



References on the Administration of Follicle Stimulating Hormone Using ALZET® Osmotic Pumps

Q10435: E. E. Deiktakis, *et al.* Impact of add-back FSH on human and mouse prostate following gonadotropin ablation by GnRH antagonist treatment. *Endocrine Connections* 2022;11(6):

Agents: Follicle stimulating hormone, human **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** Not Stated; **Duration:** 4 weeks;

ALZET Comments: Dose (10 IU/kg/day); Controls received mp w/ vehicle; animal info (Male; 6-8 weeks old; C57BL/6 mice, Chemically castrated); FSH aka follicle-stimulating hormone; cancer (Prostate);

Q7663: G. Shetty, *et al.* Effect of hormone modulations on donor-derived spermatogenesis or colonization after syngeneic and xenotransplantation in mice. *Anesthesia & Analgesia* 2019;7(2):257-265

Agents: Follicle stimulating hormone, recomb. human **Vehicle:** Not Stated; **Route:** SC; **Species:** Mice; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: Dose (5 IU/day); Controls received sham surgery; animal info (7-9 weeks, male, C57BL/6Law and nude); replacement therapy (FSH);

Q6885: H. Kaneko, *et al.* Developmental ability of oocytes retrieved from Meishan neonatal ovarian tissue grafted into nude mice. *Animal Science Journal* 2019;

Agents: Follicle stimulating hormone, porcine **Vehicle:** Saline; **Route:** Not Stated; **Species:** Mice (nude); **Pump:** 2004; **Duration:** 13 days;

ALZET Comments: Dose (porcine FSH (62.5 or 125 U/ml); animal info (Female nude mice (Crlj;CD1-Foxn1nu));

Q5653: H. Kaneko, *et al.* Growth and fertilization of porcine fetal oocytes grafted under the renal capsules of nude mice. *Theriogenology* 2016;86(7):1740-8

Agents: Follicle stimulating hormone, porcine **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** mice; **Pump:** 2004; **Duration:** 13 days;

ALZET Comments: Controls were non-grafted; replacement therapy (Estradiol); Therapeutic indication (Follicular development, oocyte maturation, fertilization);
Dose (62.5 U/mL);

Q2679: J. Lopez-Saucedo, *et al.* Superovulation, in vivo embryo recovery and cryopreservation for Aoudad (*Ammotragus lervia*) females using osmotic pumps and vitrification: a preliminary experience and its implications for conservation. *TROPICAL CONSERVATION SCIENCE* 2013;6(1):149-157

Agents: Follicle stimulating hormone, porcine **Route:** SC; **Species:** Sheep; **Pump:** 1003D;

ALZET Comments: Animal info (aoudad, aka Barbary, female); multiple pumps used (2); "the traditional procedures for superovulation in domestic ruminants are complicated and difficult to perform in wild females because the procedure requires many physical contact and repetitive procedures, i.e., the administration of FSH two times per day. Thus, we choose to deliver FSH using osmotic pumps to minimize such manipulations... and we considered that it was the best approach for wild ruminant females and most likely represents a more "physiological" delivery method, with the continuous administration of FSH rather than blood level spikes." pg 152-153

Q5652: H. Kaneko, *et al.* Improved developmental ability of porcine oocytes grown in nude mice after fusion with cytoplasmic fragments prepared by centrifugation: a model for utilization of primordial oocytes. *Theriogenology* 2013;80(8):887-92

Agents: Follicle stimulating hormone, porcine **Species:** Mice; **Pump:** 2004; **Duration:** 2 weeks;

ALZET Comments: animal info (5-6 weeks); Therapeutic indication (xenografting); Dose (62.5 U/mL);

Q0281: W. Zhou, *et al.* Changes in Gene Expression in Somatic Cells of Rat Testes Resulting from Hormonal Modulation and Radiation-Induced Germ Cell Depletion. *Biology of Reproduction* 2010;82(1):54-65

Agents: Follicle stimulating hormone, human, recomb. **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 2 weeks;

ALZET Comments: Animal info (LBNF1, male); pumps replaced after 1 week



- Q5567:** J. Cozzi, *et al.* Procedures for somatic cell nuclear transfer in the rat. *Methods Mol Biol* 2010;597(137-50)
Agents: Follicle stimulating hormone **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 1003D; **Duration:** Not Stated;
ALZET Comments: animal info (60–70 g immature female rats); post op. care (Buprenorphine analgesic); “We achieved the best results using immature females and continuous diffusion of FSH by Alzet osmotic minipumps implanted sub-cutaneously.” Pg. 142;
- Q0454:** C. Agca, *et al.* Development of a Novel Transgenic Rat Overexpressing the P2Y(2) Nucleotide Receptor Using a Lentiviral Vector. *JOURNAL OF VASCULAR RESEARCH* 2009;46(5):447-458
Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** Not Stated;
ALZET Comments: Animal info (Sprague-Dawley, female, 28-30 days old)
- P9677:** V. Ritter, *et al.* Follicle-stimulating hormone does not impact male bone mass in vivo or human male osteoclasts in vitro. *Calcified Tissue International* 2008;82(5):383-391
Agents: Follicle stimulating hormone **Vehicle:** Saline; **Route:** SC; **Species:** Mice; **Pump:** 2004; **Duration:** 30 days;
ALZET Comments: Controls received mp w/ vehicle; post op. care (buprenorphine); animal info (male, C57BL/6J, 16 wks old)
- P7504:** G. Shetty, *et al.* Both testosterone and follicle-stimulating hormone independently inhibit spermatogonial differentiation in irradiated rats. *Endocrinology* 2006;147(1):472-482
Agents: Follicle stimulating hormone, recomb. human **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 2 weeks;
ALZET Comments: Controls received sham implant; pumps replaced every week; animal info (male LBNF1, 9-12 wk old); testes irradiated
- P8120:** W. E. Filipiak, *et al.* Advances in transgenic rat production. *TRANSGENIC RESEARCH* 2006;15(6):673-686
Agents: Follicle stimulating hormone, porcine **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 1003D; **Duration:** Not Stated;
ALZET Comments: Comparison of SC injections vs. mp; peptides; animal info (female, Sprague-Dawley CD, 4-6 wk old)
- P7567:** E. Popova, *et al.* Strain differences in superovulatory response, embryo development and efficiency of transgenic rat production. *TRANSGENIC RESEARCH* 2005;14(5):729-738
Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** Not Stated;
ALZET Comments: Comparison of PMSG by IP injections vs. mp; peptides; animal info (female Lewis, Wistar-Kyoto, SHRSP, Sprague-Dawley, 28-35 days old)
- P5321:** E. Popova, *et al.* Comparison between PMSG- and FSH-induced superovulation for the generation of transgenic rats. *MOLECULAR REPRODUCTION AND DEVELOPMENT* 2002;63(2):177-182
Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** Not Stated;
ALZET Comments:
- P5251:** L. J. Mullins, *et al.* Transgenesis in the rat. *Methods Mol. Biol* 2002;180(255-270)
Agents: Follicle stimulating hormone **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 1003D; **Duration:** 3 days;
ALZET Comments: Detailed procedures for priming and surgery
- P5095:** P. S. Duggal, *et al.* Effects of leptin administration and feed restriction on thecal leucocytes in the preovulatory rat ovary and the effects of leptin on meiotic maturation, granulosa cell proliferation, steroid hormone and PGE(2) release in cultured rat ovarian follicles. *REPRODUCTION* 2002;123(891-898)
Agents: Follicle stimulating hormone **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 3 days;
ALZET Comments: human FSH used; endocrinology
- P5284:** T. J. Corbin, *et al.* Strain variation of immature female rats in response to various superovulatory hormone preparations and routes of administration. *Contemp. Top. Lab Anim Sci* 2002;41(2):18-23
Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 54-60 hours;
ALZET Comments: Comparison of ip injections vs. mp; endocrinology



Q6839: C. J. P. Jones, *et al.* Ultrastructure of epithelial plaque formation and stromal cell transformation by post-ovulatory chorionic gonadotropin treatment in the baboon (*papio anubis*). *Human Reproduction* 2001;16(12):2680-2690

Agents: Chorionic gonadotropin hormone, human; follicle stimulating hormone **Vehicle:** Not Stated; **Route:** Not Stated;

Species: Monkey (baboon); **Pump:** Not Stated; **Duration:** 5 days;

ALZET Comments: animal info (normally cycling adult female baboon);

Q7694: C. J. Jones, *et al.* Ultrastructure of epithelial plaque formation and stromal cell transformation by post-ovulatory chorionic gonadotrophin treatment in the baboon (*Papio anubis*). *Hum Reprod* 2001;16(12):2680-90

Agents: Gonadotrophin, human chorionic; Follicle stimulating hormone, recomb. **Vehicle:** Not Stated; **Route:** Not Stated;

Species: Baboon; **Pump:** Not Stated; **Duration:** 4 days;

ALZET Comments: Controls received mp w/ FSH; animal info (adult, female); Bioactive vs heat-inactivated HCG were compared to FSH treatment. Pump usage described in other study "The HCG treatment protocol has previously been described (Christensen *et al.*, 1995; Fazleabas *et al.*, 1999) and involves infusion of HCG between days 6 and 10 post-ovulation via a cannula attached to an Alzet minipump." p.2680;

P4725: P. S. Duggal, *et al.* The *in vivo* and *in vitro* effects of exogenous leptin on ovulation in the rat. *Endocrinology* 2000;141(6):1971-1976

Agents: Follicle stimulating hormone, human; **Vehicle:** Saline;; **Route:** SC;; **Species:** Rat;; **Pump:** Not Stated; **Duration:** 3 days;;

ALZET Comments: Controls received mp w/ vehicle; functionality of mp verified by plasma progesterone and estradiol levels (result of FSH administration); peptides;

P3531: A. F. Treloar, *et al.* Superovulation of New Zealand white rabbits by continuous infusion of follicle-stimulating hormone, using a micro-osmotic pump. *Lab. Anim. Sci* 1997;47(3):313-316

Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** rabbit; **Pump:** 1003D; **Duration:** 3 days;

ALZET Comments: functionality of mp verified by serum levels; peptides

P3670: K.-P. Brussow, *et al.* Aspects of follicular development and intrafollicular oocyte maturation in gilts. *Reprod. Dom. Anim* 1996;31(555-563

Agents: Follicle stimulating hormone, porcine **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** pig; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: controls received mp w/ saline

P3259: T. Matikainen, *et al.* Effects of recombinant human FSH in immature hypophysectomized male rats: evidence for leydig cell-mediated action on spermatogenesis. *J. Endocrinol* 1994;141(449-457

Agents: Follicle stimulating hormone, recomb. human **Vehicle:** PBS; **Route:** Not Stated; **Species:** Rat; **Pump:** Not Stated;

Duration: 7 days;

ALZET Comments: controls received mp w/saline; replacement therapy (hypophysectomy); peptides

P3133: J. S. Tapanainen, *et al.* Induction of ovarian follicle luteinization by recombinant follicle-stimulating hormone. *Endocrinology* 1993;133(6):2875-2880

Agents: Follicle stimulating hormone, recomb. **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Pump:** Not Stated;

Duration: 48 hours;

ALZET Comments: replacement therapy (hypophysectomy); peptides

P2321: M. Ishimatsu, *et al.* Continuous luteinizing hormone infusion prevents atretic changes of the follicles during superovulation in hamsters. *Endocrine Journal* 1993;40(665-671

Agents: Follicle stimulating hormone, human; Luteinizing hormone **Vehicle:** PBS; Albumin, bovine serum; **Route:** SC; **Species:** hamster; **Pump:** 2001; **Duration:** 4 days;

ALZET Comments: controls received mp w/ vehicles only; agents infused alone and in combination; human LH used



P2359: A. Meseguer, *et al.* Effects of pituitary hormones on the cell-specific expression of the KAP gene. *Mol. and Cellular Endocrin* 1992;89(153-162

Agents: Luteinizing hormone; ACTH, human; Thyroid-stimulating hormone, rat; Follicle stimulating hormone, rat; Growth hormone, rat; Prolactin, ovine **Vehicle:** Not Stated; **Route:** SC; **Species:** mice; **Pump:** 2001; **Duration:** 7 days;

ALZET Comments: controls received mp w/ vehicles; replacement therapy (hypophysectomy); peptides

P3254: P. S. LaPolt, *et al.* Gonadotropin-induced up- and down-regulation of ovarian follicle-stimulating hormone (FSH) receptor gene expression in immature rats: effects of pregnant mare's serum gonadotropin, human chorionic gonadotropin, and recombinant FSH. *Endocrinology* 1992;130(3):1289-1295

Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** no duration posted;

ALZET Comments: replacement therapy (hypophysectomy); peptides

P1763: A. Wubishet, *et al.* Preovulatory LH profiles of superovulated cows and progesterone concentrations at embryo recovery. *Theriogenology* 1991;35(2):451-457

Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** cattle; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: no comment posted

P2046: K. K. Vihko, *et al.* Stimulatory effects of recombinant follicle-stimulating hormone on leydig cell function and spermatogenesis in immature hypophysectomized rats. *Endocrinology* 1991;129(4):1926-1932

Agents: Follicle stimulating hormone **Vehicle:** PBS; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days;

ALZET Comments: replacement therapy (hypophysectomy)

P1951: G. S. Hamilton, *et al.* The superovulation of synchronous adult rats using follicle-stimulating hormone delivered by continuous infusion. *Biology of Reproduction* 1991;44(851-856

Agents: Follicle stimulating hormone; Gonadotrophin, human chorionic **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 3, 4, 7 days;

ALZET Comments: peptides

P1859: J. A. Carnegie. Immunolocalization of fibronectin and laminin within rat blastocysts cultured under serum-free conditions. *J. Reprod. Fertil* 1991;91(423-434

Agents: Follicle stimulating hormone; Gonadotrophin, human chorionic **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 1 day;

ALZET Comments: pumps removed and reimplanted into different animals

P1698: D. S. Keeney, *et al.* Reversal of long-term LH deprivation on testosterone secretion and Leydig cell volume, number and proliferation in adult rats. *J. Endocrinol* 1990;127(47-58

Agents: Luteinizing HRH; Follicle stimulating hormone, ovine **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2002; **Duration:** 2 weeks;

ALZET Comments: peptides; ovine LHRH used

P1755: K. M. Henderson, *et al.* Oocyte production and ovarian steroid concentrations of immature rats in response to some commercial gonadotrophin preparations. *Reprod. Fertil. Dev* 1990;2(671-682

Agents: Luteinizing hormone; Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 72 hours;

ALZET Comments: FSH-P, Folltropin, Oragen, Folligon; horse and porcine LH used

P1805: A. B. Galway, *et al.* Recombinant follicle-stimulating hormone induces ovulation and tissue plasminogen activator expression in hypophysectomized rats. *Endocrinology* 1990;127(6):3023-3028

Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 76 hours;

ALZET Comments: no comment posted



P1519: C. Rivier, *et al.* Immunoneutralization of endogenous inhibin modifies hormone secretion and ovulation rate in the rat. *Endocrinology* 1989;125(1):152-157

Agents: Follicle stimulating hormone, ovine **Vehicle:** Albumin, bovine serum; PBS; **Route:** IP; **Species:** Rat; **Pump:** 2001; **Duration:** no duration posted;

ALZET Comments: dose-response; functionality of mp verified by plasma levels

P3801: M.-C. Leveille, *et al.* Preimplantation embryo development and serum steroid levels in immature rats induced to ovulate or superovulate with pregnant mares' serum gonadotropin injection of follicle-stimulating hormone infusions. *Gamete Res* 1989;23(127-138

Agents: Follicle stimulating hormone, porcine; Gonadotrophin, human chorionic **Vehicle:** Saline, sterile; **Route:** SC; **Species:** Rat; **Pump:** 2001; **Duration:** 72 hours;

ALZET Comments: comparison of sc PMSG injections vs. mp; peptides

P1238: J. J. Milette, *et al.* The importance of follicle-stimulating hormone in the initiation of testicular growth in photostimulated djungarian hamsters. *Endocrinology* 1988;122(1060-1066

Agents: Follicle stimulating hormone, ovine; Luteinizing hormone **Vehicle:** Saline; **Route:** IP; **Species:** hamster; **Pump:** 2001; **Duration:** 8 days;

ALZET Comments: controls left untreated; dose-response (graph); peptides; ovine LH used

P1815: D. T. Armstrong, *et al.* Superovulation of immature rats by continuous infusion of follicle-stimulating hormone. *Biology of Reproduction* 1988;39(511-518

Agents: Follicle stimulating hormone **Vehicle:** Not Stated; **Route:** Not Stated; **Species:** Rat; **Pump:** 2001; **Duration:** 60 hours;

ALZET Comments: comparison of bid sc injections vs. mp; 'short half-life of FSH-A requires...continuous infusion...results establish the efficacy of FSH in causing superovulation when infused continuously.' (p.517)

P0858: A. Wubishet, *et al.* Continuous subcutaneous infusion of follicle stimulating hormone as a method of superovulating dairy cows. *Theriogenology* 1986;25(6):809-812

Agents: Follicle stimulating hormone **Vehicle:** Saline; **Route:** SC; **Species:** cattle; **Pump:** 2ML1; **Duration:** 7 days;

ALZET Comments: comparison of im injections vs. mp infusion; peptides

P0520: F. Garza, *et al.* Luteinizing hormone increases the number of ova shed in the cyclic hamster and guinea-pig. *J. Endocrinol* 1984;101(289-298

Agents: Gonadotrophin, pregnant mare serum; Luteinizing hormone; Follicle stimulating hormone, ovine; Gonadotrophin, human chorionic **Vehicle:** Albumin, bovine serum; PBS; **Route:** SC; **Species:** Guinea pig; hamster; mice; Rat; **Pump:** 2001; **Duration:** 2-5 days;

ALZET Comments: comparison of agents effects; replacement therapy (hypophysectomy); agents admin. singly; peptides; bovine, ovine, & human LH used

P0322: L. L. Ewing, *et al.* Effect of luteinizing hormone on Leydig cell structure and testosterone secretion. *Endocrinology* 1983;112(5):1763-1769

Agents: Follicle stimulating hormone; Growth hormone, ovine; Luteinizing hormone; Prolactin, ovine; Thyroid-stimulating hormone **Vehicle:** Borate; Peanut oil; **Route:** SC; **Species:** Rat; **Pump:** Not Stated; **Duration:** 5 days;

ALZET Comments: replacement therapy (hypophysectomy); simultaneous infusion of testosterone & estradiol implants w/ mp infusion of polypeptides; pulsed delivery of agents (intermittent w/ vehicle); peptides; ovine LH used

R0046: P. Skett, *et al.* The effect of pituitary hormones on hepatic drug metabolism. In 'Biochemistry, Biophysics and Regulation of Cytochrome P-450,' J. -A. Gustafsson, J. Carlstedt-Duke, A. Mode, and J. Rafter (eds.), Elsevier/North-Holland, Amsterdam 1980;195-198

Agents: Enkephalin analog DADLE; Follicle stimulating hormone; Growth hormone, bovine; Growth hormone, rat; Pituitary extract; Prolactin, bovine; Prolactin, rat; Thyroid-stimulating hormone **Vehicle:** Water; **Route:** SC; **Species:** Rat; **Pump:** 1701; **Duration:** 1 week;

ALZET Comments: peptides