Implementation of analgesic refinement in rats used as models for arthritis and inflammatory pain

Status report November 2021

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Background

Animal models for pain are problematic from a welfare perspective, since it is necessary to inflict painful stimuli or prolonged painful conditions on the animals

Three fundamental questions that are the basis of our research in this field:

1. Is there any avoidable element of pain in animal pain models (pain that is not related to the relevant test parameters)?

2. If so, can these elements of pain be avoided, and what analgesic regimen should be applied to give adequate pain relief while having no unwanted effect on the model?

3. Are there other means of improving technical aspects of the model that may enhance the welfare of the animals without adverse effect on the model?

The current project

**Project supported by 3R Center in 2017; performed July 2018 – December 2019**

The overall aim is to refine a rat model for inflammatory pain and arthritis, by attempting to eliminate any unnecessary pain and other welfare implications.

This goal will be achieved byfulfilling the following:

1. To refine and optimize the rat model for monoarthitis, by increasing the success rate with induction and minimizing adverse effects on surrounding tissues, irrelevant to the arthritis

2. To implement the most relevant analgesic regimen established in the optimized arthritis model

# 1: Improving the induction of the model – results at a glance

- Establishing the model by injection into the knee joint instead of the tibio-tarsal joint shows similar disease pattern
  - The knee joint is advantageous since risk of leakage into surrounding tissue is smaller
- The injection volume can be considerably reduced compared to standard volumes with similar disease pattern
  - Less adverse effects and less risk of leakage – refinement and improvement
- One manuscript reviewed and under revision
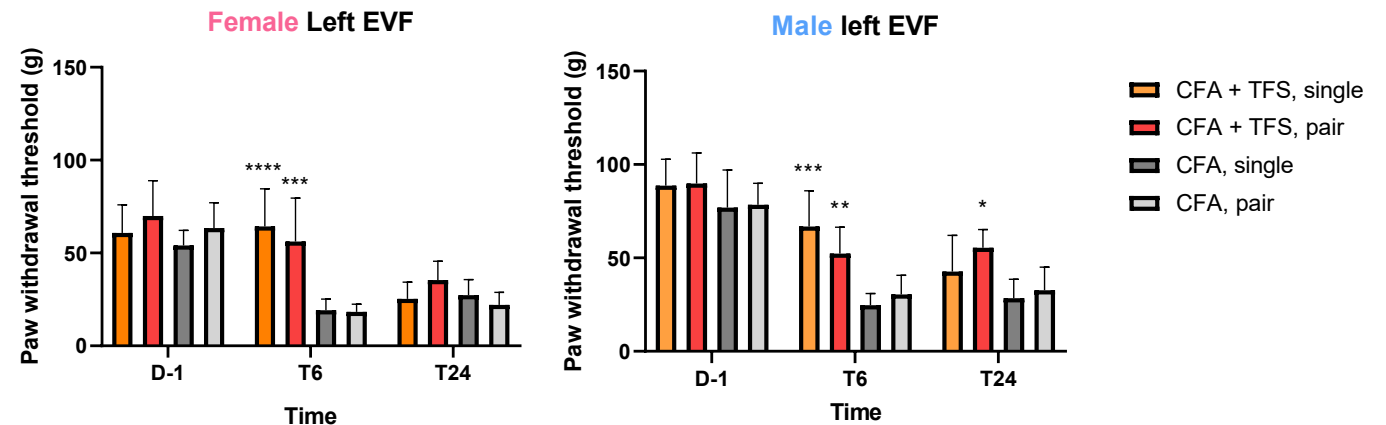- Spin-off manuscripts most likely to come
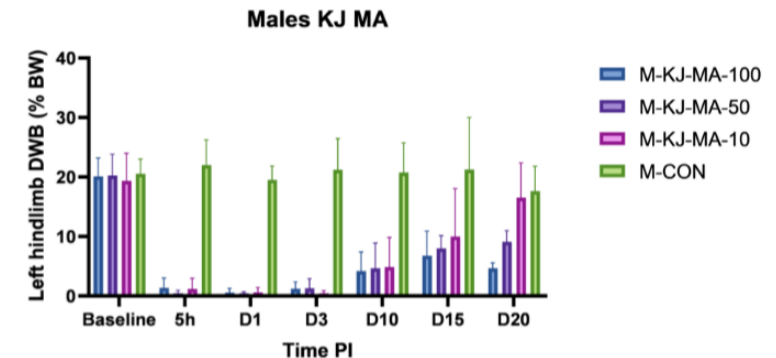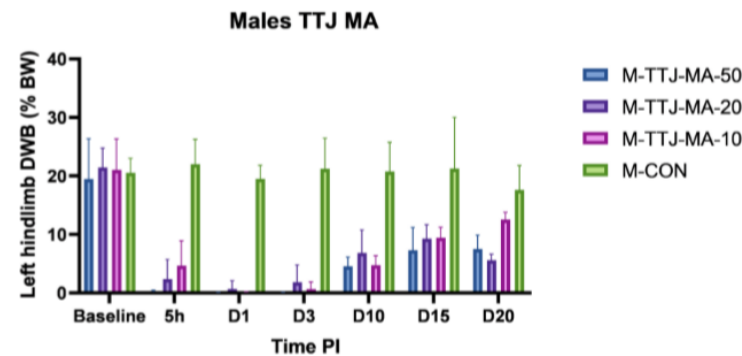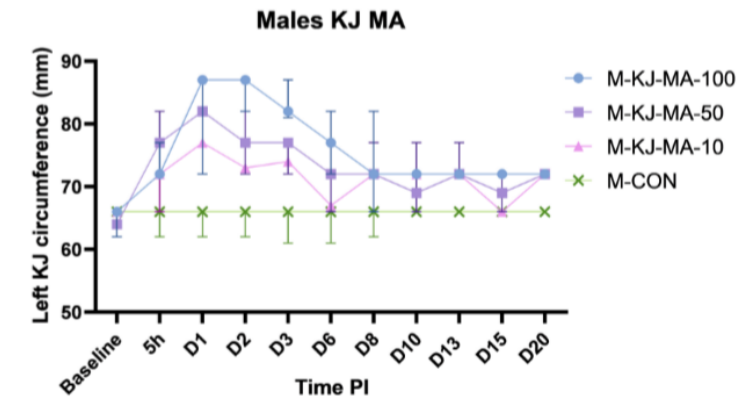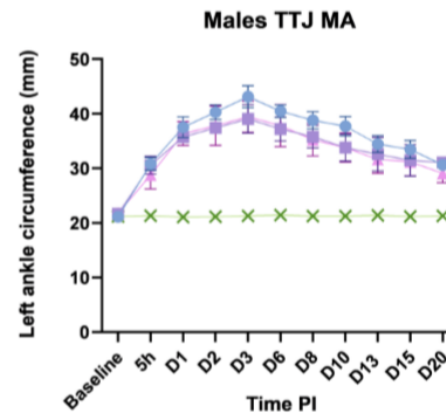
2: Implementing optimal analgesia – results at a glance

- Both buprenorphine (oral and parenteral) and transdermal fentanyl relieves pain in the early phase after induction

- None of the regimens seems to have any negative impact on the monoarthritic rat model

- Two manuscripts reviewed and revised
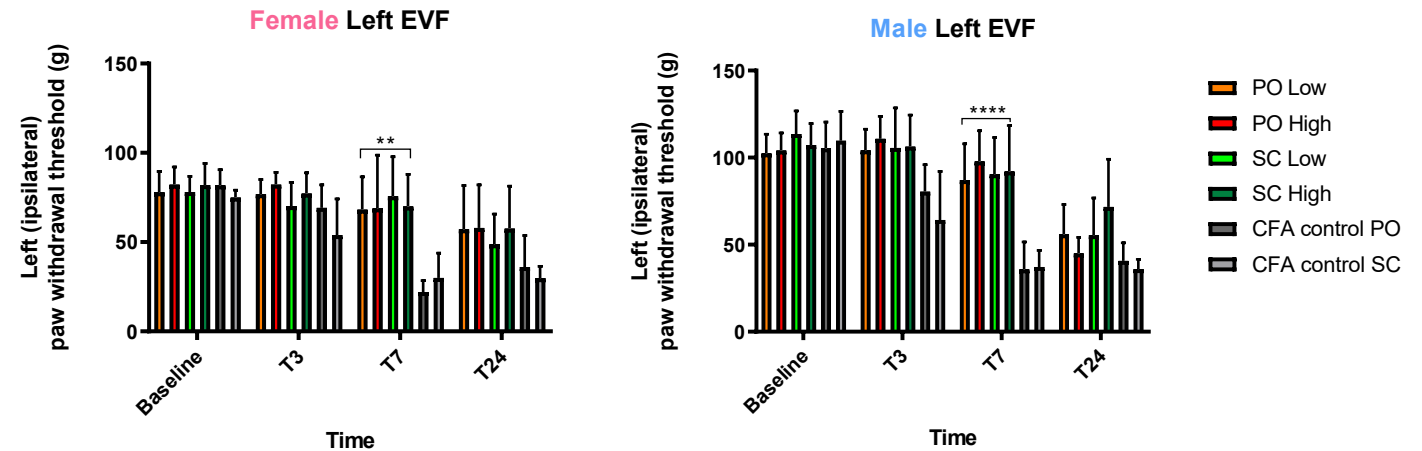
General conclusions

- It is **possible to refine** the monoarthritic model
  - By technical improvements with alternative injection sites and injection volumes
  - By analgesic treatment

- Practically no adverse effect on model parameters – as far as we know by now

- Difficult to measure improved welfare
  - **– more research is needed**

Many thanks to those involved

- Mie Berke
- Pernille Colding-Jørgensen
- Line Guldborg Pedersen
- Christian Peter Hansen
- Daniel Kylmann Hansen
- Helle Runchel Porsdal
- Trine Ahlman Glahder
- Otto Kalliokoski