moreover, when the daily volume is administered at once, the effect may be more abrupt and deleterious." pg 193;.

**Q4394:** C. B. de La Serre, *et al.* Chronic exposure to Low dose bacterial lipopolysaccharide inhibits leptin signaling in vagal afferent neurons. *PHYSIOLOGY & BEHAVIOR* 2015;139(188-194)

**ALZET Comments:** Endotoxin, LPS; IP; Rat; 2004; 2006; 4 weeks; 6 weeks; Controls received mp w/ saline; animal info (male, Wistar, 237g); functionality of mp verified by circulating LPS; long-term study;.

**Q3794:** L. Adzovic, *et al.* Insulin improves memory and reduces chronic neuroinflammation in the hippocampus of young but not aged brains. *Journal of Neuroinflammation* 2015;12(U1-U10)

**ALZET Comments:** Insulin, recombinant cat; endotoxin, LPS; CSF, artificial; CSF/CNS (fourth ventricle); Rat; 2004; 4 weeks; Controls received mp w/ vehicle; animal info (male, F-344, 3 months old, 21 months old); bilateral cannula used; behavioral testing (morris water maze); tissue perfusion (fourth ventricle); bilateral infusion; used tygon tubing to attach cannula to pump;.

**Q4748:** T. G. A. M. Wolfs, *et al.* Chorioamnionitis-induced fetal gut injury is mediated by direct gut exposure of inflammatory mediators or by lung inflammation. *AMERICAN JOURNAL OF PHYSIOLOGY-GASTROINTESTINAL AND LIVER PHYSIOLOGY* 2014;306(5):G382-G393

**ALZET Comments:** Endotoxin, LPS; Intra-amniotic; Sheep (fetus); 24 hours; Controls received mp w/ saline; animal info (124 gestation day); immunology;.

**Q4116:** G. Stifano, *et al.* Chronic Toll-like receptor 4 stimulation in skin induces inflammation, macrophage activation, transforming growth factor beta signature gene expression, and fibrosis. *ARTHRITIS RESEARCH & THERAPY* 2014;16(U10-U22)

**ALZET Comments:** Endotoxin, LPS; SC; Mice; 7 days; 28 days; Controls received mp w/ PBS, sterile; animal info (TLR2 -/- or MyD88 -/-); immunology;.

**Q3583:** I. Nitsos, *et al.* The Impact of Chronic Intrauterine Inflammation on the Physiologic and Neurodevelopmental Consequences of Intermittent Umbilical Cord Occlusion in Fetal Sheep. *REPRODUCTIVE SCIENCES* 2014;21(658-670)

**ALZET Comments:** Endotoxin, LPS; Amniotic sac; Sheep (fetus); 2ML4; 4 weeks; Controls received mp w/ saline; animal info (female, pregnant, GD80); post op. care (benacillin); teratology; immunology; E.coli LPS 055:B5, 18 mg/ml;.



**Q3556:** J. H. Ma, *et al.* Chronic brain inflammation causes a reduction in GluN2A and GluN2B subunits of NMDA receptors and an increase in the phosphorylation of mitogen-activated protein kinases in the hippocampus. *MOLECULAR BRAIN* 2014;7(U1-U10)

**ALZET Comments:** Endotoxin, LPS; CSF, artificial; CSF/CNS (fourth ventricle); Rat; 2004; 28 days; Controls received mp w/ vehicle; animal info (male, Fischer-344); behavioral testing (morris water maze); tissue perfusion (fourth ventricle); immunology; LPS from E.coli, serotype 055:B5;.

**Q3983:** M. Llorens-Martin, *et al.* Peripherally triggered and GSK-3beta-driven brain inflammation differentially skew adult hippocampal neurogenesis, behavioral pattern separation and microglial activation in response to ibuprofen. *TRANSLATIONAL PSYCHIATRY* 2014;4(U58-U68)

**ALZET Comments:** Endotoxin, LPS; PBS; SC; Mice; 1002; 1004; 2 weeks; 4 weeks; 8 weeks;; Animal info (female, C57BL6Jcc, 6 weeks old); pumps replaced every 4 weeks; neurodegenerative (Alzheimer's); immunology;.

**Q3976:** W. Liang, *et al.* Metabolically induced liver inflammation leads to NASH and differs from LPS- or IL-1 beta-induced chronic inflammation. *LABORATORY INVESTIGATION* 2014;94(491-502)

**ALZET Comments:** Endotoxin, LPS; interleukin-1B, recombinant murine; SC; Mice; 1004; 10 weeks; Controls received mp w/ PBS; animal info (male, APOE3L.CETP, 10-14 weeks old); immunology;.

**Q3852:** K. Y. Leon-Pennell, *et al.* P. gingivalis lipopolysaccharide intensifies inflammation post-myocardial infarction through matrix metalloproteinase-9. *Journal of Molecular and Cellular Cardiology* 2014;76(218-226)

**ALZET Comments:** Endotoxin, PgLPS ATCC 33277; Mice; 1003D; 1007D; 2004; 28 days; Controls received mp w/ saline; animal info (C57BL6J or MMP-9 -/-, 4-7 months old); cardiovascular; myocardial infarction; immunology;.

**Q3414:** I. Bardou, *et al.* Age and duration of inflammatory environment differentially affect the neuroimmune response and catecholaminergic neurons in the midbrain and brainstem. *NEUROBIOLOGY OF AGING* 2014;35(5):1065-1073

**ALZET Comments:** Endotoxin, LPS; CSF, artificial; CSF/CNS (fourth ventricle); Rat; 2006; 21 days; 56 days; Controls received mp w/ vehicle; animal info (male, F-344 rats, 3 months or 9 months or 23 months old); post op. care (lidocaine 1% on wound; 2ML isotonic saline SC injection; 2% tylenol in drinking water 3 days after surgery); tissue perfusion (fourth ventricle); long-term study; immunology; LPS aka lipopolysaccharide;.