Recent References on the Administration of Growth Hormones Using ALZET® Osmotic Pumps

Bovine (2004-Present)


Agents: Growth hormone, bovine recomb. Vehicle: Phosphate buffer; glycerol; sodium azide; Route: SC; Species: Rat; Pump: 2004; Duration: 6 days;

ALZET Comments: Animal info (female, Sprague Dawley, hx, normal); replacement therapy (hypophysectomized)


Agents: Insulin-like growth factor I; growth hormone, bovine; insulin-like growth factor-1, binding protein Vehicle: Not Stated; Route: SC; Species: Mice; Pump: 1007D; Duration: 7 days;

ALZET Comments: Controls received mp w/ saline; peptides; animal info (ORX, 10 weeks old, male); drugs delivered alone or in combination


Agents: Growth hormone, bovine Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2ML1; Duration: 1 week;

ALZET Comments: Controls received no treatment; peptides; animal info (male, Wistar-Hannover, 6, 18 months old); endocrinology


Agents: Growth hormone, bovine Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2001; Duration: 6 days;

ALZET Comments: Peptides; animal info (Sprague-Dawley, 7 wks old, male)


Agents: Growth hormone, human; growth hormone, bovine Vehicle: Not Stated; Route: SC; Species: Rat; Pump: 2001; Duration: 7 days;

ALZET Comments: Replacement therapy (hypophysectomy); dose-response (p. E115)

P6852: P. Kotokorpi, et al. Activation of the glucocorticoid receptor or liver X receptors interferes with growth hormone-induced akr1b7 gene expression in rat hepatocytes. Endocrinology 2004;145(12):5704-5713

Agents: Growth hormone, bovine Vehicle: Not Stated; Route: Not Stated; Species: Rat; Pump: 2001; Duration: 6 days;

ALZET Comments: Replacement therapy (hypophysectomy); peptides

Chicken


ALZET Comments: Growth hormone, chicken; Insulin-like growth factor I; Saline; Albumin, bovine serum; SC; bird (chicken); 2ML2; 10 days; controls received mp w/vehicle; functionality of mp verified by plasma levels; peptides; recomb. chicken growth hormone used;


ALZET Comments: Growth hormone, chicken; Albumin, bovine serum; Saline; SC; bird (chicken); 2ML4; 3 weeks; pumps were siliconized (probably using Prosil) to decrease protein binding in pumps.
Human (2004-Present)


**Agents:** Growth hormone, human recombinant  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 2004;  
**Duration:** 28 days;  
**ALZET Comments:** Dose (0.04 mg rhGH per day); Controls received mp w/ vehicle; animal info (Male C57BL/6 mice, 10 weeks old); behavioral testing (Motor test); Recombinant human growth hormone aka rhGH; replacement therapy (growth hormone);


**Agents:** Growth hormone, human recombinant  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 7 days;  
**ALZET Comments:** Controls received mp w/ PBS; animal info (male, Albumin-Cre); Therapeutic indication (Hepatic apoptosis); Dose (5 ug/h);


**Agents:** Insulin-like Growth Factor 1, recomb.; Growth Hormone, human  
**Vehicle:** Saline; BSA;  
**Route:** SC;  
**Species:** Mice; Rat;  
**Pump:** 2004;  
**Duration:** 5 days;  
**ALZET Comments:** Controls received sham surgery; animal info (dw/dw, 4-5 wks old)


**Agents:** Growth hormone, human  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat; Mice;  
**Pump:** 1007D;  
**Duration:** Not Stated;  
**ALZET Comments:** Animal info (CD-1, 42 days old); replacement therapy (hypophysectomy and oophorectomy)


**Agents:** Growth hormone, human  
**Vehicle:** Saline; BSA;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 2001;  
**Duration:** 7 days;  
**ALZET Comments:** Replacement therapy (hypophysectomy and oophorectomy); dose-response (p. E115)


**Agents:** Growth hormone, human  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** Not Stated;  
**Duration:** 7 days;  
**ALZET Comments:** Controls received sham operation; replacement therapy (hypophysectomy); peptides; animal info (C57B1/6J, LDL R knockout, male)


**Agents:** Growth hormone, human; growth hormone, bovine  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 7 days;  
**ALZET Comments:** Replacement therapy (hypophysectomy); dose-response (p. E115)


**Agents:** Growth hormone, human  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** Not Stated;  
**Duration:** 4 weeks;  
**ALZET Comments:** Controls received no treatment; replacement therapy (GH deficiency); pumps replaced on day 13; peptides
Ovine


**Agents:** Growth hormone, ovine; insulin-like growth factor I, recomb. ovine  
**Vehicle:** Ringer’s solution;  
**Route:** Not Stated;  
**Species:** Fish (atlantic salmon);  
**Pump:** 1003D;  
**Duration:** 4-14 days;  

**ALZET Comments:**

**P3171:** A. L. Albiston, *et al.* Sex- and tissue- specific regulation of 11B-hydroxysteroid dehydrogenase mRNA. Molec. and Cell. Endocrinol 1995;109(183-188

**Agents:** Growth hormone, ovine  
**Vehicle:** Not Stated;  
**Route:** Not Stated;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 4 days;  

**ALZET Comments:**

**R0097:** C. S. Nicoll, *et al.* Analysis of the role of hormones and growth factors in growth control and tissue differentiation using transplanted mammalian embryos and fetal structures. Growth Reg 1991;1(133-144

**Agents:** Antibody, anti-fibroblast growth factor; Antibody, anti-IGF I; Insulin; Growth hormone, ovine; Fibroblast growth factor; Epidermal growth factor; Insulin-like growth factor II; Antibody, anti-epidermal growth factor  
**Vehicle:** Not Stated;  
**Route:** IV (suprarenal);  
**Species:** Not Stated;  
**Pump:** Not Stated;  
**Duration:** no duration posted;  

**ALZET Comments:** peptides

**P1589:** R. J. Madon, *et al.* Hypoinsulinaemia in the lactating rat is caused by a decreased glycaemic stimulus to the pancreas. J. Endocrinol 1990;125(81-88

**Agents:** Growth hormone, ovine; Prolactin, ovine  
**Vehicle:** Not Stated;  
**Route:** Not Stated;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** 5 days;  

**ALZET Comments:** functionality of mp verified by serum levels; replacement therapy (oviarectomy) in some of the prolactin-treated animals

**P1177:** D. R. Smith, *et al.* Hepatic estrogen and androgen receptors and binding proteins in streptozotocin-diabetic male wistar rats. Diabetologia 1987;30(957-962

**Agents:** Growth hormone, ovine  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2001;  
**Duration:** no duration posted;  

**ALZET Comments:** peptides

Porcine (2014-Present)

**Q9414:** V. G. Piazza, *et al.* Exposure to growth hormone is associated with hepatic up-regulation of cPLA2alpha and COX. Molecular and Cellular Endocrinology 2020;509(110802

**Agents:** Growth hormone, porcine  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Mice;  
**Pump:** 1007D;  
**Duration:** 5 days;  

**ALZET Comments:**

**Q7865:** R. Sawa, *et al.* Growth hormone and Insulin-like growth factor-I (IGF-I) modulate the expression of L-type amino acid transporters in the muscles of spontaneous dwarf rats and L6 and C2C12 myocytes. Growth Horm IGF Res 2018;42-43(66-73

**Agents:** growth hormone, porcine  
**Vehicle:** Saline;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 1007D;  
**Duration:** 14 days;  

**ALZET Comments:** Dose (5 μg/h); Controls received mp w/ vehicle; animal info (6 weeks, SDR, 45-55g); dose of GH was selected to restore the GH and IGF-I levels to within the physiological ranges;

**Q4548:** H. Nishida, *et al.* Dexamethasone and BCAA Failed to Modulate Muscle Mass and mTOR Signaling in GH-Deficient Rats. PLoS One 2015;10(459-U478

**Agents:** Growth hormone, porcine  
**Vehicle:** Not Stated;  
**Route:** SC;  
**Species:** Rat;  
**Pump:** 2002;  
**Duration:** 14 days;  

**ALZET Comments:** Animal info (Sprague Dawley, 6 weeks old);
Agents: Growth hormone, porcine Vehicle: Not Stated; Route: SC; Species: Mice; Pump: 1007D; Duration: 5 days;
ALZET Comments: Controls received mp w/ saline; animal info (Swiss-Webster, 3-4 months old, 26-30g); functionality of mp verified by plasma levels; comparison of SC injection BID vs mp; toxicology; "The results indicate that sustained delivery systems that allow continuous GH plasma patterns would be beneficial in terms of treatment safety with regard to the actions of GH on EGFR signaling and its promitogenic activity.” pg 309

Rat (2009-Present)
Agents: growth hormone, recomb. rat Vehicle: Sodium bicarbonate; saline; albumin, buffered; Route: SC; Species: Mice; Pump: 1007D; Duration: 7 days;
ALZET Comments: Dose (20 ng/g body weight/hour); 30 mM NaHCO3 (pH 8.3) buffer containing 0.15 M NaCl and 100 mg/mL rat albumin used; Controls received sham surgery; animal info (8-10 weeks, male, CD1); "exogenous GH infusion using an ALZET osmotic minipump overrides the normal male plasma GH pulses and leads to downregulation of a large fraction of male-biased genes and upregulation of female-biased genes" p.1382;

Agents: Growth hormone, rat, recomb. Route: Not Stated; Species: Mice; Pump: 1007D; Duration: 7 days;
ALZET Comments: Animal info (male, female, CD-1, 7-8 wks old)

Agents: Ghrelin, recomb. rat; growth hormone, recomb. rat Vehicle: Saline; sodium bicarbonate; albumin, rat; Route: SC; Species: Mice; Pump: 1002; 2004; Duration: 10, 11 days;
ALZET Comments: Controls received mp w/ vehicle; peptides; animal info (male, wt, Goat-/-, 8 weeks old)

Agents: Growth hormone, rat Vehicle: NaCl; tween 20; NaHCO3; Na2CO3; Route: CSF/CNS; Species: Rat; Pump: 2002; Duration: 6 weeks;
ALZET Comments: Controls received mp w/ vehicleanimal info (adult, male, Sprague-Dawley, 280-350 g); pumps replaced every 2 weeks; stability verified by for 2 weeks in vitro

Q0698: R. D. Meyer, et al. Male-Specific Hepatic Bcl6: Growth Hormone-Induced Block of Transcription Elongation in Females and Binding to Target Genes Inversely Coordinated with STAT5. MOLECULAR ENDOCRINOLOGY 2009;23(11):1914-1926
Agents: Growth hormone, recomb. rat, human Vehicle: Not Stated; Species: Rat; Pump: Not Stated; Duration: 7 days;
ALZET Comments: Controls were untreated; animal info (male, Fischer 344, 9-13 wks old); replacement therapy (hypophysectomy)

Releasing Factor (2005-Present)
Agents: Ghrelin; growth hormone-releasing peptide 6, [D-Lys-3] Vehicle: Saline; Route: CSF/CNS (ventral tegmental area); Species: Rat; Pump: 2002; Duration: 14 days;
ALZET Comments: Controls received mp w/ vehicle; animal info (male, Long evans, 216-375g); post op. care (SC injection of meloxicam; feed of mashed food); behavioral testing (food operant responses); used Plastics One cannula; obesity;

**Agents:** Ghrelin, acylated; ghrelin, non-acylated; ghrelin mimetic growth hormone-releasing peptide-6 **Vehicle:** Saline; **Route:** CSF/CNS; **Species:** Rat; **Pump:** Not Stated; **Duration:** 14 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, Wistar, 250g); immunology;


**Agents:** Growth hormone-releasing peptide-2 **Vehicle:** Not Stated; **Route:** SC; **Species:** Rat; **Pump:** 2001D; **Duration:** 1 day;

**ALZET Comments:** Controls received mp w/ saline; animal info (male, Sprague Dawley, 50-70 g); peptides

P8904: M. L. Fiorotto, et al. Transplacental transfer of a growth hormone-releasing hormone peptide from mother to fetus in the rat. DNA and Cell Biology 2006;25(8):429-437

**Agents:** Growth hormone-releasing hormone; radio-isotopes 125I tracer **Vehicle:** BSA; **Route:** SC; **Species:** Rat (pregnant);

**Pump:** 1003D; **Duration:** 52-58 hours;

**ALZET Comments:** Controls received sham operation; functionality of mp verified by residual volume, total activity; no stress (see pg. 433); half-life (p. 432) 8 hours; teratology; peptides; animal info (female, Sprague Dawley, gd18)


**Agents:** Growth hormone-releasing peptide-6 **Vehicle:** Saline; **Route:** IV (jugular); **Species:** Rat; **Pump:** 2001; **Duration:** 7 days;

**ALZET Comments:** Controls received mp w/ vehicle; animal info (male, wistar 200-250 g); ghrelin receptor agonist; peptides