(VAS; 0–10 cm). Participants performed standardised arm movements, from a seated position, while wearing 1 kg wrist weights. Six arm abduction movements (30° to frontal plane, 3 per side) were performed to an angle of 140°. Each movement consisted of two 3 s phases (up/down) and was separated by a 6 s break, before moving the opposite arm. Surface electromyography (EMG) was recoded from 8 bilateral muscles. Recordings were done before, immediately after, and 5 min after the experimental pain. Root-mean-square (RMS) of the EMG signals were extracted for each muscle and averaged for the 3 trials. Data was compared between sides and no differences were identified after which data was pooled for further analysis.

Results: During the painful condition for the slow upward movement, a reduced RMS-EMG activity was found for the ipsilateral upper trapezius ($P < 0.01$). In addition, increased RMS-EMG was found bilaterally for the erector spinae muscle ($P < 0.01$).

Conclusion: Bilateral experimental neck reorganise axioscapular and trunk muscle activity during resisted, slow upward movement. The results of this supports previous studies on neck pain patients suggesting neck pain is linked to axioscapular function and underpins the necessity to include the shoulder girdle in assessment and rehabilitation of neck pain patients.

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Mast cell proteases protect against histaminergic itch and attenuate tissue injury pain responses

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Aims: Mast cell proteases comprise up to 25% of the total protein content within mast cells and have various functions that are still poorly understood but can be either protective or pro-inflammatory. Three of those proteases in mice have been identified as the closest functional homologues to human mast cell proteases, and in this currently ongoing study we are investigating if they play a role in itch and tissue injury pain, and if they do, what the possible mechanism behind that could be.

Methods: Knock-out mice were generated, lacking either one or multiple proteases. To evaluate itch, the animals ($n = 8$–10) were injected intradermally with histaminergic (histamine, compound 48/80) and non-histaminergic (protease activated receptor 2 (PAR2) agonist, chloroquine) pruritic substances and their itch behavior over 1 h scored. Formalin injection ($n = 20$) in the hind paw was used as a model for tissue injury pain, where the mice were monitored for pain behavior for 1 h following the injection. Age and gender matched C57BL/6 mice were used as controls.

Results: Mice lacking three of the proteases had twice as many scratching episodes in response to histamine ($P = 0.016$) and compound 48/80 ($P = 0.034$) than controls. The non-histaminergic substances chloroqine and PAR2 are more potent pruritogens but difference was not seen in itch levels between genotypes. Furthermore, the protease-deficient mice exhibited a more pronounced pain response during the inflammatory stage (10–60 min after formalin injection, $P = 0.025$) of the tissue injury test.

Conclusions: The mouse mast cell proteases have a protective role against histaminergic itch and in acute inflammation following a tissue injury. The exact mechanism remains unclear at present as the proteases cleave a variety of different pro-inflammatory substrates and can act in complimentary fashion by cleaving the same substrates but at different sites.

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The impact of opioid treatment on regional gastrointestinal transit

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Aims: To employ a human experimental model of opioid-induced bowel dysfunction (OIBD) in healthy volunteers, and evaluate the impact of opioid treatment compared to placebo on gastrointestinal (GI) symptoms and motility, assessed by questionnaires and regional GI transit times.

Methods: Twenty-five healthy males were randomly assigned to oxycodone or placebo for five days in a double-blind, crossover design. Adverse GI effects were measured with bowel function index, gastrointestinal symptom rating scale, patient assessment of constipation symptoms questionnaire, and bristol stool form scale. Regional GI transit times were determined using the 3D-Transit system and segmental colonic transit times were determined using a custom Matlab® graphical user interface.

Results: GI symptom scores increased significantly across all applied questionnaires during opioid treatment. Oxycodone increased median total GI transit time from 22.2 to 43.9 h ($P < 0.01$), segmental transit times in the cecum and ascending colon from 5.7 to 9.9 h ($P < 0.05$), rectosigmoid transit time from 2.7 to 9.0 h ($P < 0.05$), and colorectal transit time from 18.6 to 38.6 h ($P < 0.01$). No association between questionnaire scores and segmental transit times were detected.

Conclusions: Self-assessed adverse GI effects and increased GI transit times in different segments were induced during oxycodone treatment. This detailed information about segmental changes in motility has great potential for future interventional head-to-head trials of different laxative regimes for prevention and treatment of OIBD.

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