Glasgow Pain and Welfare Research Group  (3-Dec-2002)

J. Reid and A. Nolan

Glasgow University Veterinary School, Glasgow, Scotland, UK

The Pain and Welfare group is a multidisciplinary group of scientists, which covers a variety of disciplines including Veterinary Pharmacology, Veterinary Anaesthesia, Small and Large Animal Clinical Studies and Statistics. Leaders of the group are Professor Andrea Nolan, Professor Jacky Reid, Professor Marian Scott (Statistics) and Professor Julie Fitzpatrick (Farm Animal Medicine and Production). The group currently has collaborative links with workers in related disciplines including drug delivery (Prof. Stevens, Strathclyde University), spinal plasticity (Prof. Morris, University of Glasgow) and animal behaviour (Prof. Nicol, University of Bristol).

The aims of the group can be summarized as follows:

- To foster interdisciplinary research in pain recognition, assessment and management
- To develop reliable methods of assessing pain in domestic animals
- To highlight the occurrence of pain in domestic species
- To educate those concerned in the care of animals in the recognition and management of pain
- To develop best practice in acute and chronic pain management by developing evidence based medicine
- To train veterinarians and veterinary nurse specialists in pain management
- To train a cadre of young scientists equipped to promote and further basic and clinical pain research

Active Projects Include:

1. Development of pain scales in companion animals

The development of effective analgesic strategies is fundamental to the management of both acute and chronic pain, but without a valid, reliable means of assessing pain and the effect of therapeutic agents, this is impossible. Traditionally unidimensional pain scales such as the Simple Descriptive Scale, Numerical Rating Scale and the Visual Analogue Scale have been used to assess pain in domestic species, but these have been shown to be unreliable in the measurement of acute pain in dogs in a hospital setting (Holton et al., 1998). Additionally, these rate only the intensity of the pain, and do not attempt to evaluate the sensory and affective components, which are unique to each individual, and which contribute to the multidimensional nature of the pain experience. Multidimensional pain assessment tools such as the McGill Pain Questionnaire have been developed to address these limitations in man, but since animals cannot report their feelings, alternative methods have been developed which translate observed behavioural changes into a pain score. Several such composite scales have defined behaviours that are thought to be indicative of an animal in pain, but their development and use have not been validated. A pain scale, in common with other measurement tools, must manifest a number of properties, including content and criterion validity and must be reliable. We have constructed a validated, reliable composite pain scale for the measurement of acute pain in dogs in a hospital setting (CMPS), the methodology of which followed that of the McGill Pain Questionnaire (Holton et al., 2001). Work is ongoing to define an appropriate weighting system for the items included in the scale, which will convey interval level measurement properties and increased sensitivity to the scale.

Despite their increased longevity, and the widespread incidence of chronic pain in the dog, no tools have been developed for the assessment of chronic pain in this species. With chronic pain in humans, Health Related Quality of Life (HRQL) has become an increasingly important focus of measurement, and many of the scales now used are concerned primarily with the way in which the pain experience disrupts activities of daily living and alters quality of life. We believe that the same applies in domestic species and additionally, in chronic pain states, changes in behaviour may be so subtle that they are apparent only to someone very familiar with the individual animal, such as the owner. A preliminary study provided some evidence that
chronic pain in dogs was associated with a wide range of behavioural disturbances and that these changes could be observed and reported by owners (Wiseman et al., 2001). Subsequent work has resulted in the development of a HRQL tool, The Glasgow University Health-Related Dog Behaviour Questionnaire (GUHRDBQ) which can be used by owners of dogs suffering chronic painful conditions, and validation of this is ongoing in the Small Animal Hospital of Glasgow University Veterinary School.

We believe that both the Glasgow CMPS and the GUHRDBQ will be the first validated behavioural pain scales to have been developed for this species using sound scientific psychometric principles. This will represent a major breakthrough in the assessment of pain in non-verbal species and the group is now ready to extend its work to include the cat and the horse.

2. Development of a composite pain index for use on farm in dairy cows
We are currently working on the application of scaling methodology to the creation of a reliable on-farm pain measure in dairy cows, which comprises objective and subjective measures in a composite scale. Pain associated with inflammatory diseases such as mastitis and lameness is a major welfare problem for domestic ruminant species. This study is applying measurement theory to integrate quantitative and qualitative measures of disease severity, pain and behaviour with application in animal welfare. The focus of study is on the inflammatory diseases mastitis and those that induce lameness. The technological basis is the recent advances in the understanding of mechanical hyperalgesia and acute phase proteins and their relationship to mastitis and lameness in dairy cows. Behaviours that are easy to identify, relatively quick to assess are being measured to study the association between behaviours and disease severity. The combination of objective disease measurement, indirect measures of pain and direct measures of behaviour will be done using scaling methodologies.

3. Pathophysiology & pharmacology of inflammatory pain
Inflammation induces alterations in pain information processing in humans and animals, which have serious consequences. Allodynia (perception of innocuous stimuli as noxious) and hyperalgesia (exaggerated response to noxious stimuli) are common sequelae of inflammatory pain, which in general abate as healing occurs. Indeed the presence of hyperalgesia and/or allodynia is indicative of altered pain information processing and a hypersensitive state. Studies are ongoing to explore the spinal mechanisms of inflammatory pain and hyperalgesia using carrageenan inflammation and models of acute and chronic inflammation. Of particular interest is the role of spinal prostaglandin signaling pathways in the development of maintenance of hyperalgesia and the interactions of these pathways with excitatory amino acid receptors. Specifically the role of spinal cyclooxygenase isoenzymes (1 & 2) and prostaglandin E receptors (EP1 - 4) in neuronal plasticity, and their interaction with excitatory amino acid receptors, in particular the metabotropic glutamate receptors, are being explored (Dolan & Nolan, 2000).

Chronic pain is a major cause of disability in humans and we consider that it is likely to be a significant problem in many animal species. The triggers of chronic pain are not understood, and yet a greater understanding of the events that facilitate the development of chronic pain would ultimately aid prevention of chronic pain. The contribution of metabotropic glutamate receptors to the adaptive responses to acute and chronic pain and hyperalgesia are under study using in vitro (gene expression studies) and in vivo techniques (behavioural measures) and pharmacological approaches. It has been noted that changes in expression of the group 2, mGluR3 and the group 1, mGluR5 occur in a bi-directional manner, differentiated depending on the inflammatory process. We are studying these changes using experimental inflammation (carrageenan-induced) and models of acute and chronic inflammatory disease.

4. New advances in perioperative analgesia
The alpha2 adrenoceptor agonists have been used in veterinary medicine for many years as sedative drugs, but their potent analgesic properties have largely been ignored. However in human medicine there is now renewed interest in the perioperative use of these drugs, for their analgesic, anaesthetic sparing and sympatholytic effects. The Anaesthetic Group has reported the halothane-sparing effects of small boluses (1µg kg⁻¹) of medetomidine repeated at regular intervals throughout the surgical period in the dog, where the surgical severity ranged from moderate to severe. Cardiovascular and respiratory parameters were well maintained and surgical conditions were excellent. The group is now investigating a similar application for medetomidine in association with target-controlled infusions (TCI) of propofol in the dog. Work is ongoing to establish the optimum infusion rate of medetomidine which, when used concurrently with propofol TCI, will provide optimum surgical conditions with minimal cardiovascular depression, while maintaining spontaneous respiration.

Some Recent Relevant Publications
Holton LL, Scott EM, Nolan AM, Reid J, Welsh E & Flaherty D. Comparison of three methods of pain scoring used to assess

All rights reserved. This document is available on-line at www.ivis.org. Document No. P0502.1202.