



References on the Administration of Glucocorticoids Using ALZET® Osmotic Pumps

1. Corticosterone

Q6066: D. J. Morris, *et al.* Glucocorticoids and gut bacteria: "The GALF Hypothesis" in the metagenomic era. *Steroids* 2017;125(1-13)

ALZET Comments: Chenodeoxycholic acid, progesterone, 11b-hydroxy-, corticosterone, deoxy-, corticosterone, 3 α ,5 α -TH-, progesterone, 3 α ,5 α -TH-11 β -hydroxy-; SC; Rat; steroidal derivatives of corticosterone; Review presents the role of gut microbial metabolism of endogenous adrenocorticosteroids as a contributing factor in the etiology of essential hypertension.

Q6077: D. E. Livingstone, *et al.* Metabolic dysfunction in female mice with disruption of 5 α h-reductase 1. *J Endocrinol* 2017;232(1):29-36

ALZET Comments: Corticosterone; DMSO; Propylene glycol; Mice; Dose (100 ug/day); 50% DMSO, 50% Propylene glycol used; animal info (Female 3-4 month old 5 α R1-KO and wild-type mice); replacement therapy (glucocorticoid);.

Q6029: A. Dey, *et al.* Glucocorticoid-mediated activation of GSK3 β promotes tau phosphorylation and impairs memory in type 2 diabetes. *Neurobiol Aging* 2017;57(75-83)

ALZET Comments: Corticosterone; 2-hydroxypropyl-B-cyclodextrin; TDZD-8/TDZD-8,; Saline; CSF/CNS (hippocampus); Mice; 2 weeks; animal info (5 weeks); functionality of mp verified by ELISA; bilateral cannula; behavioral testing (Y-maze, novel object preference task); TDZD-8 is a non-ATP-competitive selective inhibitor of GSK3 β ; Dose (2 uM/day);.

Q6635: M. Nixon, *et al.* ABCC1 confers tissue-specific sensitivity to cortisol versus corticosterone: A rationale for safer glucocorticoid replacement therapy. *Science Translational Medicine* 2016;8(352):352-352ra109

ALZET Comments: Corticosterone; Cortisol; DMSO; Propylene glycol; SC; Mice (knockout); 2001; 7 days; Dose (corticosterone (250 ug/day) and cortisol (250 ug/day); Controls received mp w/ vehicle; animal info (Male(Abcc1-/-) mice);.

Q6050: S. Koyanagi, *et al.* Glucocorticoid regulation of ATP release from spinal astrocytes underlies diurnal exacerbation of neuropathic mechanical allodynia. *Nat Commun* 2016;7(13102)

ALZET Comments: Corticosterone; Water, PEG, DMSO, Ethanol; SC; Mice; 2001; 7 days; Controls received mp w/ vehicle; animal info (5-6 weeks old); Vehicle: water and propylene glycol (1:1 volume) with 5% DMSO and 5% ethanol. Therapeutic indication (neuropathic mechanical allodynia, circadian rhythm);.

Q5320: M. Benlloch, *et al.* Pterostilbene Decreases the Antioxidant Defenses of Aggressive Cancer Cells In Vivo: A Physiological Glucocorticoids- and Nrf2-Dependent Mechanism. *Antioxid Redox Signal* 2016;24(17):974-90

ALZET Comments: Pterostilbene, Corticosterone; DMSO, Ethanol; PEG400; IV (jugular); mice; 35 days; Controls received mp w/ vehicle; animal info Female nu/nu nude mice (6-8 weeks); Vehicle solution DMSO and ethanol at 2:1 ratio; functionality of mp verified by plasma levels, pg 979; functionality of mp verified by plasma levels, pg 979; Pterostilbene is a natural dimethoxylated analog of resveratrol; Mice xenograft models; Dose (50 mg/ml Pter; 0.3 ug/hr corticosterone); Resultant plasma level (pg. 979);.

Q4018: B. F. Nelson, *et al.* Protracted treatment with corticosterone reduces breeding success in a long-lived bird. *General and Comparative Endocrinology* 2015;210(38-45)

ALZET Comments: Corticosterone; PEG 400; SC; Bird (kittiwake); 2002; 8 days; Controls received mp w/ vehicle; animal info (late incubation, 380g); functionality of mp verified by serum levels; Multiple pumps per animal (2);.

R0351: D. J. Morris. Why do humans have two glucocorticoids: A question of intestinal fortitude. *Steroids* 2015;102(32-8)

ALZET Comments: Corticosterone; progesterone, hydroxy-; SC; Rat; These infused steroids produce glucocorticoid induced mineralocorticoid receptor mediated Na⁺ retention.



Q5025: R. Maayan, *et al.* Dehydroepiandrosterone Attenuates Cocaine-Seeking Behaviour Independently of Corticosterone Fluctuations. *J Neuroendocrinol* 2015;27(11):819-26

ALZET Comments: Corticosterone; DMSO; SC; Rat; 2002; 14 days; Controls received mp w/ vehicle; animal info (male, Sprague Dawley, 250-350g); functionality of mp verified by plasma levels; behavioral testing (lever pressing); dependence; Dose (15 mg/kg);

Q4387: J. S. M. Cuffe, *et al.* Differential mRNA Expression and Glucocorticoid-Mediated Regulation of TRPM6 and TRPM7 in the Heart and Kidney throughout Murine Pregnancy and Development. *PLoS One* 2015;10(U1394-U1410)

ALZET Comments: Dexamethasone sodium phosphate; corticosterone; Saline; SC; Mice (pregnant); 1003D; 60 hours; Controls received mp w/ saline; animal info (female, E12.5, C57Bl6J, 8-10 weeks old); teratology; cardiovascular;

Q3696: M. Wosiski-Kuhn, *et al.* Glucocorticoid receptor activation impairs hippocampal plasticity by suppressing BDNF expression in obese mice. *Psychoneuroendocrinology* 2014;42(165-177)

ALZET Comments: Corticosterone; Cyclodextrin, 2-hydroxypropyl-b-; CSF/CNS (hippocampus); Mice; 2 weeks; Controls received mp w/ vehicle and aCSF; animal info (male, C57BL6J or db/db, 5 weeks old); functionality of mp verified by hippocampal corticosterone levels; Multiple pumps per animal (2); behavioral testing (y-maze apparatus); tissue perfusion (bilateral hippocampi); immunology; Cannula placement verified via histology; used Plastics One bilateral cannula; bilateral infusion;

Q3573: A. D. Mueller, *et al.* The inhibitory effect of sleep deprivation on cell proliferation in the hippocampus of adult mice is eliminated by corticosterone clamp combined with interleukin-1 receptor 1 knockout. *BRAIN BEHAVIOR AND IMMUNITY* 2014;35(1):182-188

ALZET Comments: Corticosterone; PEG 400; ethanol; SC; Mice; 1002; Animal info (male, homozygous IL1RI null, 7-8 weeks old); 5% ethanol used; post op. care (buprenorphine 0.1 mg/kg, metacam 1 mg/kg SQ, ADX rats given saline in water bottles); replacement therapy (adrenalectomy); immunology; sleep deprivation study;

Q4468: D. J. Morris, *et al.* An alternative explanation of hypertension associated with 17alpha-hydroxylase deficiency syndrome. *Steroids* 2014;79(44-8)

ALZET Comments: corticosterone; progesterone, hydroxy-; Propylene glycol; sc; Rat; 14 days; Controls received mp w/ vehicle; animal info: adrenally intact rats; functionality of mp verified by measuring systolic blood pressure pg 46; replacement therapy (the agents infused); Dose: 5 ug/hr of both agents.

Q4712: D. I. Claffin, *et al.* Modest elevation of corticosterone in preweanling rats impairs subsequent trace eyeblink conditioning during the juvenile period. *BEHAVIOURAL BRAIN RESEARCH* 2014;258(1):19-26

ALZET Comments: Corticosterone; PEG 400; SC; Rat; 1003D; 3 days; Controls received mp w/ vehicle; animal info (Long-Evans, PND15); functionality of mp verified by plasma levels pg22; no stress "Animals recovered quickly..." (see pg.20); post op. care (antibiotic ointment on wound, buprenorphine (0.052 mg/kg, heating pad until responsive and then returned to dam); "The corticosterone pellet was designed to produce a low, constant release of hormone over a 21-day period, but plasma assays showed otherwise. There was a large supraphysiological increase in circulating corticosterone levels (to ~80 ug/dl) for about three days after implantation and a return to normal levels by the time testing occurred... In the present study, we administered corticosterone using an alternative, more reliable method that yielded the low level (within a normal physiological range) and constant rate of delivery we had originally expected. Furthermore, since the ~3-day period of elevation in the previous study was sufficient to produce lasting effects on behavior, we chose to use an osmotic mini-pump that was designed to deliver corticosterone at a low and constant rate over a 3-day period only." pg 20; pumps primed for 24 hours in sterile saline;

Q3774: B. L. Callaghan, *et al.* Early Emergence of Adult-Like Fear Renewal in the Developing Rat After Chronic Corticosterone Treatment of the Dam or the Pups. *Behavioral Neuroscience* 2014;128(594-602)

ALZET Comments: Corticosterone; Water, deionized; SC; Rat (neonate); 1007D; 7 days; Control animals received mp w/ vehicle; animal info (naive, Sprague Dawley, P7). no stress pg 595-596. "The entire surgery took less than 5 min and the rats recovered well. The dorsal placement of the micropump was chosen because it does not interfere with the feeding position



of pups." pg 595. "...dams in the current studies tolerated the pups well after both surgeries and there were no instances of cannibalism or obvious abuse (e.g., bite marks)" pg 596; pumps removed after 1 week;

Q5532: A. S. Brem, *et al.* Adrenalectomy amplifies aldosterone induced injury in cardiovascular tissue: an effect attenuated by adrenally derived steroids. *Steroids* 2013;78(3):347-55

ALZET Comments: Aldosterone, dehydrocorticosterone, 11-; DMSO; SC; Mice; 7 days; Controls received mp w/ (DMSO) (sham operated); animal info (C57BL/6 mice weighing 20-25 g); Cardiovascular (Aldosterone exposure); Therapeutic indication (Cardiovascular); Aldosterone (8 ug/kg/day); 11-dehydrocorticosterone (800 ug/kg/day).

Q2345: J. S. M. Cuffe, *et al.* Maternal Corticosterone Exposure in the Mouse Has Sex-Specific Effects on Placental Growth and mRNA Expression. *Endocrinology* 2012;153(11):5500-5511

ALZET Comments: Corticosterone; SC; Mice; 1003D; 60 hours; Control animals were untreated; animal info (C57BL/6, E12.5).

R0281: F. Chaouloff, *et al.* Temporal modulation of hippocampal excitatory transmission by corticosteroids and stress. *Frontiers in Neuroendocrinology* 2011;32(1):25-42

ALZET Comments: Corticosterone; 2 weeks; Review, see H.H. Liu, H.R. Payne, B. Wang, S.T. Brady, Gender differences in response of hippocampus to chronic glucocorticoid stress: role of glutamate receptors, *J. Neurosci. Res.* 83 (2006) 775–786.

Q2273: Y. Hayashi, *et al.* Influence of a Time-Restricted Feeding Schedule on the Daily Rhythm of *abcb1a* Gene Expression and Its Function in Rat Intestine. *Journal of Pharmacology and Experimental Therapeutics* 2010;335(2):418-423

ALZET Comments: Corticosterone; Rat; Animal info (Wistar, male, 6 wks old); replacement therapy (adrenalectomy).

Q1004: A. S. Brem, *et al.* Direct fibrogenic effects of aldosterone on normotensive kidney: an effect modified by 11 beta-HSD activity. *American Journal of Physiology-Renal Physiology* 2010;298(5):F1178-F1187

ALZET Comments: Aldosterone; RU-318; dehydrocorticosterone, 11-; corticosterone; DMSO; SC; Mice; 7 days; Controls received mp w/ vehicle; animal info (male, C57BL/6, 20-25 g).

Q0842: D. Ackermann, *et al.* In vivo nuclear translocation of mineralocorticoid and glucocorticoid receptors in rat kidney: differential effect of corticosteroids along the distal tubule. *American Journal of Physiology-Renal Physiology* 2010;299(6):F1473-F1485

ALZET Comments: Corticosterone; NaCl; SC; Rat; 2 days; Controls received mp w/ vehicle; animal info (male, Wistar); replacement therapy (adrenalectomy).

P9869: M. Herrmann, *et al.* The challenge of continuous exogenous glucocorticoid administration in mice. *Steroids* 2009;74(2):245-249

ALZET Comments: Corticosterone; PEG 400; DMSO; SC; Mice; 2004; 21 days; Controls received mp w/ vehicle; functionality of mp verified by residual volume; comparison of SC injections vs. pellet vs SC mp; animal info (Swiss White, male, CD1. 7-9 wks old).

P9394: M. S. Byerly, *et al.* Effects of BDNF, T₃, and corticosterone on expression of the hypothalamic obesity gene network in vivo and in vitro. *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 2009;296(4):R1180-R1189

ALZET Comments: Corticosterone; triiodothyronine; DMSO; propylene glycol; SC; Bird (chicken); 2001; 72 hours; Controls received mp w/ vehicle; animal info (male, 29 days old); 50% DMSO used; 50% propylene glycol used.

P8854: A. D. Mueller, *et al.* Sleep deprivation can inhibit adult hippocampal neurogenesis independent of adrenal stress hormones. *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 2008;294(5):R1693-R1703

ALZET Comments: Corticosterone; PEG 400; SC; Rat; 2ML2; 7, 11 days; Replacement therapy (adrenalectomy); dose-response (Fig. 6); comparison of oral vs. mp; pumps replaced after 1 week; animal info (male, Long-Evans, 300-400g.; male, Sprague Dawley, 250-300g.); "the method of Cort replacement is crucial for detecting an effect of RSD on cell proliferation." (p. R1700), mp was successful at this.



P7872: C. R. Maxwell, *et al.* Corticosterone modulates auditory gating in mouse. *Neuropsychopharmacology* 2006;31(5):897-903

ALZET Comments: Corticosterone; PEG 400; SC; Mice; 1002; 14 days; Controls received mp w/ vehicle; dose-response (fig. 3); comparison of SC pellets vs. mp; animal info (male, C57BL/6J, 10-11 wk. old).

P7810: H. H. Liu, *et al.* Gender differences in response of hippocampus to chronic glucocorticoid stress: Role of glutamate receptors. *Journal of Neuroscience Research* 2006;83(5):775-786

ALZET Comments: Corticosterone; PEG; SC; Mice; 2002; 2 weeks; Controls received no treatment; functionality of mp verified by plasma corticosterone levels; animal info (male, female, C57BL/6J, 7 wk old); "Although daily injections do elevate plasma corticosterone chronically, animals experience spikes of corticosterone associated with both handling and injection" (pg. 776).

P7247: U. A. Nuber, *et al.* Up-regulation of glucocorticoid-regulated genes in a mouse model of Rett syndrome. *Human Molecular Genetics* 2005;14(15):2247-2256

ALZET Comments: Corticosterone; DMSO; polypropylene glycol; SC; Mice; 48 hours; Controls received mp w/ vehicle; functionality of mp verified by plasma corticosterone levels; comparison of silastic implants vs. mp; 50% DMSO used; 50% propylene glycol used.

P7432: S. Ellis, *et al.* Early life immune challenge alters innate immune responses to lipopolysaccharide: implications for host defense as adults. *FASEB Journal* 2005;19(8):U826-U842

ALZET Comments: Corticosterone; PEG; IP; Rat; 2001; 1 week; Replacement therapy (adrenalectomy); no stress (see pg. 4); immunology; post op. care (derapen); "the survival rate of this procedure (ADX + mp) was 100% with animals having normal body temperature within 24 hours after the surgery."

P6237: H. Watanobe, *et al.* Adrenal glucocorticoids do not mediate impaired reproductive function induced by lipopolysaccharide in rats. *Neuroendocrinology* 2003;78(1):23-28

ALZET Comments: Corticosterone; PEG 400; SC; Rat; 2ML2; 14 days; Controls received no mp and saline injection; functionality of mp verified by plasma drug concentrations; replacement therapy (orchidectomy; adrenalectomy); LPS given by injection.

P5226: J. Wang, *et al.* The immunosuppressive effects of chronic morphine treatment are partially dependent on corticosterone and mediated by the mu-opioid receptor. *J Leukoc. Biol* 2002;71(5):782-790

ALZET Comments: Corticosterone; PEG 400; SC; Mice; 48 hours; Controls received mp w/ vehicle; functionality of mp verified by corticosterone plasma levels; dose-response (p. 784); immunology;

P5331: M. S. Man, *et al.* Corticosterone modulation of somatodendritic 5-HT_{1A} receptor function in mice. *JOURNAL OF PSYCHOPHARMACOLOGY* 2002;16(3):245-252

ALZET Comments: Corticosterone; PEG; SC; Mice; 2001; 72 hours; Corticosterone plasma levels checked; replacement therapy (adrenalectomy); comparison of SC injections vs mp.

P4979: J. L. W. Yau, *et al.* Lack of tissue glucocorticoid reactivation in 11 beta-hydroxysteroid dehydrogenase type 1 knockout mice ameliorates age-related learning impairments. *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA* 2001;98(47):4716-4721

ALZET Comments: Corticosterone; Saline; Ethanol; Radio-isotopes; SC; mice; 2001; 7 days; brain tissue distribution; Vehicle was 90% saline; 10% ethanol; aging; corticosterone brain distribution.

P4494: R. Sacedón, *et al.* Early maturation of T-cell progenitors in the absence of glucocorticoids. *Blood* 1999;94(8):2819-2826

ALZET Comments: Corticosterone; Propylene glycol; NaCl; SC; Rat (pregnant); 2ML4; Controls received sham surgery; functionality of mp verified by corticosterone levels in plasma; replacement therapy (adrenalectomy); teratology;



P3714: E.-L. Sainio. The role of adrenal hormones in the activation of tryptophan 2,3-dioxygenase by nicotinic acid in rat liver. *Meth. Find Exp. Clin. Pharmacol* 1997;19(7):465-470

ALZET Comments: Epinephrine; Corticosterone; Ethanol; NaCl; SC; Rat; 2ML1; 6 days; controls received mp w/vehicle; replacement therapy (adrenalectomy).

P4144: G. W. Souness, *et al.* 11a- and 11b- hydroxyprogesterone, potent inhibitors of 11b-hydroxysteroid dehydrogenase, possess hypertensinogenic activity in the rat. *Hypertension* 1996;27(pt 1):421-425

ALZET Comments: Progesterone, 11a; Hydroxyprogesterone, 11b; RU-28318; Corticosterone; Propylene glycol; SC; Rat; 2002; 14 days; controls received mp w/vehicle; functionality of mp verified by residual volume; replacement therapy (adrenalectomy); agents infused singly and concomitantly in same pump; cardiovascular.

P3153: G. K. DeKrey, *et al.* Effects of exogenous corticosterone treatment on alloantigen-specific cytotoxic T lymphocyte activity in mice. *J. Pharmacol. Exp. Ther* 1995;273(2):823-829

ALZET Comments: Corticosterone; Dexamethasone; PEG 400; mice; 2002; 14 days; controls received mp with PEG; functionality of mp verified by plasma levels; immunology; agent infusion delayed 1 day after surgery (by using catheter tubing).

P2905: L. G. Palmer, *et al.* Regulation of apical K and Na channels and Na/K pumps in rat cortical collecting tubule by dietary K. *J. Gen. Physiol* 1994;104(6):693-710

ALZET Comments: Aldosterone; Corticosterone; PEG 300; SC; Rat; 2002; no duration posted; replacement therapy (adrenalectomy).

P3168: A. H. Miller, *et al.* Effects of selective type I and II adrenal steroid agonists on immune cell distribution. *Endocrinology* 1994;135(5):1934-1944

ALZET Comments: Aldosterone; RU-28362; Corticosterone; Propylene glycol; SC; Rat; 7 days; replacement therapy (adrenalectomy).

P3238: M. J. Lobo, *et al.* Effect of chronic intravenous injection of steroid hormones on body weight and composition of female rats. *Biochem. Molec. Biol. Intl* 1993;29(2):349-358

ALZET Comments: Progesterone; Cortisol; Cortisone; Corticosterone; Dehydroepiandrosterone; Androstenedione, 4-; Androstendiol, 5-; Testosterone; Nortestosterone, 19-; Estradiol, B-; Estrone; Estriol; Deoxycorticosterone; PEG 400; IV (lower cava); Rat; 2002; 15 days; controls received mp with PEG; no stress (see pg. 351); pumps placed into peritoneal cavity and sutured to musculature; surgical wound sprinkled with sulphathiazol.

P2441: G. Thordarson, *et al.* Mammary gland differentiation in hypophysectomized, pregnant mice treated with corticosterone and thyroxine. *Biol. Reprod* 1992;47(6):676-682

ALZET Comments: Corticosterone; Cyclodextrin; SC; mice (pregnant); 2001; no duration posted; controls received mp w/ vehicle, sham operation or no treatment; vehicle was Molecusol.

P2271: S. Fragman, *et al.* The hypertensinogenic activity of 18,19-dihydroxycorticosterone in adrenalectomized rats. *Am. J. Hypertens* 1992;5(3):399-401

ALZET Comments: Aldosterone; Corticosterone, dihydroxy-; Propylene glycol; SC; Rat; 2002; 2 weeks; controls received mp w/vehicle; replacement therapy (adrenalectomy).

P2032: J. N. Petitte, *et al.* Daily infusion of corticosterone and reproductive function in the domestic hen (*Gallus domesticus*). *Gen. Comp. Endocrinol* 1991;83(3):397-405

ALZET Comments: Corticosterone; PEG 400; SC; bird (chicken); 2ML2; 2ML4; 14 days; dose-response; pulsed delivery achieved by externalizing PE-60 catheter from pump. Catheter could be disconnected at will for intermittent delivery: 10 hr on/14 hr off, 4 hr on/20 hr off, 24 hr on/0 hr off (pg 398-399).

P1649: E. P. Gomez-Sanchez, *et al.* ICV infusion of corticosterone antagonizes ICV-aldosterone hypertension. *Am. J. Physiol* 1990;258(21):E649-E653



ALZET Comments: Aldosterone; RU-26988; Corticosterone; CSF, artificial; Propylene glycol; CSF/CNS; Rat; 2002; 28 days; dose-response (graph); pump replaced at 2 weeks; propylene glycol at 2%.

P1849: G. Brown, *et al.* Effect of angiotensin II infusion in rats on Na, K-ATPase activity in renal cortical microsomal preparations. *Arch. Biochem. Biophys* 1989;275(1):236-243

ALZET Comments: Angiotensin II; Corticosterone; Acetic acid; PEG 400; IP; Rat; 24, 72 hours; replacement therapy (adrenalectomy); peptides; multiple pumps per animal (2) placed IP.

P1429: T. Rosenthal, *et al.* The hypertensinogenic activity of 18-hydroxy-19-norcorticosterone in the adrenalectomized rat. *Am. J. Hypertens* 1988;1(3):49S-51S

ALZET Comments: Aldosterone, 18-; Hydroxy-19-norcorticosterone; Hydroxycortisone, 18-; Propylene glycol; SC; Rat; 2002; 2 weeks; hc and aldo administered concomitantly.

P1265: R. B. Jones, *et al.* Tonic immobility and Heterophil/lymphocyte responses of the domestic fowl to corticosterone infusion. *Physiol. Behav* 1988;42(3):249-253

ALZET Comments: Corticosterone; PEG 400; SC; bird (chicken); 2ML2; 11 days; controls received mp w/vehicle; dose-response; functionality of mp verified by previous studies.

P1003: D. R. Mann, *et al.* Mutually independent effects of adrenocorticotropin on luteinizing hormone and testosterone secretion. *Endocrinology* 1987;120(15):1542-1550

ALZET Comments: ACTH (1-24); Corticosterone; Propylene glycol; Saline; SC; Rat; 2001; 2ML1; 72/96 hours; controls received mp w/vehicle; peptides; replacement therapy (adrenalectomy).

P1139: T. M. John, *et al.* Influence of corticosterone infusion on plasma levels of catecholamines, thyroid hormones, and certain metabolites in laying hens. *Poult. Sci* 1987;66(6):1059-1063

ALZET Comments: Corticosterone; PEG 400; SC; bird (chicken); 14/28 days; Pump model not stated; controls received mp w/ vehicle.

P1202: P. C. Powell, *et al.* Induction of Marek's disease in vaccinated chickens by treatment with betamethasone or corticosterone. *Isr. J. Vet. Med* 1986;42(2):73-78

ALZET Comments: Corticosterone; SC; bird (chicken); 14 days; Pump model not stated; controls received saline injections; concomitant cyclophosphamide injections; immunology.

P0850: B. S. McEwen, *et al.* Aldosterone effects on salt appetite in adrenalectomized rats. *Neuroendocrinology* 1986;43(3):38-43

ALZET Comments: Aldosterone, d-; RU-28313; Corticosterone; Propylene glycol; SC; Rat; 2001; 2-3 days; controls received mp w/vehicle; hypertension; 3 doses of aldosterone infused; replacement therapy (adrenalectomy); RU-28313 is an antimineralcorticoid.

P0566: P. C. Will, *et al.* Regulation of amiloride-sensitive electrogenic sodium transport in the rat colon by steroid hormones. *Am. J. Physiol* 1985;248(1):G124-G132

ALZET Comments: Aldosterone; Corticosterone; Dexamethasone phosphate; Estradiol, 17B-; Progesterone; Testosterone; PEG 400; PEG 600; IP; Rat; 1701; 2001; 3-8 days; comparison of agents effects; replacement therapy (adrenalectomy & ovariectomy); controls received mp with solvent or glass rods of mp size; no stress implied G125, weight regained; functionality of mp verified.

P0656: A. A. J. C. van Zon, *et al.* ACTH-dependent modulation of malaria immunity in mice. *Parasite Immunol* 1985;7(2):107-117

ALZET Comments: Cosyntropin; Corticosterone; Dexamethasone; Hank's solution; HEPES solution; PEG; SC; mice; 2002; no duration posted; comparison of agents effects; replacement therapy (adrenalectomy); tetracosactin (cosyntropin) is a synthetic ACTH analog; dose-response data; immunology.



P0612: R. Phillips, *et al.* Effect of mineralocorticoids and glucocorticoids on compensatory adrenal growth in rats. *Am. J. Physiol* 1985;248(4):E450-E456

ALZET Comments: Aldosterone; Fluorocortisol acetate, 9a-; Corticosterone; Deoxycorticosterone; Dexamethasone; Ethanol; Propylene glycol; Water; SC; Rat; 3 days; replacement therapy (unilateral adrenalectomy); each mp used twice, 3 days in one animal, then 3 days in another; cannot tell if stability/concentration of ald. determined by RIA before or after exp.

P0710: D. E. Mills, *et al.* Interaction of prolactin with adrenal hormones in blood pressure regulation in rats. *Am. J. Physiol* 1985;249(E614-E618)

ALZET Comments: Corticosterone; Epinephrine; Norepinephrine; Prolactin, ovine; Ethanol; Sodium chloride; Water; IP; Rat; 2001; 7 days; replacement therapy (adrenalectomy); separate and simultaneous infusion of agents; multiple pumps per animal (2) for CORT; hypertension; controls received mp w/NaCl; peptides.

P0709: M. Fukushima, *et al.* Interaction of light and corticosterone on food intake and brown adipose tissue of the rat. *Am. J. Physiol* 1985;249(R753-R757)

ALZET Comments: Corticosterone; Propylene glycol; Saline; Rat; 2ML2; 2 weeks; comparison of ip injection vs. mp infusion; replacement therapy (adrenalectomy); mp functionality (rates) verified in vitro prior to study.

P0731: L. D. Devenport, *et al.* Continuous infusion of aldosterone: correlates of body weight gain. *Pharmacol. Biochem. Behav* 1985;22(707-709)

ALZET Comments: Corticosterone; PEG; SC; Rat; 2002; no duration posted; replacement therapy (adrenalectomy); controls received sham pumps; varied doses of aldosterone administered in combination w/ mp infusion; mp delivery failure? (see pg. 707).

P0194: P. Komanicky, *et al.* Hypertensinogenic potencies of aldosterone and deoxycorticosterone in the rat. *Hypertension* 1982;4(1):140-145

ALZET Comments: Aldosterone acetate; Deoxycorticosterone acetate; Ethanol; Propylene glycol; Water; SC; Rat; 1701; 3 weeks; additional pump implanted after 7 and 14 days adjacent to the 'spent' pumps.

P0182: J. Carroll, *et al.* The relationship between plasma 18-hydroxy-11-deoxycorticosterone levels and production of hypertension in the rat. *J. Steroid Biochem* 1981;14(989-995)

ALZET Comments: Deoxycorticosterone, 18-OH-; Deoxycorticosterone acetate, 11-; Ethanol; Propylene glycol; Water; SC; Rat; 3 weeks/ 2 days; pumps replaced on days 7 & 14 in Exp. 1.

P0140: J. Carroll, *et al.* 5a-dihydro-11-deoxycorticosterone: effect on blood pressure in the rat. *Steroids* 1981;37(1):111-120

ALZET Comments: Deoxycorticosterone acetate; Deoxycorticosterone acetate, 11-; Deoxycorticosterone, 5a-dihydro-; Deoxycorticosterone, 5a-dihydro-11-; Ethanol; Propylene glycol; SC; Rat; 7 days; no comment posted.

P0061: P. C. Will, *et al.* Polyethylene glycols as solvents in implantable osmotic pumps. *J. Pharm. Sci* 1980;69(6):747-749

ALZET Comments: Aldosterone; Corticosterone; Deoxycorticosterone acetate; Dexamethasone acetate; Estradiol, 17B-; Hydrocortisone; Progesterone; Spironolactone; Testosterone; PEG; PEG 400; PEG 600; IP; Rat; 1701; no duration posted; 3-7 days aldosterone, 6 days PEG only; replacement therapy (adrenalectomy).

2. Cortisol

Q7120: D. F. Cobice, *et al.* Quantification of 11beta-hydroxysteroid dehydrogenase 1 kinetics and pharmacodynamic effects of inhibitors in brain using mass spectrometry imaging and stable-isotope tracers in mice. *Biochem Pharmacol* 2018;148(88-99)

ALZET Comments: Cortisol; radio-isotopes; DMSO; propylene glycol; 2H tracer; SC; Mice; 1003D; 2 days; Dose (1.75 mg/day); Controls received mp w/ vehicle; animal info (Male, C57Bl6, 12 weeks old); stable-isotope labelled [9,11,12,12-2H]4-cortisol; dependence;



Q6635: M. Nixon, *et al.* ABCC1 confers tissue-specific sensitivity to cortisol versus corticosterone: A rationale for safer glucocorticoid replacement therapy. *Science Translational Medicine* 2016;8(352):352-352ra109

ALZET Comments: Corticosterone; Cortisol; DMSO; Propylene glycol; SC; Mice (knockout); 2001; 7 days; Dose (corticosterone (250 ug/day) and cortisol (250 ug/day); Controls received mp w/ vehicle; animal info (Male(Abcc1-/-) mice);.

Q2977: L. Kleppe, *et al.* Cortisol treatment of prespawning female cod affects cytogenesis related factors in eggs and embryos. *General and Comparative Endocrinology* 2013;189(:):84-95

ALZET Comments: Cortisol; propranolol; Hydrocortisone; IP; Fish; 27.3 days; Controls received mp w/ 80% 1.2-propranolol; animal info (cod, 1.8kg, female); 2ML pump used.

Q3071: X. D. Feng, *et al.* Cortisol stimulates proliferation and apoptosis in the late gestation fetal heart: differential effects of mineralocorticoid and glucocorticoid receptors. *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 2013;305(4):R343-R350

ALZET Comments: Cortisol; potassium canrenoate; mifepristone; Saline; SC; Sheep (ewe); 2ML2; 10 days; Controls received mp w/ vehicle; animal info (female, singleton pregnancies); teratology; cardiovascular; impact of maternal stress during late gestation.

Q2583: P. Dorniak, *et al.* Cortisol and Interferon Tau Regulation of Endometrial Function and Conceptus Development in Female Sheep. *Endocrinology* 2013;154(2):931-941

ALZET Comments: Cortisol; PF915275; meloxicam; interferon, tau, recomb. ovine; Ethanol; Intrauterine (uterine horn); Sheep (ewe); 2ML1; Control animals received mp w/ vehicle; animal info (mature, rambouillet, female, ewe); 2% ethanol used; vinyl catheter used (0007760); "Our previous studies found that infusion of that amount of IFNT in the uterine lumen each day mimics effects of the conceptus on endometrial expression of hormone receptors and IFNT-stimulated genes during early pregnancy in ewes" pg 932.

Q5637: C. P. Cutler, *et al.* Cortisol regulates eel (*Anguilla anguilla*) aquaporin 3 (AQP3) mRNA expression levels in gill. *Gen Comp Endocrinol* 2007;152(2-3):310-3

ALZET Comments: Cortisol; Cyclodextrin, 2-hydroxypropyl-b-; Fish (Eel); 1003D; 8 days; Controls received mp w/ vehicle; functionality of mp verified by plasma levels; 30% 2-hydroxypropyl-b-cyclodextrin used; "The infusion of cortisol into FW eels using osmotic mini-pumps led to a 2.8-fold increase in the level of plasma cortisol as measured 8-days after the onset of the experiment (Fig. 1)" pg 311; Dose (15 ug/hr);.

P7143: A. S. Martinez, *et al.* Cloning and expression of three aquaporin homologues from the European eel (*Anguilla anguilla*): effects of seawater acclimation and cortisol treatment on renal expression. *Biology of the Cell* 2005;97(8):615-627

ALZET Comments: Cortisol; Cyclodextrin, beta; IP; Fish (eel); 1003D; 8 days; Controls received mp w/ vehicle; functionality of mp verified by cortisol plasma levels; pumps implanted IP per contact with author; 30% cyclodextrin used.

P7146: A. S. Martinez, *et al.* Regulation of expression of two aquaporin homologs in the intestine of the European eel: effects of seawater acclimation and cortisol treatment. *American Journal of Physiology-Regulatory Integrative and Comparative Physiology* 2005;288(6):R1733-R1743

ALZET Comments: Cortisol; Cyclodextrin, beta; IP; Fish (eel); 1003D; 8 days; Controls received mp w/ vehicle; cortisol plasma levels; yellow/silver eels with an ambient temp. of 5-14 degrees celsius, 30 degrees celsius Cyclodextrin used; pumps implanted IP; per contact with author; 30% cyclodextrin used.

P6093: J. R. Metz, *et al.* Regulation of branchial Na⁺/K⁺-ATPase in common carp *Cyprinus carpio* L. acclimated to different temperatures. *Journal of Experimental Biology* 2003;206(13):2273-2280

ALZET Comments: Cortisol; Cyclodextrin, beta; IP; Fish (carp); 1007D; Controls received mp w/ vehicle; functionality of mp verified by cortisol plasma levels taken; "this approach was used instead of cortisol injection, which evokes stress responses due to repetitive handling..." (p. 2275); 30% cyclodextrin used.



P5333: K. Pacak, *et al.* Chronic hypercortisolemia inhibits dopamine synthesis and turnover in the nucleus accumbens: An in vivo microdialysis study. *Neuroendocrinology* 2002;76(3):148-157

ALZET Comments: Cortisol; SC; Rat; 2001; 7 days; Controls received mp w/ saline.

R0368: B. A. Teicher. The Combination of Antiangiogenic Therapy with Cytotoxic Therapy. *Tumor Angiogenesis and Microcirculation* 2001;506-548

ALZET Comments: Tetrahydrocortisol; Cyclodextrin-beta tetradecasulfate; SC; Mice; 14 days; Dose: b-Cyclodextrin tetradecasulfate (1000 mg/kg) and tetrahydrocortisol (125 mg/kg); cancer (Lewis lung carcinoma);

P3347: E. Wolfovitz, *et al.* Effects of hypercortisolemia or hyperinsulinemia on neurochemical indices of catecholamine release and synthesis in conscious rats. *J. Auton. Nerv. Syst* 1995;54(104-112

ALZET Comments: Cortisol; Saline; SC; Rat; 1 week; controls received mp w/saline.

P2851: P. T. Sangild, *et al.* The prenatal development and glucocorticoid control of brush-border hydrolases in the pig small intestine. *Pediatr. Res* 1995;37(2):207-212

ALZET Comments: Cortisol; Saline; SC; pig (fetus); 2001; 6 days; controls received mp with saline; after surgery fetuses received 50 mg of ampicillin into the amniotic cavity; sows maintained on antibiotics 3-4 days after surgery.

P2823: N. K. Popnikolov, *et al.* In vivo growth stimulation of collagen gel embedded normal human and mouse primary mammary epithelial cells. *J. Cell. Physiology* 1995;163(51-60

ALZET Comments: Epidermal growth factor; Cortisol; Toxin, cholera; Uridine, bromodeoxy-;; Medium 199;; SC; gel;; Mice (nude);; 1003D;; 3 days;; peptides; "tissue perfusion" -- gel containing human mammary epithelial cells was infused; estradiol, progesterone, and cholesterol combinations administered via silastic capsules EGF cholera toxin and hydrocortisone stimulated DNA synthesis substantially with the greatest response seen in the gel proximal to the pump: local delivery appears to be superior to injection;.

P3326: K. Pacak, *et al.* Catecholaminergic inhibition by hypercortisolemia in the paraventricular nucleus of conscious rats. *Endocrinology* 1995;136(11):4814-4819

ALZET Comments: Cortisol; SC; Rat; 2001; 7 days; controls received mp w/saline.

P2997: J. M. Shrimpton, *et al.* Downregulation of corticosteroid receptors in gills of coho salmon due to stress and cortisol treatment. *Am. J. Physiol* 1994;267(36):R432-R438

ALZET Comments: Cortisol, 21-hemisuccinate; Saline; Cyclodextrin; IP; fish; 18 days; controls received mp w/ vehicle or no surgery; functionality of mp verified by plasma levels; comparison of ip injections and daily handling vs. mp; no stress (see pg. R433); stability verified for 18 days at 7.5 degrees C; only chronic infusion resulted in reduction of corticosteroid receptor number and affinity; cyclodextrin was Molecusol HBP.

P2955: P. T. Sangild, *et al.* Developmental regulation of the porcine exocrine pancreas by glucocorticoids. *J. Pediatr. Gastroenterology and Nutrition* 1994;19(204-212

ALZET Comments: Cortisol; ACTH; Saline; SC; pig (fetus); 2001; 6 days; controls received mp with saline; peptides; no stress: mp was generally well tolerated; the cortisol used was hydrocortisone hemisuccinate.

P2956: P. T. Sangild, *et al.* Adrenocortical stimulation of stomach development in the prenatal pig. *Biol. Neonate* 1994;65(378-389

ALZET Comments: Cortisol; ACTH(1-24); Saline; SC; pig (fetus); 2001; 6 days; controls received mp with saline; peptides.

P2957: P. T. Sangild, *et al.* Secretion of acid, gastrin, and cobalamin-binding proteins by the fetal pig stomach: developmental regulation by cortisol. *Exp. Physiology* 1994;79(135-146

ALZET Comments: Cortisol; SC; pig (fetus); 2001; 6 days; controls received mp with saline or no operation; mp implanted just behind ribs; ampicillin given via amniotic fluid.



P2903: K. Pacak, *et al.* Adrenalectomy augments in vivo release of norepinephrine in the paraventricular nucleus during immobilization stress. *Endocrinology* 1993;133(1404-1410)

ALZET Comments: Cortisol; Saline; SC; Rat; 2002; 14 days; controls received mp with vehicle or sham operation; replacement therapy (adrenalectomy).

P3238: M. J. Lobo, *et al.* Effect of chronic intravenous injection of steroid hormones on body weight and composition of female rats. *Biochem. Molec. Biol. Intl* 1993;29(2):349-358

ALZET Comments: Progesterone; Cortisol; Cortisone; Corticosterone; Dehydroepiandrosterone; Androstenedione, 4-; Androstendiol, 5-; Testosterone; Nortestosterone, 19-; Estradiol, B-; Estrone; Estriol; Deoxycorticosterone; PEG 400; IV (lower cava); Rat; 2002; 15 days; controls received mp with PEG; no stress (see pg. 351); pumps placed into peritoneal cavity and sutured to musculature; surgical wound sprinkled with sulphathiazol.

P3216: R. Kvetnansky, *et al.* Endogenous glucocorticoids restrain catecholamine synthesis and release at rest and during immobilization stress in rats. *Endocrinology* 1993;133(3):1411-1419

ALZET Comments: Cortisol; Saline; SC; Rat; 2001; 7 days; no comment posted.

P2025: B. A. Teicher, *et al.* Antiangiogenic agents potentiate cytotoxic cancer therapies against primary and metastatic disease. *Cancer Res* 1992;52(6702-6704)

ALZET Comments: Cyclodextrin-beta tetradecasulfate; Cortisol, tetrahydro-; SC; mice; 2002; 14 days; cancer.

P2405: K. Pacak, *et al.* Hypercortisolemia inhibits yohimbine-induced release of norepinephrine in the posterolateral hypothalamus of conscious rats. *Endocrinology* 1992;131(3):1369-1376

ALZET Comments: Cortisol; Saline; SC; Rat; 2001; 7 days; controls received mp w/ vehicle; microdialysis.

P2682: R. T. Chatterton, *et al.* Depletion of luteal phase serum progesterone during constant infusion of cortisol phosphate in the cynomolgus monkey. *Fertil. Steril* 1991;56(3):547-554

ALZET Comments: Cortisol 21-phosphate; Saline; SC; monkey; 2001; 2ML2; 8 weeks; controls received mp w/ saline; functionality of mp verified by plasma level assay; pumps replaced every 7 or 14 days; long-term study.

P2594: D. E. Andersen, *et al.* Metabolic effects associated with chronically elevated cortisol in rainbow trout (*Oncorhynchus mykiss*). *Can. J. Fish. Aquat. Sci* 1991;48(9):1811-1817

ALZET Comments: Cortisol; Cyclodextrin, B-; IA (dorsal aorta); fish (rainbow trout); 2001; 10-14 days; controls received mp w/ vehicle or sham operation; functionality of mp verified by RIA of plasma levels; stress from surgery caused hyperglycemia (p.816) for 22 hours; "Mini-osmotic pumps. . . were an effective method for chronically elevating cortisol titers in trout."; Moleculsol HBP is a beta-cyclodextrin.

P1548: K. Szemeredi, *et al.* Opposite effects of chronic cortisol treatment on pre- and postsynaptic actions of clonidine in pithed rats. *J. Auton. Pharmac* 1989;9(35-43)

ALZET Comments: Cortisol; Saline; SC; Rat; 2001; 7 days; dose-response; functionality of mp verified by plasma levels.

P1303: K. Szemeredi, *et al.* Sympathoadrenomedullary inhibition by chronic glucocorticoid treatment in conscious rats. *Endocrinology* 1988;123(5):2585-2590

ALZET Comments: Cortisol; Saline; SC; Rat; 2001; 7 days; dose-response; functionality of mp verified by plasma levels.

P1269: M. B. Elam, *et al.* Stimulation of in vitro triglyceride synthesis in the rat hepatocyte by growth hormone treatment in vivo. *Endocrinology* 1988;122(4):1397-1402

ALZET Comments: Cortisol; Growth hormone, human; Triiodothyronine; Sodium hydroxide; Saline; SC; Rat; 7, 14 days; pump model not stated; male rats infused for 7 days, females for 14; agents infused separately; replacement therapy (hypophysectomy); peptides.

P0612: R. Phillips, *et al.* Effect of mineralocorticoids and glucocorticoids on compensatory adrenal growth in rats. *Am. J. Physiol* 1985;248(4):E450-E456



ALZET Comments: Aldosterone; Fluorocortisol acetate, 9a-; Corticosterone; Deoxycorticosterone; Dexamethasone; Ethanol; Propylene glycol; Water; SC; Rat; 3 days; replacement therapy (unilateral adrenalectomy); each mp used twice, 3 days in one animal, then 3 days in another; cannot tell if stability/concentration of ald. determined by RIA before or after exp.