



References on the Administration of Interleukin Using ALZET® Osmotic Pumps

1. Interleukin-1

Q7035: Y. P. Zhang, *et al.* Mifepristone attenuates depression-like changes induced by chronic central administration of interleukin-1beta in rats. *Behavioural Brain Research* 2018;347(436-445

Agents: Interleukin-1 beta **Vehicle:** Saline, pyrogen-free; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Dose (10 ng/7uL/rat/day); Controls received mp w/ vehicle; animal info (Male Sprague Dawley rats (220–260 g)); behavioral testing (open field, elevated plus maze and sucrose preference); ALZET brain infusion kit used; Brain coordinates (AP=-1 mm, ML=+1.4 mm, DV=-1 mm); Therapeutic indication (depression);

Q6989: Y. P. Zhang, *et al.* Mifepristone attenuates depression-like changes induced by chronic central administration of interleukin-1beta in rats. *Behavioural Brain Research* 2018;347(436-445

Agents: Interleukin-1 beta **Vehicle:** Saline; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** 1002; **Duration:** 14 days; **ALZET Comments:** Dose (10 ng/7uL/rat/day); animal info (Male Sprague Dawley rats (220–260 g)); behavioral testing (open field, elevated plus maze and sucrose preference); functionality of mp verified by residual volume; ALZET brain infusion kit used; Brain coordinates (AP=-1 mm, ML=+1.4 mm, DV=-1 mm.); Cannula placement verified via sectioning the brains coronally;

Q6320: M. L. Bonnemaïson, *et al.* Interleukin-1beta as a driver of renal NGAL production. *Cytokine* 2017;91(38-43

Agents: Interleukin-1 beta, mouse recomb. **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days; **ALZET Comments:** Dose (10 ng/h); 0.1% bovine serum albumin used; animal info (12-week-old male C57Bl/6 mice);

Q5171: S. Okizaki, *et al.* Vascular Endothelial Growth Factor Receptor Type 1 Signaling Prevents Delayed Wound Healing in Diabetes by Attenuating the Production of IL-1beta by Recruited Macrophages. *American Journal of Pathology* 2016;186(6):1481-98

Agents: Placenta growth factor, recombinant human; antibody, interleukin-1B **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle or control antibody; animal info (male, C57BL6, 8 weeks old, STZ); immunology; diabetes; Dose (PIGF 10 ug/mouse; anti-IL-1B 1 ug/day);

Q6636: C. S. Nunemaker. Considerations for Defining Cytokine Dose, Duration, and Milieu That Are Appropriate for Modeling Chronic Low-Grade Inflammation in Type 2 Diabetes. *J Diabetes Res* 2016;2016(2846570

Agents: Interleukin-1beta; Interleukin-6 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days; **ALZET Comments:** Dose (32

2. Interleukin-2

Q8018: R. Gutierrez Jauregui, *et al.* IL-1beta Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082

Agents: Interleukin-1 beta; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 beta, anti; Transforming Growth Factor-B1, anti **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** Not stated;

ALZET Comments: Dose (IL-1B- 83 ug/ml, IL-6-83 ug/ml, IL-10-166 ug/ml, IL-12-83 ug/ml, IL-17-125 ug/ml, IL-23- 126 ug/ml, IFN γ -83 ug/ml, TNF α -166 ug/ml, anti-TGF-B1-166 ug/ml, or anti-IL-1B-150 ug/ml); Controls received mp w/ vehicle; animal info (8-12 weeks old, Female, C57BL/6); immunology;

Q7344: R. Gutierrez Jauregui, *et al.* IL-1beta Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082



Agents: Interleukin-1 beta; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 beta, anti; Transforming Growth Factor-B1, anti **Vehicle:** PBS; **Route:** SC;

Species: Mice; **Pump:** 1007D; **Duration:** 10 Days;

ALZET Comments: Dose (IL-1b (83µg/ml); IL-6 (83µg/ml); IL-10 (166µg/ml); IL-12 (83µg/ml); IL-17 (125µg/ml); IL-23 (166µg/ml); IFNγ (83µg/ml); TNFα (166µg/ml); anti-TGF-b1 (166µg/ml); anti-IL-1b (150µg/ml)); Controls received mp w/ vehicle; animal info (Eight- to twelve-week-old female C57BL/6 mice); Immunology (“evaluate the suitability of osmotic pumps as a model for biofilms in implant associated infections, we implanted osmotic pumps pre-colonized with bioluminescent *Staphylococcus aureus*”);

Q4522: P. T. Mantani, *et al.* IL-25 Inhibits Atherosclerosis Development in Apolipoprotein E Deficient Mice. *PLoS One* 2015;10(U1274-U1291)

Agents: Interleukin-25, recombinant mouse **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1004; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ control medium; animal info (Apoe -/-, 9-10 or 21 weeks old); cardiovascular; brain tissue distribution; pumps removed after 4 weeks in young mice;

Q4140: A. Y. Tilahun, *et al.* Systemic Inflammatory Response Elicited by Superantigen Destabilizes T Regulatory Cells, Rendering Them Ineffective during Toxic Shock Syndrome. *Journal of Immunology* 2014;193(2919-2930)

Agents: Interleukin-2, murine; antibody, anti-interleukin-2 **Vehicle:** PBS; **Route:** SC; **Species:** Mice (transgenic); **Pump:** Not Stated; **Duration:** 10 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (HLA-DR3); comparison of injection vs mp; immunology;

Q5597: K. R. Mott, *et al.* Role of interleukin-2 and herpes simplex virus 1 in central nervous system demyelination in mice. *J Virol* 2013;87(22):12102-9

Agents: Interleukin-2 **Vehicle:** PBS; **Route:** CSF/CNS; SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;

ALZET Comments: Controls received mp w/ Interleukin 2 without HSV-1 infection; animal info (6 weeks) ; ALZET brain infusion kit 1 used; neurodegenerative (demyelination); Therapeutic indication (CNS demyelination; Herpes simplex virus 1; HSV); Dose (1 ug/24 h);

3. Interleukin-3

Q8594: T. Kan, *et al.* IL-31 induces antitumor immunity in breast carcinoma. *J Immunother Cancer* 2020;8(2):

Agents: Interleukin-31, recombinant mouse **Vehicle:** Not stated; **Route:** Not stated; **Species:** Mice; **Pump:** Not stated; **Duration:** 3 weeks;

ALZET Comments: Dose (14 ug/day); animal info (BALB/c female mice, 10 weeks old); recombinant mouse Interleukin-31 aka IL-31; cancer (Breast Cancer);

Q5345: M. Feld, *et al.* The pruritus- and TH2-associated cytokine IL-31 promotes growth of sensory nerves. *J Allergy Clin Immunol* 2016;138(2):500-508 e24

Agents: Interleukin-31, recombinant mouse **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 14 days;

ALZET Comments: animal info (6 – 8 week old, C57BL/6 and Trpv1 knockout mice); functionality of mp verified by observation of skin phenotype; dose-response (pg. 508.e5); Dose (20 mg/day);

Q2996: K. N. Rao, *et al.* Ikaros limits basophil development by suppressing C/EBP-alpha expression. *Blood* 2013;122(15):2572-2581

Agents: Interleukin-3 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Animal info (C57BL/6:SV129 IK-/-)

P9822: T. Yoshimoto, *et al.* Basophils contribute to T_H2-IgE responses in vivo via IL-4 production and presentation of peptide-MHC class II complexes to CD4⁺ T cells. *NATURE IMMUNOLOGY* 2009;10(7):706-U54



Agents: Interleukin-3 **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;
ALZET Comments: Animal info (DO11.10, IL-4 deficient)

Q0809: S. Kim, *et al.* Basophils Can Directly Present or Cross-Present Antigen to CD8 Lymphocytes and Alter CD8 T Cell Differentiation into IL-10-Producing Phenotypes. *Journal of Immunology* 2009;183(5):3033-3039

Agents: Interleukin-3 **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice (transgenic); **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Animal info (C57BL/6, OT-I TCR-transgenic, IL-4KO B6); immunology

P9722: T. Shen, *et al.* T cell-derived IL-3 plays key role in parasite infection-induced basophil production but is dispensable for in vivo basophil survival. *International Immunology* 2008;20(9):1201-1209

Agents: Interleukin-3 **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Mice; **Pump:** Not Stated; **Duration:** Not Stated;

ALZET Comments: Animal info (BALB/c, IL-3 deficient)

4. Interleukin-4

Q6977: Cottrell JN, *et al.* Interleukin-4 supplementation improves the pathophysiology of 4 hypertension in response to placental ischemia in RUPP rats. *American Journal of Physiology Regulatory, Integrative, and Comparable Physiology* 2019;316(2):R165-R171

Agents: Interleukin-4 **Vehicle:** Not Stated; **Route:** IP; **Species:** Rat (pregnant); **Pump:** Not Stated; **Duration:** 19 days;

ALZET Comments: Dose (600 ng/day); animal info (pregnant Sprague-Dawley rats; pumps implanted on gestational day 14); ischemia (placental);

Q5193: T. Sato, *et al.* The effect of local IL-4 delivery or CCL2 blockade on implant fixation and bone structural properties in a mouse model of wear particle induced osteolysis. *J Biomed Mater Res A* 2016;104(9):2255-62

Agents: Ultra-high molecular weight polyethylene particles; interleukin-4, mouse recombinant **Vehicle:** BSA; PBS; **Route:** Bone (femur); **Species:** Mice; **Pump:** 2006; **Duration:** 4 weeks;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, BALB/cByJ, 10-12 weeks old); 1% BSA used; post op. care (buprenorphine injection SC); used vinyl tubing to connect pumps to titanium rods;

Q5411: X. Liu, *et al.* Interleukin-4 Is Essential for Microglia/Macrophage M2 Polarization and Long-Term Recovery After Cerebral Ischemia. *Stroke* 2016;47(2):498-504

Agents: Interleukin-4 **Vehicle:** Saline; **Route:** CSF/CNS (ventricle); **Species:** Mice (knockout); **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (C57/BL6 mice; 8-10 weeks, 25-30 g); ischemia (cerebral; stroke model); behavioral testing (Rotarod, corner, foot fault, and Morris water maze tests); healing, recovery; learning, memory; Therapeutic indication (Cerebral ischemia); Dose (60 ng/day); Brain coordinates: -0.20 mm anterior and 1.00 mm lateral to bregma;

Q4037: J. Pajarinen, *et al.* Modulation of mouse macrophage polarization in vitro using IL-4 delivery by osmotic pumps. *JOURNAL OF BIOMEDICAL MATERIALS RESEARCH PART A* 2015;103(1339-1345

Agents: Interleukin-4, mouse recombinant **Vehicle:** BSA; PBS; **Route:** In vitro (cell culture); **Species:** Cell culture; **Pump:** 2006; **Duration:** 4 weeks;

ALZET Comments: 1% BSA used; immunology; "Osmotic pumps delivered IL-4 at a rate that closely followed the expected delivery rate." pg 1343; used vinyl tubing; pumps lead into mouse bone marrow macrophage augmented media; incubated at 37C

Q4370: J. D. Cherry, *et al.* Arginase 1+ microglia reduce Abeta plaque deposition during IL-1beta-dependent neuroinflammation. *Journal of Neuroinflammation* 2015;12(U14-U26

Agents: Antibody, interleukin-4Ra **Vehicle:** Not Stated; **Route:** CSF/CNS (hippocampus); **Species:** Mice; **Pump:** 1004; **Duration:** 28 days;



ALZET Comments: Controls received mp w/ control antibody; animal info (APPswe/SP1dE9, 7-5 months old); ALZET brain infusion kit 3 used; neurodegenerative (Alzheimer's disease); immunology; pumps primed 48 hours in 37C saline;

5. Interleukin-5

Q3803: L. M. Amaral, *et al.* Progesterone supplementation attenuates hypertension and the autoantibody to the angiotensin II type I receptor in response to elevated interleukin-6 during pregnancy. *American Journal of Obstetrics and Gynecology* 2014;211(U377-U382)

ALZET Comments: Interleukin-5, recombinant rat; Rat (pregnant); 2002; 5 days; Controls received mp w/ vehicle; animal info (pregnant, 14-19 days gestation); cardiovascular; bp measured using catheter; preeclampsia;

P5279: A. Mishra, *et al.* IL-5 promotes eosinophil trafficking to the esophagus. *J Immunol* 2002;168(5):2464-2469

ALZET Comments: Interleukin-5; PBS; BSA; IP; Mice (transgenic); 2001; 8 days; Controls received mp w/ vehicle; Immunology; peptides; human IL-5 used.

6. Interleukin-6

Q8361: E. E. Parks, *et al.* Interleukin 6 reduces allopregnanolone synthesis in the brain and contributes to age-related cognitive decline in mice. *J Lipid Res* 2020;61(10):1308-1319

Agents: Interleukin-6 **Vehicle:** Saline; **Route:** CNS/CSF; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Dose (100 ng/day); Controls received mp w/ vehicle; animal info (Male, C57BL/6N); neurodegenerative (Alzheimer's Disease);

Q8018: R. Gutierrez Jauregui, *et al.* IL-1beta Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082)

Agents: Interleukin-1 beta; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 beta, anti; Transforming Growth Factor-B1, anti **Vehicle:** Saline; **Route:** SC;

Species: Mice; **Pump:** 1007D; **Duration:** Not stated;

ALZET Comments: Dose (IL-1B- 83 ug/ml, IL-6-83 ug/ml, IL-10-166 ug/ml, IL-12-83 ug/ml, IL-17-125 ug/ml, IL-23- 126 ug/ml, IFN γ -83 ug/ml, TNFa-166 ug/ml, anti-TGF-B1-166 ug/ml, or anti-IL-1B-150 ug/ml); Controls received mp w/ vehicle; animal info (8-12 weeks old, Female, C57BL/6); immunology;

Q7344: R. Gutierrez Jauregui, *et al.* IL-1beta Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082)

Agents: Interleukin-1 beta; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 beta, anti; Transforming Growth Factor-B1, anti **Vehicle:** PBS; **Route:** SC;

Species: Mice; **Pump:** 1007D; **Duration:** 10 Days;

ALZET Comments: Dose (IL-1b (83 μ g/ml); IL-6 (83 μ g/ml); IL-10 (166 μ g/ml); IL-12 (83 μ g/ml); IL-17 (125 μ g/ml); IL-23 (166 μ g/ml); IFN γ (83 μ g/ml); TNFa (166 μ g/ml); anti-TGF-b1 (166 μ g/ml); anti-IL-1b (150 μ g/ml)); Controls received mp w/ vehicle; animal info (Eight- to twelve-week-old female C57BL/6 mice); Immunology ("evaluate the suitability of osmotic pumps as a model for biofilms in implant associated infections, we implanted osmotic pumps pre-colonized with bioluminescent Staphylococcus aureus");

Q7205: L. Madaro, *et al.* Denervation-activated STAT3-IL-6 signalling in fibro-adipogenic progenitors promotes myofibres atrophy and fibrosis. *Nat Cell Biol* 2018;20(8):917-927

Agents: Interleukin-6 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 15 days;

ALZET Comments: Dose (1.0 mg/ml); Dose (1.0 mg/ml); Interleukin-6 aka IL-6; spinal cord injury;

Q5906: C. von Loeffelholz, *et al.* The human longevity gene homolog INDY and interleukin-6 interact in hepatic lipid metabolism. *Hepatology* 2017;66(2):616-630



Agents: Interleukin-6, human **Vehicle:** NaCl; BSA; **Route:** Not Stated; **Species:** Mice; **Pump:** Not Stated; **Duration:** 14 days; **ALZET Comments:** animal info (male, mINDY KO); 0.1% BSA used; immunology;

Q6604: D. Z. Milikovsky, *et al.* Electrocorticographic Dynamics as a Novel Biomarker in Five Models of Epileptogenesis. *J Neurosci* 2017;37(17):4450-4461

Agents: Transforming growth factor- β 1; SJN2511; Interleukin-6; Bovine serum albumin **Vehicle:** CSF; artificial; dextran; **Route:** CSF/CNS; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Dose (0.4mM BSA, 100 ng/ml (TGF- β 1, 300 μ M SJN2511); Controls received mp w/ vehicle; animal info (2- to 3-month-old FVB/N and C57BL/6 mice); SJN2511 is a selective blocker of the TGF-B type I receptor/ALK5; Brain coordinates (0.5 mm posterior, 1 mm lateral to bregma);

7. Interleukin-7

Q5839: H. K. Kim, *et al.* Distinct IL-7 signaling in recent thymic emigrants versus mature naive T cells controls T-cell homeostasis. *European Journal of Immunology* 2016;46(7):1669-80

Agents: Interleukin-7 **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 5 days;

ALZET Comments: Controls received mp w/ vehicle; immunology; "we utilized osmotic pumps to administer recombinant IL-7 and increase IL-7 bioavailability in vivo... T-cell proliferation was dramatically increased in IL-7 pump installed mice compared to control PBS pump installed mice" pg 1671; Therapeutic indication (T-cell homeostasis); Dose (5 ug);

Q1289: J. Quiel, *et al.* Antigen-stimulated CD4 T-cell expansion is inversely and log-linearly related to precursor number. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 2011;108(8):3312-3317

Agents: Interleukin-2; interleukin-7; interleukin-15 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ PBS; animal info (6-12 wks old, gender, age matched); immunology

Q1758: M. J. Palmer, *et al.* Signaling thresholds govern heterogeneity in IL-7-receptor-mediated responses of naive CD8(+) T cells. *Immunology and Cell Biology* 2011;89(5):581-594

Agents: Interleukin-7 **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ PBS; animal info (C57BL/6, 6-16 wks old); wound clips used; post op. care (betadine)

P9932: J. H. Park, *et al.* Signaling by intrathymic cytokines, not T cell antigen receptors, specifies CD8 lineage choice and promotes the differentiation of cytotoxic-lineage T cells. *NATURE IMMUNOLOGY* 2010;11(3):257-U10

Agents: Interleukin-7, recomb, mouse **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 2 weeks;

ALZET Comments: Animal info (79Z); immunology

Q0940: J. H. Park, *et al.* 'Coreceptor tuning': cytokine signals transcriptionally tailor CD8 coreceptor expression to the self-specificity of the TCR. *NATURE IMMUNOLOGY* 2007;8(10):1049-1059

Agents: Interleukin-7, recomb. mouse **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: Controls received mp w/ PBS; animal info (C57BL/6)

8. Interleukin-8

P3730: E. H. Garin, *et al.* Effect of interleukin-8 on glomerular sulfated compounds and albuminuria. *Pediatric Nephrology* 1997;11(274-279

ALZET Comments: Interleukin-8; BSA; IA (renal); Rat; 2ML1; 5 days; controls received mp w/BSA; good methods (pg. 275); peptides; used PE-10 catheter stretched to further reduce its diameter.



P4097: C. R. Plata-Salaman, *et al.* Anorexia induced by chronic central administration of cytokines at estimated pathophysiological concentrations. *Physiol. Behav* 1996;60(3):867-875

ALZET Comments: Interleukin-1 receptor antagonist; Interleukin-6; Interleukin-1, beta heat inactivated; Interleukin-8; Interleukin-1, beta; Tumor necrosis factor- α ; Saline, sterile physiological; BSA; CSF/CNS; Rat; 2001; 7 days; controls received mp w/vehicle; guide cannula was used, and a sterile 29 g stainless steel obturator was used to ensure cannula patency during at least a 10 day recovery period after surgery; BSA added as stabilizing agent and carrier protein for cytokines; recomb. human IL-6 & 8 used.

9. Interleukin-10

Q8489: E. E. Gillis, *et al.* IL-10 treatment decreases blood pressure in male, but not female, spontaneously hypertensive rats. *Am J Physiol Renal Physiol* 2020;319(3):F359-F365

Agents: Interleukin-10 **Vehicle:** Not stated; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Dose (3.5 ug/kg/day); animal info (11-wk-old male and female spontaneously hypertensive rats); Blood pressure measured via tail-cuff method; 160 mmHg - 220 mmHg; Resultant plasma level (8 pg/mL IL-10); Interleukin-10 aka IL-10; cardiovascular;

Q6788: M. F. Iulita, *et al.* CD4(+) Regulatory T Lymphocytes Prevent Impaired Cerebral Blood Flow in Angiotensin II-Induced Hypertension. *J Am Heart Assoc* 2019;8(1):e009372

Agents: Angiotensin II; Interleukin-10, recomb. human **Vehicle:** PBS; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Dose (Angiotensin II (1000 ng/kg/min); IL-10 (60ng/day)); Controls received mp w/ vehicle; animal info (Eight- to 10-week-old C57BL/6 male mice); cardiovascular;

Q8018: R. Gutierrez Jauregui, *et al.* IL-1 β Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082)

Agents: Interleukin-1 β ; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 β , anti; Transforming Growth Factor-B1, anti **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** Not stated;

ALZET Comments: Dose (IL-1 β - 83 ug/ml, IL-6-83 ug/ml, IL-10-166 ug/ml, IL-12-83 ug/ml, IL-17-125 ug/ml, IL-23- 126 ug/ml, IFN γ -83 ug/ml, TNF α -166 ug/ml, anti-TGF-B1-166 ug/ml, or anti-IL-1 β -150 ug/ml); Controls received mp w/ vehicle; animal info (8-12 weeks old, Female, C57BL/6); immunology;

Q7344: R. Gutierrez Jauregui, *et al.* IL-1 β Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082)

Agents: Interleukin-1 β ; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 β , anti; Transforming Growth Factor-B1, anti **Vehicle:** PBS; **Route:** SC;

Species: Mice; **Pump:** 1007D; **Duration:** 10 Days;

ALZET Comments: Dose (IL-1 β (83 μ g/ml); IL-6 (83 μ g/ml); IL-10 (166 μ g/ml); IL-12 (83 μ g/ml); IL-17 (125 μ g/ml); IL-23 (166 μ g/ml); IFN γ (83 μ g/ml); TNF α (166 μ g/ml); anti-TGF-b1 (166 μ g/ml); anti-IL-1 β (150 μ g/ml)); Controls received mp w/ vehicle; animal info (Eight- to twelve-week-old female C57BL/6 mice); Immunology (“evaluate the suitability of osmotic pumps as a model for biofilms in implant associated infections, we implanted osmotic pumps pre-colonized with bioluminescent Staphylococcus aureus”);

Q7435: A. F. Bressan, *et al.* Interleukin-10 negatively modulates extracellular signal-regulated kinases 1 and 2 in aorta from hypertensive mouse induced by angiotensin II infusion. *Fundam Clin Pharmacol* 2019;33(1):31-40

Agents: Angiotensin II, Interleukin-10 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Dose (90 ng/min- Ang II, 0.5 ng/min- IL10); Controls received mp w/ vehicle; animal info (10-12 weeks old, male, C57BL/6, IL10 knockout); enzyme inhibitor (IL-10-immune-regulatory cytokine); cardiovascular;



Q7405: A. F. Bressan, *et al.* Interleukin-10 negatively modulates extracellular signal-regulated kinases 1 and 2 in aorta from hypertensive mouse induced by angiotensin II infusion. *Fundam Clin Pharmacol* 2019;33(1):31-40

Agents: Angiotensin II, Interleukin-10 **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1002; **Duration:** 14 days;

ALZET Comments: Dose (90 ng/min- Ang II, 0.5 ng/min- IL10); Controls received mp w/ vehicle; animal info (10-12 weeks old, male, C57BL/6, IL10 knockout); enzyme inhibitor (IL-10-immune-regulatory cytokine); cardiovascular;

10. Interleukin-11

Q4341: J. N. Buzzelli, *et al.* IL-1RT1 signaling antagonizes IL-11 induced STAT3 dependent cardiac and antral stomach tumor development through myeloid cell enrichment. *ONCOTARGET* 2015;6(679-695

ALZET Comments: Interleukin-11, recombinant human; SC; Mice; 1007D; 7 days; Controls received mp w/ saline; animal info (WT or IL-1RT1, 12-14 weeks old); immunology;

P5900: K. A. Kuenzler, *et al.* IL-11 pretreatment reduces cell death after intestinal ischemia-reperfusion. *Journal of Surgical Research* 2002;108(2):268-272

ALZET Comments: Interleukin-11; Saline; IV (jugular); Rat; 1003D; 48 hours; Controls received mp w/ vehicle; peptides; IL-11 was human recomb; ischemia (intestinal).

P5148: K. A. Kuenzler, *et al.* Interleukin-11 enhances intestinal absorptive function after ischemia-reperfusion injury. *Journal of Pediatric Surgery* 2002;37(457-459

ALZET Comments: Interleukin-11; Saline; IV (jugular); Rat; 1003D; 3 days; controls received mp w/ vehicle; peptides; ischemia (bowel).

P4291: I. Roeder, *et al.* Interactions of erythropoietin, granulocyte colony-stimulating factor, stem cell factor, and interleukin-11 on murine hematopoiesis during simultaneous administration. *Blood* 1998;91(9):3222-3229

ALZET Comments: Interleukin-11; Stem cell factor; Granulocyte-colony stimulating factor, PEGylated; Erythropoietin;; SC;; mice;; 2002; 1007D;; 7 days;; controls received mp w/ saline; functionality of mp verified by pilot studies; no stress (see pg. 3223); peptides; recomb. human interleukin-11, EPO, & G-CSF used; recomb. rat stem cell factor used (pegylated);agents were given in every combination;

P3407: J. P. Leonard, *et al.* Constant subcutaneous infusion of rhIL-11 in mice: efficient delivery enhances biological activity. *Exp. Hematol* 1996;24(270-276

ALZET Comments: Interleukin-11; Antibody, anti-interleukin-1 receptor; Serum, mouse; Saline, sterile; SC; mice; 3, 7, 10, 13 days; controls received mp w/vehicle; comparison of sc injections vs. mp; immunology; peptides; cardiovascular; "Compared to SC injection, both the magnitude and duration of the platelet increase were significantly enhanced following continuous SC infusion." (pg. 270).

12. Interleukin-12

Q8018: R. Gutierrez Jauregui, *et al.* IL-1beta Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082

Agents: Interleukin-1 beta; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 beta, anti; Transforming Growth Factor-B1, anti **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 1007D; **Duration:** Not stated;

ALZET Comments: Dose (IL-1B- 83 ug/ml, IL-6-83 ug/ml, IL-10-166 ug/ml, IL-12-83 ug/ml, IL-17-125 ug/ml, IL-23- 126 ug/ml, IFN γ -83 ug/ml, TNFa-166 ug/ml, anti-TGF-B1-166 ug/ml, or anti-IL-1B-150 ug/ml); Controls received mp w/ vehicle; animal info (8-12 weeks old, Female, C57BL/6); immunology;

Q7344: R. Gutierrez Jauregui, *et al.* IL-1beta Promotes Staphylococcus aureus Biofilms on Implants in vivo. *Front Immunol* 2019;10(1082



Agents: Interleukin-1 beta; Interleukin-6; Interleukin-10; Interleukin-12; Interleukin-17; Interleukin-23; Interferon, gamma; Tumor Necrosis Factor, alpha; Interleukin-1 beta, anti; Transforming Growth Factor-B1, anti **Vehicle:** PBS; **Route:** SC;

Species: Mice; **Pump:** 1007D; **Duration:** 10 Days;

ALZET Comments: Dose (IL-1b (83µg/ml); IL-6 (83µg/ml); IL-10 (166µg/ml); IL-12 (83µg/ml); IL-17 (125µg/ml); IL-23 (166µg/ml); IFNγ (83µg/ml); TNFα (166µg/ml); anti-TGF-b1 (166µg/ml); anti-IL-1b (150µg/ml)); Controls received mp w/ vehicle; animal info (Eight- to twelve-week-old female C57BL/6 mice); Immunology ("evaluate the suitability of osmotic pumps as a model for biofilms in implant associated infections, we implanted osmotic pumps pre-colonized with bioluminescent *Staphylococcus aureus*");

Q3101: C. M. Krejsa, *et al.* Interleukin-21 Enhances Rituximab Activity in a Cynomolgus Monkey Model of B Cell Depletion and in Mouse B Cell Lymphoma Models. PLoS One 2013;8(6):U875-U888

Agents: Interleukin-12, recomb. human **Vehicle:** Saline; **Route:** SC; **Species:** Mice (SCID; NOD/SCID); **Pump:** 2004; **Duration:** 28 days;

ALZET Comments: Animal info (female, SCID and NOD/SCID, 8-10 weeks old); cancer (Lymphoma);

Q3684: J. V. Berg, *et al.* Intratumoral IL-12 combined with CTLA-4 blockade elicits T cell-mediated glioma rejection. Journal of Experimental Medicine 2013;210(13):2803-2811

Agents: Interleukin-12, murine **Vehicle:** PBS; **Route:** CSF/CNS (intratumoral); **Species:** Mice; **Pump:** 1004; 2004; **Duration:** 28 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (C57BL6); cancer (glioma); tissue perfusion (tumor; glioma); immunology; pumps primed at 37C; pumps explanted after 28 days;

P8510: H. R. Djalilian, *et al.* Efficacy of an osmotic pump delivered, GM-CSF-based tumor vaccine in the treatment of upper aerodigestive squamous cell carcinoma in rats. Cancer Immunology, Immunotherapy 2007;56(8):1207-1214

Agents: Colony-stimulating factor, GM, murine; interleukin-12 **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 28 days;

ALZET Comments: Controls received mp w/ vehicle; dose-response (fig 1); no stress (see pg. 1209); cancer (upper aerodigestive tract carcinoma); peptides; animal info (Fisher 344, 125-150 g); good methods; "This latter method (mp) has several advantages. First, the use of minipumps obviates the cumbersome need to transfect tumor cells and completely characterize their cytokine repertoires. Second, it allows for independent and rigorous control over the kinetics of administration of cytokine and antigen dosages. Third, it may generate less controversy than those techniques requiring "gene therapy" IRB approval." (p. 1213).

13. Interleukin-13

R0378: B. Halle, *et al.* Convection-enhanced Drug Delivery for Glioblastoma: A Systematic Review Focused on Methodological Differences in the Use of the Convection-enhanced Delivery Method. Asian-Australasian Journal of Animal Sciences 2019;14(1):5-14

Agents: Etoposide, Bevacizumab, IMCA12, Interleukin-13-PE38, Tetrakis Chlorin **Vehicle:** Not Stated; **Route:** CSF/CNS (intratumoral); **Species:** Mice, Rat; **Pump:** 2001D, 1003D, 1007D, 1004, 2004; **Duration:** 24 hours, 3, 7, 21, 28 days;

ALZET Comments: ALZET brain infusion kit 1,2, and 3 used; cancer (Glioblastoma);

Q5433: A. Suzuki, *et al.* Analysis of biodistribution of intracranially infused radiolabeled interleukin-13 receptor-targeted immunotoxin IL-13PE by SPECT/CT in an orthotopic mouse model of human glioma. J Nucl Med 2014;55(8):1323-9

Agents: Interleukin-13 Pseudomonas exotoxin **Vehicle:** PBS; HSA; **Route:** CSF/CNS (intracranial); **Species:** Mice; **Pump:** 1003D; **Duration:** 3 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (tumor-bearing mice); cancer (glioblastoma multiforme); brain tissue distribution; HSA aka human serum albumin; CED model, convection-enhanced delivery; orthotopic mouse model of human glioma; Dose (3,700 kBq);



Q0801: T. Fujisawa, *et al.* Targeting IL-13Ralpha2 in human pancreatic ductal adenocarcinoma with combination therapy of IL-13-PE and gemcitabine. *International Journal of Cancer* 2011;128(5):1221-1231

Agents: Interleukin-13-Pseudomonas exotoxin, recomb. **Vehicle:** Not Stated; **Route:** IP; **Species:** Mice (nude); **Pump:** Not Stated; **Duration:** 14 days;

ALZET Comments: Animal info (nu/nu, 5-6 wks old); comparison of IP injections vs IP mp; IL-13-PE is a recombinant immunotoxin; "Mice receiving continuous IL-13-PE exhibited better tumor response compared to bolus administration" pg 1224

Q1342: T. Shimamura, *et al.* Interleukin 13 Mediates Signal Transduction through Interleukin 13 Receptor alpha 2 in Pancreatic Ductal Adenocarcinoma: Role of IL-13 Pseudomonas Exotoxin in Pancreatic Cancer Therapy. *Clinical Cancer Research* 2010;16(2):577-586

Agents: Interleukin-13 **Vehicle:** PBS; albumin, human serum; **Route:** IP; **Species:** Mice (SCID); **Pump:** 1007D; **Duration:** 7 days;

ALZET Comments: Controls received vehicle injections; animal info (5-6 wks old, male, SCID); comparison of ip injections vs ip mp; cancer (pancreatic); "Compared with (bolus IP) administration of 50 ug/kg IL-13 cytotoxin daily for 7 consecutive days, (ALZET pumps) (infused over 7 days) significantly suppressed tumor growth (P = 0.022) from the beginning of the treatment until the end of the experiment... Compared with the (bolus IP) 50 ug/kg group, a significant prolonged survival time was observed in the (ALZET pump) 50 ug/kg group", pg 581

Q0583: J. D. Milner, *et al.* Sustained IL-4 exposure leads to a novel pathway for hemophagocytosis, inflammation, and tissue macrophage accumulation. *Blood* 2010;116(14):2476-2483

Agents: Interleukin-4, recomb. mouse; interleukin-13 recomb. mouse **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 3 days;

ALZET Comments: Controls received mp w/ PBS; animal info (C57BL6, b6 Rag2 -/-, b6 Stat6 -/-); 100 ul sized pump used; immunology

14. Interleukin-15

Q4425: S. Garofalo, *et al.* Enriched environment reduces glioma growth through immune and non-immune mechanisms in mice. *Nature Communications* 2015;6(U26-U38)

ALZET Comments: Interleukin-15; brain-derived neurotrophic factor; PBS; CSF/CNS (striatum); Mice; 1007D; 7 days; Controls received mp w/ vehicle; animal info (male, C57BL6, 3 weeks or 2 months old); ALZET brain infusion kit 3 used; cancer (glioma, U87MG human); tissue perfusion (right striatum); immunology; pumps primed in 37C saline overnight;

Q1289: J. Quiel, *et al.* Antigen-stimulated CD4 T-cell expansion is inversely and log-linearly related to precursor number. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 2011;108(8):3312-3317

ALZET Comments: Interleukin-2; interleukin-7; interleukin-15; SC; Mice; 2001; 7 days; Controls received mp w/ PBS; animal info (6-12 wks old, gender, age matched); immunology.

P9700: J. S. Do, *et al.* IL-15 produced and trans-presented by DCs underlies homeostatic competition between CD8 and gamma-delta T cells in vivo. *Blood* 2009;113(25):6361-6371

ALZET Comments: Interleukin-15, murine; Mice; 14 days; Animal info (Thy 1.1 C57BL/6).

P8943: E. E. Pistilli, *et al.* Systemic elevation of interleukin-15 in vivo promotes apoptosis in skeletal muscles of young adult and aged rats. *Biochemical and Biophysical Research Communications* 2008;373(1):20-24

ALZET Comments: Interleukin-15, recomb. human; SC; Rat; 2002; 14 days; Peptides; animal info (Fischer Brown Norway).

P7460: S. Roychowdhury, *et al.* IL-15 but not IL-2 rapidly induces lethal xenogeneic graft-versus-host disease. *Blood* 2005;106(7):2433-2435

ALZET Comments: Interleukin-15, recomb. human; interleukin-2, recomb. human; PBS; albumin, human; SC; Mice (SCID); 1007D; 10 days; Controls received mp w/ vehicle; immunology; animal info (female, CB17, hu-PBL-SCID, 8-12 weeks old).



15. Interleukin-31

Q8594: T. Kan, *et al.* IL-31 induces antitumor immunity in breast carcinoma. *J Immunother Cancer* 2020;8(2):

Agents: Interleukin-31, recombinant mouse **Vehicle:** Not stated; **Route:** Not stated; **Species:** Mice; **Pump:** Not stated;

Duration: 3 weeks;

ALZET Comments: Dose (14 ug/day); animal info (BALB/c female mice, 10 weeks old); recombinant mouse Interleukin-31 aka IL-31; cancer (Breast Cancer);

Q5345: M. Feld, *et al.* The pruritus- and TH2-associated cytokine IL-31 promotes growth of sensory nerves. *J Allergy Clin Immunol* 2016;138(2):500-508 e24

ALZET Comments: Interleukin-31, recombinant mouse; SC; Mice; 14 days; animal info (6 – 8 week old, C57BL/6 and Trpv1 knockout mice); functionality of mp verified by observation of skin phenotype; dose-response (pg. 508.e5); Dose (20 mg/day);.

P7009: S. R. Dillon, *et al.* Interleukin 31, a cytokine produced by activated T cells, induces dermatitis in mice. *NATURE IMMUNOLOGY* 2004;5(7):752-760

ALZET Comments: Interleukin-31, mouse; PBS; BSA; SC; Mice; 7-14 days; Controls received mp w/ vehicle; immunology.