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Bibliography – November 2015

Thermal Probe Development, key papers:

Dixon MJ, Taylor PM & Robertson SA (2002) A thermal threshold testing device for evaluation of analgesics in cats. *Research in Veterinary Science* 72: 205-210

Dixon MJ, Taylor PM, Slingsby LA, Waterman-Pearson AE (2006) Development of a remote controlled thermal threshold testing system for the cat. Proceedings of the 9th World Congress of Veterinary Anaesthesiology. Santos, Brazil. September 2006. 168

Dixon MJ, PM Taylor PM (2008) Validation of a hand-held dual thermal and mechanical nociceptive threshold testing device. *Proceedings of the Association of Veterinary Anaesthetists*, Barcelona, October 2008 85 (poster)

Luna SP, Lopes C, Rosa AC, Oliveira FA, Crosignani N, Taylor PM, Pantoja JC.(2014) Validation of mechanical, electrical and thermal nociceptive stimulation methods in horses. *Equine Veterinary Journal* 47:609-614 doi: 10.1111/evj.12332

Dixon MJ, Taylor PM, Slingsby LC Murrell JC (2015) Refinement of a thermal probe to prevent burns. *Laboratory Animals*. Online First Mar 12 doi:10.1177/0023677215577313

MouseMet & RatMet:

A.L. Miller, M.C. Leach, M.J. Dixon, M. Scotto di Perrotolo, N.J.V. Roughan, P.A. Flecknell, P.M. Taylor (2011) Evaluation of a new electronic von Frey system for pre and post surgical measurement of mechanical thresholds in mice. *Proceedings of the AVA* Liverpool, September. 33

Taylor PM, Dixon MD, Holmes F, Davletov B (2012) Comparison of mechanical threshold testing in mice using von Frey filaments and the MouseMet electronic system. *Proceedings of the NC3R conference*, London, October 2012

Thomas A, et al, (2013) Validation of the RatMet electronic von Frey for measurement of mechanical nociceptive thresholds in rats. *Proceedings of the AVA*, 2013

Thomas A, et al, (2013) Validation of a novel electronic von Frey system for use in rodents: MouseMet and RatMet. *Proceedings of LAVA*, Cambridge 2013

Dixon MJ, et al, (2014) Mechanical nociceptive threshold testing in mice: evaluation of the errors incurred using the up-down method to analyse von Frey filament data. *Proceedings of the AVA*, Nottingham 2014

Deuis JR, Zimmermann K, Romanovsky AA, Possani LD, Cabot PJ, Lewis RJ, Vetter I. (2013) An animal model of oxaliplatin-induced cold allodynia reveals a crucial role for Nav1.6 in peripheral pain pathways. *Pain* 154:1749-57 doi: 10.1016/j.pain.2013.05.032

Deuis JR, Lim YL, de Sousa R, Silmara L, Alewood RJ, Cabot PJ, Vetter I (2014) Analgesic effects of clinically used compounds in novel mouse models of polyneuropathy induced by oxaliplatin and cisplatin. *Neuro-Oncology* Epub 2014 April 8 doi:10.1093/neuro/nou048

Deuis JR, Whately E, Brust A, Inserra MC, Asvadi NH, Lewis RJ, Alewood PF, Cabot PJ, Vetter I (2015) Activation of κ Opioid Receptors in Cutaneous Nerve Endings by Conorphin-1, a Novel Subtype-Selective Conopeptide, Does Not Mediate Peripheral Analgesia. *ACS Chemical Neuroscience*. Epub Aug 12 doi:10.1021/acscemneuro.5b00113

Schuster CJ, DSJ Pang DSJ (2015) Assessment of a novel mechanical sensory threshold testing device. Proceedings of the 66th meeting of the American Association of Laboratory Animal Scientists. Phoenix, November 2015. 224. (RatMet)

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Main Bibliography: (** key stages of development; thermal, mechanical, thermal & mechanical.

Posters available: Superscript^{poster}; Publications including MouseMet: superscript^{MM} or RatMet superscript^{RM})

- Robertson SA, PM Taylor PM, BDX Lascelles, BDX, Dixon MJ (2003). Analgesia in the cat: effects of buprenorphine, butorphanol and morphine on thermal thresholds. *Veterinary Record* 153: 462-465
- Lascelles BD, Robertson SA (2004) Use of thermal threshold response to evaluate the antinociceptive effects of butorphanol in cats. *American Journal of Veterinary Research* 65: 1085-1089
- Lascelles BD, Robertson SA (2004) Antinociceptive effects of hydromorphone, butorphanol, or the combination in cats. *Journal of Veterinary Internal Medicine* 18: 190-195
- Wegner K, Robertson SA, Kollias-Baker C, Sams RA, Muir WW 3rd (2004) Pharmacokinetic and pharmacodynamic evaluation of intravenous hydromorphone in cats. *Journal of Veterinary Pharmacology and Therapeutics* 27: 329-336
- Spiecker-Hauser U (2004) Investigation of flupirtine in comparison with analgesic and sedative agents in a feline thermal pain model. *Dissertation for Dr.med vet. Tierärztliche Hochschule Hannover, Germany*
- Robertson SA, Taylor PM, Sear LW, Keuhnel G (2005) Relationship between plasma concentrations and analgesia after intravenous fentanyl and disposition after other routes of administration in cats. *Journal of Veterinary Pharmacology and Therapeutics* 28: 87-93
- Robertson SA, Taylor PM, Sear JW, Lascelles BDX (2005) PK-PD modeling of buprenorphine in cats: intravenous and oral transmucosal administration. *Journal of Veterinary Pharmacology and Therapeutics* 28: 453-460
- Robertson, S.A., Sanchez, L.C., Merritt, A.M. and Doherty, T.J. (2005) Effect of systemic lidocaine on visceral and somatic nociception in conscious horses. *Equine Veterinary Journal* 37: 122-127
- Steagall PVM, Carnicelli P, Taylor PM, Brondani JT, Luna SPL, Dixon MJ, Ferreira TH (2006) Effects of subcutaneous methadone, morphine, buprenorphine or saline on thermal and pressure thresholds in cats. *Journal of Veterinary Pharmacology and Therapeutics* 29: 531-537
- Pypendop BH, Ilkiw JE, Robertson SA (2006) Effects of intravenous administration of lidocaine on the thermal threshold in cats. *American Journal of Veterinary Research* 67:16-20
- **Dixon MJ, Taylor PM, Steagall PVM, Brondani JT, Luna SPL (2007) Development of a pressure nociceptive threshold testing device for evaluation of analgesics in cats. *Research in Veterinary Science* 82: 85-92
doi:10.1016/j.rvsc.2006.03.010
- Wegner K, Robertson SA (2007) Dose-related thermal antinociceptive effects of intravenous hydromorphone in cats. *Veterinary Anaesthesia and Analgesia* 34: 132-138
- Steagall PVM, Taylor PM, Brondani JT, Luna SPL, Dixon MJ, Ferreira TH (2007) The effects of buprenorphine, carprofen and saline on thermal and mechanical nociceptive thresholds in cats. *Veterinary Anaesthesia and Analgesia* 34: 344-350 doi:10.1111/j.1467-2995.2006.00331.x
- **Taylor PM, Steagall PVM, Dixon MJ, Ferreira TH, Luna SPL (2007) Carprofen and buprenorphine prevent hyperalgesia in a model of inflammatory pain in cats. *Research in Veterinary Science* 83: 369-375.
doi:10.1016/j.rvsc.2007.01.007
- Murrell, JC, Robertson SA, Taylor PM, McCown JL, Bloomfield M and Sear JW (2007) Use of a transdermal matrix patch of buprenorphine in cats: preliminary kinetic and dynamic data. *Veterinary Record* 160: 578-583
- Taylor PM, Robertson SA, Dixon MJ (2007) Evaluation of the use of thermal thresholds to investigate NSAID analgesia in a model of inflammatory pain in cats. *Journal of Feline Medicine and Surgery* 9: 313-318
doi: 10.1016/j.jfms.2007.03.008
- Johnson JA, Robertson SA, Pypendop BH (2007) Antinociceptive effects of butorphanol, buprenorphine, or both, administered intramuscularly in cats. *American Journal of Veterinary Research* 68:699-703
- Sanchez, L.C., Robertson, S.A., Maxwell, L.K., Zientek, K. and Cole, C. (2007) Effect of fentanyl on visceral and somatic nociception in conscious horses. *Journal of Veterinary Internal Medicine* 21: 1067-1075

Topcat Metrology Ltd

- Steagall PVM, Taylor PM, Brondani JT, Luna SPL, Dixon MJ (2008) Antinociceptive effects of tramadol and acepromazine in cats. *Journal of Feline Medicine and Surgery* 10: 24-31. doi:10.1016/j.jfms.2007.06.009
- Slingsby LS, Taylor PM (2008) Thermal antinociception after dexmedetomidine administration in cats: a dose-finding study. *Journal of Veterinary Pharmacology and Therapeutics* 31: 135-42 doi:10.1111/j.1365-2885.2007.00931.x
- Pypendop BH, Siao KT, Pascoe PJ, Ilkiw JE (2008) Effects of epidurally administered morphine or buprenorphine on the thermal threshold in cats. *American Journal of Veterinary Research* 69: 983-7
- poster Dixon MJ, Taylor PM, Murrell JC, Love EJ (2008) Development of a multispecies wireless mechanical threshold testing system. *Proceedings of the Association of Veterinary Anaesthetists, Barcelona, October 2008* 97
- Sanchez, L.C., Eلفenbein, J.R. and Robertson, S.A. (2008) Effect of acepromazine, butorphanol, or N-butylscopolammonium bromide on visceral and somatic nociception and duodenal motility in conscious horses. *American Journal of Veterinary Research* 69: 579-585
- Eلفenbein et al (2009) Effect of detomidine on visceral and somatic nociception and duodenal motility in conscious adult horses. *Veterinary Anaesthesia and Analgesia* 36: 162-172
- poster & full paper (2015) Dixon MJ & Taylor PM (2009) Refinement of a thermal threshold probe to prevent burns. *Proceedings of the WCVA, September 2009, Glasgow.* 138
- Pypendop BH, Siao KT, Ilkiw JE (2009) Effects of tramadol hydrochloride on the thermal threshold in cats. *American Journal of Veterinary Research* 70: 1465-70
- Brosnan RJ, Pypendop BH, Siao KT, Stanley SD (2009) Effects of remifentanil on measures of anesthetic immobility and analgesia in cats. *American Journal of Veterinary Research* 70: 1065-1071
- Slingsby LS, Taylor PM (2009) Thermal antinociception after dexmedetomidine administration in cats: a comparison between intramuscular and oral transmucosal administration. *Journal of Feline Medicine and Surgery* 11: 829-834 doi:10.1016/j.jfms.2009.03.009
- Steagall PVM, Mantovani FB, Taylor PM, Dixon MJ, Luna SPL (2009) Dose related antinociceptive effects of intravenous buprenorphine in cats. *The Veterinary Journal* 182: 203-209 doi:10.1016/j.tvjl.2008.06.017
- Slingsby LA, Taylor PM, Murrell JM (2010) Combination of dexmedetomidine with buprenorphine enhances the antinociceptive effect to a thermal stimulus in the cat compared to either agent alone. *Veterinary Anaesthesia and Analgesia* 37: 162-170
- ** Dixon MJ, Taylor PM, Slingsby LS, Hoffmann MV, Kästner SBR, Murrell J (2010) Development of a small, silent, low friction, linear actuator for mechanical nociceptive testing in veterinary research. *Laboratory Animals* 44: 247-253 doi:10.1258/la.2010.009080
- Pypendop BH, Siao KT, Ilkiw JE (2010) Thermal antinociceptive effect of orally administered gabapentin in healthy cats. *American Journal of Veterinary Research* 71: 1027-32
- Clark C, Mendl M, Jamieson J, Arnone A, Waterman-Pearson A, Murrell JC (2011) Do psychological and physiological stressors alter the acute pain response to castration and tail docking in lambs? *Veterinary Anaesthesia & Analgesia* 38: 134-145 doi:10.1111/j.1467-2995.2011.00594.x
- K Wegner K, Soma LR, Ippolito M, C. E. Uboh CE (2010) Validation of a wireless thermal and mechanical nociceptive testing device in horses. *Proceedings of the 18th International Conference of Racing Analysts and Veterinarians.* June 2010, New Zealand
- Niyom S, Mama KR, Rezende ML (2011) Repeatability of thermal and mechanical nociceptive threshold testing devices in dogs. *Veterinary Anaesthesia & Analgesia* 40:1-12 (on line abstracts) 38, 1-35 doi:10.1111/j.1467-2995.2011.0647a.x
- Pypendop B, Brosnan R, Ilkiw J (2011) Use of naltrexone to antagonize high doses of remifentanil in cats: a dose-finding study. *Proceedings of the ACVA* September
- Eichenberg A, Tuensmeyer J, Kaestner S (2011) Thermal and mechanical nociception after tramadol with and without naloxone in dogs. *Proceedings of the ACVA*, September

Topcat Metrology Ltd

- E. Fierheller, K. Orsel, J. Paterson, R. Mortier, J. De Buck, N. Caulkett (2011) Evaluation of force algometry as an objective measure of post-operative pain associated with hot iron disbudding in calves given a local anaesthetic, with or without meloxicam. *Proceedings of the AVA Liverpool*, September. 24
- Love EJ, Taylor PM, Murrell J, Whay HR (2011) Effects of acepromazine, butorphanol and buprenorphine on thermal and mechanical nociceptive thresholds in horses. *Equine Veterinary Journal* 44, 221-225. doi: 10.1111/j.2042-3306.2011.00412.x.
- Mcgowan KT, Elfenbein JR, Robertson SA and Sanchez LC (2012) Effect of butorphanol on thermal nociceptive threshold in healthy pony foals. *Equine Veterinary Journal* (Epub ahead of print) doi: 10.1111/j.2042-3306.2012.00673.x
- Hoffmann MV, Beate S, Kastner SBR, Kietzmann M, Kramer S (2012) Contact heat thermal threshold testing in beagle dogs: baseline reproducibility and the effect of acepromazine, levomethadone and fentanyl. *BMC Veterinary Research* 8: 206
- Polson S, Taylor PM, Yates D (2012) Analgesia after feline ovariohysterectomy under midazolam-medetomidine-ketamine anaesthesia with buprenorphine or butorphanol, and carprofen or meloxicam: a prospective, randomised clinical trial. *Journal of Feline Medicine and Surgery* 14, 553-559. doi: 10.1177/1098612X12444743 jfms.com
- Slingsby LS, Murrell JC, Taylor PM (2012) Buprenorphine in combination with naloxone at a ratio of 15:1 does not enhance antinociception from buprenorphine in healthy cats. *The Veterinary Journal* 192, 523-524
- Bortolami E, C Murrell JC, S Slingsby LS (2012) Methadone in combination with acepromazine as premedication prior to neutering in the cat *Veterinary Anaesthesia and Analgesia* doi:10.1111/j.1467-2995.2012.00736.x
- Steagall PVM, Pelligand L, Giordano T, Auberge C, Sear JW, Luna SPL, Taylor PM (2012) Pharmacokinetic and pharmacodynamic modelling of intravenous, intramuscular and subcutaneous buprenorphine in conscious cats *Veterinary Anaesthesia and Analgesia* doi:10.1111/j.1467-2995.2012.00779.x
- Siao KT, Pypendop BH Escobar A, Stanley D, Ilkiw JE (2012) Effect of amantadine on oxymorphone-induced thermal antinociception in cats. *J vet. Pharmacol Therap* 35: 169–174. doi: 10.1111/j.1365-2885.2011.01305.x.
- Grint NJ, Beths T, Yvorchuk K, Taylor P, Dixon M, Whay HR & Murrell JC (2012) Preliminary evaluation of a colorectal distension model for visceral nociceptive threshold testing in the donkey. *Veterinary Anaesthesia & Analgesia* 40:1-12 (on line abstracts) doi:10.1111/j.1467-2995.2012.12001a.x
- Nalon E, Maes D, Devleeschauwer B, Millet S, Van Riet M, Janssens G, Tuytens F (2012) Assessment of mechanical nociception thresholds in lame versus non-lame sows with two methods ESPHM Congress, Bruges, April.
- ^{poster} Guillot M, Rialland P, Taylor P, Dyson MJ, Lecorre-Laliberté D, Troncy E (2012) Protocol development of temporal summation in cats to highlight the central component of the osteoarthritis-associated chronic pain. *Proceedings of the non human SIG (IASP)*, Milan, August.
- ^{poster} Taylor PM, Dixon MJ (2012) A review of mechanical nociceptive threshold data in eight mammalian species. *Proceedings of the WCVA*, Capetown, September 2012
- ^{poster} Dixon MJ, Taylor PM (2012) The relationship between probe tip diameter and mechanical nociceptive threshold. *Proceedings of the WCVA*, Capetown, September 2012
- Herbert GL, S. A. Robertson SA, Murrell JC (2012) Changes in the facial expression of cats during nociceptive threshold testing. *Proceedings of the WCVA*, Capetown, September 2012
- Poller C, Hopster K, Rohn K, Kastner SBR (2013) Evaluation of contact heat thermal threshold testing for standardized assessment of cutaneous nociception in horses - comparison of different locations and environmental conditions. *BMC Veterinary Research* 9:4. doi: 10.1186/1746-6148-9-4
- Poller C, Hopster K, Rohn K, Kastner SBR (2013) Nociceptive thermal threshold testing in horses - effect of neuroleptic sedation and neuroleptanalgesia at different stimulation sites. *BMC Veterinary Research* 9:135 doi: 10.1186/1746-6148-9-135

Topcat Metrology Ltd

- Nalon E, Maes D, Piepers S, van Riet MM, Janssens GP, Millet S, Tuytens FA (2013) Mechanical nociception thresholds in lame sows: evidence of hyperalgesia as measured by two different methods. *The Veterinary Journal* 198: 386-390. Doi: 10.1016/j.tvjl.2013.08.016
- Ambros B, Duke T (2013) Effect of low dose rate ketamine infusions on thermal and mechanical thresholds in conscious cats. *Veterinary Anaesthesia & Analgesia* 40: 76-82 doi:10.1111/vaa.12057
- Hunt JR, Grint NJ, Taylor PM, Murrell JC (2013) Sedative and analgesic effects of buprenorphine, combined with either acepromazine or dexmedetomidine, for premedication prior to elective surgery in cats and dogs. *Veterinary Anaesthesia & Analgesia* 40: 297-307. doi: 10.1111/vaa.12003
- Hunt JR, Slingsby LS, Murrell JC (2014) The effects of an intravenous bolus of dexmedetomidine following extubation in a mixed population of dogs undergoing general anaesthesia and surgery *The Veterinary Journal* 200:133-139. doi: 10.1016/j.tvjl.2014.01.015
- Polson S, Taylor PM, Yates D (2014) Effects of age and reproductive status on postoperative pain after routine ovariohysterectomy in cats, *Journal of Feline Medicine and Surgery* 16:170-176. doi: 10.1177/1098612X13503651
- Porters N, Bosmans T, Debille M, de Rooster H, Duchateau L, Polis I (2014) Sedative and antinociceptive effects of dexmedetomidine and buprenorphine after oral transmucosal or intramuscular administration in cats. *Veterinary Anaesthesia & Analgesia* 41: 90-96 doi: 10.1111/vaa.12076
- Musk GC, Murdoch FR, Tuke J, Kemp MW, Dixon MJ, Taylor PM (2014) Thermal and Mechanical nociceptive threshold testing in pregnant sheep, *Veterinary Anaesthesia & Analgesia*. 41: 305-311. doi: 10.1111/vaa.12103
- Grint NJ, Beths T, Yvorchuk K, Taylor PM, Dixon M, Whay HR, Murrell JC (2014) The influence of various confounding factors on mechanical nociceptive thresholds in the donkey, *Veterinary Anaesthesia & Analgesia* 41: 421-429 doi: 10.1111/vaa.12132
- Guillot M, Taylor PM, Rialland P, Klinck MP, Moreau MM, Martel-Pelletier J, Pelletier JP, Troncy E (2014) Evoked temporal summation in cats to highlight central sensitization related to osteoarthritis-associated chronic pain; a preliminary study. *PLoS ONE* 9(5):e97347. doi: 10.1371/journal.pone.0097347
- poster Taylor PM et al, (2014) Dose range-finding studies of high dose formulations of buprenorphine in cats, *Proceedings of the Society of Veterinary Hospital Pharmacists Annual Meeting*, Madison, WI, June 9-11, 2014
- Hedges AR, Pypendop BH, Shilo-Benjamini Y, Stanley SD, Ilkiw JE (2014) Pharmacokinetics of buprenorphine following intravenous and buccal administration in cats, and effect on thermal threshold. *Journal of Veterinary Pharmacology and Therapeutics* 37: 252-259. doi: 10.1111/jvp.12084
- Porters et al, (2014) Prepubertal gonadectomy in cats: different injectable anaesthetic combinations and comparison with gonadectomy at traditional age. *Journal of Feline Medicine and Surgery* 17: 458-67. doi:10.1177/1098612X14546919
- Ambros B, Alcorn J, Duke-Novakovski T, Livingston A, Dowling PM (2014) Pharmacokinetics and pharmacodynamics of a constant rate infusion of fentanyl (5 µg/kg/h) in awake cats. *American Journal of Veterinary Research* 75:716-721. doi: 10.2460/ajvr.75.8.716
- Ambros B (2015) Effect of pretreatment with hydromorphone or buprenorphine on thermal antinociception induced by fentanyl in awake cats. *Journal of Feline Medicine and Surgery* Online First Jul 15 doi: 10.1177/1098612X15595835
- Lopes C et al (2015) Antinociceptive effects of methadone combined with detomidine or acepromazine in horses *Equine Veterinary Journal* Epub Early View Sept 21 doi: 10.1111/evj.12483
- Slingsby L et al (2015) Effect of intramuscular methadone on pharmacokinetic data and thermal and mechanical nociceptive thresholds in the cat. *Journal of Feline Medicine and Surgery*. Online First Sept 24 doi: 10.1177/1098612X15605164
- Grint NJ, Whay HR, Beths T, Yvorchuk K, Murrell JC (2015) Challenges of thermal nociceptive threshold testing in the donkey. *Veterinary Anaesthesia & Analgesia* 42: 205-214. doi: 10.1111/vaa.12182

Topcat Metrology Ltd

Taylor PM, Luangdilok CH, Sear JW (2015) Pharmacokinetic and pharmacodynamic evaluation of high doses of buprenorphine delivered via high-concentration formulations in cats. *Journal of Feline Medicine and Surgery*. Epub ahead of print 2015 May 5 doi:10.1177/1098612X15581206

Taylor PM, Crosignani N, Dixon MJ, Lopes C, Rosa AC, Luna SPL & Puoli Filho JNP (2015) Mechanical nociceptive thresholds using four probe configurations in horses. *Veterinary Anaesthesia & Analgesia*. Epub Early View May 21 doi: 10.1111/vaa.12274

Schutter AF, Tünsmeier J, Kastner SBR (2015), Influence of metamizole on 1) minimal alveolar concentration of sevoflurane in dogs and 2) on thermal and mechanical nociception in conscious dogs. *Veterinary Anaesthesia & Analgesia* Epub Early View Jul 31. doi: 10.1111/vaa.12289

Nalon E, Maes D, Piepers S, Taylor PM, van Riet MM, Janssens GP, Millet S, Tuyttens FA (2015) Factors affecting mechanical nociceptive thresholds in healthy sows. *Veterinary Anaesthesia & Analgesia* Epub Early View Oct 15 doi:10.1111/vaa.12313