B01 - Animal Models of Chronic Pain

(783) Spared nerve injury rats exhibit profound thermal hyperalgesia on a cortex dependent pain behavioral measure

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Pain perception in animals can be only determined by assessing behavioral cues. Well-established methods are available to measure reflexive pain behaviors; however, tools to assess supraspinal, especially cortex dependent, nocifensive behaviors are very limited. In this work two rat models of neuropathic pain: spared nerve injury (SNI) and chronic constriction injury (CCI), are contrasted to sham controls using a new behavioral test, termed AlgoTrack, and compare it to other well-established behavioral tests of pain. AlgoTrack is a fully automated thermal algesia assessment tool designed to emphasize supraspinal (learned cortex-dependent behavior) responses to painful stimuli. The device consists of two separate heating plates whose temperatures are computer-controlled. When the plate, where the animal is located, is heated to the desired nociceptive temperature, the animal avoids the noxious stimulus typically by escaping to the opposite non-heated side; the escape latency and temperature are automatically recorded. The new method was compared to hotplate and plantar tests. AlgoTrack uncovered increased heat sensitivity in both groups of neuropathic rats, and showed larger than 8 °C leftward shift in thermal stimulus-response profile, which peaked in 7-14 days, and was sustained for 24 days post nerve injury. In contrast hotplate and plantar tests showed no significant change in thermal sensitivity in SNI rats, and only a 2 °C change in CCI rats. Since AlgoTrack measures complex and learned pain behavior, and since it can automatically generate thermal stimulus-response curves in rodents, it is useful in assessing cortically mediated thermal pain in various animal models of pain. Funded by NIH NINDS 35115

B16 - Psychophysics/Hyperalgesia

(784) Clinical relevance of laboratory pain responses in healthy adults: Relationships to reported clinical pain and physical health

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Laboratory pain research, which typically involves administration of standardized noxious stimuli under highly controlled conditions, has been criticized as being irrelevant to the clinical experience of pain. Previous findings have been inconsistent, with some studies suggesting that experimental pain responses may bear small to moderate relationships with the reported presence or intensity of clinical pain in healthy individuals and chronic pain patients, while others report no such associations. However, few studies assessing such relationships administer a variety of laboratory pain stimuli; most are limited to a measure of pain threshold or tolerance using a single pain-induction modality. We administered measures of quality of life and recent pain complaints to a sample of 93 healthy adults participating in a laboratory study of age differences in pain responses. Laboratory pain variables that were assessed included: thermal pain threshold and tolerance, responses to a repeated cold pressor procedure, temporal summation of thermal pain, and a measure of diffuse noxious inhibitory controls (DNIC). Expected positive correlations (p's $< .01$) were observed between measures of pain threshold and tolerance, and these variables were inversely correlated with temporal summation of pain. Interestingly, DNIC was not related to any of the other laboratory pain measures (p's $> .10$). Regression models predicting clinical pain and health-related variables revealed that laboratory pain responses explained between 10% and 25% of the variance in these dependent measures. While most individual laboratory pain responses were inconsistently associated with clinical variables, DNIC was a relatively consistent predictor of clinical pain and physical health, with greater DNIC responses related to less pain in the past month, better physical functioning, and better self-rated health. These findings highlight the potential clinical relevance of experimental pain procedures and suggest that measures of DNIC may be the laboratory pain responses most closely associated with clinical pain and health-related variables.

B09 - Inflammation

(785) Incision-Induced Pain Behaviors In The Mouse

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Because genetic manipulation is commonly accomplished in mice, mouse models for pain have advanced our understanding of persistent pain mechanisms. In order to further understand postoperative pain, we have developed a mouse model for incisional pain similar to our rat model (Pain 64:493). Under halothane anesthesia, a 0.8 cm longitudinal incision was made at the hindpaw of male DBA/2 mice. Withdrawal frequency (WF) from 5 applications of 5 von Frey filaments (1.3, 3.4, 6.0, 14.1, 27.4 mN) were examined in an incision ($n = 8$) and sham ($n = 8$) group. Withdrawal latencies (WL) to two intensities of radiant heat were measured. A pain score based on guarding and weight bearing was also recorded in different groups of incised ($n = 8$) and sham ($n = 8$) operated mice. Tests were performed 1 day before incision then 2 hr, 1-3 days, 5 days and 7 days after incision (baseline, 2h, 1d, 2d, 3d, 5d, 7d). The base WF for the strongest filament, 27.4 mN, was $35.0 \pm 25.6\%$ before incision and increased to $100 \pm 0\%$ at 2h ($p < 0.05$ vs sham). And the WF decreased to $65 \pm 26\%$ at 7d. WL (high intensity heat) was 7.0 ± 1.4 sec before incision and decreased to 2.4 ± 0.7 sec at 2h ($p < 0.05$ vs sham) and was 5.9 ± 1.7 sec at 7d. WL (low intensity heat) was 22.0 ± 2.2 sec before incision and decreased to 8.6 ± 4.2 sec at 2h ($p < 0.05$ vs sham) and was 21.0 ± 5.4 sec at 7d. The pain score increased from 1 ± 2 to 11 ± 4 at 2h, 10 ± 3 at 1d and 7 ± 4 at 2d ($p < 0.05$ vs sham). In conclusion, plantar incision in the mouse produced persistent nonevoked pain behavior and increased responses to thermal and mechanical stimuli. Further studies using mouse models should improve our understanding of postoperative pain.

B10 - Joint, Muscle, & Visceral Pain

(786) Role of Spinal Cholinergic Receptors in TENS-Induced Antihyperalgesia

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Transcutaneous electrical nerve stimulation (TENS) is a form of non-pharmacological therapy used in painful conditions. Spinal and supraspinal involvement of serotonin and endogenous opioids are implicated in TENS-induced analgesia. Activation of cholinergic receptors in the spinal cord is antinociceptive and involves opioids. In the current study, the possible involvement of spinal cholinergic receptors in TENS analgesia was investigated in rats. Hyperalgesia was induced by inflaming one knee joint with 3% kaolin-carrageenan and assessed by measuring paw withdrawal latency to heat (PWL) before and 4h after injection. The non-selective nicotinic antagonist mecamylamine (50 μg), non-selective muscarinic antagonist atropine (30 μg) or one of the muscarinic receptor subtype antagonists: pirenzepine (M1, 10 μg), methoctramine (M2, 10 μg), 4-DAMP (M3, 10 μg), or vehicle was administered intrathecally just prior to TENS treatment. Low (4Hz) or high (100Hz) frequency TENS at sensory intensity was then applied to the inflamed knee for 20 min and PWL was determined again. Mecamylamine had no effect on the antihyperalgesia produced by either low or high frequency TENS. Atropine, pirenzepine (M1) and 4-DAMP (M3) significantly attenuated the antihyperalgesic effects of low and high frequency TENS compared to respective vehicle controls. Methoctramine (M2) had no significant effects on high or low frequency TENS antihyperalgesia. The results show that TENS-induced antihyperalgesia is mediated partially by activation of spinal muscarinic receptors but not by spinal nicotinic receptors. Further, the results also indicate that spinal M1 and M3 muscarinic receptor subtypes mediate TENS-induced antihyperalgesia. Supported by Arthritis Foundation and KO2AR02201.