Pain in Animals and Humans: An Introduction
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No issue in animal research is more sensitive than that of inducing distress in animals. Both the Animal Welfare Act and Health Research Extension Act (1985) require special justification and committee approval before research likely to produce distress in animals is performed. It is therefore imperative that investigators carefully review all aspects of their proposed investigations, with the intention of reducing or eliminating factors that may lead to distress.

A variety of factors contribute to distress in the research setting. These factors are commonly termed stressors and are known to elicit typical physiological and/or biochemical responses, for example, stimulation of the adrenocortical axis. While exposure to some stressful events is necessary for normal development, it is the abnormal response to these events, distress, that should be avoided. Whether or not an animal responds to a stressor by manifesting signs of distress depends on the duration and intensity of the stressor as well as the animal’s previous experience. One signal of distress, sometimes the only sign, is maladaptive behavior. As a result, special attention must be given to species typical behaviors and abnormalities in these behaviors when attempting to assess the presence or absence of distress.

One well recognized stressor is pain. While many scientific investigations can adequately avoid pain, a few types of experiments, especially those involved with testing analgesics, may induce pain. It is particularly important in these studies that the methods chosen appropriately simulate the condition under study in man, that the intensity and duration of the stimulus be the minimum necessary to generate scientifically valid results, and that special attention be given throughout the study to assess the presence of distress in the animal. Animals involved in studies that may lead to severe or chronic pain that is not expected to be relieved by analgesics should be euthanized during or at the conclusion of the procedure. With this in mind, we have invited a number of investigators to submit manuscripts dealing with pain and its assessment and alleviation in humans and nonhuman animals.

In the report entitled Behavioral Assessment of Pain: Non-verbal Measures in Animals and Humans, Keefe et al. introduce readers to methods used for the quantification of pain in humans and laboratory animals. The types of pain humans experience during different clinical conditions are discussed, as are the limitations of studying pain in humans in the clinical setting. The strengths and weaknesses of each laboratory method is considered whether it involves humans or laboratory animals. Special precautions associated with each method are detailed. Keefe et al. remind investigators designing procedures involving pain that “the decision to induce pain must be carefully weighed against the advances in knowledge that can be gained.”

Dr. Patricia Osgood addresses the issue of pain in a specific clinical condition. Prior to 1900, few people survived burns that encompassed 20 percent or more of the body, while today the mortality rate among burn victims is approximately five percent. This dramatic improvement resulted from a better understanding of the pathophysiology of burns and the assessment of pain and its control, as well as the development of therapeutic modalities that counteract the perturbations caused by burns. In her paper entitled The Assessment of Pain in the Burned Child and Associated Studies in the Laboratory Rat, Dr. Osgood discusses techniques used to assess pain in verbal children, as well as the special problems associated with pain assessment in nonverbal children. She briefly reviews the major achievements leading to our current understanding of the pathophysiology of burns and documents the valuable contributions made through animal research. The use of laboratory rats to characterize changes in the pharmacodynamic and pharmacokinetic attributes of analgesic agents and the applications of the information in the burned human is of particular interest.

Dr. Peter Davis addresses the question of pain perception and assessment in the newborn human in his article entitled Pain in the Neonate: The Effects of Anesthesia. Dr. Davis first discusses some concerns shared by many that establish a rationale for withholding anesthesia in newborn humans. This is followed by a discussion of neonatal perception of pain, with special attention given to cardiovascular and neuroendocrine responses to noicCEPTION. Throughout his paper, Dr. Davis illustrates how the proper use of anesthetics and analgesics modifies the neonates responses to stressful procedures. Speciﬁc precautions are associated with the use of potent anesthetics in newborn children. Differences in the cardiovascular responses to anesthetics have been documented in neonatal children and laboratory animals. Once iden-
tified, these differences can lead to the selection of anesthetic-analgesic regimes that are safe and effective in human infants.

Our special issue closes with A Question of Pain in Invertebrates by Dr. Jane Smith. Dr. Smith reviews the physiologic and behavioral responses seen in certain invertebrates submitted to noxious stimuli. She briefly discusses the organization of the nervous systems of several invertebrate families and presents evidence for both nociceptors and a system of endogenous and behavioral responses to repeated noxious stimuli. Despite these observations, it is still difficult to demonstrate conclusively that cephalopods actually perceive pain. This being the case, Dr. Smith concludes that invertebrates should be given "the benefit of the doubt where questions of pain and suffering are concerned." She provides some practical guidelines for investigators dealing with invertebrates.

During the past several years, a variety of meetings and publications have been devoted to the issue of assessment and alleviation of pain in experimental animals. In an upcoming issue of ILAR News we will present summaries of: the ILAR/NRC report entitled Recognition and Alleviation of Pain in Laboratory Animals, the UFAW document Alleviation of Pain in Laboratory Animals, the Cornell University International Symposium on Animal Pain and Its Control and the 1990 ACLAM forum dealing with Pain and Distress in Animals. Additional articles relevant to the issue of animal pain and distress will be published in subsequent issues of ILAR News. Your comments on this issue would be appreciated by the editorial panel.

### Pain in Animals and Humans

#### Behavioral Assessment of Pain:
Nonverbal Measures in Animals and Humans

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#### INTRODUCTION

Pain has been defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage" (International Association for the Study of Pain Subcommittee on Taxonomy, 1979). Given that pain is a subjective experience, it is perhaps not surprising that so much effort in human pain assessment is devoted to the measurement and analysis of pain perception. Pain, however, can have very significant effects on the behavior of humans and animals. In clinical settings, patients experiencing pain often display a variety of behaviors that communicate the fact that they are experiencing pain (Fordyce, 1976). These pain behaviors may include complaints of pain, reductions in activity, increased medication intake, or alterations in facial expressions or body posture. Animals who are exposed to painful stimuli are likewise known to exhibit pain behaviors such as withdrawal from the painful stimulus or other self-protective maneuvers.

Since pain behaviors are overt, they can be observed and recorded. Systematic assessments of pain behaviors have long been viewed as useful in analyzing pain phenomena in animals and are increasingly viewed as valuable by human pain researchers (Dubner, 1989). In the past 2 decades, standardized methods for carrying out behavioral assessments in humans and animals have been developed and evaluated by a number of researchers. Research carried out by these investigators has demonstrated that objective and reliable measures of behavior can be quite useful in the analysis of pain phenomena.

The purpose of this paper is to provide the reader with an overview of behavioral assessment methods commonly used in evaluating pain in animals and humans. The paper reviews behavioral assessment methods utilized in three major settings: (1) the animal laboratory, (2) the...