<table>
<thead>
<tr>
<th>(Narcotics)</th>
<th>(Non-Narcotic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfentanil</td>
<td>Acetylsalicylic Acid/Aspirin</td>
</tr>
<tr>
<td>Buprenorphine</td>
<td>Aminopyrine</td>
</tr>
<tr>
<td>Butorphanol</td>
<td>Antipyrine</td>
</tr>
<tr>
<td>Codeine</td>
<td>Indomethacin</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>Ketorolac</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>Naproxen</td>
</tr>
<tr>
<td>Levorphanol</td>
<td>Sodium Salicylate</td>
</tr>
<tr>
<td>Meperidine</td>
<td>Tramadol</td>
</tr>
<tr>
<td>Methadone</td>
<td>F13640</td>
</tr>
<tr>
<td>Morphine</td>
<td></td>
</tr>
<tr>
<td>Nalbuphine</td>
<td></td>
</tr>
<tr>
<td>Normorphine</td>
<td></td>
</tr>
<tr>
<td>Oxymorphone</td>
<td></td>
</tr>
<tr>
<td>Pentazocine</td>
<td></td>
</tr>
<tr>
<td>Propoxyphene</td>
<td></td>
</tr>
<tr>
<td>Sufentanil</td>
<td></td>
</tr>
</tbody>
</table>
Narcotic

1. Alfentanil


ALZET Comments: Alfentanil; Sufentanil; Saline; SC; Rat (pregnant); 2ML2; 14 days; controls received mp w/ saline; dose-response (text); 3 doses of sufentanil infused; agents infused separately; author states 'in terms of experimental design, the cost of using sc implanted osmotic minipumps is small'; teratology.

2. Buprenorphine


Agents: Methadone or Buprenorphine Vehicle: Saline; Route: CSF/CNS; Species: Rat; Pump: 2ML4; Duration: 28 days;

ALZET Comments: Dose (Buprenorphine- 1 mg/kg/day or ); Controls received mp w/ vehicle; animal info (Female); post op. care (Metacam); dependence;


Agents: Norbuprenorphine; Morphine Vehicle: Saline; Route: SC; Species: Rat; Pump: 2ML2; Duration: 14 days;

ALZET Comments: Dose (1,3 or 10 mg/kg/day); Controls received mp w/ vehicle; animal info (Long-Evans); dependence;


Agents: Morphine; buprenorphine; methadone Vehicle: Saline; Route: SC; Species: Mice; Pump: Not Stated; Duration: 6 days;

ALZET Comments: Dose (45 mg/kg/d; 5 mg/kg/day; 60 mg/kg/day); Controls received mp w/ vehicle; animal info (Male CD-1 mice, approximately 30g); comparison of morphine alkaloid pellet vs mp;


Agents: Buprenorphine; methadone Vehicle: Saline; Route: SC; Species: Mice; Pump: Not Stated; Duration: 6 days;

ALZET Comments: Controls received mp w/ vehicle; animal info (male, CD-1, 30g); behavioral testing (tail flick latencies, mouse locomotion); dependence; Dose (Buprenorphine 5 mg/kg/day; methadone 60 mg/kg/day);


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

ALZET Comments: Controls received mp w/ PBS; animal info (female, C57BL6, 8 weeks old); behavioral testing (pain score); "we used subcutaneously implanted ALZET® osmotic pumps to apply the analgesic buprenorphine. We ob–served strongly reduced pain scores in diseased mice receiving analgesics, whereas the immune response was not altered in these mice. Hence, our study offers a new treatment option to improve wellbeing of mice used to study LCMV-induced meningitis without grossly altering immune parameters " pg 184; "In this study, we subcutane–ously implanted ALZET® osmotic pumps releasing the anal–gesic agent buprenorphine. Continuous delivery with osmotic pumps ensures constant compound levels for maximized thera-peutic efficacy and reduced adverse effects. Additionally, un–necessary stressful animal handling due to repeated injection is not required. " pg 188; Dose (0.15 mg/kg/day);

3. Butorphanol Back to top
Q5136: M. Meredith M. Clancy DVM, et al. Pharmacokinetics of butorphanol delivered with an osmotic pump during a seven-day period in common peafowl (Pavo cristatus). American Journal of Veterinary Research 2015;76(12):1070-1076
**Agents:** Butorphanol  **Vehicle:** Not Stated;  **Route:** SC;  **Species:** Bird (peafowl);  **Pump:** 2ML1;  **Duration:** 7 days;
**ALZET Comments:** animal info: 14 healthy adult male common peafowl; functionality of mp verified by plasma levels; good methods (pg. 1071-1072); “Use of these osmotic pumps may provide options for avian analgesia.” pg 1070; analgesic administration to avian species; Pharmacokinetics; Dose: 247 ug/kg/h); Resultant plasma level ((mean, 106.4 ug/L; range, 61.8 to 133.0 ug/L)); Industry authored (Wildlife Conservation Society); Interesting (Plasma concentrations of butorphanol in common peafowl were maintained at or above reported efficacious analgesic concentrations; Use of these osmotic pumps may provide options for avian analgesia) pg. 1070

**Agents:** Butorphanol tartrate  **Vehicle:** Not Stated;  **Route:** SC;  **Species:** Rat;  **Pump:** 2ML1;  **Duration:** 48 hours;
**ALZET Comments:** Controls received mp w/ saline; animal info (Sprague Dawley, male, 302 g); “Implantation of the pumps took less than 1 min per rat, and the length of the anesthesia was approximately 5 min per rat.” pg 576; functionality of mp verified via residual volume

**Agents:** Butorphanol tartrate; nitroindazole, 7-  **Vehicle:** Saline; DMSO;  **Route:** CSF/CNS;  **Species:** Rat;  **Pump:** 2001;  **Duration:** 72 hours;
**ALZET Comments:** Enzyme inhibitor (nitric oxide synthase, NOS); animal info (male, Sprague Dawley, 250-275 g.); pump connected to catheter after 1 week recovery period; 10% DMSO used; PE60 tubing used

**Agents:** Butorphanol tartrate  **Vehicle:** Saline, physiological;  **Route:** CSF/CNS;  **Species:** Rat;  **Pump:** 2001;  **Duration:** 3 days;
**ALZET Comments:** Controls received mp w/ vehicle; dependence; post op. care (procaine penicillin G; animal info (male, Sprague-Dawley, 250-275 g)

**Agents:** Butorphanol tartrate  **Vehicle:** Not Stated;  **Route:** CSF/CNS;  **Species:** Rat;  **Pump:** 2001;  **Duration:** 3 days;
**ALZET Comments:** Controls received mp w/ saline; dependence; animal info (male, Sprague-Dawley 230-250 g)

4. Codeine  Back to top

**ALZET Comments:** Morphine tartrate; Codeine phosphate; Saline; SC; Rat; 2ML1; 7 days; functionality of mp verified by plasma drug levels; dose response (graphs p. 161); dependence.

5. Fentanyl  Back to top

**Agents:** Fentanyl  **Vehicle:** Not Stated;  **Route:** SC;  **Species:** Rat;  **Pump:** Not Stated;  **Duration:** 28 days;
**ALZET Comments:** Dose (0.01 mg/kg/hr); animal info (Male, Sprague Dawley); neurodegenerative (Chronic pain);

**Agents:** Fentanyl citrate; morphine sulphate salt pentahydrate

**Vehicle:** PBS; water, sterile

**Route:** SC

**Species:** Mice (transgenic);

**Pump:** 1007D

**Duration:** 7 days;

**ALZET Comments:** Dose (Fentanyl (2mg/kg/day); Morphine (17 mg/kg/day)); animal info (knock-in mice with 11S/T-A mutations (Oprm1tm3.1Shlz, MGI:6117673, 11S/T-A)); behavioral testing (hot plate test; open field locomotion test); dependence; “...we used subcutaneously implanted osmotic pumps to deliver opioids at a constant rate. This approach is a powerful means of assessing both tolerance and dependence in rodents” (p.5)


**Agents:** fentanyl

**Vehicle:** Not Stated;

**Route:** SC,

**Species:** Rat;

**Pump:** Not Stated;

**Duration:** 5 days;

**ALZET Comments:** Dose (0.01mg/kg/hr); Controls received mp w/ vehicle; animal info (male, Sprague-Dawley); comparison of oxycodone and morphine injection vs mp; opioids administered 1 hour, 10 days, or 28 days post-CCI (chronic constriction injury) surgery;


**Agents:** Florfenicol voriconazole; fentanyl; amikacin

**Vehicle:** Not Stated;

**Route:** SC; in vitro;

**Species:** Rat; Snake (corn, rattle); Iguana; Cat; Hamster; Gelada; Pudu; Wallaby; Monkey; Quail; Hen;

**Pump:** Not Stated;

**Duration:** Not Stated;

**ALZET Comments:** “animal info (Eastern massasauga rattlesnakes (Sistrurus catenatus); timber rattlesnake (Crotalus horridus); pudu (Pudu puda); wallaby (Macropus rufogriseus); iguanas (Iguana iguana); Mojave rattlesnakes (Crotalus scutulatus); corn snakes (Elaphe guttata guttata); Japanese quails (Coturnix coturnix japonica); hens (Gallus domesticus)); “ Finally, the use of intracoelomic osmotic pumps was reported in iguanas (Iguana iguana) in a study of reproductive behavior.26 No complication due to the pump placement was reported in that study.” pg. 508; Advantages: Can be extracted in case of drug overdose or toxicity, Is not altered by its biological environment, Release the drug at a constant rate, Low cost, Commercially available, Release rate and operation time can be chosen; Drawbacks: Necessitate 2 light surgical procedures under anesthesia to be implanted and explanted, Can sometimes migrate in unwanted location (especially if implanted accidently in air sacs during intracoelomic implantation) "


**Agents:** Fentanyl

**Vehicle:** Not Stated;

**Route:** SC;

**Species:** Rat;

**Pump:** Pump model not stated;

**Duration:** 5 days;

**ALZET Comments:** Dose (0.01mg/kg/hr); Controls received mp w/ vehicle; animal info (Male, Sprague-dawley); dependence;

6. Hydromorphone

**Back to top**

Q3537: A. Koesters, K. L. Engisch, M. M. Rich and M. M. Rich. Decreased cardiac excitability secondary to reduction of sodium current may be a significant contributor to reduced contractility in a rat model of sepsis. CRITICAL CARE 2014;18(U351-U357

**ALZET Comments:** Hydromorphone; IP; Rat; 24 hours; Animal info (female, Wistar, adult, 250-300g); post op. care (buprenorphine 0.12 mg/kg SC injection); used 2ML size pump; pain relief;


**ALZET Comments:** Hydromorphone; Saline; SC; Mice; 2001; 7 days; Controls received inert placebo pellet; tolerance; animal info (male, Swiss Webster, 22-30 g.); “There was substantially more tolerance with infusion treatment compared to injection treatment.” pg. 43.
**ALZET Comments:** Hydromorphone; SC; rabbit; 2ML4; 4 weeks; functionality of mp verified by blood sample assays; comparison of IV bolus administration vs. EVA polymer drug delivery vs. mp; pain; cancer.

**ALZET Comments:** Hydrocortisone phosphate; Hydromorphone; Saline; SC; monkey; 2 months; monkeys received both a mp w/ HP and a mp w/ saline on alternating menstrual cycles; long-term study.

**ALZET Comments:** Hydromorphone; Saline; Water; SC; mice (pregnant); 2001; 4 days; no stress or complications (see pg. 170-71); describes mp as ‘valuable tool...’ and discusses advantages of this type of delivery system (see pgs. 165, 176); toxicology.

7. Levorphanol [Back to top]

**ALZET Comments:** Levorphanol tartrate; Naltrexone HCl; U-50,488H; ICI-154,129; Saline; IP; mice; 2001; 7 days; functionality of mp verified by measuring residual pump volume; tolerance.

8. Meperidine [Back to top]

**ALZET Comments:** Naloxone HCl; Morphine sulfate; Meperidine HCl; Fentanyl citrate; Saline; SC; Rat; 2ML1; 7 days; controls received sham pumps; tolerance.

**ALZET Comments:** Morphine; Meperidine; Fentanyl; Saline; SC; Rat; 2ML1; 1 week; tolerance.

**ALZET Comments:** Ethylketocyclazocine; Heroin; Meperidine; Oxymorphone; Pentazocine; Propoxyphene; Bremazone; Buprenorphine; Butorphanol; Methadone; Morphine; Nalbuphine; U-50,488H; SC; mice; 3 days; comparison of sc morphine pellets vs. mp infusion; comparison of agents effects; controls received unspecified placebo infusion.

9. Methadone [Back to top]

**Agents:** Methadone **Vehicle:** Saline; **Route:** SC; **Species:** Rat; **Pump:** Not stated; **Duration:** 28 days;
**ALZET Comments:** Dose (8 mg/kg, 12 mg/kg or 16 mg/kg); Controls received mp w/ vehicle; animal info (male and female Sprague Dawley rat pups); dependence;
Agents: Methadone or Buprenorphine Vehicle: Saline; Route: CSF/CNS; Species: Rat; Pump: 2ML4; Duration: 28 days;
ALZET Comments: Dose (Buprenorphine- 1 mg/kg/day or ); Controls received mp w/ vehicle; animal info (Female); post op. care (Metacam); dependence;

Agents: methadone Vehicle: Saline; Route: SC; Species: Rat; Pump: 2ML2; Duration: 13 days;
ALZET Comments: Dose (0, 10, 30 mg/kg/day); Controls received mp w/ vehicle; animal info (Male, Sprague-Dawley, 175-200g); post op. care (meloxicam, 2 mg/kg, SC); behavioral testing (Orofacial reaction, activity chamber); dependence; minipumps were removed [after 13 day infusion] and intake was monitored for an additional six days.;

Agents: Morphine; buprenorphine; methadone Vehicle: Saline; Route: SC; Species: Mice; Pump: Not Stated; Duration: 6 days;
ALZET Comments: Dose (45 mg/kg/d; 5 mg/kg/day; 60 mg/kg/day); Controls received mp w/ vehicle; animal info (Male CD-1 mice, approximately 30g); comparison of morphine alkaloid pellet vs mp;

Agents: methodone; escitalopram; venlafaxine; desipramine; clomipramine Vehicle: Not Stated; Route: SC; Species: Mice; Pump: 2002; Duration: 14 days;
ALZET Comments: Dose: methadone (0.5 mg/kg) venlafaxine (2.5 mg/kg); escitalopram (20mg/kg); desipramine (1mg/kg); clomipramine (0.5 mg/kg); animal info (Male ICR mice, 25-35g); dependence

10. Morphine Back to top

Agents: Morphine Hydrochloride Vehicle: Saline; Route: SC; Species: Mice; Pump: 2001; Duration: 7 days;
ALZET Comments: Dose (63.2mg/kg/day); 0.9% Saline used; Controls received mp w/ vehicle; animal info (C57BL/6J, Oprm1 KO, ); dependence;

Agents: Morphine Vehicle: Not stated; Route: Not stated; Species: Mice; Pump: Not stated; Duration: 28 days;
ALZET Comments: Dose (1 mg/kg/day); dependence;

Q8413: I. J. Chen, et al. The Circadian Hormone Melatonin Inhibits Morphine-Induced Tolerance and Inflammation via the Activation of Antioxidative Enzymes. Antioxidants (Basel) 2020;9(9):;
Agents: Morphine Vehicle: DMSO; Saline; Route: CSF/CNS (intrathecal); Species: Rat; Pump: Not stated; Duration: 10 days;
ALZET Comments: 0.9% Saline used; Controls received mp w/ vehicle; animal info (adult male wistar rats, 300-350 g); behavioral testing (Nociceptive Test); dependence;

Agents: PD168,077; morphine Vehicle: DMSO; Route: SC; Species: Rat; Pump: 2ML1; Duration: 6 days;
ALZET Comments: Dose (20 mg/kg/day- morphine, 1 mg/kg/day - PD168,077); 2% DMSO used; animal info (Male, Sprague Dawley, 250-300g ); PD168,077 aka D4R agonist; dependence;

**Agents:** Morphine; Trimethoxy cinnamic acid, 3, 4, 5- **Vehicle:** Saline; **Route:** CSF/CNS (lateral ventricle); **Species:** Rat; **Pump:** 2ML1; **Duration:** 7 days;

**ALZET Comments:** Dose (26 nmol/10μl/hr); Controls received mp w/ vehicle; animal info (male Sprague–Dawley rats, 220–240 g)); behavioral testing (Conditioned Place Preference Test); dependence;

11. Nalbuphine [Back to top](#)


**ALZET Comments:** Morphine chloride; nalbuphine HCl; Saline; CSF/CNS; Rat; 2001; 3 days; Controls received mp w/ vehicle; comparison of IP injections vs. mp; tolerance; dependence; animal info (male, Sprague Dawley, 220-240 g.).


**ALZET Comments:** Ethylketocyclazocine; Heroin; Meperidine; Oxymorphone; Pentazocine; Propoxyphene; Bremazocine; Buprenorphine; Buspironanol; Methadone; Morphine; Nalbuphine; U-50,488H; SC; mice; 3 days; comparison of sc morphine pellets vs. mp infusion; comparison of agents effects; controls received unspecified placebo infusion.

12. Normorphine [Back to top](#)


**ALZET Comments:** DsThr; Enkephalin agonist DADL; Fentanyl; FK-33824; MR-2034; MRZ; Normorphine; Water; SC; Guinea pig; 2001; 6 days; peptides.


**ALZET Comments:** Endorphin, a-neo-; DsThr; Dynorphin; Enkephalin analog DADLE; FK-33824; MR-2034; MRZ; Normorphine; Sufentanil; Water; SC; mice; 2001; 6 days; peptides; MRZ is 5,9-dimethyl,2’S-5,9-dimethyl-2’-hydroxy-2-(2-methoxy-propyl)-6,7-benzomorphan, a kappa opioid agonist.

13. Oxymorphone [Back to top](#)


**ALZET Comments:** Oxymorphone; Intramuscular (abdominal); Rat; Post op. care (buprenorphine); animal info (female, Wistar, 250-300g).


**ALZET Comments:** Oxymorphone HCl; IP; Rat; 32 hours; functionality of mp verified by pain relief indicators - posture, physical condition, behavior; comparison of iv infusions vs mp; compared bolus iv infusion, continuous iv infusion, osmotic pump.


**ALZET Comments:** Ethylketocyclazocine; Heroin; Meperidine; Oxymorphone; Pentazocine; Propoxyphene; Bremazocine; Buprenorphine; Buspironanol; Methadone; Morphine; Nalbuphine; U-50,488H; SC; mice; 3 days; comparison of sc morphine pellets vs. mp infusion; comparison of agents effects; controls received unspecified placebo infusion.
14. Pentazocine  

**ALZET Comments**: Haloperidol; JO-1784; Pentazocine; DTG; SC; Rat; 2-21 days; controls received mp w/saline; DTG is di(2-tolyl)guanidin.

**ALZET Comments**: Pentazocine, d-; Saline; SC; Rat; 2ML4; 4 weeks; no comment posted.

**ALZET Comments**: Ethylketocyclazocine; Heroin; Meperidine; Oxymorphone; Pentazocine; Propoxyphene; Bremazocine; Buprenorphine; Butorphanol; Methadone; Morphine; Nalbuphine; U-50,488H; SC; mice; 3 days; comparison of sc morphine pellets vs. mp infusion; comparison of agents effects; controls received unspecified placebo infusion.

15. Propoxyphene  

**ALZET Comments**: Ethylketocyclazocine; Heroin; Meperidine; Oxymorphone; Pentazocine; Propoxyphene; Bremazocine; Buprenorphine; Butorphanol; Methadone; Morphine; Nalbuphine; U-50,488H; SC; mice; 3 days; comparison of sc morphine pellets vs. mp infusion; comparison of agents effects; controls received unspecified placebo infusion.

16. Sufentanil  

**Agents**: sufentanil; nimodipine  
**Vehicle**: Saline;  
**Route**: SC;  
**Species**: Rat;  
**Pump**: 2001;  
**Duration**: 10.1046/j.1471-4159.2001.00268.x;  
**ALZET Comments**: Dose ((2 μg/h sufentanil), (1 μg/h nimodipine)); Controls received mp w/ vehicle; animal info (Male, albino Wistar, 250-300g); enzyme inhibitor ((mu-opioid agonist for sufentanil), (Ca2+ channel blocker for nimodipine)); dependence;  

**Agents**: Sufentanil citrate; Nimodipine;  
**Vehicle**: Saline; Ethanol; Propylene glycol; Water;  
**Route**: SC;  
**Species**: Rat;  
**Pump**: 2001;  
**Duration**: 7 days;  
**ALZET Comments**: Controls received mp w/ vehicle; tolerance; Group 1 received sufentanil, Group 2 received sufentanil & nimodipine, Group 3 received nimodipine, Group 4 received vehicle; Nimodipine is a Ca channel blocker; sufentanil was diluted in saline; nimodipine was diluted in 10% ethanol / 20% propylene glycol / 70% water;  

**Agents**: Sufentanil citrate; Nimodipine;  
**Vehicle**: Saline; Ethanol; Propylene glycol; Water;  
**Route**: SC;  
**Species**: Rat;  
**Pump**: 2001;  
**Duration**: 7 days;
**ALZET Comments:** Controls received mp w/ vehicle; tolerance; Group 1 received vehicle alone, Group 2 received chronic sufentanil, Group 3 received sufentanil & nimodipine, Group 4 received nimodipine alone; Nimodipine is a Ca$^{2+}$ antagonist opioid; sufentanil citrate was diluted in saline; nimodipine was diluted in 10% ethanol / 20% propylene glycol / 70% water

**P3361:** J. V. Garaulet, et al. Effect of chronic administration of dihydropyridine Ca2+ channel ligands on sufentanil-induced tolerance to u- and k- opioid agonists in the guinea pig ileum myenteric plexus. Regul. Pept 1996;63(1-8

**Agents:** Sufentanil; Nimodipine; Bay K 8644 **Vehicle:** Saline; **Route:** SC; **Species:** Guinea pig; **Pump:** 2001; **Duration:** 7 days; **ALZET Comments:** controls received mp w/ saline; tolerance

**R0117:** C. W. Stevens. Perspectives on opioid tolerance from basic research: behavioural studies after spinal administration in rodents. Cancer Surveys 1994;21(25-47

**Agents:** Morphine; DADLE; ST-91; Sufentanil; DAMGO **Vehicle:** Not Stated; **Route:** CSF/CNS (intrathecal); **Species:** Rat; **Pump:** Not Stated; **Duration:** 7 days; **ALZET Comments:** controls received mp w/ saline; cancer; peptides; tolerance; comprehensive review of mp infusion methods using y-catheter

Non-Narcotic

17. Acetylsalicylic Acid **Back to top**


**ALZET Comments:** CI-988; chlordiazepoxide; Acetylsalicylic acid; DMSO; saline; SC; CSF/CNS (intrathecal); Rat; 2ML1; 2001; 2002; 14 days; Controls received mp w/ vehicle; animal info (Male, Sprague-Dawley, 300-325 g, 8 wks old; ALZET intrathecal catheter used (0007740); behavioral testing (elevated plus-maze).


**ALZET Comments:** Acetylsalicylic acid, lysine; Saline; SC; Mice; 2002; 4 weeks; Controls received mp w/ placebo; functionality of mp verified by serum salicylate concentrations; pumps replaced after 2 weeks; cardiovascular; ischemia (cardiac); animal info (female, C57BL/6, 8-12 weeks old, 20-25 grams); MI induced by coronary artery ligation.

**P4829:** M. Yuan, N. Konstantopoulos, J. Lee, L. Hansen, Z.-W. Li, M. Karin and S. E. Shoelson. Reversal of obesity- and diet-induced insulin resistance with salicylates or targeted disruption of Ikkb. Science 2001;293(1673-1677

**ALZET Comments:** Acetylsalicylic acid; salicylate, sodium; SC; Rat; mice; 2002; 2ML2; 3-4 weeks; Controls received mp w/ vehicle; 2ML2 used in rats, 2002 used in mice; acetylsalicylic acid also called aspirin: dose was 120 mg/kg/day; diabetes (type II).


**ALZET Comments:** Acetylsalicylic acid; DMSO; Saline; IV (superficial cervical vein); dog; 2ML1; 3 days; pumps primed for 4 hrs. before implant; used prefilled catheter in vein; greater solubility of ASA in DMSO allowed greater concentration in smaller total volume.

18. Aminopyrine **Back to top**


**ALZET Comments:** Aminopyrine; Formate, sodium; radio-isotopes; $^{14}$C tracer; water, acidified; NaOH; SC; Rat; 2001; no duration posted; stability of [N-dimethyl-$^{14}$C] aminopyrine verified by radiochromatographic analysis- no decomposition observed.
**ALZET Comments**: Aminopyrine; Radio-isotopes; 14C tracer; Saline; SC; mice; 2002; 7 days; animals infected with listeria monocytogenes.

19. **Antipyrine** [Back to top]

**ALZET Comments**: Antipyrine; bleomycin; dopamine HCl; melatonin; methotrexate, sodium; nicotine; prednisolone; radio-isotopes; valproic acid; 14C tracer; 3H tracer; IA; IP; SC; Mice, rabbit, Rat; no duration posted; ALZA-authored; synoptic review of mp; post op. care (antibiotic); comparison of sc injections vs. mp infusion; pulsed delivery.

**P0592**: S. L. Sendelbeck and J. Urquhart. Spatial distribution of dopamine, methotrexate and antipyrine during continuous intracerebral microperfusion. Brain Research 1985;328(251-258  
**ALZET Comments**: Antipyrine; Dopamine HCl; Methotrexate, sodium; Radio-isotopes; 14C tracer; 3H tracer; CSF, artificial; Sodium fluorescein; CSF/CNS (diencephalon); rabbit; 2001; 6 days; comparison of agents effects; mp primed in saline 16 hr. prior to implant; stability of labelled & unlabelled Dop. & MTX tested by paper chromat. after 7 days at 37C; brain tissue distribution.

20. **Indomethacin** [Back to top]

**Agents**: Indomethacin **Vehicle**: DMSO; **Route**: CSF/CNS (intracisternal); **Species**: Rat; **Pump**: Not stated; **Duration**: 14 days;  
**ALZET Comments**: Dose (100 ug/day); 50% DMSO used; Controls received mp w/ vehicle; animal info (adult (150– 175 g) rats); Brain coordinates (0.8 mm posterior to bregma, 1.5 mm lateral to the midline and 3.5 mm ventral to the surface of the skull); dependence;

**Agents**: NA-398; SC-560; indomethacin **Vehicle**: DMSO; **Route**: SC; **Species**: Mice; **Pump**: Not Stated; **Duration**: 30 days;  
**ALZET Comments**: Controls received mp w/ vehicle; animal info (female, BALB/c); immunology;

**Agents**: fenretinide; indomethacin **Vehicle**: Not Stated; **Route**: Not Stated; **Species**: Mice; **Pump**: Not Stated; **Duration**: 24 weeks;  
**ALZET Comments**: animal info (6 weeks, male, p53+/-); comparison of caloric restriction vs mp; long-term study; fenretinide is a synthetic retinoid. indomethacin is a nonsteroidal anti-inflammatory drug; cancer (bladder); citation for study listed as (Hursting, S.D. and Perkins, S.N., unpublished observations, 2001);

**P4819**: M. C. Babin, et al. Systemic administration of candidate antivesicants to protect against topically applied suitor mustard in the mouse ear vesicant model (MEVM ). Journal of Applied Toxicology 2000;20(S141-S144  
**Agents**: Hydrocortisone; indomethacin; olvanil **Vehicle**: PEG 200; **Route**: SC; **Species**: mice; **Pump**: Not Stated; **Duration**: 2 days;  
**ALZET Comments**: Controls received mp w/ vehicle; toxicology
**Agents:** Ilprost; Cicaprost; L-NAME; Indomethacin **Vehicle:** Saline; **Route:** SC; **Species:** Rat (pregnant); **Pump:** 2ML2; **Duration:** 2 weeks; **ALZET Comments:** controls received mp w/vehicle; comparison of SC injections vs. mp; cardiovascular; L-NAME is a synthase inhibitor;


**ALZET Comments:** Ketorolac; Saline, sterile; SC; Mice; 1007D; 2 days; Controls received mp w/ vehicle; animal info (male, C57BL/6J, 4-5 wks old).

**ALZET Comments:** Ketorolac tromethamine; Saline; CSF/CNS (intrathecal); Rat; 2001; 48 hours; controls received mp w/ vehicle; ketorolac is an NSAID sold as Toradol; cannula patency verified by saline injection.

**ALZET Comments:** Ketorolac; IV (jugular); rabbit; 2ML1; 7 days; controls received mp w/saline; functionality of mp verified by residual volume; comparison of i.m. injections vs. mp; ketorolac also called Toradol; NSAID.

22. Naproxen [Back to top]

**ALZET Comments:** JNJ7777120; naproxen; SC; Mice; 1004; Control animals received mp w/ vehicle; animal info (male, C57BL/6, ~2 mo old, 25-30 g); infusion rate listed as 0.11 ul/hr; JNJ7777120 also known as (1-[(5-chloro-1H-indol-2-yl)carbonyl]-4-methylpiperazine), is a selective H4R antagonist; one group received combination of JNJ7777120 and naproxen.

**ALZET Comments:** Naproxen; PBS; In vitro; 1002; Naproxen is an non- steroidal anti-inflammatory agent; This paper reports the characterization of an electrochemical biosensor for the continuous monitoring of Naproxen delivered by alzet pumps.

**ALZET Comments:** Naproxen; Methanol; In Vitro; 1002; 16 hours; Functionality of mp verified by naproxen levels measured with sensors;

**ALZET Comments:** Ibuprofen; naproxen; PBS; SC; Rat; mice; 2004; 2ML4; 4 weeks; Controls received mp w/ vehicle; animal info (female, Sprague Dawley, 11-12 wks old, 250-270 g., female, C57BL/6, 8-9 wks old, 20 g.); spinal cord injury; behavioral testing (BBB locomotor scale, Basso mouse scale).
23. Sodium Salicylate

**P4829:** M. Yuan, N. Konstantopoulos, J. Lee, L. Hansen, Z.-W. Li, M. Karin and S. E. Shoelson. Reversal of obesity- and diet-induced insulin resistance with salicylates or targeted disruption of Ikkb. Science 2001;293(1673-1677)

**ALZET Comments:** Acetylsalicylic acid; salicylate, sodium; SC; Rat; mice; 2002; 2ML2; 3-4 weeks; Controls received mp w/ vehicle; 2ML2 used in rats, 2002 used in mice; acetylsalicylic acid also called aspirin: dose was 120 mg/kg/day; diabetes (type II).


**ALZET Comments:** Scopolamine; Methylscopolamine nitrate; Salicylate, sodium; SC; Rat; 2002; 10 days; temperatures were taken with radiotelemetry.

**P1664:** K. Bergman, E. Cekan, P. Slanina, J. Gabrielson and K.-E. Hellenas. Effects of dietary sodium selenite supplementation on salicylate-induced embryo- and fetotoxicity in the rat. Toxicology 1990;61(135-146)

**ALZET Comments:** Salicylate, sodium; Water; IV; Rat; 2ML1; no duration posted; teratology.

24. Tramadol

**P4849:** Y. C. Tsai and S. J. Won. Effects of tramadol on T lymphocyte proliferation and natural killer cell activity in rats with sciatic constriction injury. Pain 2001;92(63-69)

**ALZET Comments:** Tramadol; Saline; SC; Rat; 2ML1; 7 days; Controls received mp w/ vehicle; comparison of sc injections vs. mp; immunology; multiple pumps per animal (2) used in high-dose groups; nociception; tramadol is a centrally acting analgesic.


**ALZET Comments:** Tramadol; Saline; SC; Rat; 2ML1; 7 days; controls received mp w/ vehicle; functionality of mp verified by paw withdrawal latency (analgesia index); dose-response (graph p. 337); comparison of sc injection vs. mp; analgesia.

25. F13640


**ALZET Comments:** F13640; Acetate buffer; water, sterile; SC; Rat; 2ML1; 2ML2; 2ML4; 2, 4, 8 weeks; 1, 2, 4, 7 days; Controls received mp w/ vehicle; dose-response (fig. 2); long-term study; pumps replaced; half-life (p. 139) 2.5 hrs. in rat plasma; multiple pumps per animal (2); post op. care (Na ampicillin); animal info (male, Sprague Dawley, 220-240 g., intraorbital nerve ligation).


**ALZET Comments:** F13640; morphine, HCl; Saline; SC; Rat; 2ML2; 6 weeks; Controls received mp w/ vehicle; long-term study; pumps replaced every two weeks; multiple pumps per animal (2); animal info (male, Sprague-Dawley, 220-240 g); during pump replacement a new incision was made about 1 cm away from the previous incision.


**ALZET Comments:** F13640; SC; Rat; 2ML4; 56 days; Controls received mp w/ saline; functionality of mp verified by plasma levels; long-term study; pumps replaced at day 28; 5-HT<sub>1A</sub> receptor agonist; spinal cord injury; pain.

**ALZET Comments:** F13640; SC; Rat; 2ML4; 56 days; Controls received mp w/ saline; functionality of mp verified by F13640 plasma levels; long-term study; pumps replaced (after 28 days).


**ALZET Comments:** F13640; Water, distilled; SC; Rat; 2ML2; 5 weeks; Controls received mp w/ saline; dose-response (Fig.2; p.275); pumps replaced every week, F13640 is a novel analgesic; serotonin receptor agonist; post op. care (the site of pump emplacement was massaged daily to avoid tissue adherence).


**ALZET Comments:** F13640; F13714; morphine; baclofen; Saline; SC; Rat; 2ML2; 14 days; Controls received mp w/ vehicle; Post Op. Care (aerosol bandage applied to protect against bacterial contamination); F13640 is a novel analgesic & 5-HT1A receptor agonist; behavioral study; F13640, F13714 & morphine were infused in one pump; baclofen infused in two pumps due to limited solubility.


**ALZET Comments:** F13640; morphine HCl; imipramine HCl; ketamine HCl; gabapentin; Water, double distilled; SC; Rat; 2ML2; 14 days; Controls received mp w/ saline; dose-response (fig. 3); comparison of IP & SC injections vs. mp; tolerance; dependence; “Continuous F 13640 infusion uniquely produced profound analgesia in this model of severe, chronic pain.” (p. 955).