

ARTHRITIS PAIN PROCESSED IN BRAIN'S 'FEAR ZONE', FIRST PET SCANS REVEAL

Researchers at The University of Manchester have discovered that arthritis pain, unlike that induced as part of an experiment, is processed in the parts of the brain concerned with emotions and fear.

A team led by Dr Bhavna Kulkarni has captured the first images of how the brain processes arthritis pain, using positron emission tomography (PET) scanners based at the Christie Hospital.

In a study funded by the Arthritis Research Campaign and published in 'Arthritis and Rheumatism' this month (January 2007), they compare the brain areas involved in processing arthritic and experimental pain in a group of patients with osteoarthritis.

Dr Kulkarni said: "We knew from our previous neuro-imaging studies that experimentally-induced pain is processed in at least two brain networks, collectively known as the 'pain matrix.' The 'medial pain system' processes the emotional aspects such as pain's unpleasantness, while the 'lateral pain system' processes the pain's intensity, location and duration.

"We wanted to see whether the same applied to the clinical pain suffered by people with conditions like arthritis, as no direct comparisons of experimental and clinical pain had been undertaken in the same group of patients."

Six female and six male patients with osteoarthritis of the knee underwent PET brain-scanning during three different pain states: arthritic knee pain, experimental knee pain (when no arthritic pain was present) and a pain-free state. Each patient also rated their perceived pain intensity and unpleasantness on 0 – 100 rating scales at 10 minute intervals.

"We thought that arthritic and acute experimental pain would be processed within the same areas of the pain matrix," Dr Kulkarni continued. "But, although both activated both the medial and lateral pain systems, arthritic pain prompted increased activity in the cingulate cortex, thalamus and amygdale within the medial system - the areas concerned with processing fear, emotions and aversive conditioning.

"This suggests that arthritic pain has more emotional salience than experimental pain for these patients, which is consistent with the unpleasantness scores they themselves gave. The increased activity in the areas associated with aversive conditioning, reward and fear, which are less commonly activated during experimental pain, suggests they might be processing fear of further injury and disability associated with the arthritic pain."

Project supervisor Professor Anthony Jones said: "The finding that both experimental and arthritic pain activate the medial and lateral pain systems suggests that there isn't a unique brain network for processing arthritic pain, and we are therefore justified in using experimental pain to investigate the generalised mechanisms of pain perception. However, it seems that studying experimental pain alone does not provide the complete picture, and that PET scanning patients experiencing different types of clinical pain can reveal subtle changes in brain activity.

“Importantly, the study has demonstrated the importance of the medial pain system during the experience of arthritic pain, suggesting it would be a good target for both new analgesics and non-pharmacological interventions. The body’s own pain-killing chemicals - the endogenous opioid system – could even be a possible candidate for modulation to target pain in the areas we have identified.”

The University of Manchester (www.manchester.ac.uk) is the largest single-site higher education institution in the country, with 24 academic schools, over 5200 academic and research staff and around 36 000 students. It was awarded University of the Year by the Times Higher Educational Supplement in 2005 and The Sunday Times in 2006, and receives more undergraduate applications than any other UK university.

Its **Faculty of Medical & Human Sciences** (www.mhs.manchester.ac.uk) is one of the largest faculties of clinical and health sciences in Europe, with a research income of around £51 million (almost a third of the University’s total research income). The **School of Medicine** (www.medicine.manchester.ac.uk) is the largest of its five Schools, encompasses five teaching hospitals and is closely linked to general hospitals and community practices across the North West of England.

The **Arthritis Research Campaign (arc)**, founded in 1936, raises funds to promote medical research into the cause, treatment and cure of arthritic conditions: to educate medical students, doctors and allied healthcare professionals about arthritis and to provide information to people affected by arthritis and to the general public. arc is the only major medical research charity in the UK investigating arthritis in all its forms. Millions of pounds are provided every year for grants funding research, education and training.