**List of suggested reading material for the 2024 PhD course in Animal Pain**

*Below, the suggested literature is listed. We have tried – for overview - to block it according to type of reading and topic, but the categories are not mutually exclusive. The reading is not mandatory – participants are advised to go through the list and pick what is relevant for them*

**Textbooks and chapters**

**Adcock SJJ** and Tucker CB. 2018. Painful procedures: when and what should we be measuring? In: In: Tucker CB (Ed.): Advances in cattle welfare. Woodhead Publishing Series in Food Science, Elsevier, Kidlington, UK.

**Beausoleil NJ** et al. 2022. “Chapter 14 - Avian Nociception and Pain.” In *Sturkie’s Avian Physiology (Seventh Edition)*, edited by Colin G. Scanes and Sami Dridi, 223–31. San Diego: Academic Press.

**Braithwaite V.** 2010.Do fish feel pain? Oxford University Press, New York, p. 1-194.

**Cervero F.** 2012. Understanding pain, MIT Press, Massachusetts, p. 1-84.

**EFSA AHAW Panel.** 2017. Animal welfare aspects in respect of the slaughter or killing of pregnant livestock animals (cattle, pigs, sheep, goats, horses). EFSA Journal 15: e04782.

**Fitzgerald** **M.** 2012. The biological basis of pain in infants and children. In: Tracy I. (Editor): Refresher courses, 14th World Congress of the IASP, Milan, Italy, p. 391-399.

**Herskin MS** and Di Giminiani P**.** 2024. Pain in pigs – characterization and indicators. In: Camerlink I and Baxter EM (Eds.): Advances in pig welfare, 2nd Edition. Woodhead Publishing Series in Food Science, Elsevier, Kidlington, UK, p. 23-48.

**Mogil JS.** 2019. The measurement of pain in the laboratory rodent. In: Wood JN. (Ed): The Oxford handbook of the neurobiology of pain. Oxford University Press, NY, p. 29-60.

**Animal pain – as part of animal production**

**Casoni D,** Mirra A, Suter MR, Gutzwiller A, Spadavecchia C. 2019. Can disbudding of calves (one versus four weeks of age) induce chronic pain? Physiology and Behaviour 199: 47-55.

**Ede T** et al. 2019. Scientific assessment of affective states in dairy cattle. J. Dairy Science 102.

**Gentle M and Tilston.** 2000. Nociceptors in the legs of poultry: implications for potential pain at pre-slaughter shackling. Animal Welfare 9: 227-236.

**Jimenez RE** et al. 2019. Acute pain responses in dairy calves undergoing corneal nerve blocks with or without topical anesthetic. J. Dairy Sci. 102: 3431-3438.

**Johnson CB,** Gibson TJ, Stafford KJ, Mellor DJ. 2012. Pain perception at slaughter. Animal Welfare 21: 113-122.

**Nasr MAF** et al. 2015. The effects of two non-steroidal anti-inflammatory drugs on the mobility of laying hens with keel bone fractures. Vet. Anaesthesia and Analgesia 42: 197-204.

**Rentsch AK,** Rufener CB, Spadavecchia C, Stratmann A, Toscano MJ. 2019. Laying hen’s mobility is impaired by keel bone fractures and does not improve with paracetamol treatment. Applied Animal Behaviour Science 216: 19-25.

**Thøfner ICN**, Hougen HP, Villa C, Lynnerup N, Christensen JP. 2020. Pathological characterization of keel bone fractures in laying hens does not support external trauma as underlying cause. PLOS One 15(3): e0229735.

**Thøfner ICN**, Dahl J, Christensen JP. 2021. Keel bone fractures in Danish laying hens: prevalence and risk factors. PLOS One 16(8): e0256105.

**Wei H.** et al. 2022. Keel bone damage affects behavioural and physiological responses related to stress and fear in two strains of laying hens. Journal of Animal Science 100: 1-10.

**Comparative aspects of pain**

**Butler-Struben HM** et al. 2018. In vivo recording of neural and behavioural correlates of anesthesia induction, reversal, and euthanasia in cephalopod molluscs. Frontiers in Physiology 9: 109.

**Chambers** & Mogil JS. 2015. Ontogeny and phylogeny of facial expression of pain. Pain 156: 798-799.

**Elwood** **R**. 2012. Evidence for pain in decapod crustaceans. Animal Welfare 21,2: 23-27.

**Hart PJB.** 2023. Exploring the limits to our understanding of whether fish feel pain. Journal of Fish Biology 1-9.

**Jørgensen, K. B.**, Krogh-Jensen, K., Pickering, D. S., Kanui, T., & Abelson, K. 2016. Investigation of the presence and antinociceptive function of muscarinic acetylcholine receptors in the African naked mole rat (Heterocephalus glaber). Journal of Comparative Physiology A. Sensory, neural, and behavioral physiology, 202(1), 7-15.

**Kollmansperger S.** et al. 2023. Nociception in checken embryos, Part II. Embryonal development of electroencephalic neuronal activity in ovo as a prerequisite for nociception. Preprint from bioRxiv <https://doi.org/10.1101/2023.04.14.536947>.

**Lillywhite HB** et al. 2017. Anesthesia and Euthanasia of Amphibians and Reptiles Used in Scientific Research: Should Hypothermia and Freezing Be Prohibited? Bioscience 67: 53–61.

**Sneddon L.** 2018. Comparative physiology of nociception and pain. Physiology 33, doi:10.1152/physiol.00022.2017.

**Walters ET.** 2023. Persistent nociceptor hyperactivity as a painful evolutionary adaptation. Trends in Neurosciences 46,3 DOI: 10.1111/jfb.15386

**Williams CJA** et al. 2019. Analgesia for non-mammalian vertebrates. Current Opinion in Physiology 11: 75-84.

**Animal models and the study of pain relief**

**Abelson K.** et al. 2012. Voluntary ingestion of nut paste for administration of buprenorphine in rats and mice. Lab. Anim. 48,4: 349-351.

**Andrews N.** et al. 2012. Spontaneous burrowing behavior in the rat is reduced by peripheral nerve injury or inflammation associated pain. Eur. J. Pain 16: 485-495.

**Hestehave** **S.** et al. 2017. Antinociceptive effects of voluntarily ingested buprenorphine in the hot-plate test in laboratory rats. Laboratory Animals 51(3): 264–272.

**Lofgren J**, Miller AL, Lee CCS, Bradshaw C, Flecknell P, Roughan J. 2018. Analgesics promote welfare and sustain tumour growth in orthotopic 4T1 and B16 mouse cancer models. Laboratory Animals 52,4: 351-364.

**Malafoglia** et al. 2013. The zebrafish as a model for nociceptive studies. J. Cellular Physiology 228,10: 1956-67.

**Mirra A**, Casoni D, Barge P, Hight D, Levionnois O, Spadavecchia C. 2022. Usability of the SedLine ® electroencephalographic monitor of depth of anaesthesia in pigs: a pilot study. Journal of Clinical Monitoring and Computing 36: 1635-1646.

**Pairis-Garcia M.** et al. 2015. Behavioural evaluation of analgesic efficacy for pain mitigation in lame sows. Animal Welfare 24: 93-99.

**Roughan JV,** Sevenoaks T. 2019. Welfare and scientific considerations of tattooing and ear tagging for mouse identification. Journal of the American Association for laboratory Animal Science 58: 142-153.

**Siegenthaler J**, Pleyers T, Raillard M, Spadavecchia C, Levionnois OL. 2020. Effect of medetomidine, dexmedetomidine, and their reversal with atipamezole on the nociceptive withdrawal reflex in beagles. Animals 10,7: 1240.

**Measures of animal pain**

**Colpaert** et al. 2001. Opiate self-administration as a measure of chronic nociceptive pain in arthritic rats. Pain 91: 33-45.

**Coutant M**, Malmkvist J, Foldager L, Herskin MS. 2023. Relationship among indicators of pain and stress in response to piglet surgical castration: an exploratory analysis. Journal of Veterinary Behaviour 67: 20-32.

**Ede T**, Lecorps B, von Keyserlingk MAG, Weary DM. 2019. Calf aversion to hot-iron disbudding. Scientific Reports 9: 5344.

**Fogsgaard** **KK.** et al. 2015. Behavioral changes in freestall-housed dairy cows with naturally occurring clinical mastitis. J. Dairy Science 98: 1-9.

**Johnson CB** 2016. Research tools for the measurement of pain and nociception. Animals 6, 71; doi:10.3390/ani6110071.

**Kells NJ** et al. 2019. Post-natal development of EEG responses to noxious stimulation in pigs (Sus scrofa) aged 1-15 days. Animal Welfare 28: 317-329.

**Leach M.** et al. 2012. The assessment of post-vasectomy pain in mice using behaviour and the mouse grimace scale. PLOS ONE 7,4: e35656.

**Magee and Elwood R.** 2013. Shock avoidance by discrimination learning in the shore crab is consistent with a key criterion for pain. J. Exp. Biol. 216,3: 353-358.

**McLennan KM** et al. 2019. Conceptual and methodological issues relating to pain assessment in mammals: the development and utilization of pain facial expression scales. Applied Animal Behaviour Science 217: 1-15.

**Mogil JS** & Crager. 2004. What should we be measuring in behavioural studies of chronic pain in animals? Pain 112: 12-15.

**Neave H.** et al. 2013. Pain and Pessimism: Dairy Calves Exhibit Negative Judgement Bias following Hot-Iron Disbudding. PLOS ONE 8,12: e80556, (6p).

**Park RM** et al. 2020. A comparison of behavioural methodologies utilised to quantify deviations in piglet behaviour associated with castration. Animal Welfare 29: 285-292.

**Roughan JV** et al. 2014. The Conditioned Place Preference Test for Assessing Welfare Consequences and Potential Refinements in a Mouse Bladder Cancer Model. PLOS One 9,8: e103362.

**Weary DM** et al.2017. Behavioral Evidence of Felt Emotions: Approaches, Inferences, and Refinements. Advances in the study of behavior 49: 27-48.

**Pain assessment and effects of experience and expectation**

**Bingel U**, Wanigasekera V, Wiech K, Ni Mhuircheartaigh R, Lee MC, Ploner M, Tracey I. 2011. The effect of treatment expectation on drug efficacy: imaging the analgesic benefit of the opioid remifentanil. Sci Transl Med. 16;3(70):70ra14. doi: 10.1126/scitranslmed.3001244.

**Botvinik-Nezer R** et al. 2023. Placebo treatment affects brain systems related to affective and cognitive processes, but not nociceptive pain. bioRxiv [Preprint]. doi: 10.1101/2023.09.21.558825.

**Ede T** et al. 2023. Calves peak-end memory of pain. Scientific Report 13: 5679.

**Flecknell P. & Roughan J.** 2004. Assessing pain in animals – putting research into practice. Anim. Welfare 13: S71-75.

**Jepma M.** et al. 2018. Behavioural and neural evidence for self-reinforcing expectancy effects on pain. Nat Hum Behav. 2(11): 838-855. doi: 10.1038/s41562-018-0455-8.

**Kessner S**, Wiech K, Forkmann K, Ploner M, Bingel U. 2013. The effect of treatment history on therapeutic outcome: an experimental approach. JAMA Intern Med. 173(15):1468-9. doi: 10.1001/jamainternmed.2013.6705.

**Nogues E.** et al. 2023. Can a social partner alleviate conditioned place aversion caused by isolation and pain in dairy calves? Applied Animal Behaviour Science 269: 106092.

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**Wiech K** et al. 2022. Cortico-Brainstem Mechanisms of Biased Perceptual Decision-Making in the Context of Pain. J Pain. 23(4): 680-692. doi: 10.1016/j.jpain.2021.11.006.

**Wiech K**, Lin CS, Brodersen KH, Bingel U, Ploner M, Tracey I. 2010. Anterior insula integrates information about salience into perceptual decisions about pain. J Neurosci. 30(48):16324-31. doi: 10.1523/JNEUROSCI.2087-10.2010.

**Wiech K.** 2016. Deconstructing the sensation of pain: The influence of cognitive processes on pain perception. Science 354(6312): 584-587. doi: 10.1126/science.aaf8934.

**Pain, welfare and suffering**

**Armstrong EA.** et al. 2020. Keel bone fractures induce a depressive-like state in laying hens. Scientific Reports 10: 3007.

**Dawkins M.** 2008. The science of animal suffering. Ethology doi: 10.1111/j.1439-0310.2008.01557, (12p)

**Gentle M.** 2011. Pain issues in poultry. Appl. Anim. Behav. Sci. 135,3: 252-258.

**Keeling L** et al. 2019. Animal welfare and the United Nations sustainable development goals. Front. Vet. Sci. 6:336. doi: 10.3389/fvets.2019.00336.

**Nordquist RE** et al. 2017. Mutilating Procedures, Management Practices, and Housing Conditions That May Affect the Welfare of Farm Animals: Implications for Welfare Research. Animals 7, 12; doi:10.3390/ani7020012.

**Steiner AR** et al. 2019. Humanely Ending the Life of Animals: Research Priorities to Identify Alternatives to Carbon Dioxide. Animals *9*, 911; doi:10.3390/ani9110911.

**Tate T,** Pearlman R. 2019. What we mean when we talk about suffering – and why Eric Cassell should not have the last word. Perspectives in Biology and Medicine 62,1: 95-110.

**Weary DM.** 2014. What is suffering in animals? In: Appleby, Weary and Sandøe (Editors): Dilemmas in animal welfare, CABI Publishers, p. 188-202.

**Yao V.** 2019. Two Problems Posed by the Suffering of Animals. The Journal of Speculative Philosophy 33: 324-339.

**Animal models and the quality of animal pain studies**

**Aleman-Laporte J** et al. 2019. Quality of adherence to the ARRIVE guidelines in the material and methods section in studies where swine were used as surgical miomodels: a systematic review (2013-2018). Animals 9, 947; doi:10.3390/ani9110947.

**Macleod** et al. 2015. Risk of bias in reports of in vivo research: a focus for improvement. PLOS Biology DOI: 10.1371/journal.pbio.1002273, (12p).

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**Rice A.** et al. 2008. Animal models and the prediction of efficacy in clinical trials of analgesic drugs: a critical appraisal and call for uniform reporting standards. Pain 139: 243-247.

**Ritskes-Hoitinga M,** van Luijk J. 2019. How can systematic reviews teach us more about the implementation of the 3Rs and animal welfare? Animals 9(12), 1163; <https://doi.org/10.3390/ani9121163>.

**Tuyttens F.** et al. 2014. Observer bias in animal behaviour research: can we believe what we score, if we score what we believe? Animal Behaviour 90: 273-280.